STAGING FOR CREATIVE COLLABORATION IN DESIGN TEAMS

Models, tools and methods

Doctoral thesis
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Trondheim, 2001

URN:NBN:no-2324

Department of Product Design Engineering
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Trondheim, 2001

Doktor ingeniøravhandling 2001:26
IPD-rapport 2001:11
ISBN 82-7984-188-1
ISSN 0809-103X

Photos in thesis taken by:
Halvor Gudim (chapter 5)
Students and participants in workshops (chapter 7 & 8)
Illustrations: Trond Romø

Text and layout: Microsoft Word, Times 11pt
Printed by Tapir Trykk

URN:NBN:no-2324

Abstract

Many design projects in industry require close collaboration between different actors in companies. Furthermore, due to globalisation and increased competition, companies have a growing need to quickly develop new innovative concepts and products. In this respect it is important to study how creative collaboration in design teams in the early phases of the design process may be stimulated and improved. The main objective of this thesis has been to develop models, tools and methods that stimulate and improve such collaboration. Factors involved in the staging for creative collaboration has been studied, and models, tools and methods have been developed. The empirical material was collected through in-depth interviews of company employees and design consultants. Furthermore, material was collected through action research in a new innovation course at NTNU in Trondheim and in 3 industrial cases.

Initially, three *conceptual models* are proposed and used as a background in the thesis. These models are visualised graphically. The first model proposes that the creative process is an ongoing cycle moving through order and chaos. The second model proposes that design is a creative activity in a dialectic tension. The third model, which is called the vision-based model, proposes that any product may be related to four levels of abstraction: the spiritual, the contextual, the principal and the material levels. All three models can function as tools for discussion and shared understanding in a team. In the innovation course the vision-based model functioned as a supporting tool for creative collaboration in the concept development process.

Further, the physical arrangement of space for creative collaboration in design teams has been studied. Two major concepts are proposed: *Flexible project space* and *activity zones*. The concept of activity zones, where different zones in the workspace are connected to different activities and modes of thinking, has been implemented in a specific case. The general conclusion is that conscious arrangement of space is one of the factors that may improve creative collaboration.

Results from the interviews show the need for a shared innovation level and focus in a design team for good collaboration. It is concluded that participants in a team have different roles and perspectives and in this regard the concept of flexible role structure and the use of role-play are proposed for improving collaboration. The use of scenario play and mental visualisation exercises as tools in the concept development process have also been studied and tried out in courses and in specific industrial cases. The conclusion is that such exercises have both process and problem related effects and can help to improve creative collaboration in design teams.

Based on indicated limitations in existing methodology this thesis proposes finally, as the main contribution, a *vision-oriented methodology* for the early phases of the design process. It is divided into two stages: a vision-based and a specification-based stage. The vision-based stage has focus on user experience and applies visions, rather than specifications, as guidelines in the early phases of the concept development. Two types

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of visions are proposed in this stage: Goal visions and provocative visions. In the provocative visions elements of the goal visions are drawn to the extreme through fantasy scenarios. The methodology also integrates the physical arrangement of space and the use of scenario play, storytelling and mental visualisation exercises. It emphasises the extensive use of associative images and qualitative keywords. It also proposes the use of events, such as conceptual workshops and milestones, during the development process. Furthermore the methodology applies the vision-based model, with four levels of abstraction, as a supporting tool. Parts of the methodology (the vision-based stage) has been tried out and evaluated in the innovation course.

It is concluded that the methodology can help to improve creative collaboration in design teams, especially for projects that have a conceptual orientation and a focus on user experience. With an initial focus on visions it is argued that a design team may more easily create a shared understanding. Furthermore, with the active integration of play and work with visions the methodology seems to be more process oriented, motivating and engaging than traditional methodology. It also integrates the active use of the body and senses and helps to avoid initial mental fixation to existing solutions. It is emphasised that it is important that the methodology is adapted to the specific company setting.

URN:NBN:no-2324

Acknowledgements

This thesis has been carried out at the Department of Product Design Engineering (IPD), at the Norwegian University of Science and Technology (NTNU). The first half year I was affiliated to the Department of Machine Design and Material Technology (IMM). During the doctoral project I had a three months stay at the Faculty of Industrial Design Engineering, at Delft University of Technology, the Netherlands, and a four months stay at the Department of Control and Engineering Design, at the Technical University of Denmark. The financial support for this doctoral project was generously granted by Skanaluminium and the Norwegian Research Council (NFR). This is gratefully acknowledged.

I am deeply grateful to Sigurd Støren who initially believed in me and arranged financial resources for this thesis. We had many fruitful discussions on creativity and human development and Sigurd helped to lift me up and keep in sight a larger perspective. I wish furthermore to thank Per Boelskifte for both the professional freedom, the confidence in letting me partake in the development and teaching of the innovation course, and for fruitful comments on my different concepts in the thesis.

I owe a special thanks to Kristin Støren Wigum for her presence, great friendship, support and patience in everyday life and for inspiration and sharing of visionary ideas in the field of design. Trond Are Øritsland gave many valuable comments and suggestions to different ideas in this thesis. He was also clever to empathise with the different phases I was passing through.

I had the great pleasure to develop and run the innovation course together with Per Finne. In this process I learned a lot, Per shared many visionary and interesting thoughts that were new to me. Mogens Myrup Andreasen challenged me and gave many useful comments during my stay in Denmark. Marvin Rausand, Mette Mo Jakobsen and Johannes Sigurjonsson provided constructive critique and feedback when reading through what I had written. Ole Petter Wullum gave many insights and thoughts in the field of design. Kari Qvam helped with many small practical problems through the years. Per Grøholt, Mette Carlsen, Jacob Buur and Robin Groeneveld were inspirations along the path. My friend Trond Rømo contributed generously with great illustrations. Thanks to all of them!

I express my deep gratitude to my good friend Kårstein Måseide for encouragement, fruitful discussions and general presence during the years of this doctoral project. I owe also special thanks to my mother Judy who did an important job reading proofs and who also showed support and interest in this work. I also give thanks to my two brothers, Arnbjørn and Christian, my aunt Aase and all of my family for their support and kind interest for the subject of this thesis.

All my colleagues at IPD contributed to the learning and general framework of my thesis. Thanks to all of them! Finally I would like to give personal thanks to all the

students who participated and contributed with ideas and feedback in the courses and workshops I was teaching. They indirectly taught me a lot and were very open-minded and willing to try out many new exercises and methods in the courses and workshops!

As you go the way of life,
you will see a great chasm.
Jump.
It is not as wide as you think.

Advice given to a young Native American
at the time of his initiation.

(Told by Joseph Campbell)

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Contents

Chapter 1

Introduction

The switches to light
are in darkness

URN:NBN:no-2324

1.1 Object of study & background

1.1.1 Object of study and aim of thesis

The object of study in this thesis is the conditions for creative collaboration between different actors in a design team, with special focus on the early phases of the design process. The design teams that are in mind are multidisciplinary and consist of employees from different divisions in companies such as the marketing and sales divisions, the internal product development division, the production or technical division. Additionally the teams will consist of external design consultants and maybe also other of consultants. The aim of this thesis is to find out how companies can set the stage, both physically and mentally, to improve creative collaboration in design teams. Creative collaboration is collaboration that involves a great deal of creativity and will require other lines of work than normal collaboration. The intention is that this thesis ends up with new models, methods and tools that will help to improve creative collaboration in such multidisciplinary design teams.

1.1.2 Background and trends

In a world of increasing complexity of products and services and shorter time to market, it is becoming increasingly important to build up teams and networks of employees with expertise from different domains in order to solve integrated design problems. In many design processes nowadays there is a close collaboration and interaction between actors with different expertise, and where an increased number of actors seem to be involved more deeply than before [Rothwell, 1992]. In general, increased use of cross-functional teams in new product development is correlated to higher project success [McDonough 2000]. Besides the need for cross-functional teams it is important that all the groups that are supposed to use the results from the project participate in it [Kirkebak 2000].

Companies are generally experiencing increased competition, due to globalisation, rapid exchange of information through information technology and due to markets that are becoming increasingly open. Companies seem to have a growing need to come up quickly with new innovative concepts and products [Rothwell 1992; Cooper 1993]. In this respect it is important that the companies have design teams who have the ability to collaborate well and also have the ability to work conceptually in the early phases of the design process. Well functioning teams who have the ability to come up with innovative and successful concepts and products will give the company competitive advantage.

Both Olsson [1976] and Andreasen and Hein [1987] have proposed and visualised an integrated product development model where there is a close interaction between the marketing, product and production problems in a development project. The view of Andreasen and Hein [1987] is that many development projects need to be integrated from the start to the end so the development process may be optimised. This is a view that is supported in this thesis. A crucial factor will then be how the different actors in a design team are able to collaborate and how the companies are able to set the stage for good interaction and creative collaboration between these actors in the teams.

1.2 Research orientation, focus & framing

1.2.1 Broad & qualitative approach

Creative processes and collaboration in teams are phenomenon that occur in a complex field with many influences such as culture, history, physical space, attitude, values, roles, chemistry between people, etc. The viewpoint taken in this thesis is therefore that it gives little meaning to isolate, focus and just look at very separate factors in this complex field, but that these factors should be viewed in an overall interconnected totality. The focus of this thesis may therefore be viewed as fairly broad, where there is a study of subjects ranging from the arrangement of physical space for collaboration to suggestions for a vision-oriented concept development methodology. Nevertheless, these interconnected subjects have been divided so they are linked to different chapters of the thesis. In the thesis the links between the different subjects and topics that are brought up in the different chapters will be made.

Many factors and aspects connected to collaboration, interaction and creativity in a company setting seem hard to quantify and isolate, since these factors are rather qualitative and complex. In this thesis the empirical material gathered is mostly qualitative and inter-subjective. It consists of in-depth interviews made of employees in companies and of external design consultants. Furthermore it consists of observations and reflection made in the teaching of a new innovation course at the Department of Product Design Engineering (IPD), situated at the Norwegian University of Science and Technology (NTNU). It also consists of qualitative feedback and reflection from the students in relation to different tools, models and methods that were used in the course. Through phenomenological analysis the aim is that this empirical material collected will give clear indications and suggestions and function as a basis for discussion and reflection. This thesis leads not directly to ‘hard’ proofs. Information concerning the research approach and methods in the thesis is presented and discussed in chapter 3.

1.2.2 Physical meetings

The framework and focus in this thesis lies on meetings, workshops and events where the design team is meeting in a physical space. It is acknowledged that the use of electronic mail, virtual meetings and computer supported cooperative work (CSCW) over the web are becoming increasingly used, also in connection with product development. Nevertheless, it is the viewpoint and assumption taken in this thesis that people will still need to meet physically in the future, and that the quality of such meetings will also be important in the future. One could nevertheless say that an increased use of virtual meetings will influence the physical meetings and how these meetings are arranged. This will be discussed in chapter 6. Some of the concepts and ideas proposed for physical meetings may furthermore hopefully also be adapted and transferred to computer supported co-operative work.

1.2.3 Team process orientation

Traditional design methodology [e.g.; Pahl and Beitz 1984; Roozenburg and Eekels 1995; Ulrich and Eppinger 1995] has been largely problem oriented and has put little focus on the interactions between the different actors in the design team. This is discussed thoroughly in chapter 2. It is the position of this thesis that design methodology should incorporate and put emphasis on the interaction between actors in the design team, since this interaction is viewed as important for the design process. Organisational tools and human process tools [Cummings and Worley 1997] which are supposed to help the team process do not seem to be linked to design methodology in itself. In this regard it is viewed as important to develop tools and methods that can help to create a stronger team feeling, motivation and atmosphere while they at the same time may help to solve the problems and task at hand. Factors connected to the social process of the team should, if possible, be integrated with the task of solving the problems in the project. This viewpoint correlates with the tendency and trend that employees are increasingly seeking to have challenging, fun and rewarding work where they can develop their own skills, knowledge and personality through daily practice [Cummings and Worley 1997].

In agreement with [Kunde 2000] it is the position in this thesis that the external image of the company through their products should correlate with the internal culture in the company. The values and intentions in the products should reflect the internal culture in the company, forming a total identity and “corporate soul”. With this position it is important that some of the values from the team processes are reflected in the products, and vice versa.

1.2.4 User experience orientation

In recent years the focus on the user's total experience when interacting with the product has become increasingly important, especially where the differentiation between products is not so technical and functional, but mainly based on aesthetics, experience, branding and social values [e.g., Norman 1998]. A new field, called interaction design, is quickly emerging. In this thesis the initial focus for the concept development and design of products is linked to the user experience. The companies that have been chosen as basis for investigation in this thesis are companies that are making products in a market where aesthetics, user experience and brand are viewed as central elements of the products. The companies selected for in-depth interviews, which is discussed in chapter 3, are all developing interior products, such as furniture, stoves and lamps. Initially Skanaluminium, who funded this thesis together with the Norwegian Research council (NFR), desired that the company cases studied should be connected to the use of aluminium. This condition was dropped later in the thesis. Skanaluminium contributed initially in the contact towards some of the companies, as described in chapter 3, and this influenced initially the choice of companies for interviews.

1.2.5 Conceptual phase

The focus and object of study in this thesis is the staging for creative collaboration in design teams. The main focus lies furthermore on the conceptual phase of the development process. This is a phase in the design process that is often described as "messy", being a "fuzzy front end" lacking adequate methods and tools [Montoya-Weiss and O'Driscoll 2000]. A number of studies have nevertheless pointed to the importance of the early conceptual phases in new product development. These phases are concerned with a number of critical decisions that have great impact on the performance of product development [Verganti 1997]. It seems therefore important to develop tools and methods for this "fuzzy front end". The models, tools and methods that are developed in this thesis are mainly intended for this phase. It is nevertheless the intention that several of the models, tools and methods described may be used in other phases in the development process.

In this thesis the background and starting point is that many design processes require nowadays a close collaboration between actors with different expertise and that many projects in companies are team based with meetings and close interactions between team members. Several studies also indicate the importance of close collaboration and early involvement of key development roles in product development [Verganti 1997]. It is not the goal to discuss if some projects could

have been done better with just individual work, but take as a basis that teams are used and viewed by the company as necessary and from this basis look at how the staging for creative collaboration between these team members may be improved.

1.2.6 Organisational aspects

This thesis has a focus on both the physical space arrangement and mental staging connected to creative collaboration. It is taken as basis that a team is composed of participants from different divisions and areas of the company such as marketing, production, product development, sales, etc., and of external design consultants. It is also taken as a framework or basis that this team has a development project they are set to work and collaborate on. The team has to have meetings and has to work together in the project. There is little focus on the structural and organisational aspects of team collaboration, such as for instance the size of the team, the empowerment of the team, the type of expertise present, the support of the top management, the amount of information and knowledge available, the sufficient amount of resources allocated, the initial interdependence and commitment of the team members and the team integration policy at the company. There is furthermore little focus on how decisions are made and who has the mandate to make the decisions.

All these aspects are viewed as crucial conditions for team collaboration, but are not the main focus in this thesis. Much literature and research already exists on these matters [Rothwell 1992; McDonough 2000]. The focus lies on the staging for creative collaboration in design teams connected to development projects, such as physical staging, the use of exercises and supporting tools and the specific, overall concept development methodology. Nevertheless, some theory and concepts on structural and organisational aspects of team collaboration will be mentioned in chapter 2 since there are overlapping areas of interest in regard to this thesis.

1.3 Assumptions and research questions

1.3.1 Assumptions

Two assumptions, which indicate the perspective and viewpoint taken in the thesis are made:

A1. Optimising the staging for creative collaboration between different actors in a design team will increase the chances for making successful products.

A2. The extensive use of tools, model and methods for improving collaboration in the design process will over time influence and change the internal culture in the company towards a more creative culture than previously.

The first assumption made in this thesis is making the link and connection between the staging for collaboration and success of final products. It appears almost impossible to really 'prove' such a link. It must therefore be taken as an assumption. The second assumption is connected to the idea that employees who have used tools, exercises and methods for improving collaboration will over time also change their own attitude and values both towards themselves and others. They will furthermore get skills and competence that they directly or indirectly will use in their own daily practice and in the interaction with other employees.

1.3.2 Research questions

The aims and assumptions of this thesis have now been stated. They provide the basis for the research questions. The first two questions that are posed are related to the status quo and existing practice in companies:

Q1. How are the different actors in a design team nowadays interacting and setting the stage for creative collaboration in the development of new concepts and products?

Q2. What factors or elements are influencing and forming the setting of the stage for creative collaboration in design teams?

These two questions are investigated through observation and inquiry concerning existing practice. Through this investigation a ground of understanding is developed which naturally leads to the second set of questions, which are related to the potential improvement of creative collaboration in design teams in relation to existing practice:

Q3. How may the company set the stage, both mentally and physically, to improve creative collaboration in design teams in relation to existing practice?

Q4. What type of models, tools and methods may be used to improve creative collaboration in design teams?

The intention is to develop and evaluate tools, models and methods that may improve creative collaboration in design teams in relation to existing practice. Probable answers, indications or suggestions to these questions will be proposed, formulated and evaluated in the next chapters of this thesis. The type of models,

tools and methods developed and investigated may be *process oriented*, which means that they are connected to the improvement of the team atmosphere, mood, motivation and spirit that so indirectly leads to an improvement of the creative collaboration in design teams. The type of models, tools and methods developed and investigated may on the other hand be *problem oriented*, meaning that they are connected to improvements in relation to solving of the design problems in the team. The models, tools and methods may finally be both process and problem oriented in connection with creative collaboration in design teams.

1.4 Structure and contributions of the thesis

1.4.1 Structure of the thesis

In this section the general structure of this thesis is presented. It is emphasised that the readers do not necessarily have to read the thesis in a chronological order, even though this is favourable for the total understanding. Readers may choose to read specific chapters that they view to be of the most interest. It is nevertheless important to emphasise that the different chapters are interconnected and to really understand one chapter it will generally be of help to read some of the other chapters.

In **chapter 2** *different theories and concepts* are reviewed on creativity, play and imagination, communication, team collaboration, environmental aesthetics, arrangement of space and on design methods and approaches. This chapter functions as a basis for the forthcoming chapters 4, 5, 6, 7 and 8 in the thesis.

In **chapter 3** the *general research approach* and *the specific research methods* used in the thesis are outlined and discussed. There is a description of the methods used for inquiry: in-depth interviews with employees in companies and action research and qualitative feedback from students in class.

In the following chapters (4-8) models, concepts, tools and methods to stage for creative collaboration in design teams, are proposed, reviewed and discussed.

In **chapter 4** three *conceptual models* are proposed and discussed:

1) The *process model*, describing the creative process as an evolutionary cycle going through phases of chaos and order, discomfort and comfort, divergence and convergence.
2) The *dialectic model*, describing design as a creative activity in dialectic tension between “soft” and “hard” aspects and approaches to the design field.

3) The *vision-based model*, describing aspects of products in four levels; the spiritual (intention), the contextual (expression), the principal (concept) and the material (product) levels.

The first two models (the process model and the dialectic model) may be viewed as giving new insight and understanding to the field while the vision-based model may also be viewed as an operational model, in addition to giving insight and new understanding. The vision-based model has been tried out in several concept development courses and workshops. All three models, but especially the vision-based model, are used as frameworks for discussion in the following chapters.

In **chapter 5** the *arrangement of physical space* for creative thinking and collaboration is investigated. This arrangement of space is related to both the specific meetings in design teams and to the general space where people are meeting and collaborating. Two major concepts for organising and arranging work space are finally proposed: *Flexible project space* and *activity zones*. The concept of activity zones is tested and evaluated in a specific company case.

In **chapter 6** the *project staging and team framework* is investigated. Based on the interviews this chapter discusses the importance of atmosphere and general attitude in a team. Furthermore, there is a discussion on roles, ownership and sectional interests and the problems connected to different conceptual levels and skills in design teams. The concepts of using happenings and events in the design process are proposed and discussed.

In **chapter 7** the concepts of using *scenario play and mental visualisation exercises* as tools for creative collaboration in design teams are proposed and discussed. Both process and problem related effects of scenario play and mental visualisation exercises are reviewed.

In **chapter 8** a *vision-oriented methodology* for the early phases of the design process is proposed and discussed. In this methodology the total user interaction experience is the focus and starting point for the development of product concepts. The methodology is divided into a vision-based stage and a specification-based stage. This methodology is closely related to the vision-based model that was proposed in chapter 4. Elements from chapter 4, 5, 6 and 7 are integrated and part of the overall methodology, see figure 1.1.

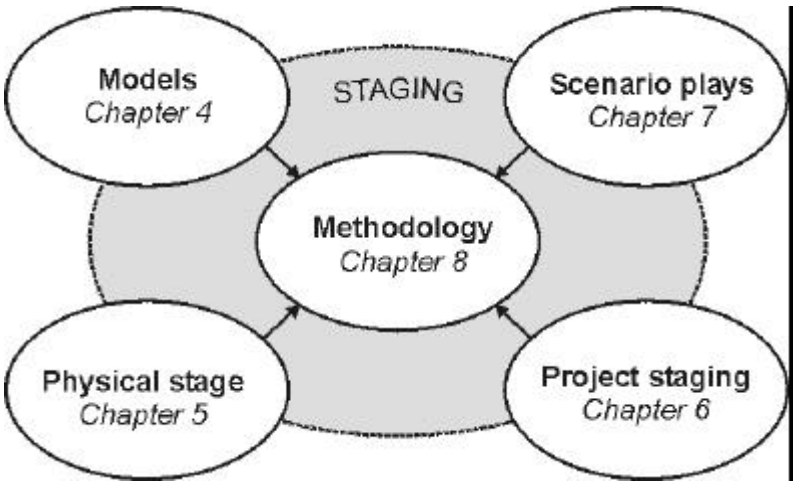

Figure 1.1 Elements from chapters 4-7 are integrated into the vision-oriented methodology.

In **chapter 9** evaluations of results and research methods are made and some final conclusions are drawn. Furthermore, recommendations for further work are proposed.

1.4.2 Contributions of the thesis

In this section the contributions of this thesis to the field of design and design methodology are outlined.

Vision-oriented methodology
The main contribution of this thesis is the development of a vision-oriented concept development methodology. This methodology integrates the use of exercises, the arrangement of space, the use of a vision-based model and the use of events and happenings in the design process. The methodology is related to two stages; the vision-based stage and the specification-based stage. The overview of different presentation tools proposed for the different phases in the vision-based stage, such as poetic and visual images, stories, scenario plays, sketches and props, is viewed as a contribution to the field of design methodology. The proposal of two types of visions, goal visions and provocative visions, as support for the concept development process is also viewed as a contribution to design methodology.

Conceptual models
In this thesis three conceptual models are proposed which are related to creativity and design. All three models are viewed as a contribution to the field of design, since they show graphically important relations that have not previously been visualised in a similar way. In one of the models, the vision-based model, a link is proposed between the spiritual and contextual aspects of products and the principal and material aspects of products. As a supporting tool for concept development in teams this model contributes to the field of design methodology.

Overview of the field
A large extent of in-depth interviews of designers and of employees in five Norwegian companies has contributed to give an overview of the team collaboration in product development projects. Factors that are inhibiting creative collaboration, such as different conceptual levels, sectional interests and fixed roles in design teams are outlined. The thesis also gives an overview of current research in relation to concept development and creative collaboration in design teams.

Arrangement of physical space
The concepts of *flexible project space* and *activity zones* in workspace are proposed and viewed as a contribution to the field of design methodology. This thesis contributes generally to put focus on and awareness around the physical arrangement of space as a way to support creative collaboration in design teams. It has also contributed in making the link between physical arrangement of space and working procedures.

Exercises
The use of exercises as tools to improve creative collaboration in design teams has been little investigated in design research. This thesis has investigated and studied the use of scenario play, storywriting and mental visualisation exercises as tools to stimulate creative collaboration in design teams. Such exercises do function as tools for improving and stimulating creative collaboration in design teams. This investigation and the results from this investigation are viewed as contributions to the field of design methodology.

Process related effects
This thesis proposes and reviews tools and methods which have both problem and process related effects on team collaboration. Tools which have process related effects have previously been little investigated. Literature concludes that it is important with a good team climate with trust and mutual respect, but seldom suggests concrete tools, such as exercises, to improve team collaboration.

Different paradigm

This thesis indicates a different paradigm for design methodology compared to traditional methodology. In this paradigm play, imagination, visualisation, team atmosphere, arrangement of space and the use of events, exercises, visions and scenarios are a natural and integrated part of the methodology. In this paradigm the use of the whole body and not just the mind is actively integrated. The paradigm is thus significantly different in relation to the attitude towards how humans should collaborate and work together and how design projects should be carried out. It is also different in relation to how products are perceived and developed, where for instance the spiritual and contextual aspects of products are viewed as essential in the development of new products.

Chapter 2

Theory and concepts

Generally the theories we believe
we call facts,
and the facts we disbelieve
we call theories

- Felix Cohen

URN:NBN:no-2324

This chapter presents theories and existing concepts which form a background for the chapters 4, 5, 6, 7 and 8 in this thesis. As discussed in chapter 1 the study of the staging for creative collaboration in design teams is a complex field with many influences such as culture, history, physical space, attitude, values, roles, chemistry between people, etc. The viewpoint taken in this thesis is therefore that it does not make so much sense to isolate, focus and just look at very separate factors in this complex field, but that these factors should be viewed in an overall totality. The focus of this thesis may therefore be viewed as fairly broad, where there is a study of subjects ranging from the physical arrangement of space for collaboration to suggestions for a vision-oriented methodology for the early phases of design. In this chapter the most relevant theory and concepts for this thesis are presented. The theory and concepts are related to creativity and creative processes (2.1), play and imagination (2.2), communication (2.3), team collaboration and organisational change (2.4), environmental aesthetics and physical arrangement of space (2.5) and design methods and approaches (2.6-2.8). In figure 2.1 a visual overview of this chapter is given.

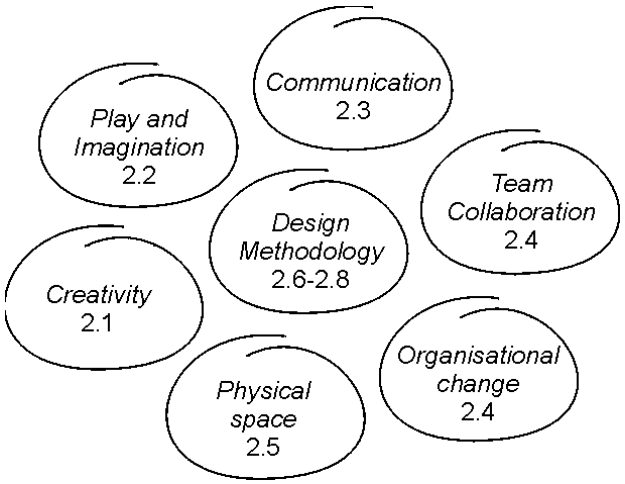

Figure 2.1 An overview of theory and concepts

2.1 Creativity and creative processes

In this subchapter some general theories and empirical results on creativity are shortly presented and discussed, as theoretical background for the thesis. First, general definitions on creativity are presented, followed by a general discussion on creativity and research in creativity. Theories and concepts on creativity and the creative process are then presented. The ability to combine ideas and creative imagery is reviewed in relation creativity and different types of motivators that seem to enhance and diminish creativity are also reviewed.

The way a problem is formulated and the danger of mental fixation seem also to be central challenges in the understanding of creativity. Concepts and research on this matter are briefly presented. The concept and theory of flow is then described and finally some aspects connected with organisational creativity are presented. The material presented in subchapter 2.1 is viewed as central for all the chapters 5, 6, 7, 8 in this thesis.

2.1.1 General definition of creativity

Creativity can be defined in several ways. It can be defined as the ability to produce work that is both novel (i.e., original, unexpected) and appropriate (i.e., useful, adaptive concerning task constraints) [Sternberg and Lubart 1999]. Boden [1999] defines creativity in a similar way: It is the generation of ideas that are both novel and valuable. Singer and Singer [1990] describe creative processes as the ability to produce varied and flexible associations, what is called divergent cognition. [p. 129]. Another definition is that creativity is the combination of two or more ideas into a new and more useful one [Bernsen 2000]. Some describe creativity as the ability to ask the right questions. Kao [1996] describes creativity as the ability to have two contradictory ideas in the head at the same time. In general creativity has something to do with coming up with new ideas that are experienced as novel and useful. What is understood as novel and useful will of course depend upon the specific context. This leads to the idea of distinction between different forms of creativity, based on the perspective and context.

2.1.2 Creativity and public recognition

Good ideas do not automatically translate into accepted creative products. Psychological theorists generally acknowledge this viewpoint [Csikszentmihalyi 1999]. In relation to this acknowledgement Maslow [1963] views the process itself as important, and not the outcome of the process. He viewed the quality of the subjective experience as important, not the judgement of the world. According to Csikszentmihalyi [1999], on the other hand, if creativity is to retain a useful meaning, it must refer to a process that results in an idea or product that is recognised and adopted by others. He views creativity as a phenomenon that is constructed through interaction between producer and audience. He describes creativity as a process that can only be observed at the intersection where individuals, domains and fields interact. Csikszentmihalyi defines the field as the social organisation of the domain.

This is a strict definition of creativity, which makes it difficult to use the term, and is not supported by many researchers in the field studying creativity [see Sternberg, 1999]. Who has the right to define that an achievement is creative? How many people in the field must agree that an achievement is creative before one may put the label 'creative' on it? The origin of the word comes from the verb 'create'. In this thesis, when the term 'creative collaboration' is used, creativity does not have the strict and academic definition made by Csikszentmihalyi. It is closer to the view propelled by Maslow. In this thesis a smaller intersubjective group, like a group in a company may define for themselves, based on their intersubjective experience, what is 'creative' activity, within their social construction. If several employees in a company feel subjectively that they have had a creative collaboration then this view will be accepted in this thesis.

When the term "creative collaboration" is used in this thesis it is not necessarily connected to collaborations that lead to revolutionary concepts and products that a unity among experts in a domain view as creative. The definition made of 'creative' in this thesis lies somewhere in between what Csikszentmihalyi defines as 'personally creative' and 'universal Creative', [see Csikszentmihalyi 1996, p. 25-26]. Several researchers have used the term creative collaboration in relation to design practice [e.g., Bray 2000, Reid et al 1998].

2.1.3 Research on creativity

According to Wehner et al. [1991] who studied 100 dissertations in the field of creativity there are many approaches to the field. They ranged from psychology, education, business, design, history, architecture, sociology and political science. The different fields tended to use different terms and to focus on different aspects of what seemed to be the same basic phenomenon. Psychological research on creativity, which often has claimed a monopoly on research in creativity, has generally focused on the individual or group, isolated from its social context. This has been criticised by many authors [e.g., Csikszentmihalyi 1999, Kupferberg 1996]. Business dissertations used the term *innovation* and tended to look at the organisational level, whereas psychology dissertations used the term *creativity* and looked at the level of the individual. It is also clear that doctoral thesis in this area will range from the use of hard, experimental and quantitative approaches to soft and qualitative approaches. The approaches will vary depending upon the field and specific 'school', and will depend upon what is the subject of study. This thesis uses qualitative methods in the study and collection of empirical material. This is discussed in chapter 3.

2.1.4 The creative process

Vygotsky [1995] described the creative process as a process in two major phases. The first phase is the dissociation phase, where the complicated totality is separated into pieces. He writes: *"So one is later able to connect the different elements one must first break down the natural connection between the elements, the connection that one does perceive them"* [p.32]. The next phase is the association, the combination of dissociated and changed elements. Finally in this phase comes the combination of the separate images, and putting them into a system and creating a total image. With some similarity to these ideas Kurt Lewin [1951] developed the idea of systems as changing from a condition of equilibrium, in the stages of unfreeze, change, refreeze. The frozen states are for instance those of fixed beliefs. In chapter 4 a visual model for the creative process is proposed, which has some similarity to the two above mentioned concepts. In this model the creative process is understood as an evolutionary movement going through order and chaos, involving on the one hand discomfort, anxiety and breaking up, in the movement towards chaos, and on the other hand comfort, crystallisation and insight in the movement towards new order. In the creative process one may go through such a cycle many times on different levels of abstraction. This understanding of the creative process is important and useful in the discussion of a new concept development methodology in chapter 8, where the different stages in the methodology involve phases of divergence and convergence.

2.1.5 Conceptual combination, imagery and metaphors

Several researchers of the creative process have identified the synthesis or merging of previously separated concepts as being crucial to human creativity [e.g., Baughman and Mundford 1995, Koestler 1964, Rothenberg 1979]. Creators themselves regularly comment on the generative power inherent in considering novel combinations of concepts [see Donaldson 1992, Freeman 1993, Bernsen 2000]. Several creative techniques are based on forcing together ideas and thus forming new ideas and concepts, such as forced relationships. The ability to make associations and combine concepts that originally did not have anything in common seems to be central in creative activity, and will be central in the discussion in chapter 8 in connection with the presentation of a vision-oriented methodology.

A lot of studies have shown the importance of creative imagery in relation to creativity [e.g; Ward et al 1999]. In a study about architectural students the free play of metaphors was a central element of the creative process [Coyne, 1994]. As Bratteteig and Stolterman [1997] writes: *"In a creative design process one thing*

leads to another, analogies and metaphors influence the design thinking in new ways, a certain chaos is present." The ability to imagine, to visualise images and use metaphors cannot be underestimated as a crucial factor for creative capability. This understanding of the importance of images and metaphors is central in relation to the tools presented in chapter 7 and in relation to the general concept development methodology proposed in chapter 8.

2.1.6 Creative behaviour and motivation

Amabile [1983] has argued that there are three crucial components involved in the production of creative work: *Intrinsic task motivation*, *domain relevant skills* (expertise and talent in the task domain), and *creativity relevant processes* (cognitive skills and work styles conducive to the production of novelty). She divided between intrinsic and extrinsic motivation, where *"the intrinsically motivated state is conducive to creativity, whereas the extrinsically motivated state is detrimental*" [p. 91]. Intrinsic motivation is defined as *"the motivation to engage in an activity primarily for its own sake, because the individual or group perceives the activity as interesting, involving, satisfying, or personally challenging"*. Extrinsic motivation is defined as *"the motivation to engage in an activity primarily in order to meet some goal external to the work in itself, such as attaining an expected reward, winning a competition, or meeting some requirement*" [Collins and Amabile, p.298].

When the work is externally 'motivated', such as pressure from the outside, control, observation and direction of one's work then creativity is reduced. Csikszentmihalyi [1996] also noted intrinsic motivation as a personal characteristic that contributes to creativity. He suggested that high levels of intrinsic motivation, accompanied by relatively low levels of extrinsic motivation, may help creative individuals to be more independent of their field because they are less susceptible to pressures to conform. Much extrinsic motivation forces individuals and groups easily to conform. A number of studies have shown the detrimental effect of extrinsic motivators and extrinsic constraints to creativity [Collins and Amabile 1999, p. 302]. Extrinsic motivation may draw the attention away from the task and thus decrease the task involvement [p. 303].

Under certain circumstances extrinsic motives may not be detrimental to creativity. Some empirical research has indicated that when subjects had been explicitly instructed to try to generate unusual responses, reward was found to enhance creativity. Evaluation or feedback that is informative and constructive or that recognises creative accomplishment can also be conducive to creativity [see Collins and Amabile 1999, 304]. Due to these results and other work the concept of extrinsic motivation has been refined to include two facets: control and

information. Amabile [1993] has described two types of extrinsic motivators: *Synergetic extrinsic motivators*, which provide information or enable the person to better complete the task and which act in concert with intrinsic motives; and *nonsynergistic, extrinsic motivators*, which lead the person to feel controlled and are incompatible with intrinsic motives. It seems also important that extrinsic motivators are in the service of intrinsic ones, and not the opposite. High levels of intrinsic motivators are suggested to be particular important when the emphasis is on novelty. Furthermore, synergetic, extrinsic motivators may be more important when the emphasis is on persistence and evaluation. Some results indicate also that there may be personal differences in the way a person interprets and reacts to extrinsic motives and constraints [Collins and Amabile 1999, p. 307].

In general, the conclusion made is that intrinsic motivation is important for the creative process, and that extrinsic motivation, in form of control and too strong external requirements has a detrimental effect on creativity. This understanding of motivation is central in relation to chapter 7 and 8, where the discussion suggests that the design methodology and tools for the design process should in themselves help for motivation.

2.1.7 Problem formulation and fixation

An central aspect related to creativity and concept development is how the formulation of the problem influences the concepts derived and the solution space. A number of studies have attempted to characterise how the central properties of known concepts or recent experience influence the development of new ideas. For instance, a study by Goldschmidt et al [1996] has indicated that 'closed' formulations that present a concept with existing, familiar solutions of similar design problems lead to less creative solutions than 'open' formulations that avoid those familiar concepts. Jansson and Smith [1991] have also shown through experiment that designers who were given an example design before solving a problem often created solutions that conformed to the example. Thus, previous product exemples can influence the content of imaginative creations even in the case of design experts.

When a designer develops a new concept he will base his concepts on past images, experience and knowledge. At least as far as the designer or problem solver is not aware of the tendency to fixate and connect to known images, the ideas and concepts derived will easily be conformed. In some cases researchers have found out that a simple warning is enough to avoid mental blocks [Luchins and Luchins 1959]. Other studies indicate that conformity effects are not diminished when subjects are urged to give ideas very different from the examples they view [Smith et al 1993, Jansson and Smith 1991]. One could thus conclude that creative

solutions easily can be inhibited by mental and functional fixation, maybe even when designers are aware of this tendency. Furthermore one could conclude that the way the problem is formulated and how the mind is initially fixated is important for the final outcome. The most creative step in a design process may thus be to derive and formulate the real problem and solution space. This understanding is central in relation to the framework for the design process and will be brought up again in chapter 8 in relation to the proposed concept development methodology.

2.1.8 The Flow experience

Csikszentmihalyi [1996] and his team have described a flow state, an experience of optimal involvement in an activity, based on interviews with many famous scientists, athletes and artists. He argues that people involved in creative pursuits actively seek flow experiences and that creativity is more likely to result form such states. Flow experiences are enjoyable states, which could be viewed as states that more often are connected with creative activity. Nine main elements were mentioned over and over again: 1) Clear goal every step of the way, 2) immediate feedback to one's action, 3) balance between challenge and skills, 4) action and awareness are emerged, 5) distractions are excluded from consciousness, 6) no worry of failure, 7) self consciousness disappears, 8) the sense of time becomes distorted, 9) the activity becomes autotelic, there is enjoyment in the task for its own sake. Many of these findings such as the right level of challenge, absorption in the work, doing the work for its own sake and pleasure, deep concentration are supported by other studies [Collins and Amabile, 1999]. The flow state is often connected to play [Sutton-Smith 1997], which is discussed in subchapter 2.2. A relevant question is what tools and methods may help so a design team more easily may enter into a state of flow, total presence and shared imagination. Play and mental visualisation exercises, discussed in chapter 7, will address this matter.

2.1.9 Organisational creativity

Constant, open communication between segments of an organisation is an essential ingredient for creative production [Kanter, 1988]. Williams and Yang argue that traditional concepts of organisation have had the effect of minimising employee creativity [1999, p. 374]. They also argue that the creative process is perceived as taking place within the context of a particular environment rather than in a vacuum [p. 379], which is similar to the idea brought up by Csikszentmihalyi [1996] concerning his theory of field and domain. Environmental stimulation and organisational context seems to be important for

creative accomplishment [Williams and Yang, 1999]. Organisational structure may enhance or diminish organisational innovation.

The innovative process is seen as being uncertain and unpredictable, it is knowledge intensive, controversial and it crosses boundaries. Thus, innovation is seen most likely to flourish under conditions of flexibility, quick action and intensive care, coalition formation and connectedness. Creativity may be enhanced if managers establish environments in which people can freely exchange their ideas and explore mutual interests in their work [Collins and Amabile 1999, p. 306]. Sternberg and Lubart [1999] express the importance of having an environment that is supportive and rewarding for creative ideas [p. 11]. Nonexperimental research on the effects of competition in the workplace has reported that creative performance is higher when competition occurs between groups than within groups [see Collins and Amabile 1999, p. 308]. Kanter [1988] states that innovation may more easily occur in organisations that (a) have integrative structures, (b) emphasise diversity, (c) have multiple structural linkages inside and outside the organisation, (d) have intersecting territories, (e) have collective pride and faith in people's talent, and (f) emphasise collaboration and teamwork. According to Coch and French [1948] much resistance in organisations to change stems from *motivational barriers* rather than from unfamiliarity with or unwillingness to acquire new skills.

The understanding that organisation culture and environment are central for the creativity in groups will be background material later in the thesis. It is for instance important, in the implementation of radical new tools, as discussed in chapters 5-8, that there is a general openness and acceptance in the organisation and especially top management for trying out such tools.

2.2 Play and imagination

"*Every good idea and all creative work are the offspring of the imagination, and have their source in what one is pleased to call infantile fantasy. Not the artist alone, but every creative individual whatsoever owes all that is greatest in his life to fantasy. The dynamic principle of fantasy is play, a characteristic also of the child, and as such it appears inconsistent with the principles of serious work. But without this playing with fantasy no creative work has ever yet come to birth. The debt we owe to the play of imagination is incalculable* ." [Jung 1921: par. 93].

"*Man plays only when he is in the full sense of the word a man, and he is only wholly a Man when he is playing"* [Schiller 1965, p.80]

These two starting quotes from Jung and Schiller describe imagination and play as central for both creative activity and work and for the essence of being wholly human. Up through history imagination and play have been given different value. As will be discussed in this chapter many adults and researchers have had an ambiguous relationship to play. This section 2.2 will present general concepts, theories and research on the field of play and imagination. It is especially relevant in relation to chapter 7 of this thesis, which presents qualitative, playful tools for creative collaboration.

2.2.1 Ambiguity of play

Bateson [1972] describes play as a paradox because it both is and is not what it appears to be. Sutton-Smith [1997] calls his latest book on play "the ambiguity of play", emphasising this characteristic of play. Animals at play, for instance, bite and fight each other playfully, still in a way that indicates that it is not a "real bite" or a "real fight". Sutton-Smith refers to Empson's "Seven types of ambiguity" which he says can be related to play [p.2]. These are (with the play example in parentheses):

1. the ambiguity of reference (is that a pretend gun sound, or are you choking?);
2. the ambiguity of the referent (is that an object or a toy?);
3. the ambiguity of intent (do you mean it or is it pretend?);
4. the ambiguity of sense (is this serious, or is it nonsense?);
5. the ambiguity of transition (you said you were only playing);
6. the ambiguity of contradiction (a man playing at being a woman);
7. the ambiguity of meaning (is it play or playfighting?)

Finally there is also the ambiguity that grown up people and many researchers have in relation to play. There is a general attitude and tendency to view play as a childish activity which is important for the development of children, but at the same time which adults should not be involved in or admit they are partaking in. With such an attitude it would be appropriate and 'correct' to say that adults recreate, children play. Sutton-Smith [1997: 7] describes it in this way: *"There are the ambiguities that seem particularly problematic in Western society, such as why play is seen largely as what children do but not what adults do; why children play but adults only recreate; why play is said to be important for children's growth but is merely a diversion for adults."* Sutton-Smith also tells that people will often call different play activities with other names, such as entertainment, recreations, pastimes and hobbies, as it would be *"an embarrassment to admit that they can also be called play"* [p. 4]. This understanding of the attitude towards play among adults seems to be important to have in the back of the head when one

is attempting to introduce play exercises as help for collaborative work in design teams, as will be described in chapter 7.

The seven types of ambiguity listed above have some parallels to the list of five criteria Singer and Singer [1990] have for symbolic or pretend play:

1. Familiar activities may be performed in the absence of necessary material or a social context.
2. Activities may not be carried out to their logical outcome.
3. A child may treat an inanimate object as animate (offer food to a teddy bear).
4. One object or gesture may be substituted for another (a block becomes a pot).
5. A child may carry out an activity usually performed by someone else (pretending to be a doctor). [p. 65]

When implementing play exercises for design teams, as proposed and discussed in chapter 7, it is relevant to relate to these criteria for symbolic and pretend play.

2.2.2 Bateson's concept of play

This section 2.2.2 presents Bateson's [1972] concept of play. Some of the ideas presented here could also fit to the subchapter 2.3 which presents theory and concepts on communication in general. Bateson describes that in play the different actors must set the "frame" or context for play, so others understand that it is play. The "frame" is the enabling device allowing the fictive world of play to operate. When two animals are play fighting, they must exchange messages or signs of fighting and at the same time give signs that "it is play". These messages are what Bateson calls metacommunication [p. 178] or communication about communication. Bateson distinguishes between three types of messages: a) mood signs (like in fighting), b) messages which simulate these mood signs and finally c) messages which enable the receiver to discriminate between signs of type a) and b) [p. 189]. The message will also be dependent upon the frame and context. A message in one context or environment may be understood differently than in another context or environment. There are different "play rules" depending upon the social and environmental context, and different people may have individually different rules for play. When introducing play exercises in design teams this is important to have in mind.

Many researchers on play claim the division between reality and play (or fantasy) is so important for children that they during the play will signalise if they are inside or outside the play context or play "reality" [Berg 1999: 294]. According to Bateson there will be a circular connection between the development of metacommunication and the ability to play. Play is a condition for the

development of metacommunication ability and metacommunication is a condition for the ability to play. When one wants to make a real change in communication one has to make a change also on the meta level. One has to make a change in the set of rules for the making and understanding of the messages [p. 191].

The difference between play and seriousness can be very small, and it is the frame and context that the players set that defines if it is play or serious. At the same time play is by nature ambiguous, so often the message will on one level be not serious, while on another level be serious. Furthermore, people will sometimes understand differently the "frame" and context, based on their previous experience. In play the different participants will try to form and change the context. Whether this change is successful is dependent upon how the others participants understand and accept this change of context or these signs on a metacommunication level. This understanding is central in the setting of the frame for play in a design team, discussed in chapter 7.

2.2.3 Degree of flexibility and novelty in play

According to Berg [1999] play can be on an experimental scale that is quite broad. It can, on the one extreme, be mostly the repetitive imitation of some kind of experienced "reality", which at least from the outside is experienced as stiffened in one form. On the other extreme it can be a type of play that is based on some kind of knowledge or experience, but has a high degree of fantasy, flexibility and unpredictable. It is then play that is driven forward by the experience of the participants of the spontaneous and paradoxical as something fun and pleasurable [p.298]. Equally, the use of scenario play exercises in design teams may be more repetitive or more experimental in character.

2.2.4 Involvement and elements of play

To get involved in the play requires that we do not stand on the outside or above the play but that we get totally involved in the activity [Bakhtin 1981]. This is similar to the state of "Flow" described by Csikszentmihalyi [1996]. It is central to playing that the players indulge in the "magic formula" of the play, one needs "mindful engagement" [Salomon 1995]. It is important that the participants do not stay on the outside. One of the conditions for achieving such involvement is that the participants need to have a shared language or code where they communicate what they want to communicate in play. Such communication will be like "you can join the play" or "this is play" or "now it is no longer play, now it is really serious" [Bateson 1972, Kupferberg 1996:169]. The general public, the observers

will also be a part of the play, they do not act as distant observers, but as participants that get involved in what is happening [Gadamer 1965].

In the act of playing there are often some general characteristics. Stewart [1978] describes in detail how playful forms depend upon such elements as reversal and inversion, exaggeration, paradox, playing with boundaries, playing with infinity, playing with space and playing with time. An important aspect of play is the manipulation of established expectations through tricks, pranks, teasing, riddles, puzzles, sound play, spelling play, grammar play, genre play and puns [McCarthur 1992, p. 787]. The manipulation of established expectations may also be a way to break loose from the existing fixation. This is discussed in chapter 8 in relation to the use of provocative visions.

2.2.5 Place to play

Several play researchers point to the importance of having a place to play for children, both physically and mentally. Singer and Singer [1990] writes: "*Just as children need a special person to sanction and inspire their innate curiosity and their eagerness to explore, they also need a place to play and enough time to carry out their adventure*" [p. 11]. A good playground, which the environment has accepted as a place for play, can thus be an important place to foster make-believe and imaginative play. The social environment has then accepted that the place has its own rules, which is legalising and supporting play activity. This understanding, connected to the framing of playgrounds, is central when discussing space and zones for play and creative collaboration in chapter 5.

2.2.6 Pretending and imaginative worlds

In the following sections 2.2.6 - 2.2.9 concepts connected to pretending and imaginative play are presented. This is especially relevant in relation to chapter 7 where play and visualisation tools for collaboration are discussed.

A fundamental aspect of play is the character and element of "pretending". Something that one is "just playing" differentiates clearly from not-play, because it happens not "in real" [Olofsson 1990: 17]. So on the one side play is very serious, children who are playing can be very serious and deep concentrated. At the same time it is "not for real", it is an imaginative world the participants have created with its own rules and laws. The one that plays steps for a while out of this life and "reality" and into an activity space that has its own laws and rules [Huizinga 1993].

The imaginative world also functions as a space to work with difficult problems. Kupferberg [1996] writes: *"The play forms a sort of free space in the human condition, a space where we can work on difficult problems and attain deeper comprehension through putting parenthesis around reality."* Pateman [1997] also pinpoints the fact that imagination fills out the holes and makes complete something that is just suggested: *"Imagination can fill out, complete, or concretize something that is given only in an outline or merely suggested in a text or image"* [p.1]

Through the use of imagination the designer or creator can create imaginative worlds, and imagine for instance "what might be". Singer and Singer [1990] authors of probably the most extensive book on imaginative play, write: *"The concept of "what might be"- being able to move in perception and thought away from the concrete given, or "what is" to "what was, what could have been, what one can try for, what might happen" and ultimately, to the purest realms of fantasy – is a touchstone of the miracle of human experience, the imagination"* [p. 19]. Additionally they write: *"…the imagination liberates us from the tyranny of this place, these chores, these people. Through our human capacity…termed "taking an attitude towards the possible"… we are capable of exploring a range of potential futures or of travelling through time and space to a different or better childhood."* [p. 20]. The importance of creating space for imagination is central in the development of scenarios and visions, discussed in chapters 7-8.

2.2.7 Some effects of imaginative play

Singer and Singer [1990] refer to several studies that indicate that training in various forms of imaginative play among children enhanced the spontaneous tendency to engage and have persistency in such play. It also yields more signs of *divergent* and *creative thought*, *higher concentration* and greater *positive emotionality* and *motivation*. [p. 135-136] Several studies have shown that positive emotions such as joy and liveliness were positively correlated with imaginative play. [Singer and Singer: 69]. Training studies in imaginative play furthermore have the value of naturally developing*cognitive skills* for the growing child and likely also enhance the skills in the use of imagery and in reshaping mental representations more generally. It is also suggested that imagery heightens aesthetic experience and human sensitivity [p.137-138]. The communication of pretending provides a rich amount of information, evoking surprise and interest for both the pretenders and observers [p. 141].

Research indicates that play with objects seems to increase the children's ability to demonstrate associative fluency. It is suggested that this not just attributable

simply to the fact they manipulate more objects, but rather that the play behaviour seem to establish a playful attitude and mind-set that prompts the children to produce novel sets of responses [p. 142]. Some studies have shown that simple and minimal structured toys or objects elicit more varied themes and richer fantasy than more advanced, highly structured toys among children from kindergarten through second grade [Pulaski 1973].

Children predisposed to make-believe play had a more *flexible attitude* and could more easily change their point of view when asked to play with an object in a different way than they had before [p. 143]. Vygotsky [1978] has written that in play a child behaves beyond his age and normal skills. He views it as a major source of development [p.102]. Research indicates that many creative individuals have had parents that helped them to foster imagination as children [Singer and Singer 1990]: *"The adults who foster imagination offer children a sense of security and closeness they remember long into adulthood"* [p. 161]. These reported effects are relevant in relation to the effects of imagination and play exercises reviewed in chapter 7.

2.2.8 Imagery for relaxation, change of mood

Imagery is extensively used in helping people to relax by pretending that they are in a peaceful, nonthreatening environment. Furthermore, studies of pain indicate that making up a mental story of being in another place at another time is one of the most effective procedures in achieving relief. Singer and Singer [1990] write: "*Changing one's mood by imagining a humorous outcome or picturing a beautiful alternative setting has also been shown to be effective at least temporarily, even with individuals hospitalized for depression"* [p. 286]. Imagining and pretending can be employed as useful tools also by ordinary people outside therapeutic situations. Singer and Singer refer among others to the possible positive use in athletics, in dance and in the creative development of products [p. 287-288].

In his book "Experiences in Visual thinking" McKim [1972] writes about the concept of "Relaxed attention". He stresses the nature and importance of relaxation and attention in the creative process, connected to design. Relaxed attention is closely allied to meditation techniques. He writes: *"Relaxation and attention are mutually supportive. By relaxing irrelevant tension, the individual releases full energy and attention to the task at hand… Directed imagination is enhanced by a disciplined form of letting go; visual ideas flow most freely onto paper when the marker is held and moved with graceful ease. Even more than most human skills, seeing, imagining, and drawing require relaxed attention."* In his now classic book he also states the importance of imagining and inner visual thinking in the design process. Athavankar [1997] has similarly observed how

mental imagery is central for designers. Effects of mental imagery as a tool in the design process will be reviewed and discussed in chapter 7.

2.2.9 Body and learning

With the basis in music Nielsen [1999, 2000] discusses the importance of using the whole body in the learning process. Nielsen argues that the splitting of the physical body and mental consciousness is a tradition in western society partly introduced by Descartes (1596-1650). Nielsen argues that in this western mind-set the body is viewed as something mechanical. This is for instance reflected in that bodily skills are described as motorised skills, referring to motors.

According to Merleau-Ponty [1986] a person acts in the world, where body and situation call on each other. It is not just a form of conscious inner intention that is within a person, but rather an intention that constantly exists in the relationship between humans and situations; there is a bodily anchoring in the world. He suggests that the body is not one object among many, but rather it is our means of belonging to the world, and facing tasks. The body conveys a spatiality of situation, an orientation toward a possible world. The focus changes from just thinking and analysing to also include performing and acting. With such a perspective creative activity is also anchored in the body, it is not just a mental process. Scenario play of intended users in a context, discussed in chapter 7, could be viewed as a way of learning and solving a design task where both body, feelings and intellect are involved. The act of using different postures actively in collaboration and design activity, discussed in chapter 5, is acknowledging the importance of the body in learning and creative activity. Empirical research has also indicated that a person remembers better words when they are linked to body movements [Helstrup 1993].

2.2.10 Fostering playfulness

Many play researchers argue that adults should play more, both for their own wellbeing, and for their creative ability, learning and development. Singer and Singer [1990] list three ways that one may stimulate and foster playfulness as adults:

A. Observe children play, recognise their worries, concerns, fantasies, wishes and dreams
B. Remember our own childhood, pleasant early experiences, open the door to our playful selves out of memories

C. Playing with a child, getting down on the floor, participating in the play

In relation to the second point, Singer and Singer [1990] write: "*Relaxing in a chair and allowing ourselves time to daydream and play out fantasies in our minds moves us away from the mundane tasks of everyday life and brings us closer to the magical realm of childhood*" [p. 174]. The potential of using childhood memories as a source for entering into a more playful mood and awakening imagination is discussed and described more in chapter 7, in relation to mental visualisation exercises.

2.2.11 Games and play in design practice

Little research has been carried out in relation to the use of scenario play in design. Faste [1993] has described the use of improvisational drama exercises in engineering design education at Stanford. Ehn and Sjögren [1991] suggested the use of design games in the interaction between users and designers in participatory design. They stressed the productive role of stages and props to create a common language of engagement between designer and users. Brandt and Grunnet [2000] reflect, based on their own experience and observations, on the potential usefulness of drama and props as an approach to engage users more directly in the design process. They proposed that using drama was a way to bring in a 'bodily approach' to the design process. They experienced that little scenography was needed to create an illusion of being in the world of the users. They reported that acting scenarios was a way for them in the design team to identify problems and generate ideas for their solutions. They also experienced that it was a way to create a common platform beyond verbal language for the designers and users in collaborative meetings that made the communication and understanding easier among them. Unfortunately their paper lacks direct user feedback and evaluation of the use of drama in the design process, especially for users who have not used drama previously. The use of drama and scenerio play in design projects will be particularly addressed in chapter 7.

2.3 Communication theory

In subchapter 2.3 some theories and schools on communication will be presented in brief form. In team collaboration communication is one of the central elements. This subchapter is important for all the chapters 5-8, in the thesis. It may be especially important and relevant in relation to chapter 6, since discussion in that chapter is brought up in relation to communication and different perspectives, roles, preferences and viewpoints.

A general definition of communication is *'social interaction through messages'* [Fiske 1990, p.2]. There are two main schools in the study of communication, the 'process school' which sees communication as the transmission of messages and the 'semiotic school' which sees communication as the production and exchange of meanings.

2.3.1 The 'process school'

The process school emphasises the process of communication and sees communication as the transmission of messages. It is concerned with how senders and receivers encode and decode and sees communication as a process by which one person affects the behaviour or state of mind of another. This school defines social interaction as the process by which one person relates to others, or affects the behaviour, state of mind or emotional response of another, and vice versa.

A. Shannon and Weaver's model (1949)
One of the main and underlying theories within the process school is Shannon and Weaver's Mathematical Theory of Communication [1949]. In figure 2.2 a simple illustration of the model of communication is presented. The model is made by Buur and Andreasen [1989] and is based on the original theory of Shannon and Weaver. In this model, which is linear, there is a sender and receiver. The message or signal is coded by the sender and again decoded by the receiver. According to the model when sending the information there will be a loss of information and noise will enter. The code of the model is for instance human language, symbols, drafting standards and projections. Outside of the brain, information can only exist in a medium, like sound, touch or written on paper.

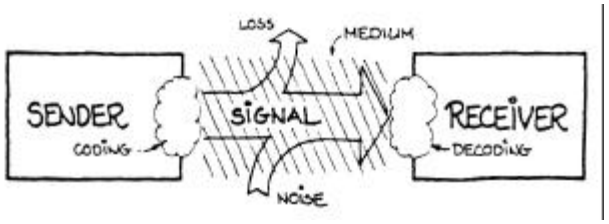

Figure 2.2 Model for communication, adapted from Shannon and Weaver [Buur and Andreasen, 1989]

The theory of Shannon and Weaver grew out of the work with telephones, and may be viewed as a more technical and linear approach to communication. In this school they assume basically that communication is a transfer of message from A to B. Their main concerns are with medium, channel, transmitter, receiver, noise and feedback, all of which are terms relating to the process of sending a message [Fiske 1990, p. 39].

In the original model by Shannon and Weaver there was no feedback, but later works have found it useful. Feedback helps the communicator adjust his or her message to the needs and responses of the receiver. It helps the receiver feel involved in the communication. The act of being aware that the communicator is taking account of our responses makes us more likely to accept the message.

In this school one will use concepts such as redundancy and entropy. Redundancy is that which is predictable or conventional in a message, i.e. surplus information already known. The opposite of redundancy is entropy. Redundancy is a result of high predictability, entropy of low predictability. Messages of high predictability are less likely to be misunderstood.

When relating to this thesis one will have different actors in a design team sending and receiving messages. These messages will be encoded and decoded. In the transfer there will be, according to the theory, a loss of information. Additionally noise will enter which 'distorts' the message more. The communication failure that occurs, according to this theory, will lead to misunderstanding and easily worsen the collaboration. In communication some messages are more redundant, thus less likely to be misunderstood, while others are less redundant. For a specific, limited group a message may be highly redundant, they all have a shared understanding of the message, while the same message in another group may have low redundancy. Structuring a message according to shared patterns or conventions is one way of increasing redundancy.

B. Newcomb's model (1953)

Newcomb developed a model that introduces the role of communication in a society or a social relationship. The model is not linear, but triangular, see figure 2.3. 'A' and 'B' are communicator and receiver; they may be individuals, or management and union, or government and people. X is part of their social environment. ABX is a system, in which its internal relations are interdependent and in equilibrium: if A changes, B and X will change as well. Or if A changes its relationship to X then B will also change its relationship with either A or X. X may be a thing or a person or any part of a shared environment. When X changes, A and B need to communicate to establish their co-orientation to the new X, thus establishing a new equilibrium.

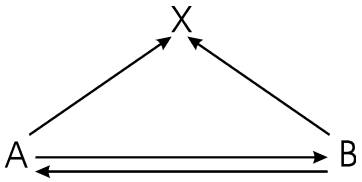

Figure 2.3. Schematic illustration of Newcomb's minimal ABX system

Related to this thesis, 'A' and 'B' could be viewed as different actors in the design team, and X could be the environment or specific setting. By changing and staging the setting and surroundings one will also indirectly change the relation between A and B. One could also view X as the product or concept the design team is synthesising. Change in the product will influence the equilibrium between A and B.

2.3.2 The 'semiotic school'

The semiotic school sees communication as the production and exchange of meanings. It defines social interaction as that which constitutes the individual as a member of a particular culture or society. In this school the sender, defined as transmitter of the message, declines in importance. The emphasis shifts to the text and how it is 'read'. The message is a construction of signs that through interaction with the receiver produce meaning. Readers or receivers with different social experiences or from different cultures may find different meaning in the same text or message. This does not necessarily imply communication failure. Producing and reading the text are seen as parallel processes in that they occupy the same place in a structural relationship, visualised as triangle, see figure 2.4. The arrows in the model represent constant interaction.

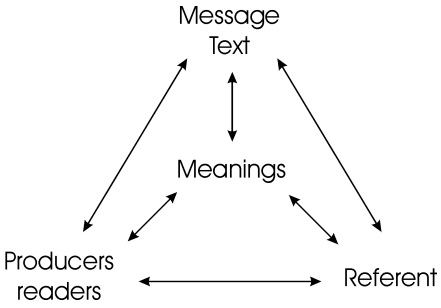

Figure 2.4. Messages and meanings [Fiske 1990]

The emphasis in this school is on communication as the generation of meaning. For communication to take place one has to create a message out of signs. This message stimulates the receiver to create a meaning himself that relates in some ways to the meaning that was generated in the first place. The more the sender and receiver share the same codes, the more they use the same sign systems, the closer the two 'meanings' of the message will approximate each other [Fiske 1990, p. 39]. The models in this school are not linear, but structural; they concentrate on analysing a structured set of relationships, which enables a message to signify something. At the centre of concern are signs. The study of signs and the way they

work is called semiotics. In the schools they focus on three areas: the sign, the codes or systems into which signs are organised and the culture within which these codes and signs operate.

The reader or receiver helps to create meaning of the text or message by bringing in his or her emotions, experiences, cultural values and attitude. Depending upon the cultural background, the experience of a message will differ.

Peirce's model

Peirce's model [1931-58] is one of the main models within the semiotic school, and will be the one presented here. It consists of three terms: the sign, the object and the interpretant, see figure 2.5. A*sign* refers to something other than itself, the *object*, and is understood by somebody; it is an effect of the mind of the user, the *interpretant*. The interpretant is not the user of the sign; it is a mental concept produced both by the sign and the user's experience of the object. The model makes no distinction between encoder and decoder, which we find in the process school. The interpretant is the mental concept of the user of the sign, and decoding is as active as encoding.

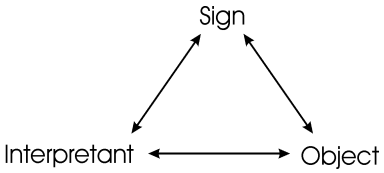

Figure 2.5. Peirce's elements of meaning

Relating to this thesis the message in the context and view of the world of the sender may have one meaning, in the context and view of the world of the receiver it may have a different meaning. But this is not necessarily evidence of communication failure. People from different subcultures will have different mental concepts of a message, and they will have different views and experience connected to an object. So it must be taken into account that people from different subcultures will experience different meaning connected to a message and sign. Even though concepts and theories from the process school are of interest for this thesis, concepts from the semiotic school seem to be of even more relevance. In design teams the different actors are approaching the product from different perspectives, roles and viewpoints. This becomes even more clear in the discussion of the perception of a product or product concept described in the following section.

2.3.3 Perception of product

According to Monö [1997], which belongs to the 'semiotic school', "*when a group of people look at an object, none of them see exactly the same thing as anyone else*". Even though they receive approximately the same image on their retina the image will be interpreted based on the observer's personality, mental state, cultural background and role. For one person a useful thing may be an implement, for another person it may be an ornament, for a third person merchandise, and so forth, see figure 2.6. The different people base their opinions on the way in which they read the message, hence the phrase semantic necessity in the figure.

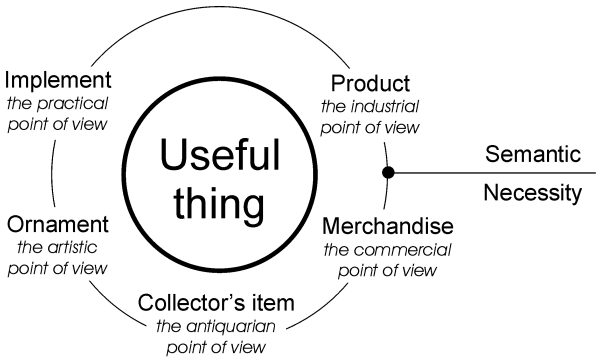

Figure 2.6 Point of view and perception of a useful thing [Monö 1997: 18]

In regard to this thesis, it is useful to relate this understanding to the context of a company with a group consisting of different actors with different roles and belonging to different 'subcultures', thus having different viewpoints and perception when looking at a product, a concept or an interior. The different actors will interpret and put different meaning into the message of a product, concept or interior, formulated in a 'language' that they see, hear or feel. This language consists of signs, which is the subject of semiotics. This important aspect, connected to the collaboration in design of industrial products, will be discussed more thoroughly in chapter 6.

In the following sections concepts related to practical*tools for communication* between actors from different backgrounds and culture will be presented.

2.3.4 Boundary objects

Objects that allow members of different groups to come together for some endeavour, though their understandings of the object of their mutual attention many be quite different, have been labelled by Leigh Star [1989] as boundary

objects. Successful boundary objects exhibit flexibility by allowing for more specific or restricted reading of codes to be embedded within a more universal one. Boundary objects are flexible and may be understood on multiple levels by diverse groups or individuals. They can facilitate the co-ordination of multidisciplinary and scientific work. The reason for that is that specialists may interpret them in a tightly focused way while they at the same time are readable for generalists. When different experts or employees collaborate, which is the concern of this thesis, it seems important that there are some areas that overlap, such as objects that everyone can relate to in their own way. Boundary objects have shared meaning as well as individual meaning for the participants.

2.3.5 Sketches as tools for communication

According to Henderson [1999], who has studied how engineering designers communicate, design sketches and drawings are necessarily boundary objects that help integrate various perspectives. Sketches function as building blocks of design and production. Henderson writes: *"They are developed and used in interaction, their visual representations act as the means for organising the design to production process and hence serve as a glue both between individuals and between groups. The drawings and sketches themselves structure the work process as well as its product"* [p.6]. She views sketches and drawings *as "the basic components of communication; words are built around them"* [p.1]. Visual representations such as sketches and prototypes are, besides being devices for communal sharing of ideas, also a ground for design conflicts because they "*facilitate the social organisation of workers, the work process, and the concepts that workers manipulate to produce a collective product"* [p. 10].

Sketches and drawings are also, according to Henderson, the centre of power in the design process because *"control of access to drawings determines who may participate in the design process"* [p.134]. They are thus locus of action, which "*may be negotiation or consensus or it may be conflict and power play"*. Bucciarelli [1994] notes that design is a process of achieving consensus among different participants. Visual representations are an arena in which negotiations can be held, since they allow intangible ideas to become concrete, but still allow ideas to be reworked and renegotiated.

The flexibility in visual representations makes such representations significantly different from other representation. This flexibility facilitates multiple readings of the same image by different parties. The level of ambiguity and possible different ways of perceiving a sketch, superseding the restricted codes allows creative ideas to come to the surface and creative tension to naturally unfold. It may also cause much misunderstanding and hinder collaboration and communication [Stacey et al

1999]. The action orientation of drawings, scratching down visual concepts that may occur in fragments and then try to put them together as a whole are part of the thinking process. Drawing and thinking go hand in hand. McKim [1972] has illustrated the visual thinking process as a combination of seeing, drawing and imagining, with the three areas integrated into each other. Kaufmann [1980] has shown that when ideas or information become too complex students have a need to use drawings as means of representation [p. 167].

The act of presenting many concepts around on the wall can be a good way to exchange and develop ideas. Ulrich and Eppinger [1995] describe the *gallery method* as a way of displaying a large number of concepts simultaneously for discussion. Sketches are then taped and pinned to the walls of the meeting room. The members of a team evaluating the concept circulate around, while the creator of concepts give explanations. They emphasise the importance of graphical and physical media, rather than just words. Sketching surfaces are important and should be available as an important source for discussion and collaboration [p. 89-91].

2.3.6 Whiteboards as tools for communication

In the group process it is important to have a shared space to communicate through. Suchman [1988] characterises the whiteboard as structuring a *"shared interactional space"* [p. 319] and a *"second interactional floor which is co-extensive and sequentially interlocked with talk"* [p. 322]. According to Henderson [1999, p. 201] *"both the drawings and the whiteboards may be delineated into owned territories or inhabited jointly"*. Henderson points out that the very function of representation as boundary objects is *"the merging of individually owned and interpreted territories, as well as jointly inhabited ones, into larger jointly inhabited frame…"* [p. 201]. The merging allows visual representations and whiteboards the flexibility to become *"an arena for the introduction, manipulation, and resolution of design dilemmas"*. Easily accessible whiteboards or shared work surfaces (IT tools) may thus be viewed as a support for the creative process. This understanding is central when discussing the setting of the physical stage for creative collaboration in chapter 5.

2.3.7 Competitive products

In relation to the design process several authors remark about the importance of an understanding of existing and competing products as a source for communication and inspiration. Ulrich and Eppinger [1995] writes: *"An understanding of*

competitive products is critical to successful positioning of a new product and can provide a rich source of ideas for the product and production process design". [p. 19] Analysis of competitive products is also called competitive benchmarking. Several authors mention that an understanding of the market with its competing products is important for success and that it is an important inspiration for new concepts and ideas. The use of competing products as tool for concept development is discussed in chapter 5, in relation to the setting of the physical stage for creative collaboration.

2.3.8 Types of dialogue in design work

There is three types of dialogue in design work, according to Jonsson and Mansour [1988]:

1) *The inner dialogue* which refers to the thoughts processes going in the minds of those involved in design work. Here one can say that the subject is thinking and visualising internally.
2) *The inter subjective dialogue* which refers to the interaction between the designers and the object of design. It is an externalisation of the inner dialogue. The idea is expressed by the help of a sign. The later does not replace the idea or concept, but represent them. The representing sign or image is a means of reflection for the thinking subject. The image functions as an effect of feedback for the subject.
3) *The interpersonal dialogue* which refers to the dialogue between the actors in the design process. Once the idea or the concept is expressed and represented by signs or images they can be perceived, interpreted and discussed by other subjects.

This characterisation of three types of dialogues is of great help in the discussion of different tools and means used to support the visualisation process in design teams, such mental visualisation exercises, storywriting and scenario play (chapter 7 and 8) and visual and poetic images (chapter 8).

2.4 Team collaboration & organisational change

This subchapter 2.4 presents selected concepts and theory directly related to team collaboration. Furthermore some concepts related to organisational change are shortly presented. This section is central for all chapters 5-8, since this thesis is concerned with team collaboration and the implementation of new tools for concept development which will be connected to organisational change.

2.4.1 Group interdependence

Vygotsky [1978] argued that learning and development happened on two levels: externally and internally. Learning occurs in the social interaction between humans, which is the external level and is then internalised to the individual. Internal activities, such as thinking and reflection can not be understood as independent of external, social activities. These activities are according to Vygotsky intertwined.

With the basis in the Vygotsky tradition Salomon [1995] came up with two criteria for collaboration in teams: a) Mindful engagement b) Genuine interdependence. 'Mindful engagement' is connected to the experience with students in class that the quality of processes and of outcomes were consistently correlated with students' volitional mindfulness, their voluntary expenditure of task-related mental effort. 'Genuine interdependence' is connected to the fact that the participants are dependent upon each other to get a result. For genuine collaboration to take place there is a need to share necessary information, meanings, conceptions, and conclusions and build on each other's knowledge and thoughts. 'Mindful engagement' has some parallels to the involvement that was described in relation to play. For successful play it is viewed as important that the participants really are involved and engaged in the task. Genuine interdependence has parallels to what Lewin [1948] describes as 'task dependence'. Research by Rosenbaum et al [1980] indicates that when the degree of interdependence among group members becomes more and more negative, the productivity drops off, the degree of co-ordination declines, and the amount of interpersonal attraction decreases.

2.4.2 Group norms

In the process of developing the group, group norms will be established. These norms define the limits of acceptable and unacceptable behaviour. The norms are linked to values and attitudes [Brown 1988: 42]. Included in the norms are everyday rituals, attitudes and ways of viewing the world. For the individual norms act *"as frames of reference through which the world is interpreted"* [p. 44]. Group norms concerning behaviour and attitude are viewed as important to make a group function: *"If we did not have those norms… it is doubtful whether the group could really function as a learning unit"* [p. 46]. At the same time rigid group norms can inhibit change and productivity. Suggestion for new norms and values will in a group often be faced with some resistance before they are possibly integrated. It is important for a group that an eventual change in norms is not

enforced from the outside, but that the members participate themselves in this change. Some group norms can be very stable over a long period of time [p. 48]. The importance of participation in changes when introducing new tools with new norms and values is central in the discussion made in several of the chapters in the thesis.

2.4.3 Task and socio-emotional activities

Bales [1950] made an important distinction between task / 'instrumental' and socio-emotional orientation and behaviour in the activity of groups. Bales initial standpoint is that any activity is ultimately driven towards the achievement of some task. Task activities are activities that are directly linked to the work with the task. Socio-emotional activities are activities that are connected to the emotional interrelation between the members. These behaviours or activities can both be negative and positive oriented. Positive oriented activities are necessary to resolve social conflicts and tension between the members. These activities or behaviours are also linked with solidarity and integration in the team [see Bales 1950: 61]. Included in such activities are telling jokes, and having laughs that release tension. Furthermore there are activities of solidarity that raise each other's status and give help. Bales had the view that 'instrumental' activities must be balanced by 'expressive' activities. He also believes that socio-emotional activities are especially important around the phases of making decisions since these phases are often connected with a lot of bargaining and tension. Some of the tools presented in this thesis, such as visualisation and play exercises in chapter 7, may be related to effects on both the task and the team spirit. In the concept of Bales both socio-emotional and task orientation and behaviour are observed to be initiated by the team. In chapter 5, 6, 7 and 8 the focus will be on the staging of the meeting, where activity and procedure are consciously used to stage and influence the team spirit and help to solve the task.

2.4.4 Overlap in competence

Zaccai [1998] argues that an overlap of competence is central for collaboration and for innovation, in connection with product development. He writes: "*This overlap is not considered redundant or inefficient but instead adds new dimension and depth of knowledge to the role of each discipline. This overlap actually stimulates innovation and adds overall efficiency to the entire development process.*" Similarly, Bastick [1982] remarks that overlap and redundancy of knowledge and experience are essential element for intuitive thought. There is a need for overlap of competence both for shared understanding and respect and for

making creative coupling of separated knowledge. Results also indicate that increased use of cross-functional teams in new product development is related to higher project success [McDonough 2000].

2.4.5 Group climate and atmosphere

A study by Frankenberger and Badke-Schaub [1999] indicates the importance of good group climate as a basis for an open discussion to be an essential factor for communication and collaboration in design teams. They also point to group organisation as important. Their study also indicated that in critical situations most of the designer's work was performed in collaboration, in contrast to everyday activity. Milne and Leifer [1999] also mention that a proper cultural climate will help to promote innovation. What provided positive influences are among others a playful atmosphere and acceptance of failure.

2.4.6 Organisational factors for team collaboration

As it is mentioned in the introduction chapter this thesis does not focus so much on the pure structural and organisational aspect of team collaboration, but more on the area which has to do with setting the stage for collaboration, such as the physical stage, the use of exercises, the general methodology. Nevertheless, in this section 2.4.5 some important structural factors for collaboration will be shortly mentioned, since they are also central for collaboration.

Sebell and Goldsmith [1997] discuss, based on their experience, what are crucial aspects and roadblocks for innovation in relation to collaboration in teams. They list up some basic guidelines that they argue are fairly well agreed upon:

1. Manageable numbers
2. Necessary and relevant expertise
3. Diversity and naiveté
4. Real decision making, recommending, and implementing responsibility

Manageable numbers mean that they should not be too few and not too many in a team. Necessary and relevant expertise means that all the key organisational functions are in the room. This is viewed as important in relation to ownership of the project and so that the expertise needed is easily available. Diversity and naiveté is viewed as counterbalance to necessary and relevant expertise, since such expertise can also stifle the development of new ideas. Diversity and naiveté can help in achieving raw, breakthrough newness. The last point, real decision making,

is related to empowerment of the team, that the team can make the necessary decisions to work effectively. Finally the idea of not forcing consensus is mentioned, but that one gives room for visionary ideas, and "championed teamwork".

Organisational actions that may be of importance for a development team are: 1) Changing the timing or frequency of meetings, 2) changing the project staff, 3) locating the team together physically, 4) soliciting more time and effort for the team, 5) focusing all effort on the critical tasks, 6) engaging outside resources and 7) changing the project scope or schedule [Ulrich and Eppinger 1995: p. 278]. Several authors point to the importance that there is committed sufficient time to the early stages of the process as an important requirement for collaboration and for making a successful product [see for instance Cagan and Vogel 1999].

Based on literature review McDonough [2000] has listed up several factors contributing to the success of cross-functional teams, some of them similar to the above mentioned: Shared goals, enpowerment of the team, a good climate, human resources in the team, senior management support, champions in the team, good team leadership, good cooperation and commitment in the team, shared ownership and mutual respect and trust.

Hauptman and Hirji [1999] offers a diagnostic tool which measures the effectiveness of the Concurrent Engineering team's process in terms of the behaviours and attitudes. In this tool the central measures are: (a) two-way communication, (b) overlapping problems-solving, (c) readiness to use uncertain and ambiguous information released by team counterparts for decision-making, and (d) readiness to release uncertain and ambiguous information to team counterparts. They are thus emphasising the readiness and openness in team members to release and share uncertain and ambiguous information.

2.4.7 Team project organisation

A project team as is described in this thesis is similar to the definition of Ulrich and Eppinger [1995: p. 26]: It is a set of people involved in a project, regardless of the organisational structure of the product development staff. The participants come from different functional units in the company, such as marketing, production, product development, distribution and so forth. The most central units or functions in a product development project are marketing, design and manufacturing or production. In design one will often find both an in-house and external competence.

Hayes et al. [1988] describes two main types of project organisation, heavyweight project organisation and lightweight project organisation. A heavyweight project organisation contains strong project links and less functional links. The project manager has more authority and control while the functional managers have little authority and control. In a lightweight project organisation the influence and control is opposite. There the project managers update schedules, arrange meetings and facilitate co-ordination, but have little authority or control in the project organisation. Lightweight project organisations tend to breed specialisation and deep expertise in the functional areas while heavyweight project organisations tend to enable rapid and effective co-ordination among diverse functions [Ulrich and Eppinger 1995: p. 27]. As described in chapter 1, in this thesis there will not be so much focus on the organisational aspects of team collaboration, even though such factors are viewed as central conditions for team collaboration.

2.4.8 Skills of practitioner in organisational change

Cummings and Worley [1997] list a set of skills and knowledge that are important for an organisation development practitioner if they are to be effective: Intrapersonal skills, interpersonal skills, general consultation skills and general knowledge of organisation development theory. [p.49-50]. It is emphasised that the practitioner must have knowledge and skills both related to himself, to the communication with others, and knowledge connected to the understanding of the organisation as a whole. Cummings and Worley [1997] also remarks that organisation development professionals have traditionally shared a common set of humanistic values promoting open communication, employee involvement, and personal growth and development [p.47]. Such skills will be mostly relevant for facilitators who are implementing new tools and exercises to improve team collaboration, as will be discussed in the chapters 5, 6, 7, 8.

2.4.9 Managing team and organisational changes

Cumming and Worley [1997] describe five main activities that they argue are contributing to effective change management. The first activity is motivating for change. In this activity one seeks to create readiness for change and overcome resistance for change. The second activity is creating a vision. The vision can energize commitment to change by providing a compelling rationale for why change is necessary. In the vision lies a description of a desired future state. The third activity is developing political support from key stakeholders and influencing stakeholders. The fourth activity is managing the transition with an activity and commitment planning. The fifth activity is sustaining momentum, which includes

providing resources for change, reinforcing new behaviour, developing new skills and competence and building up support system [p.153-154]. When implementing new tools and methods in design teams it may be very useful to have these activities in "mind".

2.4.10 Contingencies for designing interventions

The term intervention refers to *"a set of sequenced planned actions or events intended to help an organisation increase its effectiveness"*. Two major sets of contingencies that can effect intervention success have been discussed in the organisation development literature: 1) those that are related to the change situation and 2) those related to the target of change [Cumming and Worley, 1997: 142-151].

Contingencies related to the**change situation** are:

1) *Readiness for change*. The success will often depend upon how the organisation is ready for change.
2) *Capability to change*. Managing planned change requires particular skills and knowledge.
3) *Cultural context*. Intervention design needs to account for the cultural values and assumptions held by organisation members.
4) *Capabilities of change agent*. The change agents or facilitators should not apply interventions that lie far beyond their competence.

Two contingencies related to the**target of change** are:

1) Tee *level of organisational system* at which the intervention is intended to resolve: Individual, group, department, organisation.
2) The *organisational issues* that the intentions are intended to resolve.

Four interrelated organisational issues are viewed as key target of interventions, according to Cumming and Worley [1997: 144]:

1) Strategic issues
2) Technology and structure issues
3) Human resources issues
4) Human process issues

In this thesis the tools and methods developed for the staging of creative collaboration in design teams will be related to all these four issues. The main focus will nevertheless lie on the human process issues, but with a strong overlap

to the other issues. The contingencies related to the change situation described above seem to be very relevant in the implementation of tools and methods for improving team collaboration, described in chapter 4, 5, 6, 7 and 8.

2.5 The physical space

This subchapter 2.5 presents concepts and theory connected to the arrangement of the physical space for team collaboration and concepts related to environmental aesthetics. It is especially relevant in relation to chapter 5, which presents concepts for the arranging of rooms and space.

2.5.1 General preference of space for well-being

Nature and nature elements and even simulations and symbolic images of nature appear to have a positive impact on people's wellbeing and health [e.g., Cold et al 1998, Ulrich 1991]. Natural elements include for instance daylight and scenes with water. It seems that natural elements help to facilitate positive mood change or greater psychological wellbeing. Openness or closeness of space seems also to have significance. Research on enclosure suggests that people prefer defined open space to wide-open spaces or highly enclosed spaces [Nasar 1994]. Too "open spaced" office environments were perceived as too noisy and affecting concentration [Drisis 1999]. This will also be dependent upon the role and experience of the observer, as discussed in the next section.

2.5.2 Roles and preference for physical space

Canter [1991] claims that "environmental roles" are the major determinant of the differences between people in their cognition, actions and evaluation of places. The role can for instance be the user, the caretaker or designer. Greenbie [1982] argues that humans extend symbols of social dominance, territory and sexuality away from their bodies into the built environment. Research has shown that preference will differ depending upon education and social background. Some people, for instance architects and artists have a high preference for novelty and become bored with "typical" and familiar environments very easily. Lay people, on the other hand, have a great need for both typical and familiar environment and become annoyed if they are confronted with extreme novelty. In general, culture, evolution and individual knowledge and experience influence our aesthetic preferences on an unconscious and conscious level [see Cold et al 1998]. Boselie

[1991] states that preferences will also be relative to factors such as ongoing activity, goals and intentions.

2.5.3 Identity and symbolic significance of places

Authors like Noschis [1994] have discussed the importance of the built environment for the identity of the inhabitants. Noschis describes that identity is formed in the interplay with the physical environment and talks about three types of processes involved in this development: the conscious dialogue with the environment, the subconscious dialogue with the environment and the internal dialogue between the conscious and the subconscious. He tells that through emotional experience of a place it also gains symbolic significance for us. Symbolic significance is viewed as central: *"Places with symbolic significance are quite central in our dealings with other people. They may enhance or inhibit the meeting between people, and give a totally different perception of the environment than the mere physical structures which constitutes the buildings."* A space that is viewed as a playground, see 2.2.5, may be viewed as having symbolic significance. The understanding of symbolic significance is important in relation to chapter 5, where activity zones or places in the work environment with both functional and symbolic significance (labels) are proposed.

2.5.4 Process architecture

In the book 'Excellence by Design' Horgen et al. [1999] bring up the term 'process architecture'. They write: *"Process architecture shapes and guides the workplace-making process. Its goal is a dynamically coherent workplace, which we define as one in which work and workplace are joined in a potentially reinforced relationship"* [p. 38]. They argue that organisational transformation and rethinking must be reflected in a change and redesigning of workspace: *"Thinking about the work process influences workplace design"* [p. 6-7]. This is a view that is supported in this thesis. In the process of transforming workplace they view it as important that the participants are engaged in developing a new design. They write: *"If participants are engaged in developing a new design, they are more likely to be committed to its implementation; even more important, they learn how to improve work and workplace on a continuing basis."* According to Granath [1999] work-place making could be a strategic value to the company, which is related to both the process of designing the work place and the actual design of the work place.

Bateson [1972] brought up the concept of the connection between the internal psychological characteristics and external representation, which may be extended to physical rooms. He writes, *"…human beings operate more easily in a universe in which some of their psychological characteristics are externalized"* [p. 187]. In this respect it is interesting to discuss how rooms and the design of rooms can support and sustain the internal psychological characteristics in a design process for teams. This will be discussed in chapter 5.

2.5.5 Physical distance

Allen [1977] has made a curve that shows the relation between distance and communication for individuals with an organisational bond, such as belonging to the same design team. The probability of communication drops drastically with the distance, especially when the distance is over 3-4 meters. Much of the communication in a design team is informal and Ulrich and Eppinger [1995] claim that good informal communication is one of the most useful mechanisms in breaking down individual and organisational barriers to cross functional co-operation. By locating the core members of a design team together, informal communication is dramatically enhanced [p. 275]. The primary formal communication mechanism for project teams is meetings. Teams that are located at the same workspace need fewer formal meetings than those in which members are geographically separated [p.276].

2.5.6 Meeting place in work environment

Horgen et al. [1999] argue for meetings that are not closed, but open, where different people can come and leave [p. 211] and to put the meeting places *"inside the very heart of the work and make their boundaries permeable and flexible"* [p. 215]. The example is given of Xerox, where there is a conference table and a place for meeting: *"People would enter and leave meetings as time permitted, or when they felt they had something to learn or to contribute"*. The share meeting, which became a concept, grew out of a typical drop-in-and-out conversation in the common place. This was a meeting where the participants informally shared work in progress and incomplete ideas. According to Ulrich and Eppinger [1995] some design teams that hold meetings every day meet standing up to emphasise that the meeting is intended to be quick [p.276]. Designers experience that much time is wasted in long meetings [Drisis 1999: p. 569]. Poulsen [1993] describes how the company Oticon transformed their work space, both physically and mentally for instance by giving room for informal meeting places in stairways and generally in the working space.

2.5.7 Creative Space

The consultant Peter Lloyd [1999] argues that creating room for creativity is one of the best ways to develop a creative culture. He writes: *"One of the best ways to begin developing a creative culture is to literally make room for creativity, as long as you keep in mind that a creative space is not the solution but simply a step in the right direction"* [p.1]. A company needs to provide space for such activity. He writes that it is important to keep the design of the room flexible enough for modification and for continuous adaptation. He also comments that it is important that the participants are free to move around: *"We hear complaints of conference room meetings with pre-arranged seating that become utterly predictable, boring, and much less productive that they could be. The opposite is true in a room in which people are free to get up and move around, stand up and stretch out, use the walls and easel pads to illustrate their point, and so on."* He continues by remarking that *"the focal points of innovation in most organisations are the places where people choose to gather informally – whether it's the coffee machine, copy machine, cafeteria, or hallways"*. [p. 2] He also comments that it is important to seek environments that help to put the participants in a playful and less stressful state. According to Myerson and Ross [1999] writes that in the 'creative office' there is a growing awareness that work has social aspects and awareness on these aspects can help on productivity and adding values. In creative offices life in the city is 'imitated' with neighbourhoods, meeting places, cafés and boulevards.

2.5.8 Design Collaboratorium

In relation to usability practice in design, Buur and Bødker [2000] has proposed the concept of a design collaboratorium, which they view as a room that can either be permanent or semi-permanent, that functions as a physical framing for the collaboration in design teams and with users. Such room is supposed to reflect the use context, accumulate design knowledge and inspire innovation. In relation to the inspiration for innovation Buur and Bødker [2000] write: *"The room is equipped with artifacts and illustrations pointing out new directions either related to the work domain in question or unrelated to provoke contrast."* A "design collaboratorium" room that is permanent is often called a war room in software development [Karat and Bennett 1991]. Such a room should be furnished by props; mock ups and prototypes that set the stage for action and collaboration in the *"attempt to discover essential of those use situations that the product will evoke in the future"*. The concept of design collaboratorium is very relevant in relation to the discussion of flexible project space that is made in chapter 5.

2.6 Design methods in general

In the subchapters 2.6, 2.7 and 2.8 different design methods and methodologies will be presented and discussed. This presentation is essential for the discussion made in chapter 8, where a concept development methodology is proposed.

2.6.1 Definitions

Ulrich and Eppinger [1995] define a product development process as "*the sequence of steps or activities that an enterprise employs to conceive, design and commercialise a product*" [p. 14]. The design process is generally viewed more narrowly as a subpart of the integrated development process [Andreasen and Hein, 1987]. In relation to industrial design the Industrial Designers Society of America (IDSA) defines industrial design as the "*professional service of creating and developing concepts and specifications that optimize the function, value and appearance of products and systems for the mutual benefit of both user and manufacturer.*" [Ulrich and Eppinger 1995: p. 155]

One can view design methods as tools for support and guidance in the design process. Roozenburg and Eekels view a method as being "*a specific way to proceed*", it is "*a rational procedure*" and that it is general and can be adapted to different problems [p. 39]. Webster dictionary defines a method as "*a systematic procedure, technique, or mode of inquiry employed by or proper to a particular discipline or art*". In general one could say that a design method is a procedure, flexible or rigid, that is supposed to support and indicate ways to proceed in the design process.

A methodology is a wider term than a method. A methodology will often contain a set of methods. Webster Dictionary defines a methodology as "*a body of methods, rules, and postulates employed by a discipline: a particular procedure or set of procedures*". In this thesis a methodology is even connected to a whole worldview and perspective, and will contain a set of methods, techniques and tools.

2.6.2 User- and technology-driven development projects

Ulrich and Eppinger [1995] describes three types of development projects. The first type could be described as user-driven development projects, where the main or core benefit is derived from the functionality of its interface and / or its

aesthetic appeal. In these products there is a high degree of user interaction. In these products the industrial design will be more important than the technical requirements, even though the products may be technically sophisticated. In this category products like furniture and interior items often generally fit. The next type of development project is the technology-driven, where its core benefit is based on its technology, or its ability to accomplish a specific task. The product may have important aesthetic or ergonomic requirements, but consumers are most likely to purchase the product primarily for its technical performance. The role of industrial design is then more limited. Products that may fit into this type are according to Ulrich and Eppinger computer workstations and hard disk drive. The last type of development projects are for products that are both user- and technology-driven. Industrial design is also here of great importance. In this thesis the focus is on development projects that are more user-driven than technology-driven, or both user and technology driven, see chapter 3.

2.6.3 General about design methods and methodology

In the design of products one could argue that there has traditionally been two major schools of thought in the approach to the design process. The first school, which Stoltermann [1994] has called "the aesthetic approach", has an approach based primarily on intuition, personal experience and is based on the idea that a designer can only be 'guided' through the design process by his own ideals and values. It is a product-oriented approach, focusing on the physical product. This description can be related to the school that Jones [1981] describes as viewing the design process as a 'black box', which cannot be understood rationally. No external rational methods can be used; the process is individual and personal. This school has originally its background and basis in art, handcraft design and industrial design. The 'aesthetic approach' has few externalised tools.

The second school is what Stoltermann [1994] has called "the guideline approach". According to this school the design process can be described rationally. It is possible to formulate the guidelines as generic design principles and therefore they do not depend upon a specific designer or design situation. Stoltermann writes: *"It is thus possible to externalise the rationality of the design work, which means that the secret of a skilful designer could be formulated as guidelines and transferred to an inexperienced designer."* [p. 450]. The guideline approach is process-oriented, in the sense that it is assumed that by controlling the design process it is possible to control the result. This description can be related to the school Jones [1981] describes as viewing the design process as a 'glass box', with a set of clear and well-defined tasks and steps along the way. This school has originally its background and basis in engineering design. Some of the process

methods and models from the 'guideline approach' will be described in the following subchapter 2.7.

2.7 The 'guideline approach' school

2.7.1 Rational, linear design methods

Books that are well known in the 'guideline approach' are for instance Pahl and Beitz [1984], Ulrich and Eppinger [1995] and Roozenburg and Eekels [1995]. What is generally characteristic of the methods in these books is that they are prescriptive, linear and very rational with a step to step procedure with loops and iterations and a progression through discrete stages where the designers are told to do one thing at a time, see figure 2.7, as an example. In such models creative thought can be largely contained within a single box that contains conceptual design or synthesis [Bucciarelli 1994]. This way of describing the process is the same when Roozenburg and Eekels describe the innovation process [p. 12]. The models start with a need, function or problem that is analysed, then follows a step of synthesis, and finally an evaluation and decision step. Additionally there will be some iterative loops, see figure 2.7.

Apparently, Ulrich and Eppinger see the limitations to their models being very linear. These limitations in linearity they solve by emphasising iterations, and furthermore by having product development teams develop their own unique problem solving style, based on these linear models. They write: *"Although we present the methodology in a linear sequence, concept generation is almost always iterative. Like our other development methodologies, these steps are intended to be a baseline from which product development teams can develop and refine their own unique problem solving style."* [p. 80] They do not tell how a product development team should develop such a unique problem solving style, and do not give concrete examples on how this is done, i.e. indicating that there exists a "black box" within or beside the "glass box".

2.7.2 Independence of design task

As mentioned above the 'guideline school' view is that it is possible to formulate guidelines as generic design principles and therefore they do not depend upon a specific designer or design situation. This quote from Roozenburg and Eekels confirms this view: *"The form of the design process appears to be hardly dependent upon the content of the problem, nor of the type of object being*

designed. On the whole, the same procedure is followed in all design processes, and consequently comparable methodological problems occur" [p. 32].

Roozenburg and Eekels also describe a basic design cycle, which they claim is fundamental for all designing, with its linearity and step by step procedure and iterative loops: *"We consider the basic design cycle the most fundamental model of designing. Someone who claims to have solved a design problem has gone through this cycle at least once. The basic design cycle also appears to be a useful scheme to classify the body of rules and methods (the 'methodics') of designing."* [p. 89]. This model starts with 'a function to be realized', which refers to 'a discrepancy to be eliminated between an undesired initial state and a desired final state'. This function is analysed and then criteria or specifications are formed prior to synthesis. Finally comes an evaluation, see figure 2.7. In general these rational, step-by-step methods consist of three major steps: Analysis, synthesis and evaluation in that order.

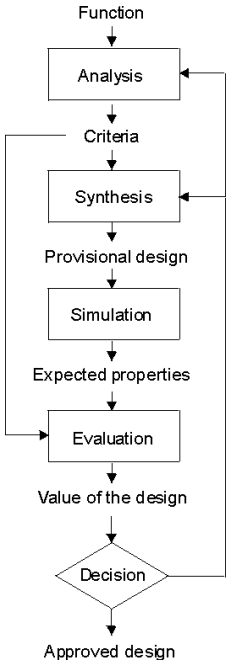

Figure 2.7 The basic design cycle according to Roozenburg and Eekels [1995]

These methods start with the basis that there is a fairly clear need, mission statement, function or problem to be solved. Ways of finding this need or problem are seldom described thoroughly and seem not to viewed as a central part of the design process itself. It is also possible that the need-finding phase is avoided because it is a less linear and step by step process.

2.7.3 'Context free' methods

As stated above, for instance in the book of Roozenburg and Eekels, the methods are viewed as universal and should be independent of the design task and of the user context. The user context is then viewed as one of many rational criteria in the specification phase. Furthermore these methods try to be independent of the context in which the product is supposed to fit, and then should also be independent of the personality of the designers and design team. These "context free" methods are increasingly being criticised by many authors [e.g., Bucciarelli 1994; Restrepo et al. 2000; Øritsland 1999]. As Restrepo et al. writes: "*…using these methodics makes difficult the management and inclusion of important contextual information, such as users' cultural background.*" Bucciarelli writes: "*To anyone interested in process, these diagrams shed very little light on how design acts are actually carried out or on who is responsible for each of the tasks within the various boxes*" [p. 112]. The methods are also viewed as independent of the values and intentions of both designers and of the company. The values and intentions should then be part of the target specifications and criteria and not part of the approach in itself.

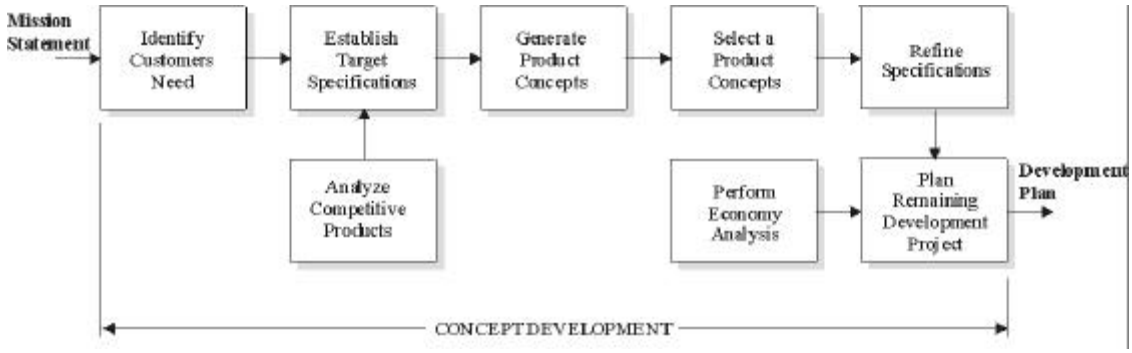

Figure 2. 8. Concept development according to Ulrich and Eppinger [1995]

2.7.4 Specifications prior to synthesis

In these step-by-step process methods, by both Pahl and Beitz [1984], Ulrich and Eppinger [1995] and Roozenburg and Eekels [1995], setting criteria or specification come before synthesis, and follow a linear, step-by-step procedure, in discrete stages, often with iterative loops. Ulrich and Eppinger, who assume that there is a mission statement already defined prior to the concept development, write about setting specifications: *'The working assumption is that a translation from customer needs to a set of precise, measurable specifications is possible and*

that meeting specifications will therefore lead to satisfaction of the associated customer needs" [p. 57]. They determine that the term product specifications means "*the precise description of what the product has to do*" [p. 55]. They divide specifications into two areas. First they have target specifications which represent "*the hope and aspirations of the team*", but still are "*spelled out in precise, measurable detail what the product has to do*" [p. 73]. Then they have refined specifications at the end of the concept development, see figure 2.8, which describe what the product should be like.

In subchapter 2.8 the concept of setting specification prior to the synthesis will be further discussed, when presenting alternative design methods.

2.7.5 Role of motivation and intuition

The authors of these rational, linear methods, like Roozenburg and Eekels [1995], seem to view motivation and inspiration as something separate from the methods themselves. Motivation and inspiration will easily be viewed as something irrational and difficult to grasp, and should therefore not be part of the methods. This is clearly stated in the book of Roozenburg and Eekels, when referring to creativity methods: "*Creativity methods cannot replace domain knowledge and task motivation; they only aim at enhancing creativity-relevant skills*" [p. 179]. This view of making methods very rational and separating methods from inspiration and motivation will be criticised in this thesis. One can read from these models that as far as apparent 'irrationality' and not linearity is part of the design process, such aspects will be contained within a single, discrete box that is the synthesis and concept generation box. Since motivation is such an important element of creativity, as discussed in section 2.1.6, a method should by itself seek to be inspiring and motivating. This will be discussed more in chapter 8, when presenting a vision-oriented methodology.

These rational methods, as they are presented, give little room for personal experience, subjectivity, and the use of intuition. This is also what Roozenburg and Eekels clearly state they want to avoid, since they are not susceptible to rational criticism: "*Design methods are based on logical considerations and not on authority, tradition or intuition – three working methods showing a strongly subjective bias, and therefore not susceptible to rational criticism.*" [p. 48]. On the contrary to what Roozenburg and Eekels claims, in chapter 8 a methodology is presented that is supposed to stimulate the use of intuition, associative thinking and personal experience as part of the concept development process, and is then not closed within a single box.

2.7.6 Use in industry

Many authors have discussed and pointed to the poor use of traditional step by step, engineering methods in industry [e.g., Maffin 1998; Tomiyama 1997; Handenhoven and Trassaert 1999]. Several reasons are outlined for this poor use: the lack of awareness on the part of practitioners of engineering design literature, the 'original design problem' orientation in many models, the absence of a specific design context in general design methods, the general and abstract dimension of the engineering design research field.

Handenhoven and Trassaert [1999] point to the importance that mechanistic views should be avoided. They write: *"Many methods look like mechanical procedures and close system-optimisation devices."* [p. 157] They also comment: *"We experience industry more like a dynamic system that can not be reduced into a set of formal procedures."* They seek light versions of methods that can be easily implemented and adapted to real life situations, and methods that should be adaptable to the ever-changing context. They suggest that one of the reasons that engineering methods are so poorly used is that they do not embrace and incorporate tacit knowledge and the *"ability to apply it unconsciously or intuitively*". They experience that design methods have become "*far too rationalised and codified for practical use in industry"* [p. 157] and wish to underline 'action' as a fundamental objective in industry. They feel that development environments *are "closer to a sport activity than they are to the science labo*ratory" where action and results are the essential elements. [p. 156]

They also mention that methods should open and give room for the personal value and experience of the designers. Luhn and Weth [1999] also suggest that design methods should be adaptable to the background of the designers' personal experience and demands of the situation. They write: *"Design methodology should be no longer the search for the one and only way to find an optimal solution, but a toolbox to support the individual way to become a creative designer. "* [p. 951]

2.8 Other design approaches

2.8.1 Reflective practice

As a reaction to the rational problem solving approach Donald Schön [1983; 1987] described design as an activity involving *reflective practice*. He stresses the uniqueness of every design problem, and identifies the core skill of designers as their ability to determine how each single problem should be approached. He describes an alternative epistemology of design practice, which he describes as a

'reflective conversation with the situation'. In this reflection the designers work by *naming* the relevant factors in the situation, *framing* the problem in a certain way, making *moves* towards a solution and *evaluating* those moves. In practice *"means and ends are framed interdependently in the problem setting. And his [the designer] inquiry is a transaction with the situation in which knowing and doing are inseparable…*" [Schön 1987: p. 78]. Schön recognised that this knowing and reflection in action (reflection-in-action) is difficult to describe and convey for students. Schön's concept of reflective practice has some parallels to Kolb's cycle of experimental learning [Kolb 1984]. This model consists of four phases in a linear cycle: Concrete experience, reflective observation, abstract conceptualisation and active experimentation. One could criticise the linearity and 'step by step' character in this model, but the change between action / concrete experience and reflection / abstract conceptualisation is similar to what for instance Schön describes. A change between abstract and concrete definition of task and solution can be understood as a method for supporting the creative processes. This seems to have been confirmed by a series of empirical research on actual design processes [Franke and Lippardt 1997].

2.8.2 Qualitative, experience-oriented design approaches

As has been discussed in section 2.1.7 the way a problem is formulated influences the outcome. Mental fixation on existing solutions seems to be a major problem in the development of new concepts. Cagan and Vogel [1999] also mention this danger of premature closure and simplistic assumptions in product development due to the fixation of existing knowledge and methods. When one is setting the specification prior to synthesis one is creating a psychological framework and closing the solution phase before one is developing ideas. So in such an approach the most creative step could be viewed as the development of the criteria and specifications, even though in these rational, linear models this is not viewed as part of synthesis. Furthermore, the first stage prior to setting the criteria consists of an analysis of existing solutions and the problem. Based on this analysis one should develop a list of specifications. This list will then easily close the solution space to include the framework for existing solutions and not 'revolutionary' new solutions. This may be a clear limitation if the intention is to develop revolutionary new concepts. Luhn and Weth [1999, p.951], on the contrary, argue for a continuous need for "re-finding" abstract concepts, of continuous restructuring of the field of experience in order to generate optimised solutions.

Hekkert [1997] has described a different and new approach to the design process that takes into consideration the danger of fixation of the old context. Rather than making a analysis of the existing problem and specification list, Hekkert suggests to break down the old context, create a new context and develop user-product

interaction vision and product vision as a tool for generating new product concepts. The visions, which consist of abstract words and notions, sometimes with images, are used as a qualitative evaluation tool in the design process. This approach or method put more emphasis on the user experience and could be described as a more qualitative approach to the design process. Using this approach the designers are approaching the design process in a more abstract and qualitative way. The designers understand then better the context of the user and do not get so easily fixated on the existing solutions. There seem to be some general problems with this approach, which will be discussed more thoroughly in chapter 8, when a vision oriented concept development methodology for the early phases in the design process is proposed.

Several other authors point to the idea of moving away from mainly a problem and product focus to a more interaction and user experience focus. Øritsland [1999] also describes an approach to the design process which focuses on the product – user interaction experience and quality. Similarly, Hummels and Overbeeke [2000] put an emphasis on the context for experience, rather than on functional products. They propose a shift from *"creating products to creating contexts for experience"* [p. 285]. By this they mean that *"a designer creates possibilities for a user to do things, to gain knowledge and to be affected in some way, dependent on the intentions of the user and the situation in which the event occurs"*.

All of these approaches and methods put more emphasis on the context and user experience than the more linear rational methods starting with specifications described above. These alternative methods could be viewed as being closer to social science, compared to the rational problem solving methods, and may fit best for user-driven development projects. These approaches and methods could also be viewed as building on the viewpoint that argues for a shift of attention from problem oriented to more ideal oriented design, from functionally oriented to more aesthetically oriented design [Stoltermann 1991]. Cagan and Vogel [1999] emphasise the importance of using ethnographic methods of social anthropology combined with traditional engineering methods. They write: *"An anthropologist's methodology tends to stay open and broad while exploring the basis of human behaviour that creates the context of use, while an engineering approach typically focuses in on specific technology or configuration in order to select specific components, allocate tolerances, and specify manufacturing processes"* [p. 367].

2.8.3 Events in the design process

According to Horgen et al. [1999] events are replicable social activities organised around a common core of procedures. These activities help participants to develop a common language for sharing experiences that lead to greater mutual

understanding [p.61]. They write: *"The theatre provides a useful metaphor for workplace events. The stage must be carefully designed to support the desired situation; the actions, music, and costumes must be right."* In such events Horgen and co-workers suggest to use instruments or tools that for instance facilitate meetings and help to surface ideas.

Binder et al [1998] discuss the staging of events in relation to collaborative design and learning. They argue for a shift from task orientation to more event orientation in collaborative design. They write: *"As we hereby replace activities with events, we will also argue for the replacement of the successive decomposition of problem-solving with a more open understanding of design problem as being continuously re-constructed and re-framed, throughout the development process."* This is a way of approaching the design process which is close to Donald Schön's notion of conversational design, putting emphasis on the experience that development work is propelled by the dialogic engagement of stakeholders and object worlds [Schön 1988]. In the staging of events suggested by Binder et al. [1998] people with different interests, competencies and professional language are gathered. The users are participating as a resource. The evaluation and design happen simultaneously within the meetings, instead of using a review of predefined ideas. Within such events different tools are used like simple, rapid mock-ups or props to stimulate collaboration [Brandt and Grunnet 2000].

2.8.4 The design process as a social process with ambiguity

Bucciarelli [1994] stresses that the design process is part of a social process with negotiation, power play, and consensus between different actors, a consensus "*somewhat awkwardly expressed in the final product*" [p.21]. He remarks that "*if we want to understand the design process, we must remain sensitive to the full breath and depth of social context and historical setting*" [p. 18]. He views "*the norms and practices of the subculture of the firm where the object serves as icon*" as more fundamental ingredients than executive mandate, scientific law and marketplace needs [p.20].

The process of designing is ambiguous and uncertain. This ambiguity and uncertainty are according to Bucciarelli *"especially evident at the interfaces where participants from different object worlds must meet, agree, and harmonise their proposals and concerns"* [p.188]. Ambiguity has a purpose, it allows the participants "*room to maneuver, to reshape, to relearn and come together again*". The use of ambiguity in the design process is central in relation to the methods proposed for the vision-oriented methodology in chapter 8.

2.9 Summary of chapter

This chapter has presented general theory and concepts on creativity and creative processes (2.1), play and imagination (2.2), communication (2.3), team collaboration and organisational change (2.4), physical space (2.5) and on design methods and approaches (2.6-2.8).

In subchapter 2.1 theory and concepts on creativity were presented. Some definitions on creativity were introduced and different research approaches to the field of creativity were presented. The role of fixation, problem formulation and extrinsic and intrinsic motivation in relation to creativity was presented and discussed. General characteristics of the creative state were then described, under the common name "Flow". Finally, some research on organisational creativity and creative environment was presented.

In subchapter 2.2 theory and concepts on play and imagination were presented. The characteristic of play being ambiguous and paradoxical was described. In section 2.2.2 Bateson's concepts on play was described, with for instance three types of messages. The importance of communication about communication (metacommunication) in play was outlined. In section 2.2.4 the importance of participation and involvement in play was described. In 2.2.5 the need to have a place to play for children, both mentally and physically, was shortly described. The sections 2.2.6-2.2.8 are concerned with pretending and imaginative play. Many different effects on imaginative play, especially for children were presented. In section 2.2.9 the connection between body and learning was discussed. Theory and concepts that reject the division between body and mind were presented. In section 2.2.11 articles on the use of scenario play and games in design practice were presented.

In subchapter 2.3 theory and concepts on communication were presented. The two major schools in communication theory were described. The 'process school' sees communication as the transmission of messages with senders and receivers while the semiotic schools sees communication as a the production and exchange of meanings. Newcomb's model in section 2.3.1 described how the change in the surrounding or social environment will influence communication. The model of Monö in section 2.3.3 described how different actors will see different things in the same concept or product. This lead to the description of boundary objects in section 2.3.4, as tools for communication in teams. Sketches and whiteboards are central elements in collaboration for design teams, as described in section 2.3.5 and 2.3.6. The importance of analysis and availability of competing products was described in section 2.3.7. Three types of dialogue were presented in section 2.3.8.

In subchapter 2.4 theory and concepts for collaboration and group processes were presented. In section 2.4.1 the importance of group interdependence was described, in section 2.4.2 some concepts around group norms were described. In section 2.4.3 the distinction between task and socioemotional orientation in groups was described. Socioemotional orientation and behaviour is connected to emotional interrelation between members. In section 2.4.4 the concept of overlap in competence between members in a team was presented and in section 2.4.5 the importance of group climate and atmosphere was outlined. In section 2.4.6 some organisational factors for team collaboration were described. Team project organisation, into lightweight and heavyweight projects, was the topic in section 2.4.7. Heavyweight-oriented projects are project organisations where the project managers have more power and control while lightweight-oriented projects are project organisation where the functional managers have the strongest influence and control. In section 2.4.8 skills needed for practitioners in organisational change were outlined and in sections 2.4.9 and 2.4.10 factors for managing organisational change and designing interventions were summed up.

In subchapter 2.5 themes connected to the arrangement and framing of the physical stage were presented. In section 2.5.2 it was described how people with different roles and expertise will have different preferences for physical space. Section 2.5.3 presented the symbolic significance of places. Section 2.5.4 - 2.5.8 presented ideas connected to the work environment, such as informal meeting places, creative spaces and “design collaboratorium”. Concepts connected to the connection between the external room representation and the internal psychological characteristic and mind-set were presented.

In subchapters 2.6, 2.7 and 2.8 different design methods and approaches were presented and discussed. The distinction between the ‘guideline approach’ and the ‘aesthetic approach’ was described. Some methods connected to the ‘guideline approach’ were presented and discussed. These methods are very rational and linear with iterative loops, consisting of three major steps; analysis, synthesis and evaluation / choice. The lack of dependence to the design task and context, the limitation of specification prior to synthesis, the independence of motivation and intuition, the poor use in industry of these methods were presented and discussed. Other design approaches were presented in subchapter 2.8, such as reflection in practice by Donald Schön and more qualitative, experience-oriented design approaches which put more emphasis on the user context, and do not have a set of specification prior to the design task. The concept of viewing the design process more in terms of events and a social process with ambiguity was then finally presented.

The theory and concepts presented in this chapter will be used as basis and underlying material for the chapters 4, 5, 6, 7 and 8 in this thesis. The theory is rather broad and extensive, and reflects the complexity and width of this thesis.

Chapter 3

Research approach and methods

If you want truly
to understand something
try to change it

- Kurt Lewin

URN:NBN:no-2324

The research carried out in this thesis is of qualitative nature, using qualitative methods. In this chapter the research approach will be outlined and discussed. First the nature of qualitative research in relation to quantitative research is described. The major paradigms within qualitative research are outlined and the choice of paradigm is presented and reviewed. An outline and description of the field that the empirical material is collected from is then presented. The choice of companies, the choice of methods and the specific research approaches used in this thesis, namely in-depth interviews and action research, is presented and discussed.

3.1 Research approach

In this subchapter the general research approach chosen in the thesis is presented and discussed. The phenomenological paradigm will be outlined since it is the specific paradigm that is chosen for the research.

3.1.1 Qualitative research

The word qualitative implies an emphasis on processes and meanings that are not rigorously examined or measured in terms of quantity, amount, intensity or frequency, as compared to quantitative research. Denzin and Lincoln [1994, p. 4] remarks:

"*Qualitative researchers stress the socially constructed nature of reality, the intimate relationship between researcher and what is studied, and the situational constraints that shape inquiry. Such researchers emphasise the value-laden nature of inquiry.*"

Qualitative research may be viewed as *interdisciplinary* with many different and multimethod approaches. As Nelson et al. [1992, p. 4] express:

"*Qualitative research is an interdisciplinary, transdisciplinary, and sometimes counterdisciplinary field. It crosscuts the humanities and the social and physical sciences. Qualitative research is many things at the same time. It is multiparadigmatic in focus. Its practitioners are sensitive to the value of the multimethod approach. They are committed to the naturalistic perspective, and to the interpretative understanding of human experience. At the same time the field is inherently political and shaped by multiple ethical and political positions.* "

The use of multiple methods reflects an attempt to secure an in-depth understanding of the phenomenon in question. Qualitative research, like all research, has always been judged on the "*standard of whether the work*

communicates or 'says' something to us" [Vidich and Lyman 1994]. Qualitative research is interested in capturing *the individual's perspective and point of view*. Rather than making scientific research based on probabilities derived from randomly selected cases they examine the constraints of everyday life. Denzin and Lincoln [1994a, p.5] pinpoints:

"*Both qualitative and quantitative researchers are concerned with the individual's point of view. However, qualitative investigators think they can get closer to the actor's perspective through detailed interviewing and observation. They argue that quantitative researchers seldom are able to capture the subject's perspective because they have to rely on more remote, inferential empirical materials. The empirical materials produced by the softer, interpretative methods are regarded by many quantitative researchers as unreliable, impressionistic, and not objective.*"

The qualitative researcher uses the tools of his or her methodological trade, deploying whatever strategies, methods, or empirical materials as are at hand [Becker 1989]. The *"choice of research practices depends upon the questions that are asked, and the questions depend upon their context"* [Nelson et al. 1992]. It also depends upon what is available in the context, and what the researcher can do in that context. The researcher works often between and within competing and overlapping *perspectives and paradigms*. Such paradigms are presented closely in section 3.1.2.

Qualitative research is a process of three interconnected, generic activities. They have different labels, including theory, method and analysis. The researcher approaches the world with a set of ideas, a framework (theory, ontology) that specifies a set of questions (epistemology) that are then examined (methodology, analysis) in a specific way [Denzin and Lincoln 1994].

The qualitative researchers are guided by highly abstract principles [Bateson, 1972, p. 320] that combine a set of beliefs about ontology, epistemology and methodology. These beliefs shape how the qualitative researcher sees and understands the world and acts in it. This set of beliefs may be termed a paradigm or interpretative framework [Guba 1990, p. 17].

3.1.2 Definition of paradigms

There are several paradigms within qualitative research. Before describing these paradigms a few definition of paradigms will be given. Burrell and Morgan [1979, p.23] has this understanding of the term:

"*It is a term which is intended to emphasise the commonality of perspective which binds the work of a group of theorists together in such a way that they can be usefully regarded as approaching social theory within the bounds of the same problematic. This definition does not imply complete unity of thought. It allows for the fact that within the context of any given paradigm there will be much debate between theorists who adopt different standpoints.* "

Christensen writes: *"A paradigm is a social phenomenon that is connected to what you call a research society."* [Christensen 1997, p.22]

Guba and Lincoln [1994, p. 107] view a paradigm as *"a set of basic beliefs (or metaphysics) that deals with ultimate or first principles. It represents a worldview that defines, for its holder, the nature of the "world", the individual's place in it, and the range of possible relationships to that world and its parts…"*

So paradigms may be viewed as related to beliefs, perspectives, values and worldviews connected to a research society. When approaching research it is important to be clear about what paradigm informs and guides the approach [Guba and Lincoln 1994, p.116].

3.1.3 The different paradigms in research

There are a number of inquiry and research paradigms within qualitative research and the grouping may vary more or less from author to author. The main difference in paradigm lies between those that have a *subjective orientation* and those that have a *objective orientation* [Christensen 1997].

Positivistic and postpositivistic paradigm
The positivistic and postpositivistic paradigm represents the objective and functionalistic approach to research. In the *positivistic paradigm* an objective reality is assumed to exist, driven by immutable natural laws and mechanisms. Knowledge of the "way things are" is conventionally summarised in the form of time- and context-free generalisations, some of which take the form of cause-effect laws. The basic position of the paradigm is argued to be both reductionist and deterministic [Hesse, 1980]. The investigator and the investigated "object" are assumed to be independent entities, and the investigator to be capable of studying the object without influencing it or being influenced by it. Questions and/or hypotheses are stated in propositional form and subjected to empirical test to verify them [Guba and Lincoln, 1994, p.110]. The positivistic approach in its cleanest form is only common in a few areas of social sciences.

The *postpositivistic paradigm* can be viewed as an adjustment in relation to the positivism and an effort to adjust the social sciences to ideals of natural sciences

where it is difficult to obtain a precise, perfect and unambiguous result in the investigation [Christensen 1997, p.24]. The notion of dualism is largely abandoned and not possible to maintain, but objectivity remains a "regulatory ideal", replicated findings are probably true, but always subject to falsification, rather than verification.

Subjective approaches

In the *subjective approaches* there seem to be several paradigms, that seem to have a lot in common, and that overlap. Terminology that is used is constructivism, critical theory and postmodernistic paradigms [Guba and Lincoln 1994]. Furthermore researchers talk about the hermeneutic and phenomenological paradigms. They all represent a subjective or inter-subjective approach. In the following subchapter the phenomenological paradigm is discussed, which is the paradigm that is chosen in this thesis. Some connection to hermeneutics will be made.

3.1.4 The phenomenological paradigm

Background of phenomenology

Phenomenology comes from the Greek word phainomenon, which means phenomenon and logos, which means "the learning of". Husserl (1859-1938) is known to have founded the modern phenomenology. Phenomenology has traditionally been connected to intentional consciousness and a humanistic life-world, whereas hermeneutics has roots in analysis of texts [Kvale 1990, p.228]. Several places the two categories are under the same label, and both directions refer to the same philosophers. Both are recognisable with an understanding of humans as thinking and acting species where reality is social, mental constructions [Christensen 1997, p.25]. Phenomenology and hermeneutics have according to Christensen got closer to each other and the differences between modern phenomenology and hermeneutics is disappearing "in the subtle light of history" [p.26]. They are both within what is called an *"Interpretative paradigm"*. Within this paradigm there will be directions and schools that are a bit less subjective in their approach and others that are more subjective in their approach.

Interpretation and intentional consciousness

Interpretation, which is a central element in the phenomenology, is formed in Husserl's "life-world": *"The life-world even includes relations other than those to other persons. It is continually "on hand" for me and I myself am a member of it. Moreover, this world is there for me not only as a world of mere things, but also with the same immediacy as a world of values, a world of goods, a practical world"* [Husserliana III, p59, translated in Føllesdal 1990].

In the phenomenological paradigm consciousness is intentional, which means that the consciousness is always oriented towards something. To be conscious means to be conscious towards something. One rejects the traditional idea or concept of a world of reality and objective given facts that may be unveiled by us as observers and that is given before the perceptive consciousness. Husserl calls such an idea the "objective illusion". Arbnor and Bjerke [1977, translated from p. 126] describe it in this way:

"*An observer of social activities can never stand on the outside of what he is studying. There is a dialectic necessity that he at the same time function as an actor that is both influencing and is influenced by what he is studying. "*

Cognitive maps and ideal types

The observer is always influenced by his own perception, by his own cognitive maps and models and by his own history. The***cognitive maps*** or our life-world is based on our images stored in memory [Sørensen 1994] or what one could call our ***ideal types*** that are collected throughout life. Any phenomenon that a human being faces, whether it is other humans, things in nature or human created things may be understood from this cognitivemap that consists of different ideal types. Reality, one could say, is a system of types and under-types. Each type consists partly of a content aspect that is related to the character of the phenomenon and an expression aspect that is related to the sensual in the phenomenon [Christensen 1997, p. 33]. Based on our images stored in memory we recognise a phenomenon and have an expectation of the phenomenon related to our ideal types. Even though a phenomenon always is special and atypical in one way or the other, we always use the ideal types as a foundation for our understanding and construction of reality.

Dialectic relation

The ***dialectic relation and frame*** is very central in the phenomenological way of thinking. Dialectic is in this respect what one could call the logic of ambiguity. It is the study of the opposites in the phenomenon with the idea that any phenomenon carries its own negation. "Sour" contains the idea of "sweet" and "heavy" contains the idea of "light". With a dialectic frame one thinks of a frame that is ambiguous, which may be understood in several ways without loosing significance, and at the same time is under continuous transformation.

Phenomenological analysis

For a phenomenological analysis it is proposed to use variation as a method for collecting as many different perspectives on a phenomenon as possible. This implies the study of:

- The researcher's own experiences
- Other peoples' experiences
- Deviations, exceptions or imagined variations

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- The same phenomenon in different cultures

One compares the different examples of experiences, their dialectic relation and tries to discover what their common denominators are. What is common or relatively constant is inter-subjective and assumed to capture the experiential essence of the phenomenon. It is to be expected that even this will change gradually over time and in different cultures. The quality of a phenomenological analysis, therefore, depends very much upon the analyst. Sensitivity similar to the aesthetic sensibility of the artist is necessary to be able to express the qualities of one's own experiences in a form that may be conveyed to others.

3.1.5 Area of research and research approach

The area of research which is in focus in this thesis, namely the human interaction and creative collaboration between different actors in a design team and the staging of this collaboration, may be described as having many qualitative elements by nature. It is the position taken in this thesis that it seems clearly to be a topic that fits well to be approached with a qualitative research approach and within a phenomenological paradigm. It is the intention in this thesis to study in depth the staging for this creative collaboration and the conditions and factors influencing this staging. With such an intention it seems important to study the collaboration viewed from different perspectives and life-worlds. With this basis it appears appropriate to use qualitative research methods and phenomenological analysis.

3.1.6 Method of inquiry

In this thesis two main methods of inquiry have been used, namely in-depth interviews and action research. In this section an argumentation for this choice of methods is given.

In-depth Interviews
The choice of using in-depth interviews is closely linked to the research paradigm that is chosen and to the main research questions and focus. It was a clear wish to get a personal encounter with the different participants involved in the collaboration of designing industrial products. I was for instance interested in understanding the different life-worlds, perspectives and viewpoints the different actors have in the design process. The act of using in-depth interview is viewed as the right approach for this type of inquiry. It is a method that is widely used within social sciences, so there was literature to build on. It fits well with the phenomenological paradigm used in this thesis.

Action research, ethnography and participant observation could have been used to a larger extent in the approach towards the companies. The choice of using in-depth interviews was also connected to the fact that companies have little time available. The experience made was that the companies were willing to give an hour or two for interviews, since they knew it was a limited duration. The increased use of action research would also imply that I as a researcher had much experience in running or participating in projects for companies, which was not the case at the time.

I participated in two development meetings where the design consultants presented concepts for the company. It would have been valuable to participate more in such meetings. There are two main reasons why such participation did not happen. First, several of the companies were afraid to give admittance to meetings for development projects, especially when it was early in the project, which was the phase that was of most interest. From the point of view of the company there is always a danger that an external researcher may reveal some secrets in relation to product concepts. Secondly, such participation would be expensive and time consuming, since all the companies were located physically elsewhere. In subchapter 3.3 a description of how the in-depths interviews were done and how they were analysed will be given.

Action Research Inquiry
Action research inquiry was used in the new Innovation course that I was responsible for developing and running together with a colleague. Furthermore it was used in three specific cases described in chapters 5 and 7. Action research inquiry fits with the paradigm that has been chosen, where one does not believe that the researcher can stand as an objective identity on the outside. In the course I tried out many exercises and methods, and this trying out was an interactive process with the students, where both the students and I were in a continuous learning process. In the course I made continuous observations and also used questionnaires and personal evaluation at the end of the course. In subchapter 3.4 a deeper description of how the action research was carried out will be given.

3.2 Selection of company & people for interview

In this subchapter an outline and discussion on the choice of companies for making in-depth interview inquiry is given. Furthermore a description of the people chosen for interviews is presented.

3.2.1 Selection of companies

The companies selected for in-depth interviews had been using design consultants regularly over a longer period of time. The companies are in the field of making interior products. The companies are making products where factors such as user experience, aesthetics and ergonomics are viewed as an important part of the total product.

Table 3.1. Facts concerning in-depth interviews

Number of companies: 5
Names of companies: Luxo (office lamps), Stokke (home furniture), Hov+Dokka (office furniture), Jøtul (stoves) and Håg (office chairs)
Total number of people interviewed: 26
Design consultants: 8
Product Development employees: 10
Production employees: 8
Period of interview: Fall 1998 – Spring 1999
Duration of interview: Between 45 minutes and 2 hours

I came in touch with two furniture companies, Stokke and Hov+Dokka, through meetings arranged by Skanaluminium, who halfway sponsored this thesis together with the Norwegian Research council. Initially I took part in a meeting that the project leader of the Cluster Project in Skanaluminium had arranged with Stokke, a furniture company and through this meeting I established a contact to this company. Later I established contact with Hov+Dokka, the other company making furniture at an aluminium course Skanaluminium had for the furniture industry. The initial conditions from Skanaluminium were that they wanted the thesis to be connected to companies who were using or planing to use aluminium in their products. Later, as the thesis evolved this condition became less important and was not promoted strongly by Skanaluminium.

After establishing contact with these two companies the strategic choice was made to focus on interviews with companies working with interior products where factors such as form, aesthetics and user experience are acknowledged as important. This choice was made so that the companies chosen were not too far away from each other in product types. Secondly, the people interviewed in the companies would have similar working contexts so it would be easier to find common, general factors in relation to the staging for creative collaboration. Thirdly, the role of industrial design would be acknowledged in such companies so that there would probably be more awareness and attention around the use of design consultants than in other companies. Fourthly, interior product companies

seem to be one of the few industrial areas in Norway were there are a range of larger companies actually using design consultants. Fifthly, the hope was that there would be a general awareness around the tension between a soft and humanistic approach and a hard and technical approach to design in such companies. Finally, interior products are products that I am personally interested in, partly because the humanistic and aesthetics part of the product is viewed as essential. As Morse [1994] points out: *'The key to selecting a qualitative research topic is to identify something that will hold one's interest over time."* [p. 220]

3.2.2 Selection of people for interview

In the work with making the interviews three categories of people / employees were chosen:

1) Industrial design consultants working with the company
2) Employees in the internal product development division
3) Employees from the production / technical division responsible for preparation for production

When looking back at the choice it could be argued that one could have chosen to also have interviews of employees from the marketing and the sales division. The original reason for choosing these three above groups lies in the initial focus of the thesis, which was the creative interaction between product design and production, with the main focus on the development of the physical product. As the work proceeded the focus was on the design team collaboration in general, and the staging for such collaboration. Such a team would generally also include participants from marketing and sales. In the later phases of the thesis I had several informal talks and discussions with sales and marketing employees, which gave fruitful insights to the understanding of the team collaboration and described some problems viewed from their specific perspective.

Industrial design consultants
The industrial design consultants chosen for the interviews have worked with one or several of the companies. Even though the interviews were made anonymous, it was viewed as fruitful that there was a close link between the design consultant and the company. In the interviews the design consultant and the employees in the company would relate and use examples from specific projects.

When I got in touch with the product development managers in the different companies I asked them for names of design consultants that could be interviewed. Usually I got a few names of design consultants that they suggested to interview. In most cases the company was still using these design consultants in development

projects. In general the design consultants interviewed were experienced designers who had been involved in many projects.

In the interviews there were in general two groups of design consultants. The first group, which was the smallest, worked mostly on a royalty basis. They develop concepts and tried to sell them to companies. The second group worked mostly on engagement and payment by the hour. They are hired to do design work for the company. Two of the designers interviewed were in the first group. The character of the collaboration will change to some degree depending upon the type of contract. Nevertheless, the main focus was not on the specific interaction between the design consultants and the company, but on the staging for collaboration in the design teams.

Employees in the internal product development division
The employees interviewed in the product development division were the product development managers who had close contact to the external design consultants and were collaborating with them. In addition other employees in the product development division were interviewed. These employees were all involved in development projects with design consultants, production and sales / marketing.

Employees from production or technical division
The employees interviewed from the production or technical division were not operators but employees who were involved in the product development process. In addition the production managers were interviewed. The interviewed would have responsibilities like preparing the product for production and several of them would participate in design teams. The people were selected either through contact with the production manager or the product development manager. They all had contact with the external design consultants.

3.2.3 Labelling of interview respondents

The interviews were made anonymous. This was done so that the respondents felt comfortable giving honest and open answers. Furthermore the specific persons in this thesis are viewed as less interesting than the role and task these persons have, and the general reflection they have made in relation to the team collaboration. There is of course a risk when making the interviews anonymous that one comes up with wrong conclusions since one loses some of the specific culture and context the respondents live and work in. But in this thesis the focus does not lie on the exact specificity of the company, but on the collaboration in general with the different actors involved.

In this thesis the design consultants interviewed were given the label ‘designers’. The employees working in the product development department / division were

labelled ‘PD-employees’, even though they also may be designers of profession, and the employees in the production division were labelled ‘P-employees’, see table 3.2.

Table 3.2. Labels given to the different actors interviewed

Division and role	**Label given**
A. Design consultants	Designer
B. Employees in product development division	PD-employee
C. Employees in production division	P-employee

Each company will to a certain degree have its own unique subculture with specific values and attitudes. Some employees from the production division in one company may in certain areas be closer related to employees in the product development department than in another company. So there is always a danger and limitation in putting employees from the same divisions in different companies in the same group or label. The argument for doing so is based on the fact that these employees from the same type of division in different companies have more or less some of the same task and activities in their daily life. However, their responsibility and sphere of influence will vary, reflecting the relationship between actors and the structuring of the design process in the company. There will be differences between each individual and between each division in different companies.

In one company it was for instance observed that the product development division was more technically oriented than in another one, that was more marked oriented in their work. The approach of the division will depend for instance upon the technical complexity of the products. There will also be a difference between the design consultants; some are more technical and practical than others are.

It is important to mention that the labelling in this thesis is not of such importance. The importance is to discuss the different viewpoints and approaches to the same problem area, whoever brings them forth and through this discussion, try to bring new light and new understanding to this area. The reason why the use of labelling is still chosen is that some common viewpoints are observed between the employees in the three groups, independent of the company. Furthermore, as earlier mentioned, the employees within the three groups have more or less some of the same task, role and activities in their daily life. This is also the reason for the apparent commonness.

3.3 In-depth interviews

In this subchapter the work with the interviews is reviewed and discussed. The intentions behind the interviews, how the interviews were prepared and made, and how they were studied and analysed.

Figure 3.1. Diagram of phases in interview

3.3.1 Phases in interview

In figure 3.1 is illustrated the different phases for the in-depth interview. Based on the research questions an interview guideline and manual was made. The interview session was then made and recorded on tape, usually at the company facilities or at the design studio. The interview material was later transcribed. After all the interviews were gathered a review and analysis was made of the interviews and some final conclusions were drawn from the interviews. In the next sections the different phases will be described more carefully.

3.3.2 Focus of the interview

Research questions
The basis for the interviews was the research questions. Especially the first two questions where central as a framework for the interview guideline:

Q1. How are the different actors in a design team nowadays interacting and setting the stage for creative collaboration in the development of new concepts and products?

Q2. What factors or elements are influencing and forming the setting of the stage for creative collaboration in design teams?

Looking for different viewpoints

Three different groups of actors collaborating and involved in the design process were interviewed. These were external design consultants, people from the internal product development division and people from the internal production division. By interviewing these three groups of actors the idea was that it would be possible to reveal and get new understanding that would not be the case if only one group was interviewed. Each group has its viewpoint and interpretation of the problem areas. By observing these viewpoints the hope was that one could get an understanding and perspective of the total picture, and see what were crucial factors for bringing different actors together in a creative collaboration. As previously mentioned it would also have been fruitful, when looking back, to additionally have made some interviews with people from sales and marketing, since they also are central actors in an integrated development process.

Reality and wishes

In the interviews it was not just the aim to ask questions and get an understanding of how collaboration is done today, but also to ask the respondents for a more optimal way of having collaboration compared to existing practice. In such a way the last two research questions described in chapter 1 were also elaborated. I asked about their dreams and visions for an improved collaboration. I tried then to stimulate the respondents to imagine and propose, out their own experiences, what might be a more optimal way of staging for collaboration compared to existing practice. The idea was that it would be easier for the respondents to relate and put quality to the present reality when it was connected to their inner dreams and desires. In some interviews the respondents would by themselves first tell about their dreams and desires and later tell about concrete cases and situations. When there were some collaborating conflicts in the company the respondents were first often reluctant to tell about them in concrete terms. Later, when the respondents felt increasingly secure, they often revealed more than initially. This was also due to the fact that the interviews were made anonymous.

Experience oriented interviews

The intentions were to unveil and bring into light the rich experience and knowledge of the respondents in relation to collaboration in the design process. The choice was made to not follow fixed cases in specific companies, but to look for the general reflections, experiences and insights of the respondents in connection with collaboration. I asked regularly for concrete examples from cases to get a concrete understanding of the collaboration and not make the answers too abstract and detached from their real life. Concrete examples were central for getting a real understanding of the collaboration. The experience made was that

the respondents in general were very concrete and project oriented. They used by themselves examples to underline their ideas and insights.

If the decision had been made to look more specifically into the companies and concrete cases than the case was, more interviews should have made in each company and fewer companies should have chosen, to get a clearer picture of the differences in practice. This would have been a different approach which was not chosen.

3.3.3 Principles for the interviews

Principles around making the interview
In the interviews each topic was started with open, nondirective questions which could allow the respondents to tell their own stories in their own term. Such questions have been aptly named "grand-tour" questions [Spradley 1979, p.86-87]. Questions would be like:
"*What do you view as important for having a good collaboration with the designer?*"
"*What is your experience with multidisciplinary teams in the design process?"*
I would often ask the respondent to come with concrete examples to clarify and elaborate the topic. I would also come with follow-up questions to clarify and understand more deeply the topics raised by the respondent. Later in the interview, at the end of each question category, I would take a "proactive" and obtrusive position. I would ask questions like: *"Can the use of exercises help to create a good collaboration? If so why, why not?"* The purpose of this second category of questions is to give the respondents something "to push off against". It is to give them the opportunity to consider and discuss phenomena that do not come readily to mind or speech [McCracken 1988, p. 34-35].

All the interviews had a general framework of questions, touching the topics of the research, which was related to the research questions. But as an interviewer I was not strictly fixed to the written questions and the manual. If necessary, I improvised using my intuition, empathy and personal experience as a guide. When the respondent felt he or she had something important to say related to the research topic, this was welcomed. The interview was viewed as a communicative event [Briggs 1986] where the interactional dynamics between the interviewer and the respondent shaped the content. When touching a central topic, I would as interviewer seek to come up with spontaneous follow up questions that could lead to new insights, if it felt right and appropriate. I tried to create a personal atmosphere and setting during the session in which insights about collaboration could more easily be accessed than without such atmosphere. The experience made was that the depth of the answers was dependent upon my presence and my ability to be focused, attentive and present.

The approach is similar to ethnographic field methods that put emphasis on a personal involvement of the investigator. It involves an iterative, improvisational approach to understanding, wherein partial and tentative formulations are revised as new observations challenge the old, and where adjustments in research strategy are made as more is learned about the particular situation at hand. This approach cannot be reduced to a set of fixed methods and techniques [Blomberg et al 1993]. Miles [1979] emphasises that the investigator needs to use his own experience and imagination in the inquiry: *"The investigator cannot fulfil qualitative research objectives without using a broad range of his or her own experience, imagination, and intellect in ways that are various and unpredictable."*[p. 597].

Degree of participation and being proactive

It was experienced that it was sometimes difficult and challenging to find a balance between a passive and a proactive role. When listening to the interviews I could hear sometimes that I interrupted the respondent or didn't always come with good follow up questions. It could be situations where I had a question ready in my head, and instead of being totally present with the answers of the respondent I was preparing the next question. This was partly due to the feeling of time pressure and maybe also because I felt the need to come into new topics. I could also sometimes ask questions that were too leading and not open enough. But I have tried in the analysis of the interviews to take that into account.

Sometimes I felt during the interview that I really had to challenge so that I could get beyond the formal, impassioned answers and get honest and profound answers of the respondent. I could for instance come with such a question to a production manager: *"One designer I have interviewed says that the production people rather quickly say "it is not possible to make this" and if they had tried a little more they would have found a useable solution. What do you think about that?"* My experience was that such questions created reactions, the respondent got provoked and involved, and even though the first answer was not necessarily interesting, it raised the intensity of the discussion and the final outcome was better.

Some times I could hear that I was too passive when the respondent started to talk about topics that were outside of my research. I was then probably too afraid to offend and had maybe too great a respect for the respondent. This was probably the case for instance when I interviewed some of the most known design consultants in Norway. One designer would start to talk about creativity in school, which was not the topic of my research. When listening to the tapes in the transcription I could observe my way of acting and learn about myself. It seems to me to be a delicate process to interrupt and change the topic of the interview when the respondent is all engaged in the matter.

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3.3.4 Preparation for the interview

Questionnaire and Manual
The questionnaire has several functions in an interview, according to McCracken [1988]. First, it *"ensures that the investigator covers all the terrain in the same order for each respondent"*. The second function is *"the care and scheduling of the prompts necessary to manufacture distance"*. The third function is that *"it establishes channels for the direction and scope of discourse."* [p. 24]

When the questionnaire for the interviews was developed all possible questions of interest were written down. As the number of questions increased they were put into different categories. Over time a paper with over 10 pages of questions was developed. Then the questionnaire was narrowed down and what seemed to be the most interesting questions were picked out, which were formulated in the form of keywords and short phrases. This type of manual, consisting of 4 pages, gave a framework for the interviews. As interviews were made, new topics were added and others were taken away, depending upon the outcome and response from the respondents. The respondent came up with some new topics that were elaborated on in the next interview, while topics that seem to be less interesting from the viewpoint of several respondent received less attention. In such a way the manual changed during the time interviews were made. Nevertheless, the main terrain and order for the questionnaire remained mostly the same. A short version of the manual, translated into English, is found in appendix A.

3.3.5 The interview session

How and where the interviews were made
All the interviews were done at the company or at a design studio (for the designers), using a tape recorder as a logging technique. The maximum of interviews within one day was three. The reason for having the interviews at the company was mostly time pressure from the respondents. I did not want to use more of the respondents' time than necessary for making the interviews. The aspect of making the interviews in the company could be both positive and negative. It was positive in the sense that the respondents felt they were in a known setting and were close to the real life problems. They could use their visual memory and show concrete examples of projects. It was negative in the sense that the respondents could have difficulty to look beyond their daily and short term problems. But the experience made was that the respondents managed, at least after a while, to change their mind-set and be really present in the interviews.

Giving the framework for the interview
Before starting the interview I presented my personal background and myself. Then I presented to the respondent in summary the research focus and why I wanted specifically to interview them. An overview of the topics for the interview were also given. It seemed to be positive for the respondents to know something about the topics of the interview before start. They seemed to feel increasingly comfortable when they knew something about what was coming. I told them that the interview would be anonymous, so they could feel free to be open and honest. I also told them the interview would take a maximum 90 minutes, usually a little over an hour. This seemed to be important since they often had time pressure in their work, and when they knew the limited length of the interview they could relax and be present during the interview session. I suggested that it would be favourable if they turned off the telephone or mobile phone during the interview session, which most of them did. It was also important that I showed respect for their stressed situation with time pressure.

Gestures and offers by the company
Usually the respondents would offer some coffee or soft drink and sometimes also some biscuits and small cakes. They would either before or after the interview session show me around in the company and show their current products. When I was at the factory I would be shown around to see the production lines. Often I would come to the company and have one interview before lunch and then one after lunch. This was something that I encouraged. Having lunch with the respondents gave also the opportunity to see the respondent in a different and more informal setting than during the interview session. I could observe the way they were communicating with colleagues and their internal culture. It was also fruitful as a shared activity. I often experienced that new factors, insights and ideas came up during the informal discussion around lunch. The respondents returned sometimes to some of the topics in the interviews and discussed them with some of their colleagues in my presence. Afterwards I noted some of the insights and observations in the notebook.

The start of the interview
Each interview was started by asking some general questions about the respondent, his career and his responsibility in the company. I also often asked about the history of the company and why the company had survived in the competitive, manufacturing industry. I did not plan to use the answers in the thesis; the reason for asking the questions was to create the right atmosphere where the respondents could present themselves and their world. It was a way to get acquainted and to have a 'soft start'. McCracken [1988] writes in this regard: "*A way to create an atmosphere of face-safety is to make the opening questions simple, informal ones. A few minutes of idle chatter at this stage is welcome, to make the respondent feel more relaxed. It is an important time to reassure the*

respondent because it is in these opening stages that he or she sets his or her defense." [p.38]

The end of the interview
The interviews were always ended by asking if there were any topics the respondents felt we had not touched that they wanted to tell more about. Some of the respondents had then several remarks while others did not have any. After turning off the tape recorder, it was experienced several times that the respondent then started to tell about new matters. Sometimes they said it should be off record, which was respected. It seemed that just turning off the tape recorder created a new setting, we would both come with stories and sometimes jokes, I would ask the respondent how he felt the interview went and if he had any comments around the interview itself. It was experienced several times that the respondents then came with new insights of interest. Either I wrote them down later in the notebook or sometimes I asked if I could start the tape recorder again, since I felt what they said was of interest. The respondents usually did not have objections against starting the tape again.

In the interviews the aim was to focus on the respondents viewpoints, opinions and insights and to not come too much with personal opinions on the matter. After the tape recorder was turned off the respondents sometimes asked what I felt about the matter. Sometimes we both felt the need to talk more informally about the matter. This created a discussion and in this discussion the respondents sometimes came with new insights.

3.3.6 Transcription and analysis

Transcription of interviews
Each interview was recorded on an audio tape recorder. During the interviews some notes were also made. The duration of an interview was on the average between 60 and 90 minutes. The longest was about two hours, the shortest about 40 minutes. The interviews were transcribed to a Word file. This transcription took a lot of time and was hard work. In the transcription about all of the interviews were recorded. Sometimes when the respondent started to talk about topics that were far outside the field of study it was not transcribed. The clear aim was to transcribe without making changes. Sometimes when a word was dropped out it was filled in, but put in parenthesis. The transcription of an interview would generally be between 15 and 25 pages. In the transcription, labels were also used in relation to what the topic was. Furthermore after reading through the transcription a few times some quotes were put in cursive that at first sight seemed to be of most interest.

One could discuss the necessity of transcribing all the material, since it took so much time and was a long and partly tedious work. The experience made was that it gave a deeper understanding of the material, it was an effective way to get into the material [Kvale 1996]. Whenever desired, it was possible to look for quotes in the material. It is suggested that if a selection of the material had been made without making a transcription than the chances for subjective evaluation based on own intentions would have been greater. Through the transcription a better understanding was obtained of the different viewpoints. One could say that it has been a maturing process. It was for instance observed that my reactions or personal feelings for some of the answers of the respondents have changed as I worked with the material and got a better understanding of the different viewpoints of the respondents.

First phase of the analysis – picking out relevant quotes
After all the interviews were transcribed I looked for comments and quotes that seemed to be of interest in relation to the topic. Quotes from each interview were picked out, sometimes with the question if it seemed relevant. From an interview of 20 pages quotes of about 5 pages were gathered. Each quote was translated from Norwegian to English and given a label or title in relation to what the topic was. The total number of quotes from the 26 interviews amounted to about 1200. All of them were cut up with scissors, so that there was about 1200 pieces of paper with quotes.

I was all the time looking for quotes that gave a broad picture of the topic and that often seemed to contradict each other. The desire was not to find just one reality or truth. There was of course a danger that in this selection important information would be lost. I could have a perceptive filter and loose insights and information that could have been important. There is no guarantee that this was avoided. But often I would see in the interviews that some topics were repeated again and again, so repetitions could be avoided. I would also see topics that were outside of the research focus. Some respondents would talk about their specific company and products that did not have a direct link to the research focus on the framework for creative collaboration. Based on the chosen approach, where I tried to generalise about the staging for collaboration and creative process and where I did not try to compare directly the different companies and their products, some of this material was dropped.

There seems to be a big difference between the answer that the respondent themselves came up with and the ones that were directed by me, where I came with suggestions. If the respondent answered *"Yes, that might be a good idea"* without any more reflection or talk around it then the answer did not really tell much, and it was not considered as a positive answer or approval. In general, in

the analysis quotes were used that were longer, where the respondents told their story from their viewpoint.

Second phase of the analysis – grouping quotes
In the second and third phases of the analysis an approach similar to the KJ-method was used [Kawakita 1982; Buur 1989]. The purpose of the KJ-method is to establish a hypothesis about the relation between large amounts of data in a bottom-up process. The idea is to let the material speak and find its own structure, rather then putting it right away into categories that fit your own mind-set. The 1200 quotes were all given labels with title and source. The title would be related to the topic that was addressed in the quote. I started to put them out on the floor and arrange together those that right away seemed to fit in the same group. Each group then got a label or title. Through this process I ended up initially with 250 groups. Some groups had a lot of quotes while others just had one or a few. All the labels of the 250 groups were written on a piece of paper. So I had 250 pieces of paper with labels.

Then the labels that seemed to belong together were grouped. Some labels fit quickly into larger groups while others remained by themselves. As several labels formed a group, this group was given a new label, always keeping into account the underlying labels. The procedure was repeated with grouping and labelling. As I worked through the labels and arranged them in different groups I got fewer labels with more general topics and categories. The topics in the groups were of course very intertwined and interconnected. The grouping into general topics and categories functioned then as a help in the forming of the chapters in the thesis, combined with the results collected through the running and trying out in the innovation course. The final material of the interviews is presented in the chapters 5, 6, 7 and 8 of this thesis.

3.4 Action research

This section presents an outline of action research and how it has been carried out in this thesis.

3.4.1 Action research in general

Within action research there are three main approaches: Co-operative inquiry, participatory action research and action inquiry [Reason 1994]. All three perspectives or approaches embrace the idea that experiential knowledge arises through participation. In general, in action research the researcher submerges him or herself in the material as an active participant. It is a demanding form of inquiry

because the researcher takes on the role of an active participant, while at the same time arranging the premises for the action and keeping a conscious eye on what is going on. Action inquiry is "consciousness in the midst of action" [Torbert 1991, p. 221]. In my approach it was also a continuous move and change between action and reflection [Argyris et al. 1985], with an approach similar to Torbert [1981] argues:

"*Research and action, even though analytically distinguishable, are inextricably intertwined in practice… Knowledge is always gained in action and for action… From this starting point, to question the validity of social science is to question, not how to develop a reflective science about action, but how to develop genuinely well-informed action – how to conduct action science.* " [p. 145]

There are a number of trade-offs in action research that differ from traditional objective methods [Øritsland 1999, p. 40].

- Action research sacrifices an objective perspective for a greater richness of information. By being submerged in the action it is possible for the researcher to observe phenomena and causal relationships that the participants are not aware of or do not consider important. The researcher experiences first hand the same phenomena that the participants report, and therefore has greater likelihood of understanding tacit knowledge, unspoken rules, etc.
- Action research makes the researcher a part in any argument. Due to an emotional engagement with the material, unbiased observation becomes difficult.
- Action research allows the researcher to influence the process that is under observation, both positively and negatively. If one wants to try out something new, it is possible for the researcher to assure that participants stay on track and remember or learn what is necessary for the successful completion of, e.g., a new method. On the negative side, participation by the researcher will colour the participants' reactions and may change a natural course of events. In effect, the researcher may force the results to show the expected.
- Action research makes an experiment a singular occurrence. The classical experimental goals of repeatability and generalisation may not be achieved. Instead one must base observations on their being acceptable and reasonable.

I will briefly comment on my role in action research studies. Most of the action researches that have been done are connected to the innovation course, which I have been responsible for together with a colleague. The general frame of the course is reviewed in chapters 4 and 8. In the course I have led the students through workshops, exercises and new methods. Additionally I have also tried out exercises and methods in three industrial cases.

3.4.2 Authority and leadership

In action research the discussion of authority and leadership of the researcher is important, and a difficult matter. On one hand, as it is in this thesis, the researcher has to lead or participate in the group and implement some exercises or new methods. At the same time it is important that the participants get their own relation to the exercises, methods and models. In my work as a teacher and researcher, trying out different exercises and methods, I have usually given a general outline and framework to the students. At the same time I have emphasised openness and was eager to let the students find their own relation to models, exercises and methods. As Torbert [1991] argues, action inquiry demands the exercise of freedom. How would for instance students adapt and relate to a new model and exercise? Many of the insights done in the course were actually through the students' creative interpretation of models and methods, where the student groups created their own way of understanding and way of using a model or a method. The degree of active facilitation from my part depended also upon the previous experience the students had with such exercises and methods. Co-operative inquiry is an emergent process that participants are first led through, amend and develop in the light of their experience, and finally embrace as their own [Reason 1994, p. 335]. The attitude towards several exercises and activities changed among several of the students during the course. This will be discussed in chapters 7 and 8.

The question of leadership of session and exercises draws the attention towards training, both the training of the facilitators and the training of participants. There is a whole range of skills required for participative research, skills that are very different from those in orthodox research, and that include skills of self-awareness and self-reflexiveness, facilitative skills in interpersonal and groups settings, political skills, intellectual skills, and data management skills [Reason, 1994, p. 335]. Before starting the course I had already led several workshops for groups and companies. In the courses and workshops I developed further my own skills in this matter. I became increasingly confident and could try out continuously new exercises based on the experiences of previous exercises. These experiences were based both on my own personal experience and the impression and experience from the students through verbal and written feedback.

3.4.5 The action research cycle

The general way the action research was carried out is illustrated in figure 3.2. Based on the research questions, on literature studies and the preliminary conclusions from the in-depth interviews, some suggested tools and methods were

tested and tried out in the innovation course. In this testing and trying out observations were made and noted. The students also came with continuous verbal feedback. At the end of the course the students gave a written feedback that was a personal evaluation and essay of the course and the methods and tools used there. The students were additionally asked, when the course was ended, to answer some questions concerning different methods, models and tools used in the course. During the running of the course some change and adaptation were made to the tools and methods based on the immediate observation and feedback from the students. This loop is given the label "1" in figure 3.2. After the course ended a review and analysis of the feedback and observations was made. In the next workshop or course some change and adaptations were then made. This is shown with the label "2" in figure 3.2.

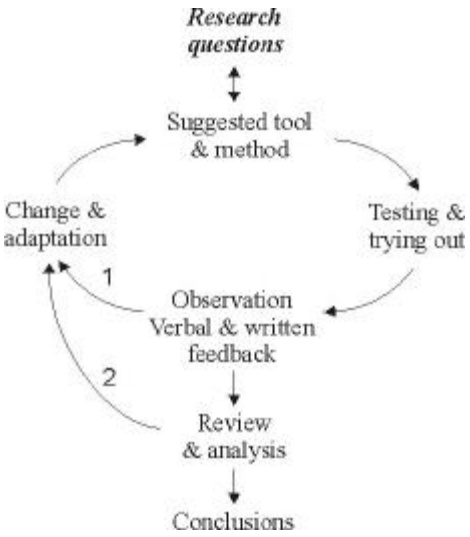


Figure 3.2 The action research cycle

3.4.3 Empirical material from course and workshops

Some general facts concerning the innovation course are described in table 3.2. In the course I was the facilitator for the exercises and set the stage for the general framework in the workshops. I would give guidance in the use of new methods and approaches to design. The empirical material collected in the course came through:

- **Personal observations and experience** (notes**)** collected during and after the class sessions
- **Verbal feedback** from the students
- **Written feedback** from the students (essay and answers on questionnaire)

- **Posters and different presentation material** from the student presentations
- **Video recording** of final presentations

Notes were taken during and after the class sessions. In some exercises, like in story writing exercises, I would have time to note when the students were involved in the activity. I noted the way the students reacted, based on their verbal feedback and on my own personal experience of how the exercises had worked out.

Table 3.2. Facts concerning action research in innovation course

Total number of students: 1999:10, 2000:12, (2001:14) ***Course credit***: Equivalent ¼ of a semester ***Background of students***: Product Design (11), Mechanical Engineering (5), Industrial Economy (3), Architecture (2), Computer and Information Science (1). ***Level of students***: Mostly 8th semester, before final master thesis ***Period of course***: Spring 1999 and 2000. Start of course spring 2001. ***Duration of course***: About 3 months

3.4.4 Participation and collection of material

The first year the course was held my teacher companion was in the room but did not partake in some of the exercises. In the final feedback from the students several of the students remarked that it had been negative that the teacher had not been participating. The students felt they were observed and it restricted their willingness to let go and be "crazy". So it seems important that the teacher and researcher participate as much as possible.

When asked, several of the students also said that the use of video would restrict their activity and make them less free, especially in exercises. So the use of video camera was restricted to the final presentation of the project, where the camera was just one of many "eyes" present. In the innovation course of spring 2001 video recordings were also used for earlier presentations.

The experience made was that it was not always easy for the students to articulate in the moment their experience and evaluation of an exercise. They would for instance say "I liked it", "it seems useful" but did not say exactly or precisely why they liked it or felt it was useful. This was partly due to the fact that the exercises touched them on emotional sides that are difficult to articulate. Furthermore, they

often needed the time to 'digest' and get accustomed to the exercises. It was then more beneficial to ask the students later in the course about the specific exercises, because they then could articulate and formulate more clearly than previously what they liked and did not like and why they felt the exercises for instance were useful. This had to do with the fact that the understanding of the student matured during the course; they were in a learning process.

3.4.6 Analysis of material

In the review and analysis of the material from the course a procedure was used that has some parallels to the KJ-method used for the in-depth interviews. The observations and feedback were carefully reviewed and the most actual material and quotes were marked or labelled with cursive. This material was then translated into English. Quotes and different viewpoints from the students were given labels and arranged into groups from a bottom-up procedure, similar to the one described in section 3.3.6 for in-depth interviews. This bottom-up procedure was important since it was observed that the question heading did not always fit with the answers by the students. Furthermore, several important statements, viewpoints and insights were brought up by the students that were not addressed in the questions. This bottom-up procedure with labelling was done in relation to all the empirical material presented in chapters 7 and 8.

3.5 Verification

In the previous subchapters the discussion was connected to the research approach and methods. In this subchapter some outlines are given for how the results and methods presented from the research may be subject for verification.

3.5.1 Verification of design theory and methods

Verification of theory and methods according to the tradition of natural science can only be achieved by successful application in practice. Buur [1989] argues that direct verification is unrealistic for design theory, due to the multitude of factors influencing the design process, and the stochastic nature of design. He therefore suggests two alternative ways of verifying design theory. These are logical verification, and verification by acceptance.

1 - Logical verification:

- Consistency: there are no internal conflicts between individual elements in the theory
- Completeness: that all relevant phenomena observed previously, can be explained or rejected by the theory

- Coherence: well established and successful methods are in agreement with the theory
- Cases and specific design problems can be explained by means of the theory

This approach has the drawback that confirmation of a theory will be by analysis, while actual design is a synthesis process, meaning that observations may be imprecise.

2 - Verification by acceptance:

- Statements of the theory are acceptable to experienced practitioners (design consultants and employees in companies).
- Models and methods derived from the theory are acceptable to experienced practitioners.

This approach has the weakness that acceptance is influenced by pedagogical and rhetorical variables that are hard to control.

Both of these methods of verification have been applied in this thesis. Logical verification by consistency, completeness, coherency and explanatory power is present in the text. In this thesis there is no attempt to come up with final proofs, which also do not fit to the paradigm that has been chosen. It is for instance impossible to show or prove that a single and isolated exercise in visualisation, storytelling or theatre play directly helped the project, because there is no distinct and clear linkage between these activities. What is looked for is soft empirical support for the results. The second method has been used, with verification by acceptance, as a way to also build support for theory, models and method proposed in the thesis. In the course the qualitative feedback and perspective of the students have been used as a guideline and as a verification of the usefulness of different tools, models and methods. In accordance with phenomenological analysis a discursive discussion has also been used, where the different viewpoints of the respondents and students have been presented and compared and where one has tried to reveal or discover what their common denominators were. What is viewed as common or relatively constant is inter-subjective and assumed to capture the experiential essence of the phenomenon.

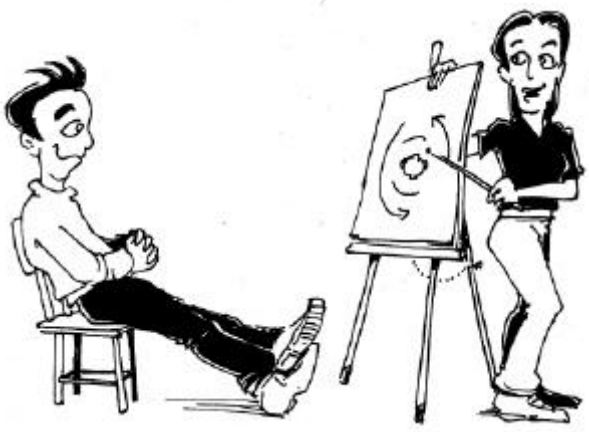
3.5.2 Soft quantification

Soft quantitative measure of the material has been used both in the in-depth interviews and in the feedback from the action research. This is done when a problem is viewed as central by many or if it is just mentioned by a few of the respondents. Soft quantitative measures like “all”, “most of”, “several”, “a few” or “one” have then been used. This might be criticised by some qualitative researchers, but after consideration the decision was made to still use such measures. When most of the respondents mention a problem area it seems likely

that it is a common problem viewed from many viewpoints and “life-worlds”. Nevertheless, the aim is still to describe the life-world of the respondents or participants in the course and not create hard statistics out of the unique and qualitative experience and life-worlds of each individual.

Chapter 4

Conceptual models



The soul never thinks
without a picture

- Aristotle

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In this chapter three *conceptual models* are proposed and shortly discussed, see table 4.1. The chapter is central in relation to the research question stated in chapter 1: What type of models, tools and methods may be used to improve creative collaboration in design teams?

Table 4.1 Overview of the three proposed conceptual models

Model	Icon/ symbol	Description
Process model		Creative process as an order-chaos cycle
Dialectic model		Design as a creative activity in dialectic tension
Vision based model		Aspects of products in 4 levels of abstraction

The models proposed in this chapter will be referred to and used as basis for discussion in the following chapters of the thesis. The first model is connected to the creative process. In this model it is proposed that the creative process is an evolutionary cycle going through phases of order and chaos, discomfort and comfort, divergence and convergence. It is called "the process model" with a symbol of a cycle since it has a cyclic form. The second model is connected to the dialectic tension in the design process. In this model it is proposed that design is a creative activity in dialectic tension between the "soft" and "hard" aspects and approaches to the design field. It is called "the dialectic model" with a symbol of a star since it has the principal form of a star. The third model is connected to different ways of perceiving a product. In this model it is proposed that aspects of products may be connected to four levels; the spiritual (intention), the contextual (expression), the principal (concept) and the material (product) levels. It is called "the vision-based model" with a symbol of a pyramid since it has the principal form of a pyramid.

The first two models, the process model and the dialectic model, may be viewed as giving insight and understanding to the field of creativity and design while the vision-based model may also be viewed as an operational model, in addition to giving insight and new understanding. These three models will be used, to a larger or lesser degree, as references and frameworks for discussion in the following chapters of the thesis.

4.1 Background for development

4.1.1 Definitions of model

In the Wordsmyth dictionary [www 1] a model is defined as *"a representation or copy, often smaller than the original and used as a guide to making a thing in full size"*.

Webster dictionary [www2] defines a model as *"a usually miniature representation of something*". Another definition by Webster is *"a description or analogy used to help visualise something (as an atom) that cannot be directly observed"*. A model will often be fairly abstract, and can therefore give room for many different interpretations. A model in the context of this thesis may be described as a *"simplification of the experienced reality"* where some relations between factors are emphasised while others are not. Even though any model has its limitations, good models may thus show and visualise relations that are of importance for new understanding. They can furthermore function as basis and framework for reflection and discussion among different people. Through such discussion new understanding may be developed. Models can be visualised with the use of forms and symbols, like the ones in this thesis, or may be described mostly by words. A good visualisation of a model may nevertheless be powerful, instructive and easier to remember, since the visual form of the model helps to recall the elements that are linked to it.

4.1.2 The story behind the models

The process model and the dialectic model where developed very early in the doctoral project. They were developed through personal reflection made in the act of working creatively and through discussions with colleagues. The development of these two models was based on a personal desire to create structure and see the perceived connection between elements connected to the creativity and the creative process. At the time being the impression was that there did not seem to be a good model visualising the creative process and the dialectic tension field of design, which could function as a basis for self reflection and also discussion with colleagues. These two models seemed to fulfil this personal need.

The vision-based model was developed about halfway in the doctoral project based on personal reflection, discussion with colleagues and through review of literature in the field of design and product development. Models that showed visually the connection between the soft and hard aspects of products were viewed as lacking. Furthermore, no visual models seemed to incorporate aspects of products connected to the spiritual and contextual level and connect these aspects with the principal and material level, as the model is proposing. As the model emerged it was discussed and shared with several colleagues at the Department of Product Design Engineering, NTNU. It seemed to fit with the new design philosophy and thoughts that was emerging at the department. Interaction experience, which is central in chapter 7 and 8, was for instance a topic that was increasingly viewed as important among several colleagues. In this context a PhD thesis was completed in the field of human-machine interaction [Øritsland 1999].

Through further self reflection and through discussion with colleagues the model was continuously changed and elaborated to the final form and content. The model also went through some minor changes when it was used in the innovation course. A few elements in the model, that did not seem to reach or awake understanding in the

students, were then dropped and changed. These changes were not connected to the main structure of the model, but to the choice of some specific words in the model.

4.2 Model for the creative process

In this subchapter 4.2 a conceptual model for the creative process is proposed, which describes the process as an organic, cyclic movement going through order and chaos, divergence and convergence, giving continuous growth and evolution, see figure 4.1. In the following sections a short discussion and presentation of the model is made, with the basis in existing concepts and theory.

4.2.1 Existing concepts and theory

Several researchers have described the creative process going through a phase of dissociation and unfreezing and then into a phase of association and refreezing. Vygotsky [1995] proposed (originally in 1930) the creative process as a process in two major phases, the dissociation phase, where the complicated totality is separated into pieces, and the association phase, where there is a combination of dissociated and changed elements. Lewin [1951] proposed in a similar way, but connected to organisation development theory, a change process in three steps: 1) Unfreezing, 2) Moving and 3) Refreezing. The unfreezing step involves reducing those forces maintaining the behavior of the group or organisation at its present level. The moving step shifts the behaviour of the group, organisation or individual to a new level. In this process the group develops new behaviour, values and attitudes. The refreezing step stabilises the group or organisation at a new state of equilibrium.

Campbell [1949] developed a visual model for the adventure of the hero, in relation to mythology. The model is circular and is divided into two parts, a lower and upper part. The lower part is under the threshold of adventure, below the level of normal consciousness. The hero passes the threshold of adventure and has to face trials and kill a danger or dark force such as a dragon, which in some stories and myths is described as a chaos dragon. He finally emerges out of the cycle, back into the normal level of consciousness. Through the process the hero is transformed and has gained new consciousness. The hero finally obtains an elixir or insight that restores the world and shares this insight with the rest of the community. In some stories the insight can be symbolised in the form of a princess or a treasure, which is hidden and guarded by the dragon. According to Campbell [1949] the dragon may be viewed as a symbol for the locked and unresolved forces within the human psyche.

4.2.2 Description of the model

In figure 4.1 the model for the creative process is presented. In this model the creative process is viewed as an organic, cyclic movement going through order and chaos, divergence and convergence, giving continuous growth and evolution. The process is driven by some kind of intention or purpose and involves an initial letting go and breaking up of existing knowledge, order and understanding. It is suggested that the designer or creators need to go through a phase of chaos to be able to create new order and that new acquired knowledge and ideas will have its foundation basically from existing knowledge and ideas. As described in section 2.1.5 new concepts may be viewed as the combination of existing concepts and knowledge. In the creative process, the designer needs to be free and break with the current mental fixation or order to be able to develop new insight and new ideas, as described in section 2.1.7. With a 'creative perspective' one should hence view knowledge and understanding as something in constant change and evolution.

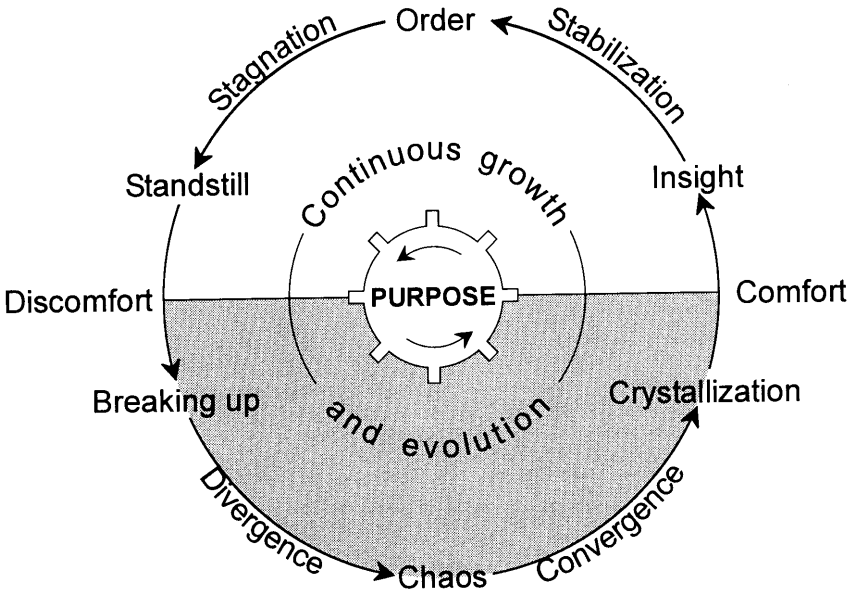

Figure 4.1. A conceptual model for the creative process

The model proposes several phases in the creative process. The basic idea of the model is similar to the concepts of Vytgotsky [1995] and Lewin [1951], even though other words are used such as order and chaos. The most important contribution of the model is among others that it is visual, almost like an icon, which is easily remembered due to its general form and structure. It has also more phases described than the concepts of Vytgotsky and Lewin. It integrates and embraces directly such aspects as discomfort and comfort into the model, which are viewed as a natural part of the creative process cycle. Lewin has described the resistance and discomfort for change in an organisation, but it is not directly part of the overall concept.

The process model also describes the creative process as an evolutionary cycle, giving growth and evolution. The degree of growth and evolution will generally depend upon the degree of reflection that is made by the designer or design team (or creator) during the process. If the reflection around the process is lacking the learning will be less significant. Reflection in action has been described as a central element of the design process [Schön 1983]. At the centre of the model a cogwheel is furthermore visualised and marked with "purpose". This is emphasising that there is some underlying purpose that is driving the process. The purpose can be quite different, all from the need for survival to the need of self-realisation. Such purpose will be linked to motivation, which was described as a central factor or condition for creativity in section 2.1.6. So it is argued that the model incorporates several elements that are not found in the concepts of Vygotsky and Lewin.

4.2.3 Process understanding

It is suggested that the model should mainly be viewed as a model giving insight to creative process. It is not an operational model. As a tool it can help a person or group who is working with the development of concepts and products to become more aware of where they are in the cyclic process. The insight of knowing that order comes out of chaos can for instance help a person or a group face the initial phase of the process with discomfort, breaking up and chaos. As it is suggested in the model, the start of the process may often involve discomfort. The act of facing, enhancing and focusing on the discomfort while trying to be open for the underlying message can be a way to evoke the creative process. This perspective to the process has some similarities to when Campbell [1949] has described that the hero "has to go out and slay his dragons". The creative process may be viewed as a "hero journey", where the unknown and unresolved areas of the consciousness is explored. Taking the attitude that a creative process, both individually and in a team, often involves discomfort and anxiety may help so one has higher tolerance and acceptance when discomfort actually is experienced. In one Ecodesign course that was taught at the Department of Product Design Engineering the model was presented and described for the students. The group of students reported at the end of the course that if they hadn't know that the design process involved phases of chaos and discomfort they would probably have given up along the way. In a design process the experience of chaos will not just be related to the solving of the design task and problem, but also be related to the social process in the group, especially if it is a new group who has to develop an order in their internal relations and working procedures.

The model is fairly general and can also be used to describe the phases that a team (or organisation) will go through also in the implementation of new methodology. Initially the team members have a certain sense of order based on the methods or tools they have been using previously in the design process. The process of implementing new methods will then start with a phase of breaking up from the existing work procedures, which may evoke discomfort and anxiety and lead to a phase of chaos. After a while

the team members will learn, adapt and master the new methodology and a new state of order will be established. Such need for adaptation of tools and methods will be discussed in chapter 7 and 8.

In a team different actors will often play different roles in the creative process. Some of the actors may have a higher preference for the divergent phases while others have a higher preference for the convergent phases. Additionally there will be people who have preference for the co-ordination role [Wilde 1997]. In general, groups will have an inclination to be more creative when they have members with different preferences [Leonard and Straus 1997; Wilde 1997]. The model, which visualises the divergent and convergent phases, may be used to discuss and reflect around different preferences in a team.

In a design process it is proposed that a team will often go through such a process cycle many times and on different levels. The group may experience a chaos – order phase for a smaller part problem of the larger design task. After having developed a new order the team might also need to break loose from this order again and once again create a new order. In chapter 8 it is proposed that each phase in the concept development will involve a divergent and convergent phase. It is viewed as important that one allows a phase of breaking up from the existing understanding and fixation before one tries to converge towards a new solution. The creative process involves a phase of mental restructuring and the mind gets easily fixated by existing solutions, see section 2.1.7. One could view the chaos phase as a phase of mental restructuring where some elements are left while new ones are added and combined to create new understanding. It is important to give room for a phase that is divergent and chaotic so it is possible to obtain a new mental structuring. New order and structure will eventually emerge from chaos in healthy minds through crystallisation.

In the innovation course, which is described in subchapter 4.4, the model was presented for the students. At the final presentation several groups used the model to describe the process they had gone through. Each phase that ended in a presentation, from visions to final concepts, was presented as a cyclic process, where the group used the model as a framework for describing their own experiences.

4.2.4 Short summary

In this subchapter a visual model for the creative process was proposed and discussed. It is argued that the model may help a team to become more aware of where they are in the process and better understand the different phases they go through. It is argued that a design team will go through such process several times in a project. The model proposes that discomfort and chaos is a natural part of the creative process. It may therefore help a team to have higher tolerance and acceptance when discomfort is actually experienced. The students in the innovation course seem to view the model as useful and a few teams have used the model to describe the different phases they have gone through during the concept development.

4.3 Model for the dialectic field of design

This subchapter 4.3 proposes a second model, which is a conceptual model that illustrates design as a creative activity in dialectic tension between traditional viewed opposites such as fantasy and reality, intuition and knowledge, improvisation and method.

4.3.1 Existing concepts and theory

Left and right mode
Based on research on the two brain hemisphere Edwards [1979] described two modes of thinking, the left and right mode. The right mode was for instance holistic, intuitive, spatial and synthetic while the left mode was linear, logical, digital and analytic. The terms mode are used to avoid entanglement in the rapidly evolving theories of brain function. In a similar way Faste [1994] described these two modes, adding aspects such as qualitative, general, relational, involved to the right mode and quantitative, specific, detached to the left mode. A close parallel of such contrasting terms is found in the understanding of duality in Ying and Yang [Edwards 1979]. According to Faste [1994] in ambidextrous thinking these two modes of thinking should be combined. Brain-body functioning should not be an issue of either/or but rather both/and.

Concepts on design schools
Stoltermann [1994] has proposed that design schools may be divided into two main school directions. The first school Stoltermann has called ‘the Romantic tradition’ with ‘the aesthetics approach’. This school, which consists of industrial designers and artists, focus traditionally on intuition, improvisation and personal experience in the design process. In this school there is often a general reluctance trying to understand the creative process in terms of methods and systems, arguing that this will easily quench the creative process. The designer is conducted by his own aesthetics, an inner vision and not by some theoretical guideline. The second school Stoltermann has called ‘the Enlightenment tradition’ with ‘the guideline approach’. This school, which generally consists of engineering designers with a background in engineering, believes in a transferable rationality, good guidelines and methods, where the designer follows prescribed actions. In this school one tries to systematise the process, using clear and fixed methods and tangible knowledge in the design process.

4.3.2 Description of the model

The dialectic model, which is presented in figure 4.2, suggests that traditional viewed opposites such as intuition and knowledge, fantasy and reality, possibility and limitation are mutual necessary conditions in design activity. This supposition of

opposites is viewed as a general aspect of design activity. In the model arrows are crossing the circle, back and forth, linking contrasting terms to their counterparts. For example, an arrow links improvisation to method and an arrow links method to improvisation. Using these arrows, the model suggests that in design activity traditional opposites such as improvisation and method or intuition and knowledge are complementary pairs in supposition. It is argued, for instance, that one needs a method or reference to be able to improvise in the design process, and without improvisation and fantasy no new concepts will take form. Design activity lies in the tension between an inner fantasy with its possibilities and an outer reality with its limitations. Equally, such activity lies in the dialectic tension between abstract and concrete representation and between viewing the whole and details.

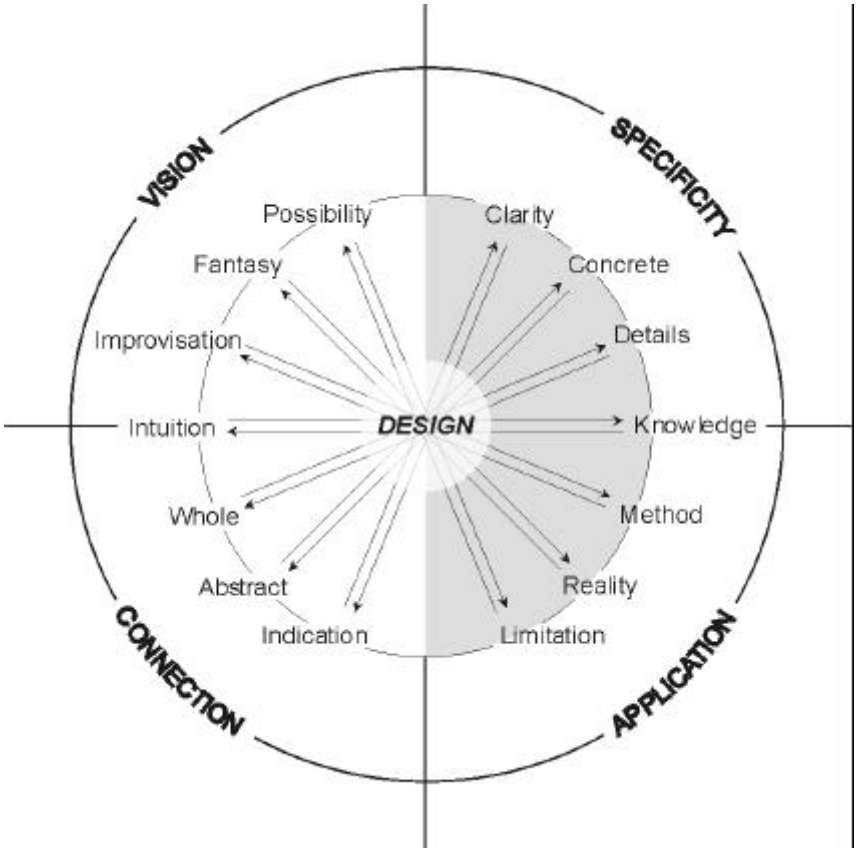

Figure 4.2. A conceptual model for design in dialectic tension

The model has general similarities to the concept of left and right mode, presented in section 4.3.1. Nevertheless, in the model specific contrasting terms are found that can be described as being directly complementary pairs in the design process. In this model design activity is lying in the tension field of all the contrasting terms, visualised as the centre of a "star". The form of a star communicates and emphasises that design lies in the centre of a tension field.

For a designer or design team the model can give insight and help to clarify, on a general level, the design process with its dialectic character. When the process stops or is blocked it is proposed that it will often be due to the situation that one is focusing too much on one of the sides of the circle. When a design team is aware of this

potential danger it can more easily be avoided. When the process stops it is therefore suggested that the design team may ask if they should make a general shift in focus. Additionally, the model could be useful in the education of new industrial designers and engineering designers, so they on an early stage become more aware of this dialectic tension in design.

The model may be related to Stoltermann's concept of design schools, presented in section 4.3.1. The left side of the model, with intuition, improvisation, vision, fantasy may be related to the 'the Romantic tradition' with 'the aesthetics approach' to design activity. The right side of the model, with method, application, reality may be related to the 'the Enlightenment tradition' with 'the guideline approach' to design activity. Based on the concept that pairs in the model are complementary it is viewed as important that these two opposite perspectives really meet, since it is argued that it is in the dialectic tension that new industrial products can come into being.

4.3.3 The four quadrants

The circle in the model is divided into four quadrants. One quadrant covers the area with clarity, concrete and details has the overall description *specificity*. It lies on the opposite side of the quadrant with the overall description *connection* which covers the area with indication, abstract and whole. These two quadrants describe how and on which level the designer or design team is facing the problem and concept. It is argued that one needs the ability to abstract and see the concept from a larger perspective. At the same time one has to look at the concrete details since they are the final elements which are part of the total product. A small detail can have a great influence on the whole.

A third quadrant is covering the area with method, reality and limitation and has the overall description *application*. This quadrant lies on the opposite side of the quadrant with the overall description *vision* covering the area improvisation, fantasy and possibility. These two quadrants describe the frame, tool and approach from which the designer or design team is facing the task. It is argued that the designer needs an inner vision or image of what he wants to create to be able to build a bridge to a new future, and must at the same time relate to the limitations, demands and needs in real life application. The model suggests that the designer or design team has to find the potential space between an inner vision and the outer, applied reality.

The left part of the model with fantasy, intuition, wholeness is crucial for the ability to make new perceptions, see new links and make a jump over to a possible new reality. It is especially crucial in the field of design, which requires a great deal of imagination, visualisation to be able to 'see' new solutions in the 'inner vision'. In the design process there is a danger that a designer or design team gets fixated on the initial, often self-imposed limitation of a design task [e.g., Dominowski 1995; Smith, Ward and Schumacher 1993]. The designer needs the ability to create inner concepts which can match with the outer reality. This requires a lot of testing and trying out, combined

with long training and experience. Equally, the right part of the model is crucial in the realisation of design concepts in the real world. Furthermore, the right part is important for the communication between different participants in a development team, since the participants then ought to have a shared framework and method they may agree on.

4.3.4 Change of main focus

In the start of a product development project it will be fruitful to focus more on the left side of the circle, stimulate fantasy, visualise, make abstractions, find associations and be more divergent in the approach [Bastick 1982; Osborn 1953]. Later in the project it will be natural to focus more on the right side of the circle, look at the details, limitations and specifications, be more convergent, concrete and face the present reality. This would also be a traditional way to approach the design process. Nevertheless, it is important to have in mind the other side of the circle also early in the process. It is for instance important to be in touch and updated with the existing solutions and knowledge of the field, as a reference point for finding new solutions, and so one may avoid to 'invent the wheel'. What is viewed as important, when one is working with more conceptual projects, is to not be fixed or conditioned by this knowledge. One must be able to make abstractions from it.

Later in the project, in the analytical verification phase of the process, one also needs to use intuition [Bastick 1982]. In this phase, when one is working more with details and facing the concrete limitations it is also important not to forget the overall vision and holistic approach to the task. The product can easily become fragmented and unclear in its message if one forgets to be in touch with the overall vision and idea behind the product.

4.3.5 Application

It is suggested that the dialectic model should be viewed as a model that is giving insight and understanding to designers and design teams. It is not an operational model. It can nevertheless, as a tool, help a group, who is working with the development of concepts and products, become more aware of the dialectic tensions that are often part of design activity. It may function as a framework for discussion in a group, and may help as a tool to bridge the traditional tension between the 'soft' and 'hard' approaches to design in a team. It may also help a team to better understand their own process and where they are having focus in the design process.

4.4 Model for a vision-based approach to design

This subchapter 4.4 is largely based on an article that was presented at the NordDesign'2000 conference [Lerdahl 2000]. A vision-based model is proposed and

discussed, in which aspects of products are divided into four levels of abstraction: The spiritual, contextual, principal and material level. The model is central for the discussion in the rest of the thesis.

4.4.1 Introduction

In the field of design methodology there are many models with origins from the engineering disciplines. They generally put little emphasis on the "soft" and immaterial aspects of design. The models for these methods are often very rational and linear with a step to step procedure with loops and iterations, with a progression through discrete stages, where the designers are told to do one thing at the time [e.g.; Roozenburg and Eekels 1995; Ulrich and Eppinger 1995]. In such method creative thought can be largely contained within a single box that contain conceptual design or synthesis [Buciarelli 1994]. Furthermore aspects connected to user experience and interaction quality are barely mentioned and then placed within a rational, logical paradigm.

Nowadays, users of industrial products are looking for more than just the function and technical capacity of a product. Especially within certain families of products users are increasingly looking for emotional fulfilment and experience in the interaction with products, they are increasingly seeking products that they can identify with and that tell a story [Jensen 1999]. The car industry is starting to use metaphors like "emotional cars". Furthermore there is an increasing demand for more eco-friendly products which are carriers of more "idealistic" values. In this shift there is a need to develop methods and tools that take into consideration the user interaction with the product, the underlying values and intentions and integrate the "softer" aspects of products [Øritsland 1999]. The model presented in this article may be viewed as a contribution to this need. It builds on the viewpoint that argues for a shift of attention from problem oriented to more ideal oriented design, from functionally oriented to more aesthetically oriented design [Stoltermann 1991]. The model has been tried out and used in several concept development projects with students. The feedback from the students concerning the use of the model will be presented and discussed.

4.4.2 Levels in the model

The conceptual model for a vision-based approach to design is presented in figure 4.3. In the model, which is represented as a triangle, perspective and views of products are divided into four levels. The levels are 1) the spiritual level which in the model is related to *intention*, 2) the contextual level related to *expression*, 3) the principal level related to *concept* and 4) the material level related to physical *product*. The first two levels are related to the immaterial and "soft" aspects of products, the other two are related to the material and "hard" aspects of products. It is stressed that the levels are closely inter-connected and that the levels should not to be seen as fixed stages in the design process but more as a way of perceiving the product. It is argued that all levels

will be present in any product. In the following the different levels will be described in more details.

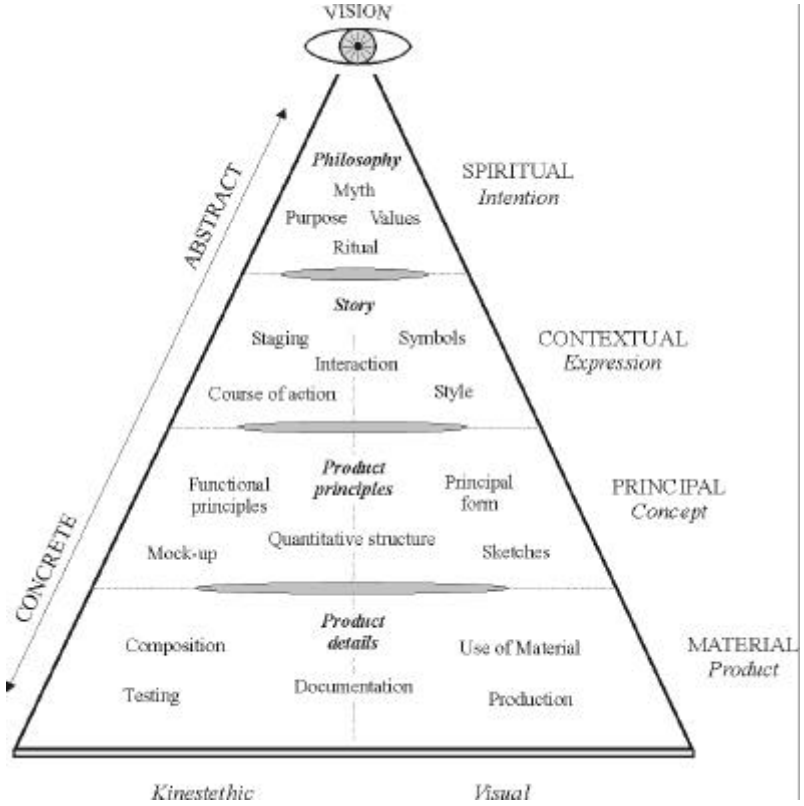

Figure 4.3. Model for a vision-based approach to design

The spiritual level in the model is related to the intention, purpose, myth and philosophy that lie behind the product. This level has to do with the mission of the product, the "myth" and value the product builds up on. It will often be connected to the business philosophy of the company, the "mission statement" and identity the company is seeking to communicate through the product. One could almost talk about the "soul" of the product and company. What kind of values does the product signalise to the users and society, what kind of intentions is put into the product? Such questions may be raised both in the understanding and analysis of existing products and in the design of new products. Any design will be based on some kind of values, intention and philosophy. Still it is important to emphasise that the user might experience a different intention than the designer and company had intended. Cultural background and previous experience with products will influence the experience. It is therefore important to try out the product in "real life" with user groups. This level can be related to what Alexander Manu [1998] calls "the Big Idea of Design". He writes *"a product is designed for its relationship with the experience in the context of the big event for the purpose of the Big Idea"* [p.17].

The contextual level in the model is related to the specific setting and environment the product is intended for. What is the overall story and social setting? Is the product for old or young people, for a single person or a group, for people from Africa, Europe or both? On this level one is also looking at the overall staging of the interaction between users, the user interaction with the product, the style. Depending upon the social

setting and intended story the staging will be different. What is the course of action and activity and how is it staged? What kind of expression does the user experience in the setting and how are the different senses stimulated in the interaction experience? We use our senses to interact with the environment. As Monö states, products are carriers of "*messages in a 'language' that we see, hear or feel…"*[8]. This level can be related to Stolterman's approach to design: "*To design is to create a social environment*" [Stoltermann 1991].

The principal level is related to the general concept of the product. On the spiritual and contextual level one is not looking at the physical product itself, but at immaterial aspects that are communicated and expressed through the product. On the principal level one is looking at principal elements of the product, in terms of function and form. What are the main functional principles? What is the principal, general form? The functional principles may for instance be viewed in terms of functional surfaces [Tjalve 1979]. A standard chair will for instance have three functional surfaces supporting the body: The ground for the feet, the back surface as a support for the back and sitting surface to keep the body to a certain height. On this level one is working with ideas for the product itself, using sketches and mock-ups, it is the first step in materialising the product itself.

The material level is the other level that has directly to do with the product. On this level one is working or looking at the product details, defining what kind of material and process that is used or should be used. One is looking and working on the composition of the parts and different details and testing the product in real life conditions. One is making real prototypes and preparing the product for production. When analysing an existing product one would at this level look for detail solutions, type of material and processes, and how the parts are connected and composed into a whole.

4.4.3 Main structure of the model

The structure of the model has some similarities with Abraham Maslow's need hierarchy pyramid which is a hierarchical categorisation of needs from physiological needs at the bottom to spiritual needs at the top, where lower needs must be fulfilled before one can seek higher needs. The model presented here, which is related to different ways of perceiving a product, has also spiritual aspects at the top and is formed as a triangle. It is narrow at the top and wide at the bottom, which symbolises increased complexity. Nevertheless, the model is not supposed to be viewed as a traditional hierarchy, it could for instance have been turned around where the material level stood at the top. The choice of having the material level at the bottom and the spiritual level at the top is connected with the metaphor that the spiritual aspects are more abstract and floating, such as clouds, while the material aspect are more concrete and "grounded to earth". No level is viewed as more important than the other levels and all levels are viewed as important for making a successful product.

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The model is divided in a kinaesthetic and visual part. The kinaesthetic aspect is related to movement and activity. It is for instance the expression of the product that is experienced in movement and activity over time, the whole staging of the interaction. The visual aspect is related to the expression and form of the 'frozen product', its shape, style and form. In an actual product these two perspectives will overlap, but it seems fruitful to have this general division between the "frozen" and "moveable" aspect of the product. A parallel from the world of films would be the difference between a single picture and a movie with a sequence of actions and activities changing over time.

4.4.4 Transition and connection between the levels

There will be a gliding transition between the levels in the model, especially between the top two levels and between the bottom two levels. With a gliding transition it might sometimes be hard to find the clear borderline. When is it a mock-up and when is it more a prototype? In the design process it is suggested that there should be a dynamic movement up and down between the levels. To be able to understand and have a shared understanding of an abstract notion or quality there is a need to come up with concrete examples. And to not be caught up in details and loose perspective it is important to have in mind the underlying values and intentions. In a group one can use a lot of time discussing details that could be resolved on a higher and more abstracted level. As Bastick [1982, p. 376] writes: *"When we realise that two things are similar then the many details about them also fit into place. Therefore combining just two things at a higher level gives many detailed associations at a lower level."*

There is a close interconnection between the levels. A change on one level will influence the others. For instance, by changing the use of materials and production processes the expression and style will change. By changing the course of action the story and intention will change. Using more sustainable production processes and ecological friendly materials will also indicate a change in values and underlying philosophy and vice versa.

Any product may be related to all four levels in the model. Any product will for instance be based on some kind of spiritual intention and value, consciously or unconsciously. In a design process it is suggested that one should move up and down between the levels and ask questions about the interrelation between the levels. How does this principal form relate to the intended style? How do the functional principles support the intended course of action? Does the concept tell the story we would like it to tell? One may also turn the questions around: What kind of concept may build up on the intended story? What kind of material and production process may I use that gives the desired style and form? It will here be fruitful to look and get inspired by existing products and solutions. The model is supposed to work as a guideline in the design process so that the designer may take into mind and remember the different aspects of the product and may better see the connection between them. The model is meant to be open and invite in a wandering between levels and methods, depending upon how each

designer works best and especially dependent upon what type of product and project that one is working on.

4.4.5 Levels and degree of novelty

A change between abstract and concrete definition of task and solution can be understood as a method for supporting the creative processes. This has been confirmed by a series of empirical research on actual design processes [Franke and Lippardt 1997]. By moving up to the higher levels of generalisation, like in the triangle, one enlarges the solution space and increases the level of redundancy or duplication [Bastick 1982]. Products that have different functions may for instance carry similar values and intentions. In user oriented innovation it is suggested that for fundamental changes one should move higher up in the triangle and try to make conscious changes there. These changes should then be connected to concrete concepts. By changing the intention, purpose and story of the product one is making a dramatic change. For smaller changes, it may be sufficient to make changes just at the lower levels. The focus and effort used on the different levels should be related to the desired degree of novelty, which is part of a strategic choice, since more fundamental changes also generally involve higher risk taking.

The act of making changes on higher levels of abstraction in the model is interesting to relate to the four steps described by Brezet et al [2000] in relation to ecodesign and the development of more sustainable product concepts. The smallest step is according to Brezet and co-authors incremental improvements (product improvements), the second step is complete redesign of existing concepts (product redesign), the third step is alternative fulfilment of functionality (function innovation) and the fourth step is functionality completely fitting into sustainable society (system innovation). Especially the fourth step seem to involve major change on the contextual and spiritual levels. For radical product innovations one has to make conscious changes on the higher levels of abstraction in the model.

Nevertheless, even for minor changes (product improvements) it is recommended that one should also look at the higher levels in the model since looking at the more immaterial and “soft” aspects of the product seems to be motivating and can give a better grip of the problem. Working with values, stories and interaction experience seems also to evoke more passion and involvement for those that are involved. This was the experience gathered in the running of the innovation course.

4.4.6 Integrated product development

In figure 4.4 the model is enlarged to include marketing and production, the traditional two other major areas in an integrated product development process [Ulrich and Eppinger 1995].

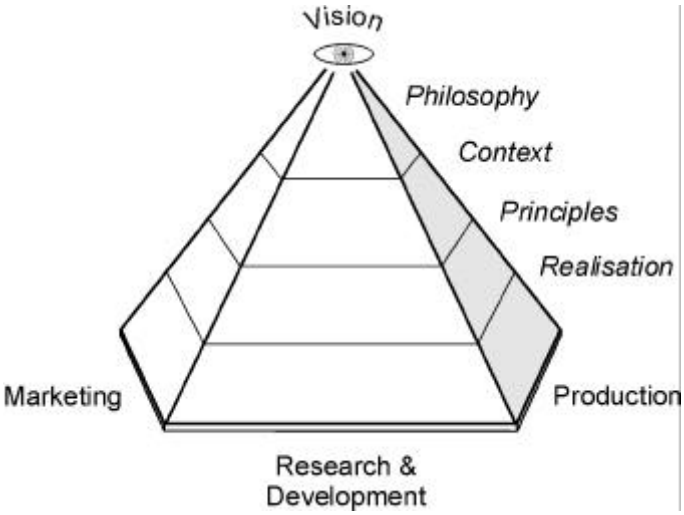

Figure 4.4. Model for integrated product development

One can talk about production and marketing philosophy, context, principles and realisation. Each area will have its own perspective and viewpoint, as indicated. In the depth interview study with companies, presented in chapter 6, several respondents indicated that the development teams often got caught too quickly in details and sectional interests. In an early phase it might therefore be fruitful to move up and create a shared vision and mental understanding. The model in figure 4.4 may function as an illustration that helps a team to work in a more visionary and conceptual way in the early phase of the project. It also illustrates visually the different perspectives.

4.4.7 Vision-based development project at NTNU

In an innovation course at our department the model has been tried out in connection with a vision-based approach to design. In this course, which is taught for students in the 8th semester from product design, architecture, industrial economy and mechanical engineering, the model is used as a general guideline in the design process. After having an early phase of need finding, the students started to focus and work on the top levels of the model. They developed and presented a value mission and then interaction visions, using qualitative words, stories, visual and poetic images and a short scenario play. The scenario play forced the students to become clearer about their own vision. In the development of the vision the students wrote future scenarios and also looked at other contexts, for instance other cultures where one is having similar or analogical needs. In the development of the vision it was very useful for the students to look and get inspiration from many different existing products.

In the early phases it was proposed that the students could write down, draw and visualise images and ideas that eventually came into mind even though they were working on the vision for the products and not the concepts themselves. What was viewed as important was that they did not focus on the product concepts, but focused on the vision for the overall experience, and that they could put aside concepts that came into mind. So the main focus was then on the top two levels, see figure 4.5. The

idea was that if the students had a clear image and picture of both the context for the interaction experience and the quality in the interaction experience, it would eventually be easier to develop concepts. In the course this appeared clearly to be the case.

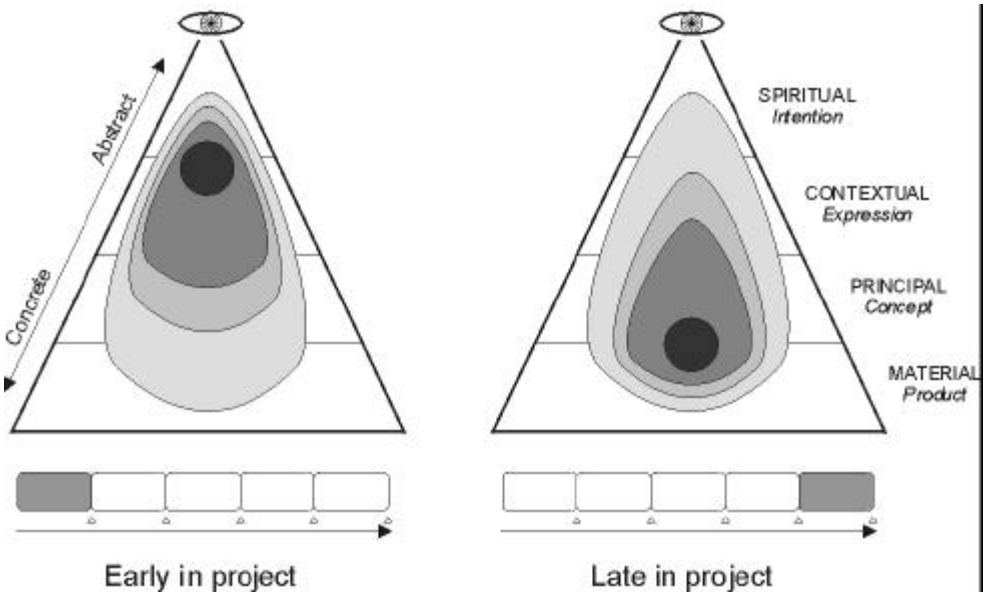

Figure 4.5. Area of focus in the student project

After having a presentation of the visions the students started to work out different concepts that could be associated with the vision for the overall interaction. The students used the mission and vision as a guidance and focus in the development. In the transfer from vision to concept, which is a critical step, the students used different creative techniques, such as mind mapping, brainwriting, forced relationship, associations from images and search for analogies. As they worked with the concepts the vision could change. They were asked to have in mind the intended interaction vision as they were evaluating ideas for products. So they were still supposed to have some focus on the upper part of the model, see figure 4.5. In the later phases the students worked out functional mock-ups and had a final presentation where they played out the product in use. Along the whole course they had presentations and milestones where they presented partial results from need findings to the final concept. The model was mentioned several times during the whole process.

4.4.8 Feedback from students at NTNU

The oral and written feedback from the students in the innovation course concerning the vision-based model was generally very positive. It had been of help in the development project. In the following the main points in the feedback from the students are presented.

A) Guideline and framework for discussion
Several students mentioned that the model functioned as a general guideline and help in orientation in the development project. One student wrote: *"The project model has*

been of great help along the way. I feel it has given us pointers of where we were heading. It gave us four firm basis areas along the way, when we did not know what was expected. We have at least used the model actively." The model has also helped the students to see products from a broader perspective, it gave an overview and helped the student groups to calibrate to the same level of abstraction: *"It was very illustrating to have an overview and to communicate with others on the same level."* One student wrote that the main structure and idea in the model has been *"in the back of our heads"*. Several of the students mentioned that the model functioned as a shared framework for discussion in the group. For some groups it has been a point of reference in the process of creating a shared vision and understanding.

B) Focus on the abstracted levels

Some students mentioned that the model had been of help to work more abstractly at the start of the project: "*We had problems to abstract the need at the start, we became too product oriented. The reason for that was probably that it was an unusual way to work. It got better when we saw the needs in relation to the two top levels in the model."* Another student wrote: "*The model helps especially to have a focus at the right level at the right time. Personally I have a tendency to look at details a bit too early, and here the model can be of help."*

C) Connection between abstract and concrete

The model seemed to help the students to see the connection between the abstract and concrete aspects of products, and helped to make classifications. One student wrote: "*The models helps to be conscious of the levels one is working on, and gives an understanding of the connection between the abstract and the concrete. It has been of help in classification and evaluation."* Several students remarked that it was of help in the evaluation of product concept, and in the process of having in mind the original aim and goal: "*The model is important to be able to see that all your solutions stand in a relation between the superior aim and goal."*

In the presentations during the course several of the groups used the triangular form of the model when they presented the concepts they were developing. They related then the concepts to the different levels of the model, mostly using images and keywords. In this use of the model one group did not use the separating lines between the levels. This might indicate that the model should be used in a flexible way when it is a tool for students used on concrete products, compared to when it is a tool in a theoretical learning process. It is important that the model is used in a way that seems useful for the students themselves. In practice the most important thing might be to have the four levels in "back of the head" and have the ability to relate the concepts and products roughly to these levels.

In the course it is emphasised that the students should learn to both find abstract aspects and principles from concrete products and to be able to find concrete examples to abstract notions and principles intended for a product, as this seems to support the creative process [Franke and Lippardt 1997]. Nevertheless the students reported that they made different associations to abstract notions that could be connected to the

higher level of the pyramid. So it was important in the development work that the students used concrete examples when they were discussing more abstract aspects of products (the top levels) both as a tool for increased understanding and as a way to come to a shared agreement. The model gave a shared basis in several groups when moving up and down in abstraction.

D) New awareness and change in attitude

For many students the top two levels of the model were new to them, and an eye opener for them. They had not seen these dimensions in other design models. This was especially the case for students from mechanical engineering, who told that such perspectives were never taught at their department. One student remarked: *"Suddenly I could look behind what previously just was a mysterious need cloud."* Another student wrote: *"In a concrete way I have never thought of the top two levels of the vision pyramid before, even though I had some kind of vague feeling of them."* By clearly seeing these levels illustrated in a structured way they told they got more respect for such aspects than they had previously. It helped to change their attitude. The model also helped to visualise and put structure to the students' own previous experience: "*The model with the different levels put a bit of structure into my own experiences "*. So the model seems to give structure to what has been largely unarticulated and previously more vaguely sensed by the students.

E) Adaptation and training

Several students mentioned that it took some time for them to really understand and adapt the model, because it was so new to them. It was connected to another way of thinking, and for some of them connected with areas they had not been consciously working with previously. One student remarked: *"When it was presented I felt it looked rather hopeless. But after a while I feel it has been an exciting way to work on. "* Another student wrote: "*It took us time to get accustomed to the mentality and way of thinking in the model. Later in the project phase I experienced that we moved well between the levels."* As help in adaptation one should try, when introducing the model, to describe the main ideas and not get caught up in the details. Furthermore, it was very important in the adaptation to use concrete examples, look at existing product and relate these products to the different levels in the model. It was also important that the students got training in abstract thinking to really get hold of the top levels of the model. This was done through the use of concrete product examples. The students also used concrete examples as help in the group. One student wrote: *"We used concrete products as examples to understand and explain for each other what we had in mind for the different levels in the model."*

F) The use in other projects

Students from architecture, product design and mechanical engineering who participated in the course have used the model in other projects. Several students who have not taken the course have come by their own initiative and asked for a copy of the model and then used it in their projects. This indicates that students experience the model as a useful tool.

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4.4.9 Feedback from Product Innovation Course, DTU

Two master students at the Department of Control and Engineering Design (IKS), the Technical University of Denmark (DTU), used the model actively in their master thesis [Christensen and Tan 2000]. They became acquainted with the model when it was presented to them in the fall of 1999, which was during my own stay at the department (IKS). In their report they wrote in relation to the model: *"When developing products, a company has to take into consideration all four levels and in particular the spiritual and contextual level. It is often at these levels that a company can conceive ideas of what they intend on changing and affecting. "*

Christensen and Tan presented the vision-based model in the following year (2000) for students in the product innovation course taught at the department (IKS). 25 students participated in this course. In this course the students were supposed to identify new business areas for Nilfisk, a vacuum cleaner company, based upon innovative ideas. The students came from different backgrounds, and had a mixed background of experience in relation to design and product development. Christensen and Tan had experienced the model as fruitful and useful when they got the presentation during the time they themselves took the product innovation course the previous year. Christensen and Tan wrote in their report: *"Lerdahl's model for a vision-based approach to design was presented in the course, because the model had proved useful in the previous year's class."* In their thesis they viewed the model as useful in the way that it aids in showing how a product is more than just form and function, technical principles and materials. Furthermore they wrote that it offers students an approach to understanding and communicating their ideas at different levels of abstraction.

Christensen and Tan observed that many student groups were becoming very quickly detailed and they wanted these students to work more abstractly with products. They used the model as a tool to make the students more aware of abstract aspects of products. They wrote in their thesis: *"It seemed that most of the groups were eager to concretise their innovative product ideas and seemed very focused on detailing. The instructors were concerned with getting the students to abstract their ideas and see them in a broader perspective."*

The feedback and response from the students to the model was reported as generally positive. Christensen and Tan reported: *"When the students were introduced to the model, the response was positive, and several students mentioned in their reports, how Lerdahl's model proved useful to them in their work."* A copy of the student reports was collected and reviewed. As Christensen and Tan wrote, many of the students chose to use the model as a tool in their development process and they also used and referred to it in their report. In the following a summary of the written reflection by these students is presented. The groups that are described consisted of two students.

A) Tool to work more abstractly and define level of abstraction
Similar to the feedback from the innovation course at NTNU a few student groups reported that the model functioned as a tool to work more abstractly and to define

internally in the group the level of abstraction. One group wrote: *"We also used Lerdahl's triangle when we worked with our innovation and when we tried to become more abstract in our thinking. It was also applied to see where our innovation was. "* One student group wrote in its report: *"The model got us to think more abstractly about our innovation, and of what level of abstraction our innovation fulfilled "*.

A third student group described in a different way: *"According to the Lerdahl triangle we have moved from the abstract level towards the more concrete. We have had some thoughts about the purpose of the concept on the spiritual level. The interaction from the contextual level, the sketches and principles in the principal level has been commented upon and has slowly proceeded into the material phase. The product development contains features from every level and not necessarily in the order shown in the triangle. The triangle is not meant to indicate the levels of importance. "* It seems that this group did not read the article that followed the model since they apparently wrote (if not misunderstood) that the model should be approached in a specific order. Several of the students did also not get the article that followed the model, according to Christensen and Tan. As already discussed, the intention is that the group should move up and down, many times during a development process, in fact similar to the way they wrote they had worked. They told that the development contains features from every level. This apparent misunderstanding in the use of the model is nevertheless important and fruitful, because it makes clear that the model by itself may possibly be misunderstood as a step by step process, moving from the very abstract to the very concrete.

B) Tool for developing many solutions based on the same story / concept

One team described how they used the model actively during the whole development process, moving up and down in the pyramid many times: *"We have followed more or less the pyramidal model of Lerdahl while designing our products: going from abstract (spiritual intention) to concrete (material product) during the process. We have walked this way back and forth, not only once but many times, as whenever you have a concrete product you have to go back to the concept to find other solutions. "* By moving up in abstraction, back to the concept or story, they could look for other product solutions, with the same underlying idea or concept.

In a similar way one student group wrote in their report: *"The shape of the pyramid as we understand it is a visual way of saying that one decision on one of the higher levels will lead to one out of many solutions in the lower layers. "* They used the model as a tool for the idea generation, where they developed general ideas on the higher levels that gave them many solutions on the lower levels.

C) Tool for improving concepts and break mental fixation

One team described that the model was a tool that could help to view a concept on different levels of abstraction, and thus improve the concept. They wrote: *"It is a tool that can be used to take the innovation process to different levels of abstraction. By placing the concept, you will get an idea of which areas to investigate further, if it is possible to take the concept to a higher level of abstraction, etc. The model will make*

you aware if you have focused too much on certain areas regarding the product and too little on others. Maybe by moving up and down the pyramid, the product shows a whole range of new qualities or possibilities, that would not come to you, if you had stayed at the same level." They expressed that by moving to different levels of abstraction they could avoid to get stuck on just some aspects of the product. The model may therefore help as a tool to avoid or break mental fixation. By studying the concept at all four levels the group wrote they are able to look at all aspects of a product. They concluded by writing: *"In this way, you are able to cover all aspects of a product."*

D) Tool for evaluating innovative effect of concepts

The same team used the model to describe and evaluate the innovative effect of different concepts in relation to level of abstraction. For one concept they wrote: "*When looking at the four steps in the Lerdahl pyramid, it is obvious, that the different elements in the concept are placed in different levels. The idea with the interactive display can be said to cover over a vision, which could be formulated as 'to change the way people are applying for products and service' e.g. 'to change the way people are communicating'. While the idea with having an extra container for large garbage is an idea on the product principle level. The fact that we have an overall idea, which is placed on the spiritual level, shows us, that there is a possibility to expand this concept to all levels of the pyramid, opening new possibilities in the further development of the concept.*" The group wrote that some concepts did not have effects on the higher levels of abstraction. They wrote, for instance, concerning one concept: *"When looking at the pyramid, the concept is placed on the principal level. To move up in the pyramid is not considered likely."* For another concept they wrote: *"When the concept is seen in relation to the Lerdahl pyramid, it is in our opinion placed on the contextual level. The concept will influence the way people are interacting with the vacuum cleaner. To expand this concept to the spiritual level is considered unlikely to give useable result."* In their evaluation they wrote that a product was most innovative if it made a change on all levels of the model. The use of the model to place innovative ideas is also supported by this final student reflection: *"It has been very instructive to place the innovative ideas in different levels of abstraction."*

E) Tool to place elements of product concepts

Another group also used the model as an evaluation and analysis tool, but in a slightly different way. They studied how elements of the concepts could be related to different levels in the model. They wrote for instance: *"[…] In this case one can talk about a vision, which is related to the content at the top of Lerdahl's model. The purpose with the concept is that Nilfisk should sell a good indoor climate that should contribute to an increase in the life quality."* They would use the triangle form with the four levels and hatch the levels that were viewed as actual for the specific elements of the concept, as shown in figure 4.6.

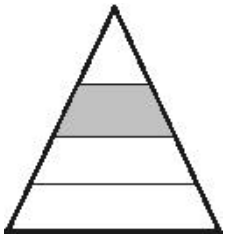


Figure 4.6 Simplified form of the model, used by students

F) Tool for defining abstract aspects of products

Similar to what was reported for the innovation course at NTNU the model seems to help to put words to aspects of products that have been hard to articulate. One student wrote in the reflection report: *"I was very glad for the models that were presented by Claus and Adrian. Both their own and the one of Lerdahl. They have been of great help in relation to defining something that is in reality extremely difficult to put words on. The models are therefore one of the things that I will with great probability use in future course work and in private reflection and thinking."* Christensen and Tan also wrote by mail that the awareness of the top two levels was experienced as new for the students.

Discussion and summary of DTU case

In general when looking at the reports, the model seemed useful as a tool for discussion in relation to the level of abstraction of their product ideas. It also gave new awareness in relation to the abstracted levels in the model, that products are more than just form and function, technical principles and materials. It helped the students to focus more on the abstracted levels, especially the spiritual and contextual level. These effects were already observed and described in the innovation course at NTNU. The students also reported other effects and areas of application. The model functioned as a tool on areas that had not been investigated and underlined so clearly previously. For instance the model functioned as a tool for developing many solutions based on the same story / concept. The students reported that they used the model to develop concepts on the higher levels that lead to many different concepts on the lower levels. The model functioned for one group as a tool for improving concepts and breaking mental fixation. Student groups reported furthermore that the model functioned as a tool for evaluation of concepts in relation to innovation effect and finally that it functioned as a tool to place and evaluate elements of the different product concepts. The use of the model as a tool for the evaluation of concepts seems interesting, and should be tested more in the future.

In this specific case at DTU the students did not give feedback and response to me as the developer of the vision-based model. The positive feedback from these students is therefore viewed as strengthening the view and argumentation that the model is a useful tool for creative collaboration in design teams. The fact that many student groups chose to use the model by themselves during the development process and in their report underline the previous result from the innovation course. The model seems

to be a useful tool, also when I am not part of the process of teaching the model. One could view these results as a verification by acceptance of the model.

It is interesting to finally discuss the positive response and extensive use of the model in the product innovation course at the department of Control and Engineering Design, DTU. My experience made during my stay at the department was that the students follow an education that has a focus on structure and conscious reflection around the development process. The department is teaching many models and concepts for the design process and there is an expectation at the department that the students should consciously reflect and make notes during this process. The students participating in the course may also have a preference for such structure since they have an engineering education, which generally puts more focus on structure and methodology. It is the viewpoint made here that it lies within the process school, as described by Stoltermann [1994]. The model is a structured form with well defined levels and seems to touch aspects of products that have not been so much emphasised previously. With the spiritual and contextual levels "put into a structure" it is possible that engineering students get increasing respect and can then consciously integrate them as part of the reflection and idea development in the design process.

4.4.10 Final reflection

The vision-based model has primarily a user- and societal- oriented focus rather than technological oriented focus. Therefore, at first hand, the model seems to be most useful in projects where qualitative aspects of products are acknowledged and viewed as important. This would for instance involve products where the differentiation between the products was not so much technical and functional but more based on aesthetics, user experience and social values. Nevertheless, it is the belief of the author that the model is also useful for other types of projects, where one seeks a more holistic approach to the design process. The model is supposed to be open and invite in a wandering between levels and methods, depending upon how each designer and development team works best and especially dependent upon what type of product and project that one is working on. The positive feedback from the students in the innovation course at NTNU concerning the model might partly be connected to the fact that the course had a strong focus on conceptual work and on the more "soft" aspects of products, where the model has its main focus. The concepts that the students ended up with also indicated that they had worked actively with values and interaction qualities in a social setting, thus creating concepts for "a new social environment".

The response and feedback from the students in the product innovation course at DTU is viewed as strengthening the view and argumentation that the model is a useful tool for creative collaboration in design teams. In this case the students gave feedback to a more 'neutral' part than in the innovation course at NTNU, where the feedback was given to me. The fact that many student groups chose to use the model by own choice, during the development process and in their report underline the previous result that

the model is viewed as a useful tool, also when I am not directly part of the teaching process. One could view these results as a verification by acceptance.

URN:NBN:no-2324

Chapter 5

Setting the physical stage

Every act of creation
is first of all
an act of destruction

- Pablo Picasso

URN:NBN:no-2324

This chapter focuses on the physical stage for creative thinking and collaboration. Questions of interest are the following: 1) What is the awareness and attitude in companies in relation to the influence of the physical space for creative collaboration in design teams? 2) How one may arrange rooms and space to set the stage for creative collaboration in design teams?

In subchapter 5.1 the existing framework and attitude of rooms for collaboration in companies is reviewed, based on observations and depth interviews. In subchapter 5.2 the concept of *project room* for team collaboration is discussed, based on the material from the interviews. Project room may help the participants to get into the project atmosphere and help to give a perspective of the total project. This might be especially important for external people who are introduced to the project. Furthermore it may help a team to get a shared ownership and identity in a project. Nevertheless, few projects are so big that one can afford to have one's own project room. Based on this acknowledgement the concept of *flexible project space* is proposed in subchapter 5.3. Flexible project space is space that is arranged prior to the meeting, so that it becomes a project space. One may arrange the space depending upon the desired outcome of a session, workshop or meeting.

In subchapter 5.4 the concept of *activity zones* is proposed, as physical means for optimising creative collaboration in design teams and in workspace in general. Six activity zones are proposed: 1) Informal meeting zone, 2) idea development zone, 3) construction zone, 4) play and performance zone, 5) library zone and 6) relaxation and reflection zone. The concept of activity zones has been tried out, adapted and integrated in a working space for a specific Norwegian company and this is described in subchapter 5.5.

5.1 Existing framework and attitude

5.1.1 The existing rooms for collaboration

In connection with the interviews the facilities and workspace of five companies were visited and observed. In addition several other Norwegian manufacturing companies have been visited during this doctoral project. During these visits observations were made of the interior and working space for meetings and workshops. In general the meeting rooms in all these companies were very similar. A meeting room consisted of one long table with chairs of normal height. Usually there was one white board at the end of the room, combined with a screen for overheads. Sometimes there was a flippover in addition, with paper one could turn around to write on. The rooms looked rather formal, the chairs were lined up along

the long table. There would be a few pictures on the wall. These types of rooms were very consistent in the companies that were visited, even for companies that were making furniture products.

5.1.2 Awareness around furnishing of rooms

When the respondents were asked about the rooms where the meeting was taking place the majority would say that the rooms were of importance for the atmosphere and for the team collaboration. One PD employee said:

"*Some rooms you get tired of being in and other rooms are good to be in and if it is a product development meeting over a whole day it is very strenuous. When you come home in the evening you are pretty tired. A good room gives you nourishment or does not drain you in the same way as a bad room. So it is very important.*"

Another PD employee said that they would often meet in the rooms at the marketing department since the rooms were better there, with better lightning. Many respondents would respond like this P-employee when asked concerning furnishing of rooms and the arrangement of meeting space: "*We do not have any tradition with this, we gather people in an arbitrary room and we do not have a special setting for special products. We are now trying to evaluate this.*"

A P-employee remarked that having large meetings in a room with long tables, like all the companies had, was ineffective and expressed that he could relax, withdraw and cut off his attention. He said: "*When you are coming to a meeting with a big, long table it signalises that you can relax, slow down and lean back. Then the time goes by, and you do not use it. It signalises that one or two should talk and 18 people should listen. Small meetings are a lot more effective.*"

When they were asked about the rooms and the physical staging for collaboration many respondents said that they were not conscious enough on these matters. Others would say that they felt that the existing solutions were not optimal, but nobody had the time and responsibility for changing the interior of the working space. In everyday life they were so occupied with projects and deadlines. The conclusion made from the interviews and the visits to the companies is that companies are not very aware of the possible effect of furnishing and the physical arrangement of space for team collaboration, but that the concern and awareness for this matter is slowly increasing. This conclusion correlates with previous research. Vos and Dewulf [1998] write for instance: "*Until recently, managers paid little attention to the workspace and its influence on the performance and productivity of the employees working there. Managers tended to neglect the*

importance of the workspace as an essential determinant of success of their core business. […] But this image is gradually changing."

5.1.3 The importance of atmosphere

In section 2.4.5 it was described how the atmosphere and climate were important factors for collaboration. In the interviews all respondents stated, to a larger or lesser degree, that the initial atmosphere and the personal chemistry were of importance and crucial for the meeting and the outcome of the project. As one designer said: *"The moods and atmosphere that are there when you sit down, when you come in to a meeting are very important for the outcome."* A PD-employee said: *"The chemistry and atmosphere are very crucial for the collaboration."* The atmosphere could be influenced through jokes and stories, reviewed in chapter 7. Several respondents mentioned that the mood and atmosphere could also be influenced by the room and the serving of food and drink.

5.1.4 Food and drink

Respondents were asked in the interviews about food and drink around the meeting. Serving coffee seems to be a ritualised gesture in all the companies and studios that were visited. Besides being a social activity, coffee helps to keep you awake and alert in a stressful day. Additional to coffee many companies would serve some biscuits and small cakes. Some companies would also offer soft drinks. One PD-employee said: *"We often serve some coffee and biscuits and have some 'softening exercises'. I don't know if everyone is aware of it, but we are."* The company also invited people for lunch.

In the interviews several of the designers would put emphasis on food and drink. Some designers would point out that it is important to get inspired, that a generosity with food, like a big plate of fresh fruit, indicated also generosity in behaviour and attitude. It supported the experience of feeling welcome. One designer said it this way: *"The atmosphere, the lightning, the furniture, what is offered as refreshments all matters. It shouldn't be too much, but that the company has made some preparations and show that it is a bit special to get visitors ."* The designer also pointed out that a plate with fresh fruit is stimulating for the eye. Another designer expressed that the companies were not very clever in the staging of meeting sessions: *"Usually there is a cold meeting room and one has to go out to find some instant coffee. There is seldom something planed consciously for the meeting."*

One designer pointed out that when there is good collaboration and people feel motivated the serving of food and drink can just be disturbing and stop a good process. A PD-employee said that food and drink can be a help to create a good, collaborative atmosphere, but when one has the right atmosphere then it is of less importance. It is also of importance how food and drink is served. When it comes as a natural break in the meeting after a longer session, for instance with lunch, it helps to change the setting. It can be a good milestone and can give natural structure to the meeting. As suggested by one designer, it is important to have some flexibility around the time of lunch break, so one can take the time to finish a good session.

When food and drink are served during the meeting it might be beneficial to have self-service. Then it may be important before the meeting, especially in new groups, to mention that there is self-service so the participants feel free to serve themselves. Several of the respondents also pointed out that it is important to have in mind what kind of people you were serving. A designer said that different departments in the company have different expectations when they come to the design studio for a meeting. He said that you should be more generous with people from the marketing department, while you should be more sober when serving people from production. People from production might even get offended and less collaborative if the serving is too overwhelming. They generally want something simple and "down to earth". This seems to correlate with the different preferences connected with different environmental roles (section 2.5.2), and to semiotic necessity (section 2.3.3).

What should be served depends upon what you desire from such a meeting. As a designer expressed: *"It is clear that humans are mood animals. The setting you create from personal abilities and what you do with it is the essence. You then create an environment which matches this. Then you use those remedies that you need, whether it is coffee or dry martini*." In general there is a danger, if the food or drink is too overwhelming, that they take away the attention from the real task, which is to do development work.

The amount of food and drink that may be served is also dependent upon the type of meeting and event. It is for instance normal to serve extravagant food for big events, like in the launching of a new product. Based on the interviews the conclusion is that it seems that many companies have little awareness about the serving of food and drink as a source of influence (either improving or disturbing) for collaboration.

5.1.5 Use of existing and competing products

In section 2.3.7 the use of competing products is outlined as an important source for inspiration and tool for coming up with new ideas. In general it seems from the interviews that the designers were more occupied than others about the use of drawings, pictures and products as a stimuli for coming up with ideas and make associations. None of the companies had any system with drawers and shelves with competing products and solutions. One designer had been surprised that the companies were so little occupied with products from competing companies being available. He said: *"The knowledge about competing products is extremely low, surprisingly low."* In all his years as designer he had only seen one company who had a lot of competing products available. He wondered if the reason for this was that there were some hidden norms and values in the company which expressed that it was seen as wrong to openly study competing products, almost as if the company felt they were "cheating". In the interviews with people in the companies many of them would say that they were not skilful enough in this area and it seemed that no one had the responsibility or time to change their existing practice. One PD-employee said: *"We get very focused on the product we are working on, and maybe we do not have enough knowledge about competing products, not enough knowledge in other form languages. We very quickly grab what we see as being the problem, go into it, and solve it without having a wider perspective. "*

A few of the companies had different magazines available which could give inspiration. The above designer mentioned that if the companies were looking for competing products they sometimes just checked Internet or eventually looked through magazines. He felt that this was a danger and insufficient: *"I am very afraid to move too much away from reality, we are supposed to make three dimensional products that stand in real rooms where you and I are acting as humans."* He remarked that to get a real understanding and experience from a product it is important to feel it, try it, touch it and use it in a real life context.

5.1.6 Communicative tools for collaboration

One PD-employee pointed out that it was important to create a setting that stimulates the participants to become active. He also pointed out that his company was not very clever in optimising for interaction and collaboration. Concerning the staging for collaboration he said: *"If you have tables to stand around, which is covered with white paper, you increase the chances that somebody scribbles on it and comes up with his opinions, compared to having a very formal atmosphere where people sit nicely and correctly."* Another PD-employee told about their "fight" in brainstorming sessions to write on the board: *"When you have*

brainstorming there are so many ideas that you forget them if you do not yourself write them down. So you say to others: "Away from the board, give me space and let me present". It is not vicious but the excitement." It seems therefore important to have enough boards in the meeting space, which was not the case in any of the companies that were visited. This view correlates with the concepts described in section 2.3.6 in relation to the use of whiteboards and shared surfaces as supporting tools for communication.

5.1.7 Change of meeting place

When asked what could help for the collaboration in the design process several respondents mentioned that a change in meeting place would be fruitful. They argued that they got stuck in everyday life, lost the freshness of meeting each other and that it was hard to take time to think conceptually due to everyday pressure and things that had to be done. A PD-employee liked for instance to have project meetings at the design studio, to get a change in environment: "*We have many of the project meetings at the designers' studio. It's good to get a change in environment, to have new places to eat lunch, and to be able to go out in the evening for a beer.*" Some P-employees would on the other hand like to have more meetings at the factory. This seems also to be part of a power struggle between the product development department and the production department, which will be discussed in chapter 6.

Some respondents mentioned the idea of arranging workshops over several days in other places, such as hotels, where the participants could try to think about new concepts and possibilities. A PD employee said: "*What we should do is to go away a weekend, have brainstorming sessions, talk about what we are doing, and what we could do in the future. Think production possibilities, other concepts, another philosophy*." Even if the seminar did not lead to new concepts and products he viewed it as valuable: "*Even if you don't get any thing out of it you get some fresh air, you get ventilated, and the system starts to work. Because we go down in depth in a problem, get stuck and then we meet the wall. And then we have to start again*." Other respondents were sceptic or negative to the idea of going to hotels and cabins to have workshops. They felt that it easily just became vacation and pleasure, where people were late up at night, drinking and not present at the workshop. It seems important that the participants do not view this as a vacation. It has a lot to do with the expectations and attitude the participants initially have concerning the workshop.

5.1.8 Shared working space

In the interviews, especially with the P-employees, there was a desire that the designers and PD-employee should sit and spend some days in the factory to get a better understanding of the production limitations and possibilities, their daily problems and their production philosophy and ways of thinking. As one P-employee said: *"I believe that the only way to manage to create an understanding is that you sit in the environment. It is not sufficient that the designer comes here and has a two hours' presentation."* Another P-employee said: *"If they had been sitting in the factory and seen the problems then they would have understood that one has to find better solutions."* A third P-employee remarked in frustration: *"The designer has never been present in the factory, he does not know the possibilities, what the production parts look like, how we think and work. So the distance between the designer and the people on the flour in production is miles apart."* The product development meetings in this specific company occurred always at the location of the product development department, so the representative from the factory and production always had to travel to the meetings.

In the interviews the idea came up that there should be an office with a computer (or easy access for lab top computers) and facilities available for external people like the designer or PD-employee. It would then be easier to invite the designer to spend a few days in the factory, where he could have his own working space. In discussions with designers and PD-employees the P-employees could use the argument that they have an available room. It becomes then something positive rather than negative; it works as an invitation. The designer or PD-employee could participate in lunch and listen to the informal talk and understand better the culture at the factory. It would help to overcome the physical and mental distance that many P-employees mentioned in the interviews.

When asking the designers about working at the factory the answers were mixed. One designer remarked that the designer should not get too conditioned by the existing production and processes. The designer has a responsibility for coming up with something new, which is what he is paid for. He also said that it could be dangerous and difficult to work too closely with the company in the conceptual phase because the company is so fixated on existing solutions. He liked to work rather freely in the initial phase, get a total picture and then meet the company. So there seems to be a tension between closeness and distance. The designer needs to know something about the production and processes, but at the same time he should not get too conditioned by them. In general, what the designer needs to know will also depend upon the type of project.

5.1.9 Informal gatherings, meetings and activities

In the interviews many respondents, especially designers and PD employees, mentioned that going together to fairs and exhibitions was a positive activity. Then both the designers and the company see what new products are on the market, and they have something they can discuss. Fairs are informal and can give inspirations to new concepts and ideas. A PD-employee mentioned the importance of going out to restaurants, of meeting the evening before, in a setting that might stimulate informality and reflection and strengthen personal relations:

"*I believe that we have much to gain, both the designer and us, from meeting outside of the project where we can create some personal relations. Not that one should become close friends, but that when one is visiting, add an extra evening, go to dinner or something, invite home, go to fairs or meetings, go around together and take along a person. Manage to have a relationship to the designer also at moments without projects with them. Manage to have a good relationship, an honest relationship… I think it is important for the company as a whole. The entire value chain becomes aware of the fact that we work with designers. It is important to have a good relationship with them and trust in what they do.* "

Another PD employee points to different settings for coming up with ideas: "*The freshest ideas can come at the most peculiar places; they can come while drinking a cognac after a dinner or some such peculiar place.*" A generous, informal place can help to put you in a reflective, playful state. Besides going to fairs and restaurants, a designer mentioned shared activities like going to concerts and theatre, especially if there is some connection to the project, which can function as an area of shared experience:

"*When I work I look at the surrounding factors in the society, things that happen that do not have a direct relevance but that I experience is a factor of influence. And in such a phase it could be very exciting to go to a concert, a play, an exhibition, a debate, something not directly related but which still has some connection to the project. If you are going to make furniture for an auditorium, why not go to a concert where you experience the rhythm and atmosphere? If you take the impressions back to the meeting and talk about rhythms in a room, then there can be things of use that I feel are very interesting.*"

Designers often seek stimuli outside from the direct connection to the project; they create new ideas by making associations. Some of the P-employees, on the other hand, who are more 'down to earth' and need to see the clear connection between things, might view it as a waste of time. It seems to be difficult to find a balance between what is formal, with clear connections to the project and what is more

vague and not so clear. As mentioned earlier there is a danger of too much informality, too much intimacy, and that meeting in restaurants or fairs is viewed as just pleasure. Going to a concert is not necessarily fruitful and takes much time. It has a lot to do with the attitude the participants have towards such activities and the role they play in the product development. The roles and different perspectives will be discussed in chapter 6.

5.2 Project room

In the interviews the respondents were asked about the concept of project rooms in the working space, with pictures, drawings, competitors' products, objects, models, prototypes, boards showing the course of the project, visions of the project written on the walls and so on. Such a permanent room resembles what is called a war room in software development literature [Karat and Bennett 1991]. In this subchapter 5.2 the thoughts brought up concerning project rooms will be presented and discussed.

5.2.1 Focus and project atmosphere

Two designers told that they had arranged their own studio with different project rooms. One of them said it helped to focus the mind, put people in the project atmosphere:

"*Since I'm working with several customers I fortunately have several rooms in the house. So I say here is where I work with this project. There are things on the wall and things standing on the floor. I go into this room. Then I also go into this mental room too up here, in the head, because I have many ways of thinking in the world of ideas. I open up and then I can concentrate on what is around. And the room is useful for the others too; when the team is going to talk about the project we have everything around us. This contributes to the concentration, to get width and focus on what we are talking about.*"

One PD employee remarked, when asked about project rooms, that it was important to have something to discuss to get the process going: "*When you go through things it is an important pedagogical principle to be concrete and visualise. It is often very difficult to sit down, with white paper, and just start to discuss solutions. If you on the other hand have something as a starting point, for instance different models and suggestions for solutions, then it can be easier to get a process going.*"

5.2.2 More "lively" project

One designer said that it was important to "see the wandering of the project", have the different solutions at different stages available for the eye. He told that one could then more easily go back and see why decisions were made. Another designer said that a project room would help because *"then the project would have an identity and live a life outside the meetings. Because it happens very often that the project is just put on a shelf between the meetings."*

He remarked that a problem in projects is that one forgets ideas that were brought up: *"Most of the important ideas in such projects are very often brought up and discussed at some time in the project. The problem is that they disappear again."* A project room could help so one could keep in mind topics that were discussed. He also reflected on the idea that by consciously arranging and furnishing the rooms one could influence and program external people like salesmen into the right mind set and mood: *"You can program external people like salesmen also by controlling the environment and the stimuli you want to use. But this can be exaggerated if you don't control the essentials in the process."*

5.2.3 Quick introduction to project

A PD-employee remarked that a project room could be of great help when new people, who were strangers, were brought into the project or when one was going to present the project for external people: *"I think it can be an interesting idea when strangers meet strangers. As a stranger you look for known elements so you can feel at home and more secure."* One designer supported this thought, he said that project rooms were less important for the project team, because they were so much into the project, but that it would be fruitful when involving new people in the project. A P-employee mentioned additionally that a project room could possibly help a team to get a shared ownership and identity around a project.

5.2.4 Taking away attention

One PD employee pointed out the danger that a too inspiring surroundings could take away attention from the work at hand: *"If you create surroundings that take more attention than the product and the things you are supposed to talk about, then it can be pretty irrational."* It is important that the arrangement of the room and the staging of the meeting should not take away the attention from the main purpose, mainly to develop concepts or a product. The arrangement of the room should thus on the contrary be a support and help in the design process by giving

associations, stimuli and a focus to the mind. Furthermore, the right furnishing of the room could help to put you in the right collaborative mood and atmosphere.

5.2.5 Lack of room available

Several people said that to have a project room was a fruitful idea, but that the company often did not have the room capacity for doing so, or perhaps just in the case of big projects. One designer said that one should not be too dependent upon the physical arrangement of rooms; in the real life of small companies projects were run where there was any space, like the cafeteria: *"When you are at Hansen and Son you sit and carry on product development in the cafeteria."* So idealistically, for a single project, most respondents approved of the idea of having project rooms, but one should view the total usage of the room. If one was seldom working on the specific project and had few rooms available it would be too costly to have different project rooms.

5.3 Flexible project space

In this subchapter the concept of flexible project space will be proposed and discussed. Flexible project space is space that is arranged prior to the meeting, so it becomes a project space. One may arrange the space depending upon the desired outcome of a session, workshop or meeting.

5.3.1 The concept of flexible project spaces

From the above discussion on project space the idea emerged that one should have flexible project spaces, that could be used for several projects, instead of having fixed project rooms. One would then have the objects, drawings, pictures, prototype in drawers and cupboards, and bring the material forth and arrange the meeting space a few minutes before the meetings, sessions or events. The respondents in the interviews who were introduced to the idea seemed positive. The concern was then expressed that one should have somebody who was responsible for arranging the space or room prior to the session, and after the meeting take away the specific furnishing, so the space did not easily become a mess. Since such furnishing did not seem as a "must" for the meeting, one could easily drop it out due to stress and shortage of time. So for the success of such a concept it would be important that the participants saw the value of arranging the space, and this might need a change in culture, awareness and attitude towards furnishing of rooms and spaces. It would also be important not to be too ambitious

and set too high goals for the furnishing of the space or room, it should not take too much time and should be practical and simple. If it becomes too complicated and time consuming such staging and arrangement prior to the meeting might easily be experienced as negative and become "one more thing to think about". It would thus be fruitful to design the interior so it was easier to stage quickly.

The word "space" is preferred to the word "room" in the concept of flexible project space. The reason is that a space is more open than a room and not necessarily restricted by fixed walls. In section 2.5.1 it was described that people tend to prefer defined open space to wide-open spaces or highly enclosed spaces. When developing a flexible project space one will have to take into account the existing interior, the amount of money available for redesigning the interior, the specific needs and desires of the employees and so forth. The degree of openness will also depend upon the type of projects in the company. In projects that have a heavyweight organisation (section 2.4.7) and require full-time occupation and shared location for the design team it seems important with a workspace where the team members can sit closely together near or in the flexible project space. The concept of flexible project space may partly resemble the concept of "design collaboratorium" by Buur and Bødker [2000], presented in section 2.5.8, where they described permanent and semi-permanent rooms for collaboration. Their concept was linked to a specific room rather than a space and the idea of flexibility and arrangement of space prior to a meeting and session was not much addressed.

5.3.2 Process and problem related effects

The concept of flexible project space has thus been proposed where one is arranging the space prior to an event or meeting for making it into a project space. The staging for the event should be made in such a way that it helps and enhances creative thinking and collaboration in design teams.

One may divide the tools and means used for staging the event into two major areas of effect for collaboration. First, some tools and means may help the process in the team. This actually means that it helps the atmosphere and mood and team spirit in the group. This has some parallels to what was called socio-emotional activities in section 2.4.3. Food and drink are typical process-related means. Such process tools do not help directly on solving the design task. By having a generous serving of fruit, soft drinks and simple food it may help to set the participants in a generous and collaborative mood, as discussed in section 5.1.4. The serving of food and drink should be related to the specific culture and to the people involved in the meeting (section 2.5.2) and it should also be related to the type of meeting and event. Other process-related tools and means that may influence the atmosphere, mood and communication are the lighting, the chairs and table at the

right size and height, the air, the colours and form of the rooms and maybe also the clothing of the participants. Some process related tools and means for improving collaboration like jokes, stories, exercises and mental plays will be reviewed thoroughly in chapter 7.

The second type of tools and means for staging the events are the ones that are of help directly for understanding and solving the problem. Such tools and means that may function as support and help in the design task will be for instance competing products, old sketches, previous projects by the company, whiteboards, tools for communicating over the internet etc.

In IDEO, one of the world's largest design companies, they have facilitators who are responsible for preparing the room for a brainstorming meeting. The facilitators *"prepare the rooms by writing the topic on the board, ordering food and drinks, putting butcher paper and pens at each seat, and bringing in products like those being designed, along with less closely related products, to inspire creativity."* [Sutton and Hargadon 1996]. They also bring along toys for play to idea sessions. So they use both process and problem related tools for staging the event.

5.3.3 Mind fixation and flexible arrangement of space

The idea of having flexible project spaces rather than fixed projects rooms seems fruitful in relation to the danger of fixation of the mind, as it was presented and discussed in section 2.1.7. If one all the time has the same atmosphere and surroundings of ideas it can be harder to break loose when one is off in the wrong direction. Then one could once in a while have a "naked" space or one could put up different pictures and products for the meeting, to get new inspiration. So in some meetings one would like to recall the "wandering of the project" while in other meetings one would like to get new, fresh blood. One designer said in an interview that he changed completely the interior of his design studio a few times a year to not get stuck in the same system: *"I refurnish 3, 4 times a year, turn everything around because I feel I get stuck in the same system."* The changing of the physical environment seems to help him to also change his mind-set and way of thinking.

Many respondents comment on the need of changing the meeting place, as discussed in section 5.1.7. Arranging the space for the meeting may be an easier way to enter into a slightly different environment. This does not mean that one should avoid to completely change the meeting place, but it may help to also take away some of the dullness and recurrence in everyday work life and give some refreshment to the mind. One could say that arranging the space is a way to change

the environment. Several of the respondents have a desire to go away for some days and have workshops where they may rethink and come up with new concepts. A flexible project space that is staged for the event, combined with activity zones proposed in 5.4, may function as a fruitful space for running large scenario workshops with users, customers and different employees from the company and from other companies as participants. Such events and workshops will be discussed in chapter 6 and 8.

The benefits of arranging the meeting space and how or to what degree it eventually should be undertaken will depend upon the size, needs, culture and values of the company. It will also depend upon the readiness and capability to change, as discussed in section 2.4.10. Just the idea, attitude and awareness that the company can use the furnishing of the workspace as a help in the design process might be a help for creative thinking and collaboration.

5.3.4 Playground

As discussed and presented in sections 2.2.7 and 2.2.10 an attitude of play and fun may be fruitful for creative thinking and collaboration. Synectic theory, which is concerned with play as a tool for creative thinking, also implies that *"not all play is creative but that all creativity contains play."* [Gordon 1961: 120]. The question arises if the company should have its own "playground" where it could develop ideas. Many respondents remarked that it was hard to have big thoughts and develop new ideas when you were surrounded by day to day problems, telephones and everyday obligations. That is the reason why some respondents would enjoy going to a cabin or a hotel, to get away from the everyday pressure and expectations. The question is then if the company should have its own place to develop ideas and concepts, a room with the label "playground". This has some parallels to the discussion made by Singer and Singer [1990] in relation to the importance for children to have a place to play, see section 2.2.5. One designer pointed out the importance of a playground but that the playground would have to be located away from the factory and everyday activity. He said: *"We have often said that the product development division should lie far away from the everyday problems and troubles and run conceptual projects to a certain stage. Have a rich abundance of thoughts from which to choose."* He continued by saying:

"*I think it should be separated from the company. It will happen that they call from production and say that now we have a problem because that the parts we get from the manufacturer do not fit. It is clear that you cannot say that you are working on a play project that it supposed to be done in four years time so you do not have time to come down into the factory right now. This is not acceptable. Therefore they must move away physically, with their own budget, own people so*

they do not become disturbed by the daily problems. The daily product development that is supposed to be done by a certain date and be presented then, or have a follow up in production with small mistakes, will necessarily have a superior priority to the long term activities and to more "playful" projects. If it is the same people that are supposed to do it there will never be time for the long-term activities and more "playful" projects. Therefore it must have a separate budget."

A possible solution to the above mentioned problem may be to run scenario and "play" workshops in the flexible project space in combination with the different activity zones proposed in subchapter 5.4. The flexible project space would then also have a label and symbolic significance as a "playground", where there was room for play. Workshops or seminars in the flexible project space could be run over several days where the employees were entirely free from daily obligations and could change their mind-sets to think in long terms. Such workshops and events will be discussed in chapter 6 and 8. A prior arrangement of the interior and project space could then help them to change their mind-sets. Such workshops may be running in periods of the year where there is less pressure on the staff.

5.3.5 Products for play and association

It is proposed that in a flexible project space the space should be arranged with the use of existing drawings, sketches and competing products. Props and simples mock-ups seem to be fruitful tools as a basis for discussion in the development process [Brandt and Grunnet 2000, Buur and Bødker 2000]. It will also be fruitful to have different products and solutions from other market segments as inspiration and help for making associations. As will be discussed and reviewed in chapter 6, a power struggle and game will often exist in design teams with negotiation. Bucciarelli [1994] also described the development process as social process with ambiguity. Several respondents told that the different participants in a team often have their domain to protect, and are thinking about their sectional interests where they are measured. The product under development will be part of this power struggle and game. Therefore it might be difficult to use the concept and product that is under development in play games and exercises, as suggested in chapter 7. In this sense it can be fruitful to use other competing products or simple props for exercises, because they are neutral in relation to the participants in the team, and the product will not so directly be part of the power struggle. In the flexible project space existing and competing products may thus have two functions. First, they are tools for inspiration, for coming up with new ideas and making associations. Secondly they may be tools that are neutral for play games, scenarios and exercises, reviewed in chapter 7.

5.3.6 Offices and flexible project space

In large projects that are full time occupation for the project team it may be fruitful to be located the same place. As described in section 2.5.5 the physical distance between the members of a team has a strong influence on the amount of communication. The offices, whether they are open or closed should, if possible, be then closely linked to the flexible project space. It is of course important that the flexible project space is in daily, active use and is not just for big meetings, happenings and presentations.

In many cases in real life, as was the case in several of the companies that were visited, the participants of the design team were allocated to different geographical places. Some of the participants of the team will have most of their daily work at the factory, while others have their daily work at the marketing, sales and development departments.

5.3.7 Attitude and the arrangement of space

The concept of flexible project space should be related to the general awareness, values and attitude of the employees towards the staging of project meetings and activities in the workspace. A general attitude and motivation among the participants that the arrangement of space prior to a meeting might help and influence the result of the meeting and thus enhance creative collaboration might be just as important as the arrangement in itself. It is possible that this awareness and attitude towards the arrangement of space for improving collaboration might in itself help to put the participants in a creative and collaborative mood. Through such physical arrangement of space one might also influence the mind set, expectations and attitude of the participants. Rather than the expectation of a dull meeting in a dull room the participants may through the physical furnishing expect a more creative session than usual. A “new environment” for the session and meeting may for instance awake positive expectations.

Anyhow, it is suggested that it will be beneficial for the success of the flexible project space that the participants have a general positive attitude towards such a concept and towards the activities connected with such a concept. The arrangement of flexible project space involves a different attitude and approach towards the running of project meetings and sessions than what is the case in existing practice. It might therefore be important with some general adaptation and training before the participants of a team feel comfortable and accustomed with such a concept and with such an approach towards project meetings. As described

in section 2.4.9 the activity of motivating for change, creating a vision and developing political support will be important in the change process.

5.4 Activity zones

This subchapter 5.4 proposes the concepts of activity zones in the working space. These activity zones are physical means in the staging for creative collaboration in design teams. The activity zones proposed in this subchapter are 1) informal meeting zone in the office and factory, 2) idea development zone, 3) construction zone, 4) play and performance zone, 5) library zone (both general and project specific) and 6) relaxation and reflection zone. The concept of activity zones has been tried out, adapted and integrated in a working space for a specific Norwegian company and this will be reviewed in subchapter 5.5. The connection between activity zones and the flexible project space will be generally outlined.

5.4.1 General ideas about activity zones

In any company there will already be several of the above mentioned activity zones, which have been developed consciously or unconsciously. It is emphasised that the concepts of activity zones proposed in this subchapter should be adjusted according to the cultural context and need of the company. The context will depend upon the size of the company, the culture and tradition, the type of projects and developed products, the existing habits and rituals in the company, the existing building and interior, the specific people and the specific desires and needs of the company. The contextual adjustment that one should make is related to:

- the desired type and the number of different activity zones
- the degree of fixedness or flexibility in the activity zones
- the intended relation between specific zones and the desired amount of different activities

One zone may set the stage for several activities, or one zone may mainly be connected to one distinct or specific activity.

By having conscious focus on activity zones the aim is that these activity zones will support and set the stage more consciously for different types of activities in the development work. The intention of such physical staging is to improve creative thinking and creative collaboration in design teams.

Activity zones may be determined and created in two ways:

- Natural function
- Mental labelling

Natural function means that a zone naturally invites to certain activity due to its function. Depending upon the functionality in the working space, the arrangement of the furniture and the facility tools in a specific area or zone may naturally invite to certain activities. For instance, the area around the printer, copying machine and coffee machine will naturally function as an informal meeting place, where people coincidentally meet during the day. If one additionally places high tables for standing, combined with white boards near such shared functional units one may actively invite and legitimate for such meetings, as will be proposed in section 5.4.5. Through such arrangement of space one also acknowledges and embraces such informal meeting places as potentially important areas for quick and informal idea exchange. Such space will also indicate and signalise a company culture with values and attitudes that give space and acknowledge informal, spontaneous talk and sharing as part of work practice.

The second way an activity zone may be created is by*mental labelling*, where the employees in the workspace give a zone a label connected to one or more specific activities. In relation to section 3.1.4 the idea of mental labelling may be related to the shared cognitive maps and mind-set that the employees in an environment are having. Such a zone may for instance be the lunchroom, where the employees have a shared mind-set and expectation of the room as a place where one is eating lunch. Specific tables and chairs at a certain height, the placement of a refrigerator, a coffee machine and cooking facilities will reinforce the mental label for such activity and make it more natural. Such room and space may additionally have the function of a meeting place, where the space is also used for activities such as formal meetings. This will again be dependent upon habits and on what mental labels the employees have of this space.

A mental label may be formed consciously or unconsciously. It may be formed over time due to habits and may thus be unarticulated. Sometimes the mental label for a zone may be impractical and unnatural, but survives due to habits and routines. Other times the mental label is not really practised in the sense that employees are using the area for other activities than those that were intended. An area for formal meetings may for instance become a storage place for mess, as was the case in one company that was visited. The optimal situation is that the mental labelling fit well with the natural functionality and the needs of the employees.

5.4.2 Functionality of the zones

When one is creating activity zones it is proposed that it is important that the zones both seem natural and functional, and in addition that the group or company using these zones develop and have a shared mind-set, mental labelling and agreement of the zones. The first remark, connected with the functionality of the zones, seems to be the most obvious. It is important that the zones are placed in a way that is practical and natural in relation to the work tasks and activities during a day. One should try to avoid inconvenience and activities that seem unnatural in the long run for the employees. In the transition from the old workspace to a new workspace there may naturally be some mental adaptation and training. Even though the employees are positive to the changes they will have the need to adapt and get accustomed to the new procedures and activities. Nevertheless, if the activities over time seem unnatural and impractical for the employees the zones for the intended activities should be adapted or changed so they fit better to the specific needs.

5.4.3 Mental Labelling of the zones

The second way an activity zone could be created was connected to the development of a shared mind-set, mental label and agreement of the zones. It is important that the employees do not feel forced into activities and a workspace they have not agreed upon or have not been oriented about. It is important for the motivation and attitude that the employees partake in the transformation, as was discussed in section 2.5.4. Furthermore, an activity zone is not formed just due to the functionality of the zone, but also through the mind-set of the employees using this zone. If the employees have a shared mental label of a space as a zone for one or several activities, it is more likely that the zone also will function for such an activity. Even though a zone is not optimised functionally it may still be used actively by the employees for such specific activities. There may nevertheless be a difference between what the employees rationally agree upon by words and what is practically done in a stressful workday. A zone may for instance end up as a place for storage of mess, even though the employees originally agreed upon a different function. This problem will be discussed more thoroughly when proposing one of the zones; the library zone.

The mental labelling of the zones may be related to the symbolic significance of places, described in section 2.5.3. The symbolic significance of a place may enhance or inhibit the meeting between people and may also influence the type of communication that people are having with each other. The mental labelling of a

zone may also differ among subcultures in the company, based on their viewpoint and role, as discussed in sections 2.3.3 and 2.5.2.

5.4.4 Flexibility and diversity in activities

The degree of flexibility and diversity in zones in relation to activities seems an important matter to address. If a zone is just intended for one specific activity, the interior can be more fixed and permanent. This will have its advantages and disadvantages. The advantage is that the zone may be used without any prior arrangement, it is simple and easy to use. The problem may be that one does not necessarily stick to one type of activity in a zone. If it is too rigidly arranged it may be a forceful way to structure the work pattern of the design team. The intention should be that the different zones have a general mental label, but that there is flexibility in the use of the zones. The zones should also be adjusted to the specific needs and culture of the company. The degree of flexibility will also depend upon the amount of space that is available. If there is very little space available more activities will be done in the same space.

It seems reasonable to suggest that the more a zone has to be rearranged prior to its use, the less the chances are that the employees will spontaneously use the zone. For active use it may then require that there are specific employees in the company who know how to arrange and furnish the zone. In a day that is often stressful it seems important that the zones are made as simple and practical as possible. In the following sections the different activity zones are proposed, one by one. The six *activity zones* are:

- Informal meeting zone
- Idea development zone
- Construction zone
- Play / performance zone
- Library zone
- Relaxation / reflection zone

5.4.5 Informal meeting zone

One of the activity zones proposed in this thesis is the informal meeting zone. In general the informal meeting zones are zones that are connected and placed in areas where people naturally and informally meet, like around a shared functional unit such as the printer, the copying machine, the coffee machine, the shared computer, the staircase etc. The informal meeting zone, as proposed in this thesis,

may be divided into two major areas. The first is the informal meeting zone in the office area and the second is the informal meeting zone in the factory / production. The activity label given for the informal meeting zone is "Meet and Share".

1. In the office area

The informal meeting zones are areas where people in the working space can meet informally. In a traditional working space the employees will for instance meet by coincidence in the corridor, by the printer, the copying machine or around the coffee machine, as described in section 2.5.7. Nevertheless, in traditional working offices there is no arrangement of space to support such coincidental, spontaneous meetings. In several of the companies visited the printer and copying machines were placed in a corner of a room or in a small, unattractive room where it was difficult to meet and have informal talks. This is maybe due to the fact that old machines made more noise. In this thesis it is suggested that shared functional units like the printer, the copying machine, a water station, the coffee machine should be placed more centrally in the working space.

Nearby these functional units one should place a high table, a white board and some magazines for inspiration. When the employees meet informally and by coincidence, they then have a place they can go where they can share ideas and thoughts that are fresh into mind. For instance, when an employee is using the printer, it may often be a new drawing, idea or concept that he is printing out. When this employee is engaged in the idea he will sometimes have the need to share and try out his new idea with his team and colleagues. Rather than waiting some days for a formal meeting before sharing the idea the employee can share the idea when it is fresh and new. As one P-employee remarked: "*It is when the idea is fresh in your mind, when you burn for it and are engaged in it that you should be able to share it. Not several days later in a formal meeting when you are not so much into it anymore.*"

If there is a table to stand around combined with a whiteboard it makes it easier to share this idea coincidentally because there is a shared surface to have the printed paper on, for spontaneous sharing and discussion. With the whiteboard close by there is a boundary object or "shared interactional surface" immediately available, as discussed in section 2.3.6, where one can draw and share ideas. One does not have to find paper and a pencil. Furthermore, when the tables are just for standing one signalises that the meeting is short. The body posture signalises the type and duration of the meeting. When one is having an informal meeting just standing, the duration will usually be short because one gets tired of standing. Furthermore, one signalises that there is an intention that the meeting is short and such a meeting is less binding. It is easier to break up and make an end to a meeting when one is standing than when one is sitting down around a table. In traditional workspaces employees talk a lot in corridors while standing, but they have no

tables to stand around and no supporting facilities and tools for sharing ideas. This causes such an informal meeting to be sometimes either dropped or moved into a formal meeting place.

With the aim of stimulating informal meetings and also the wellbeing of the employee it is suggested that there should be different types of fresh fruit, fresh cold water for drinking, tea and coffee, plants and comfortable lighting in such an informal meeting zone. As described in section 2.5.1 plants, water and good lighting has a positive impact upon people's wellbeing. Fruits in different colours may also be stimulating. Such external elements will help to put people in a relaxed, collaborative and positive mood, and could be described as process related means, as mentioned in section 5.3.2. While discussing two people can share eating fruits and drink water or coffee together.

2. In the factory / production

There is a second area, in relation to the focus of this thesis, where staged informal meeting places seem to be relevant. The first area is in the office building, for instance at the development department, as discussed above. The second area is in the factory, nearby the production lines. In the interviews several of the respondents told that they needed to share ideas with operators in the factory. They then did not have a specific place to meet, and would then often meet around some kind of surface such as cases and stacks. By placing a few high tables together with a whiteboard in the factory one has created a specific zone to gather around. Such tables and whiteboards can be placed nearby some kind of already existing functional unit, such as a computer with orders for production, like in the specific case of Luxo, which is discussed in subchapter 5.5. The zone may be more bound and reinforced with the use of walls. Several respondents mentioned in the interviews that it was very hard to get feedback from the operators in production, and the operators often became very silent when they were called into meetings in formal meeting rooms. One P-respondent said: "*They can say quite a lot in the factory, but when they come to a meeting in our meeting room they often become very silent.*"

Arranging space for informal meeting zones is a way to embrace the coincidental meetings that occur in the factory. It may also function as an invitation for more involvement. Rather than just saying that one would like feedback from the operators, one is now setting the stage so that it may more easily occur. It is a concrete action that directly changes the working environment and the way people meet. Furthermore, rather than having meetings in areas that feel foreign to the operators, these informal meeting zones encourage meetings in an environment and situation where the operators feel secure and confident, and that are closer to their daily activity.

This idea of informal meeting zones in the factory was actually brought forth by one of the P-employees in a discussion in the Luxo case described in 5.5. The concept of informal meeting zones in the office area was proposed and then this P-employee came up with the idea of doing the same thing in the factory. The main concept is the same, but it is in a different context.

5.4.6 Idea development zone

As reviewed in section 5.1.1 the existing space for idea development and collaboration consists of rather formal rooms with long tables and conference chairs, one white board and one screen for overhead. Sometimes there is also a flippover. Such a room is used for team collaboration in projects.

It is proposed that such collaboration may be optimised both by having flexible project spaces, discussed in subchapter 5.3 and by having a different type of furniture and supporting tools. In the idea development zone the intention is to have several white boards and interactional surfaces as a source of communication. Whiteboards or interactional surfaces are important for collaboration, as described in section 2.3.6. In section 5.1.6 one respondent told how they almost fought to be able to sketch on the one board available, while they were having idea sessions. The idea for the idea development zone is to have several interactional surfaces, and many walls to hang up ideas and concepts. Furthermore in the prior preparation and staging of a meeting, one could bring forth existing sketches, drawings from the project library zone (proposed in the next sections). An important part of an idea development zone is to have many shared surfaces so one can make the space into a project room with sketches and ideas from previous meetings. Furthermore this shared surfaces can be used to have an overview of new ideas that may come up during the meeting and exhibit pictures, examples of competing products and examples of different trend products on the market etc.

The suggestion for this zone is to have chairs for half standing. As described earlier, one can become easily passive when one is sitting down in a normal chair. A high chair for half standing will make it easier for the participants to stand up or go to the walls or whiteboards and draw, come with suggestions or discuss existing solutions. So such a body posture will signalise more movement and activation. The chairs may be low bar chairs or other types of chairs. It is important to have in mind that the chairs should feel convenient for both men and women. The specific choice of chairs should be related to the specific needs and culture of the company and to the overall interior. Combined with such chairs it is suggested to have smaller tables, so there is shorter distance between the participants and it is possible to divide the group into two or three smaller groups,

if desired. So instead of having one long table that signalises formality and power, it is suggested that one should have smaller, informal tables for this zone. High chairs and small tables will also possibly make it is easier both physically and mentally to stand up and leave a meeting, than is the case with a large, formal meeting table with low chairs. It often happens that some people will come and go during a meeting due to other duties. The general activity label given for the idea development zone is "Develop ideas and collaborate".

5.4.7 Construction zone

In a development department where employees are making prototypes there will generally be an area for construction and building. It is proposed that such a zone should be viewed in relation to the other activity zones. The working benches should not be placed against the wall, since a table along the wall becomes easily messy where people often leave their things. Furthermore, by having the table out in the room the different employees and team members may circle around the product from several angles, thus inviting for more collaboration and discussion than when the table is placed against the wall. This zone should have all equipment and tools necessary for making simple or complex mock-ups, prototypes and tools for production. Nowadays, with rapid prototyping and tooling through computers, much of the construction is done in the offices on computers. The construction zone could thus have the printer where one is printing the rapid prototypes and tools and also the computer to control, change and look after this printing. In possible scenario and development workshops at the company the construction zone may be the area where one may build simple mock-ups to use in scenario plays, as will be discussed in chapter 7 and 8. The general activity label given for the workshop and construction zone is "Construct and Build".

5.4.8 Play / performance zone

For creative collaboration in the design of products it is proposed that one may have a play and performance zone. Such a zone may be especially fruitful in the development of products that have a strong user focus and marked orientation, which is the focus in this thesis. It may either be permanent or flexible and arranged for specific events and is for instance related to the use of scenario play, discussed in chapter 7. Furthermore such zone is intended for events and happenings, where for instance users and people outside the project are invited for a presentation and introduction to the project. With the building of a natural contextual stage for the user-user and product – user interaction, such as an office,

a living room or bathroom the scenario plays may become more real and credible than without.

It is proposed and outlined in this thesis that scenario play, connected to the project, is important both as a process and problem related tool, see chapter 7. A process related tool means that it is a tool that helps for the atmosphere, sharing and team spirit in the group. A problem related tool means that it is a tool that helps in solving the problem at hand. For scenario play one may have simple boxes, units and tools to quickly stage a particular scene and context with intended users. Additionally one may have a theatre curtain as a tool to indicate the "start" and "end" of a scenario play. As discussed in chapter 7, it seems important to have tools to signalise and distinguish between the scenario world and the real world. Such tools, like the curtain, signalise on a metalevel that "now it is a play". This is what Bateson called the "frame", the enabling device that allows the fictive world to operate; see section 2.2.2.

As discussed in section 5.3.4 several of the respondents mention that it would be fruitful to have a playground. A playground may legitimate and stimulate for play. It may help to set the participants in a playful mood. The concept of a playground may both be present through mental labelling and through functional devices and tools. If the company and the employees view mentally a place or zone as a playground it is more likely that play will occur. If there are additionally functional tools and devices that enable play, then play may be stimulated even more. One may even consider to have objects that are just for play and recreation, which are not linked to the project. This play and performance zone is supported by the view and attitude that one learns and conceptualises not just by the use of the head and mind, but by the use of the whole body, as described in section 2.2.9. The general activity label given for the play and performance zone is "Play and perform".

5.4.9 Library zone

As discussed in section 2.3.7 the active study and use of competing products and solutions are an important source of inspiration and association for the development of new ideas and concepts. The library zone suggested here is a zone where one can search and gather information and get inspiration and associations from both competing products and from old concepts and products previously developed in the company. One may also have products that are not linked directly to the products the company is making, but that function as tools for inspiration and associations. It is also a zone where one gathers and stores material, posters, products and drawings to use in the arrangement of the flexible project space. The general activity label given for the library zone is "Store and Search".

1. General library zone
It is suggested that a company should have a general library zone nearby the idea development zone, where the employees easily may find concepts, solutions and products for inspiration in the team collaboration. It is suggested that these concepts and solutions should both be from competitors, from different market segments and from the company. Such a zone could also contain different tools and objects for the staging of scenario plays, as described in the previous section. Nowadays all the companies visited have no such system or library for products and solutions. In the interviews several respondents mentioned that they often had the need to look at an old product they had made or look at a product from a competitor. If the companies had any solutions and concepts available they would usually be coincidental drawings and pictures from magazines or from search on the Internet.

It is proposed that such library zone could also contain a computer with a simple database of scanned drawings and solutions of competing products. Such a database on a computer could also contain scanned drawings, pictures and a list of self developed concepts that have previously been rejected or put aside in the company.

The library zone should be continuously updated. The most interesting and up to date products and concepts may be exhibited, while the older and less interesting may be stored in drawers.

2. Project library zone
The second suggested zone, which is part of the library zone, is the project library zone. This zone is directly connected to specific projects. As discussed in section 5.2.5 it will be difficult to have a separate room for each project that is currently running in the company. The idea is that one is able to arrange the room for the specific project depending upon the needs and the desired outcome. The project library zone is an area where one has gathered relevant materials, boards, sketches, competing products and solutions, mock-ups and prototypes connected specifically to each current project. One could use the general library computer for databases relevant to the specific project. In such a database one could also have information about experiences and failures with similar, previous projects. The project library zone could be made up of drawers and shelves, where one could quickly bring things out and stage for the specific meeting. Similarly, one could easily put back the material after the session, workshop or meeting. Nowadays posters, sketches, mock-ups and prototypes may often be placed randomly in the working space. If the project group wants to keep the information of the projects within the project group one may use lockers on the drawers.

Library zones and the danger of mess

There will of course be a danger that the library zones become messy. Therefore it might be important to have someone who is responsible for structuring the library zone and keeping it up to date. Furthermore, such a change also requires a change in attitude and value among the employees. It is important that the employees view it as important to take responsibility for keeping the library zones structured and ordered. It is important that they view the library zones as an important contribution for getting new ideas and inspiration in the projects that need to be kept updated and orderly. In the updating of the library it is important that some employees have responsibility in this manner. It may also require some new procedures in the company.

5.4.10 Relaxation and reflection zone

The last zone that is proposed is the relaxation and reflection zone. This is a zone where employees and design teams can relax and reflect. Nowadays the space for relaxation in the work place is often the toilet and the lunchroom. The problem with too much stress at work is causing an increase in mental illnesses among employees at work, where employees are not necessarily more productive [Eriksen 2001]. The idea with this zone is that in a stressful day one needs a place to withdraw and relax, and that ideas do not necessarily occur under pressure, but just as much during periods of relaxation when one is working under pressure or in the fluctuation between these two mental states. This is related to the view of creative activity as a change between reflection and practice (section 2.8.1). In section 2.2.8 the importance of relaxation for imagery and creative thought was discussed. Such zone might strongly influence the attitude and culture at a workspace. Through the building of such zone a company gives value to reflection and relaxation as part of work. It is thus part of a strategic choice for a company. Zones were employees can experience “slower time” is viewed by Eriksen [2001] as being increasingly important. The way a relaxation zone is formed in real life will also depend upon the culture and the needs of the company. In subchapter 5.5 and 5.6 two ways this zone were implemented will be described. The general activity label given for the relaxation zone is “Relax and reflect”.

5.4.11 Link between flexible project space & activity zones

In subchapter 5.3 the concept of flexible project space was proposed, while in subchapter 5.4 the concept of activity zones has been proposed. In this section a suggestion for a way of relating the concepts of flexible project space and activity zones will be made.

A flexible project space is a space, open or closed, that one is arranging prior to the meeting, so it becomes a project space. In general a flexible project space will consist of several activity zones. The amount of activity zones in a flexible project space will depend upon the open or closed structure of the total workspace or interior. In general the flexible project space will have the idea development zone as an integrated part. It will also, if possible, have the library zones as a part. If the company is open to having a performance and play zone this should also be connected to the flexible project space. In an open space it is also suggested that the construction zone should be closely linked to the project space. The only two zones that can be independent of the flexible project space are the informal meeting zone and the relaxation / reflection zone. Both the informal meeting zone and the relaxation / reflection zone will not necessarily be specifically related to project team meetings. An illustration with a table of the activity zones and a possible connection to the flexible project space is made in table 5.1.

Table 5.1. Activity zones, label and suggested link to flexible project space

Suggested link to Flexible project Space	**Activity zone**	**Activity label**
Connected zones	Idea development zone	Develop ideas and collaborate
	Construction zone	Construct and build
	Play and performance zone	Play and perform
	Library zone	Store and search
Supporting zones	Informal meeting zone	Meet and share
	Relaxation and reflection zone	Relax and reflect

It is important to emphasise that the main concept is not each activity zones but the combination of all the different activity zones. In a workshop and during an intensive session it is the intention that a team may naturally use several of the activity zones. A possible conceptual workshop session could be, in a simplified way, the following: After making interviews and research the team develops for a few hours several ideas in the idea development zone, looking in the library zone once in a while to find inspiration and ideas. The zones have prior to the meeting been arranged so there are different products and pictures available, for

inspiration. After developing some ideas the team tries to build simple mock-ups in the construction zones. During the work some of the participants in the team may feel a bit tired and will go to the relaxation and reflection zone to relax and get new energy. After they have developed simple mock-ups they play out short scenarios in the play and performance zone. Some other employees are watching the play and give feedback to the play. Together they try to come up with improvements for the products in the idea development zone, and so forth.

This short example is a simplification of reality. The aim with this example is to show how a team may use the different activity zones actively during sessions. It is also important to view for instance the relaxation and reflection zone in relation to the construction and idea development zone. The different zones represent different activities which are viewed as part of creative collaboration. As discussed in chapter 4 it is important to try abstract ideas by making mock-ups and models of these ideas. In a creative session where one is working with more detailed parts of a product it is also viewed as important that one may move between different activities in the different zones.

When relating to the dialectic model in chapter 4 one may say that some zones, such as the construction zone are directed more towards the right side of the model, while other zones, such as the relaxation and reflection zone and the idea development zones are directed more towards the left side of the circle. The concept of activity zones proposes a totality of zones in the workspace that stimulates for different activity and state of mind. The viewpoint made in this thesis is that it is not one type of activity that stimulates creative thinking, but the mixture and change between many activities. A creative environment should stimulate for a mixture between silent reflection and practical construction, between informal gatherings and formal meetings, between information seeking and brainstorming sessions. The idea is that the workspace, represented through activity zones, will naturally stimulate and set the framework for such mixture and change in activities. It is therefore important that there is a natural and practical link geographically between the different zones.

5.4.12 Tool for navigation

The concept proposed in this subchapter is to arrange different areas in the workspace as activity zones arranged for one or more activities. Such a concept may help a team indirectly to have a shared mind-set in relation to the work that should be done in the design process. Rather than proposing that a team should do different activities in sequential order the intention is to help to put awareness on different activities independently of order. The team members have to find by themselves what activity that fits to the needs in the design process at a given time.

Some zones may be used more than others in a specific phase of the project and the need of the different zones is also dependent upon the type of project. The different zones can function as tools for navigation in the design process.

This thesis is not proposing a step by step procedure in the use of the zones. Such linear, step by step procedure was criticised in traditional design methods, see subchapter 2.7. This shift away from linearity has parallels to the intention in the use of the vision-based model, proposed in chapter 4. In relation to this model it is not proposed that a team should start at one specific level in the model and then go sequentially to another level. It is rather proposed that the team should move up and down between the levels, depending upon their needs and the type of project. Just like the activity zones the levels in the vision-based model are supposed to function as tools for navigation and awareness in the design process, without specific order.

5.4.13 Adaptation in real life

The concepts proposed in this chapter of flexible project space and activity zones should be adapted to the culture, interior space and needs and desires of the company. For instance, in the transformation of workspace for some companies the relaxation and reflection zone and the performance zone may be dropped or de-emphasised. It is important to outline that the change of workspace with the use of these concepts has just as much to do with a change in values and attitude in the company. It is important and crucial that the concepts are adapted so that the employees feel they fit to their needs and desires, and that they feel they partake in the change, as described in section 2.5.4. The choice of interior should also be adapted to the environmental roles and preferences for space of the employees. People with different roles will have different taste, as discussed in section 2.5.2. It is important to create a space or arena where all the participants in the design team feel comfortable. This is important for the attitude and for the ability to get "mindful engagement" of the members of the team, as it has been described in section 2.4.1. As described in section 2.4.9, by Cumming and Worley, it is important to motivate for the change, create a vision and get support for such change. It is also important that one educates and gives training in the use of the space.

5.4.14 Mental staging and physical arrangement

An important point to make is that if a company desires to stimulate and stage mentally for creative collaboration, it is important to see that this mental staging is

linked to the physical arrangement of the workspace. This view is related to the idea in process architecture, described in section 2.5.4. Physical staging of the meetings and events indicates values and attitudes; it directly interferes and influences the work pattern and habits of the employees and the design teams. Through the physical arrangement of space one can enhance or diminish different types of communication and types of collaboration. Through physically arranging space one may help to lower the threshold for introducing new way of organising work and collaboration in design teams. If one desires to introduce new work procedures and transform the culture and patterns in the company, a physical change of the environment will signalise directly that there is a change. A change in the physical environment may awaken new expectations, change the power and role structure and change the communication pathways between the participants.

The flexible project space and activity zones proposed in this chapter are tools that are supposed to support, stimulate and enhance creative thinking and collaboration in design teams. Combined with such physical, concrete tools and means it is suggested that one should have new mental tools and methods to support creative collaboration that can be linked to the physical arrangement of space. The underlying idea is that physical arrangement and mental staging should go "hand in hand". Mental tools and activities like scenario plays and mental visualisation exercises will be reviewed and discussed in chapter 7. Additionally the models proposed in chapter 4, such as the model for a vision-based approach to design, are supposed to be of help in the change of mind-set and attitude among the employees.

5.4.15 Originality of concepts

A matter to address is the originality of the concepts of flexible project space and activity zones. The basic idea of project rooms, which was the starting point for the development of the concept of flexible project space, is not a new concept. One could view the idea of flexible project space as an elaboration on the idea of project rooms, where the flexibility and the ability to set the stage is viewed as a central element, intended to improve creativity. Through the discussion of flexible project space the aim has been to show how one may arrange the physical space to improve collaboration in design teams.

The total 'system concept' of activity zones for the workspace and for improving creative thinking and collaboration has not been found elsewhere. Nevertheless, most of the separate activity zones proposed are known. The idea of informal meeting places in the work space is for instance not a new idea, it was described in the theory chapter, section 2.5.7. The concept of using informal meeting places in the factory and production may nevertheless be a new idea. In this chapter the

different activity zones have been connected to a whole, and described in detail. The totality and connection between the different zones are viewed as just as important as the functionality of each single zone.

5.5 Company case

The concept of activity zones has been tried out at the technical division of a production plant in a Norwegian company, Luxo. The company was in a process of changing the workspace and interior of the technical division. The technical division lies at the production plant, which is a few hours drive from the main offices with the product development division. The employees in the technical division participate in the design teams for the development of new products and the technical division is responsible for preparing the products for production. The task and problems to solve at the technical division are mostly connected to production and processes and finding solutions in the implementation of a product in production. Since the technical division is located at the factory and production plant, the culture and values at the plant will also influence the choice of interior. This will be discussed in this subchapter.

I came to the plant three times and had meetings each time that lasted for several hours. I also had regular contact with the technical division manager through e-mail and telephone. The manager sent me several drawings over the internet so I could be prepared and see the changes before I came to the plant. As this thesis comes to an end the company is not completely finished with the construction and furnishing of all the zones. Nevertheless, the work has reached far enough so it is possible to present and discuss the implementation of the different zones.

5.5.1 The initial needs of the staff

The motivation and background for refurnishing was to get the technical division located at the same place. Previously, they were spread over half of the factory. They also wanted to stimulate informal creative processes among the employees. In general, the staff at the division had a need for a place and area to build, construct and make changes in products. This need was similar to the functionality of the construction zone, described in section 5.4.7. In connection with the construction zone they had a need to have materials and different tools for constructing, which they already were possessing. Furthermore they had a need for a place to have meetings and idea sessions. This need could be related to the concept of the idea development zone, proposed in section 5.4.6.

5.5.2 The integration of the activity zones

Initial interior

In the first meeting with the technical division I presented the concept of the different activity zones proposed in subchapter 5.4. Besides the two above mentioned activity zones I mentioned the informal meeting zone, the rest and reflection zone, the library zone and the play and performance zone. The eventual use of the different activity zones had to be connected and related to the existing interior and available space. There was no intention of taking away already existing walls, but to mostly use the space as it was. During the meeting we changed between sitting down around a table and moving around in the workspace, relating the ideas and concepts of the activity zones to the concrete space and interior. The space available, which was largely empty at the start, is shown in a 2D drawing in figure 5.1. Most of the small rooms marked on the drawing are offices that the different employees have at the division.

Figure 5.1. The interior space prior to the construction and furnishing

Final interior

In figure 5.2 the different activity zones used in the technical division are marked with a number. The idea development zone is marked with (1), the construction zone is marked with (2) and (4), where (4) is a separate room. This area of the zone is closed into a separate room to avoid noise into the rest of the working space. The rest and reflection zone is marked with (3), the library zone is marked with (5), the informal meeting zone is marked with (7). An area for testing lamps is marked with (6). Simple squares and circles are placed in the drawing to indicate tables. Walls are also marked in the drawing. Some of the walls are fixed, while some are possible to move.

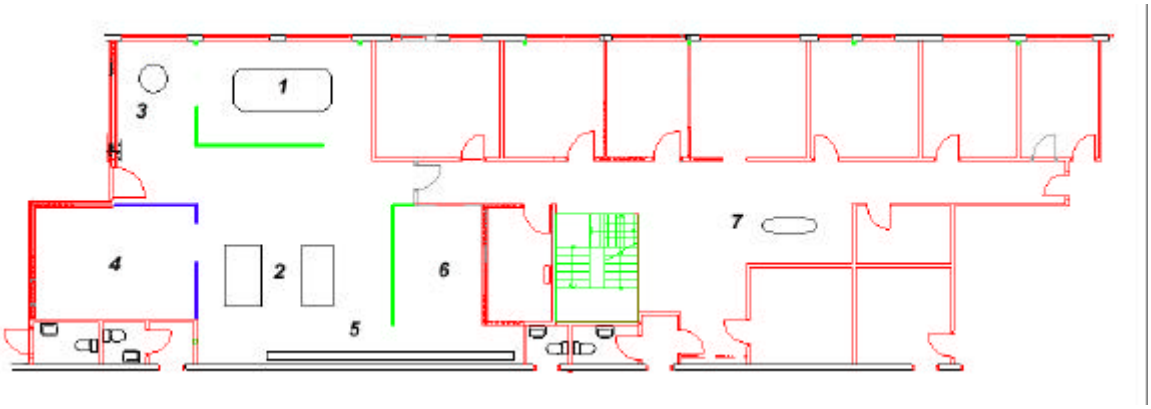


Figure 5.2 An 2D overview of the whole technical division with marked zones

Idea development zone

The area and form for the *idea development zone* was discussed and decided during the initial meetings. Instead of having one long table with conference chairs the staff decided after the discussion to have two small, high tables and chairs for half standing. Additionally one would have one large whiteboard, combined with wall area to hang up sketches and drawings. The tables could be put into one larger table or used separately as two tables so one could eventually work in two groups during a meeting, see figure 5.3. The forming of this activity zone was thus in this occasion fairly similar to the suggestions outlined in section 5.4.6. The zone was placed nearby the windows so one would have a good amount of daylight.

Figure 5.3 The idea development zone, viewed from two angles

Since the total space for the different activity zones was very open, see figure 5.1, one made the choice to have walls. Some of these walls were moveable and while others were not. These different walls would help to create partly closed and defined spaces and zones while still giving a feeling of fairly open space. For the idea development zone this was especially important in relation to the construction zone, so that the participants in a meeting could easily move over to this zone. In this way they could easily try out and look at some ideas in practice. The walls

were viewed as especially important in relation to the idea development zone, since people were often walking through the whole space, and could thus create disturbance. The walls functioned as a shield, forming the zone. The walls giving a shield for the idea development zone were moveable.

Construction zone

The construction zone was placed on the other side of the room, see figure 5.2 and figure 5.4. Working benches with adjustable height were placed out in the room, and not against the wall. In this way it was possible to approach the benches from several angles, and several people could eventually stand around for discussion and dialogue. Having the benches out in the room made it less likely that they would just become areas for the collection of mess and the storage of different objects. The arrangement of the tables in figure 5.4 should be viewed as temporarily. At the time being no specific lightning for the zones have been placed in the ceiling.

Figure 5.4 The construction zone with the library zone on the right hand.

Separate room as part of construction zone

An area of the construction zone was build into a separate room. The reason for this was that some activity connected to construction made a lot of noise and would disturb other people working in the space, for instance if a team was having a meeting in the idea development zone. Windows were placed on top of the walls, to let light shine through. The direct form and size of the windows was decided by the company. Usually, when one was not making too much noise, the door would remain open into the room, see figure 5.5. This room also functioned as a space where different working tools for construction work were placed in drawers. The original intention was to have a double door into the room, but the company chose to just have just a single door.

Figure 5.5 The separate room as part of the construction zone

Library zone

The library zone was also discussed in relation to the specific needs for the technical division. The participants were positive to having a general library zone where they could have stored already existing products and parts of products. In the existing situation they had to go out in the factory itself to fetch an example of a product or product part. This was time consuming and could break a spontaneous fruitful discussion. The library zone with existing products and solutions was now placed in the big room, behind the construction zone, against the wall, see figure 5.4.

Figure 5.6 The informal meeting zone in the technical division viewed from two angles

Informal meeting zone

The concept of informal meeting zone was presented and discussed and seemed to appeal right away to the participants in the meeting. Such a zone could easily be made and could fit well in between the area where the printer, fax machine and copying machine and the area where the offices of the staff were located. A sofa

was originally placed in this space. According to the staff participating in the meeting nobody really used this sofa, it was a 'dead' area. The staircase to the second flour was also close by, as it is shown in figure 5.1. It was an intersection and place where people often would meet by coincidence. For the zone it was decided to have one table for standing around, combined with a blackboard on the wall, see figure 5.6. A machine giving fresh water was placed nearby, combined with a thermos with hot water for tea or coffee and fresh fruits. Brochures of new products were also available on the wall, and two products were exposed nearby the zone.

Relaxation / reflection zone

In the discussion about the relaxation / reflection zone I was told that such a zone, if it was made too obvious and demonstrative, could give bad signals in a factory where the operators and employees were stamping in and out at an exact hour, with very fixed tariffs. It would be different in a product development division or for instance an advertising agency where the working hours were more flexible and where the working day was more connected to idea development and conceptual work than in a technical division. It was viewed as most convenient that such a zone should be simple and signalise short breaks. The furniture chosen for such a zone was high tables and chairs for half standing, see figure 5.7. Connected to this zone some magazines for reading and inspiration would be placed. The use of high tables and chairs signalised that one was not supposed to sit for a long time in such a zone.

Figure 5.7 The relaxation and reflection zone

Performance and play zone

The performance and play zone was also shortly discussed. We discussed that the big cantine could be used for larger events, for example in the launching of products or the presentation of projects for many external people. This area could also be used for larger workshops that involved several groups in the company.

Concerning the area directly connected to the technical division, it would be possible to make certain changes for specific events in the construction zone that would make it easier to eventually perform and play scenarios. This could thus be more of pertinence in the case when the design team for a project would meet at the factory. The conclusion was nevertheless that the technical division would not have a fixed performance and play zone. It was argued that such a zone would be more actual in the product development division, located in Oslo, where the company worked with the development of new concepts.

Informal meeting zones in factory

Through the discussion one of the staff mentioned that informal meeting zones could also be fruitful out in the factory. Several of the participants in the meeting described that they often needed to have short discussions with operators in the factory, and that they needed sometimes to write and draw. At that time there was no place specifically arranged for such short meetings and talks. It was decided that in the factory high tables with whiteboards should be placed around the already existing computer with the specific orders for the operators and production team, see figure 5.8. At the time being the white board connected to the high table was still lacking, but was ordered by the company. Walls were developed and created to define and reinforce the zones. The walls were also placed to create a shelter from all the ongoing activity, so operators could concentrate on the activity connected with working on computers. These zones were called oases by the employees in the technical division. Several such zones were under development, see also figure 5.9. The company made the choice to use fairly strong colours to signalise and mark the zones in the total production area.

Figure 5.8. One of the informal meeting zones in the factory. At the time being whiteboards on the wall were still missing.

Figure 5.9. A second informal meeting zone in the factory.

Gallery in the factory

The choice was also made by the staff to have a gallery or exhibition of some products in the production area. The choice was made by the staff to have the same colours at the gallery as they had used in for the informal meeting zones or oases. In this way they created an ongoing theme in the change process. In figure 5.10 is shown examples of the gallery.

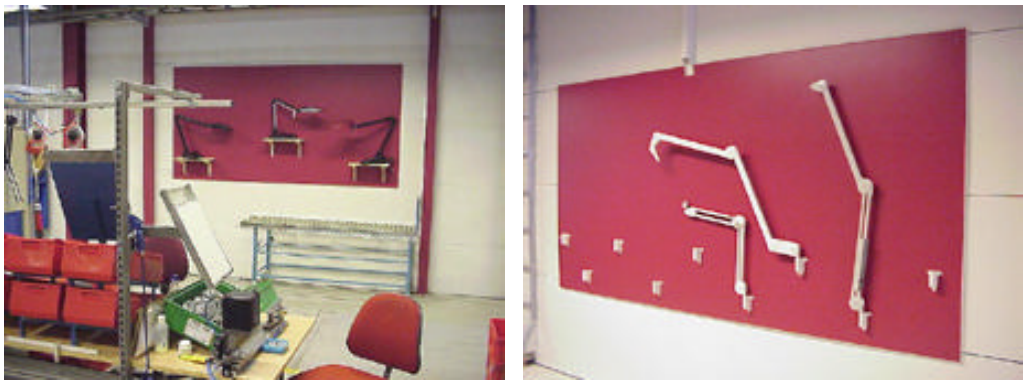


Figure 5.10. Gallery of products in the production area

5.5.3 The adaptation and acceptance of the concepts

As has been proposed in subchapter 5.3 and 5.4 the concepts of flexible project space and activity zones have to be adapted and adjusted to the specific context and need of the company. The context will be depend upon the size of the company, the culture and tradition, the type of projects and developed products, the existing habits and rituals in the company, the existing building and interior, the specific people and the specific desires and needs of the company. In this

subchapter a concrete case has been presented that shows how the concept of activity zones has been adapted to a specific context and need. In subchapter 5.3 and 5.4 it has also been argued that it is important that the participants viewed the concepts as useful and had a general positive attitude towards the change. In this case the company was making a change anyhow, so the staff was therefore initially probably more positive for input than they would have been if they already had invested in an interior. The readiness for change, as described in section 2.4.10, was there. My experience was that the participants in the meetings were very engaged and positive to many of the suggested ideas connected to activity zones. Many of these ideas were further elaborated in the meeting. The concepts were related to the available space and to the specific needs of the company. The concepts have changed and slowly been adapted in the process of discussing and trying out.

5.5.4 Feedback and evaluation from the company

At the end of the doctoral project, as the refurnishing and building of the different zones in the technical division and in the factory was coming to an end, the plant manager and the technical manager were asked to answer some questions and come with their own reflections. They did this together and got also feedback from several of the other employees at the technical division. In the following section the feedback is presented.

Unifying effect and influence on team spirit
In their evaluation the technical manager and plant manager wrote that the refurnishing project with activity zones had a unifying effect for the technical division: *"The project has had a unifying effect for the technical division. The effect is related to the fact that our offices and laboratory are brought together and that we communicate more closely than before. We believe that refurnishing gives a better possibility for everyone to contribute solutions, and we have a better system for parts, components, lab equipment and workshop*." In this quote they also commented that the activity zones had helped so that everyone could contribute with solutions. They emphasised that the use of the different activity zones, but also the process of building these zones contributed to the team spirit: "We *are a better team now, even though this process is far from completed"*. The activity zones invited for short, informal meetings, which gave an increased sense of confidence: *"Informal meetings give an increased sense of safety and confidence to the different employees."*

Supportive tools for problem solving and participation
The two managers wrote that the activity zones made people more focused in solving problems and that the zones functioned as supportive tools in this matter:

"*People are very occupied in solving problems, which is a lot more evident now. The zones function as supportive tools.*" They also wrote that the zones had given a more open environment that could help for motivation: "*The refurnishing process has given us a more open environment that hopefully seems including and engaging and motivates more people to contribute.*" The effect of increased involvement and engagement might be due to the fairly open structure of the zones. It seems also to be connected to the placement of the zones. Especially the informal meeting zone is placed in a "traffic artery": "*We have good experience so far with the table for standing which is excellent for short discussions, brainstorming etc. This zone is located in the middle of a main traffic artery, which makes it easier to get involved.*" The technical manager would recommend such a zone for other companies: "*We recommend to everyone the use of high tables for standing for short meetings and discussions.*"

Unexpected ideas and change in culture

The managers wrote in their feedback that the zones were fairly open and that coincidental passers-by had contributed with ideas in several occasions: "*Several of the zones are fairly open and are located in areas with much traffic. Several times good ideas have come from unexpected directions and the coincidental passer-by. We have few tasks where we need complete peace and quiet, and have besides that offices with doors we can close.*" So it seems that the openness and placement of the zones have made it easier for coincidental passers-by to contribute with ideas, and thus have a total effect on the company culture. This statement supports this interpretation: "*We have not yet gained the full effect of the refurnishing, but we believe already that it has had a positive effect and influence on parts of the working environment and organisation.*" This effect of more open zones in the work space, as an invitation for participation, resembles the effect that was reported by Horgen et [1999] where meeting places were located "*inside the very heart of the work*", see section 2.5.6.

The technical manager told that he thought the refurnishing project had created an environment where everyone could find his own space. At the same time it was important to work continuously with the culture: "*I hope we have started to create an environment where everyone feels that he is an important part of the whole. I think people have started to find their own space and areas of work and that very different types of personalities are now communicating well together. This can and should of course be developed further.*"

Shorter sessions

The zones invite for shorter sessions, and it is easier to find things quickly due to the library zones where different parts are located: "*The zones are in use, and it seems that it is easier to involve more people in shorter sessions. We also know better where we have things. We have a specific area where lab work can be done*

and where it is also easier to gather more people to help each other in finding solutions." Here again they emphasise the openness of the activity zones where more people can contribute to solutions. As it was previously discussed it is important that the working benches in the construction zone are placed out in the room and not against the walls. In this way one creates a shared surface where several people can stand around and contribute. This seems also to be the effect of such placement.

Influence on working procedure

The technical manager and plant manager wrote that refurnishing of the environment could clearly be a help to change the working procedure of the employees. It could set the stage for more action in the area. Nevertheless, they emphasised that such a change in working procedures also required that one worked actively to change the processes at the same time. For a full benefit of the activity zones it was important that there was also a change in attitude.

Internal initiators

My experience was that it was important to have initiators and motivators in the company who were positive to the activity zone concepts and actively contributed with ideas and enthusiasm in the adaptation and integration of such zones. The plant manager and the technical manager had this role. They also viewed themselves as initiators of the project, but emphasised that they had *"good, creative support in the technical division"*. I experienced them and the rest of the technical division as very open-minded and interested. The plant manager was also known as a visionary man who had tried out early team-based collaboration in the factory, before it was common practice in industry. It seems that internal initiators, like the technical manager and plant manager are crucial in the implementation in such project. They could motivate the employees and take charge of the implementation of the activity zones in the production hall and in the interior of the technical division.

Problems with everyday obligations

They expressed that the most difficult part of the refurnishing project has been the practical implementation, since *"we always had to give this lower priority than production related activities"*. The original plan was that they wanted to do the changes themselves, but when they engaged workmen to do the job things went a lot faster. As the external researcher I also experienced that the whole refurnishing project took a lot of time, due to daily obligations that caused delay. It might therefore be important in such projects to engage external workmen for finishing the task.

Adaptation and integration

The integration and usage of the activity zones in the technical division had gone very well according to the managers. The technical manager envisioned that the integration in the factory or assembly would require some warming up: *I' think there will be a warming up period in the assembly. In the technical division this process has gone by itself in that I have given a calling-in notice for meetings in "the bar" or "the technical meeting room", and then the others have automatically started to use the areas by themselves."*. It is interesting to note that the groups have found different nick names for some of the zones. They have for instance called the informal meeting place "the bar". It is possible that the development of nick names that are a bit amusing and fun may help to integrate the zones. Besides this the managers remarked that it was important that the employees learned to clean up after the usage of a zone: *It is important that everyone learns to clean up after use."*

In the factory the activity zones were not finished as this thesis was coming to an end. The managers expressed positive expectation to me for the informal meeting zones in the factory, since it had worked so well in the technical division. They wrote: *"It is too early to have any basis of experience, we have to complement the zones with whiteboards and flippovers. The areas are currently equipped with a PC and printer, so they are used for some of the activities we had in mind. The extended desired usage is not yet established."* They also emphasised that it was important that these zones functioned as areas for information exchange: *It is important that the zones in the factory function as areas for information exchange in production, both for those who work there and for others."*

For the integration of the zones in the factory the managers wrote that it was important that they functioned as pioneers in the usage of the zones: *For an optimal outcome we have to furnish well the different zones and go ahead as pioneers in the usage of the zones."* They also wrote: *"It is important that when we have tried out the zones in the technical division that we try to use these zones very consciously in the production divisions when we go out and discuss something with the installers."*

Problems and need for improvements

The greatest problem they had experienced in the process was that they had to work with everyday activity while they were working with the refurnishing. They also commented on the need that people should keep the zones clean.

Concerning the zones some people had commented that the walls were a bit over-sized in the factory. This was especially the case at one place. They wrote: *There is especially one place where one feels that the zone is a bit over-sized and takes too much space. It is most likely possible to move it a bit and eventually make the*

walls a bit lower. The walls otherwise are a bit lower, so it does not feel so closed in." So it seems likely that some changes will be made concerning the adaptation of the concept.

Some of the employees expressed that it was unusual with high chairs for the meeting table in the idea development zone. It was a bit difficult to get accustomed to them. Time will show if this is more a temporary problem, or just a problem connected to the initial usage of such chairs. The chairs do not have back support, which might be important if one is sitting a long time. In this zone the technical division is not yet using all the walls for whiteboards or for hanging up ideas and sketches. So it is possible that the employees have to get accustomed to a different way of working, where one is using all the walls and is not sitting in too long sequences at the time.

5.5.5 My own role in the process

In this section my own role in the refurnishing process at Luxo will be outlined and discussed. Furthermore some thoughts concerning the general atmosphere between the company and me will be given.

No contract
We never signed any contract during the refurnishing process. My impression is that the company used me as a consultant because they felt it was of benefit to them. My participation in the process had no cost for the company, except for the last trip I made, which they paid. For me, who was working on a thesis, this was a good case to try out some of the concepts that were developed during the doctoral project. Furthermore it was practical experience.

Who did what?
Originally when coming to the technical division for the first time I had the concept of activity zones for the organisation of space and interior. During the discussion the different concepts connected to activity zones were elaborated and adapted to the company context. In this process the participants from the technical division also contributed ideas. The practical implementation of the concepts was mostly done by the company. During my visit we tried to place together the different walls in the technical division. The forming of the zones in the factory was largely done by the company. Looking from the outside I could see that there were some solutions that I would have done somewhat differently. Nevertheless, it was not my intention in this project to follow the project closely day by day, but rather to try to implement some general concepts. Furthermore, it was viewed as important that the company and technical division got a strong sense of ownership to the project. I functioned as a contributor on the concept level, introducing the

concept of activity zones. Furthermore I functioned as a discussion partner and developer of ideas in the implementation of the concepts.

In the overall process I also tried to stimulate and push the process forward. As the external researcher I could see that the managers got very occupied with daily practice and that the whole process took more time than planned. The attempt to push the process forward was connected to the time constraint of using this case in the thesis.

I also asked the technical manager about my own role. He wrote in a mail: *I'don't know how you got involved, I heard about you just before you came for the first time. We had already decided that we should refurnish the technical division, as far as I remember. Your ideas of zones were most likely concepts we would not have developed by our own initiative. The experience that we have made is also that the informal zone outside my office functions in an excellent way (I don't know if I had read something about standing meetings previously). The zones in the factory are barely in the starting phase, but we also have expectations there when everything is settled and arranged. I think I can say that your creative input has given us another result than we would have got if you had not been part of the process. I feel that the interaction has been open and good, but it has probably been a sluggish material for you to work with us, things have taken a long time. The meetings with you have nevertheless given us several new ideas that I think we can and should develop further regardless of whether you get involved or not in the future*."

When looking at the above feedback it seems that the technical manager has a fairly similar view of my contribution in the project. He also commented on the natural and good dialogue between the plant manager, him and me, as the external researcher. My own impression is that this good atmosphere and open dialogue was important for the outcome. We both shared freely ideas and in this process the concepts were improved. I always had the idea that it was their own space and environment and that it was important that the whole technical division had an ownership to the project. The feedback given also indicates that the employees have an ownership.

5.5.6 Conclusion

This chapter has focused on the physical arrangement of space for improving creative thinking and collaboration in design teams. Initially the awareness and attitude of employees in companies concerning the arrangement of space and rooms was reviewed. There seems generally to be little awareness in companies

connected to the arrangement of space and the influence of furnishing on the collaboration in design teams.

Based on a discussion of project rooms the concepts of flexible project space was proposed and discussed. Then the concept of activity zones in the workspace was proposed and discussed. The proposed link between the concepts of flexible project space and activity zones was then made. The concepts of activity zones have been tried out and adapted in a concrete case at the technical division of a Norwegian company. The feedback given indicates that the zones have had a positive contribution for the work environment. The activity zones seem to have an unifying effect and strengthen the team spirit in the technical division and they seem to function as supportive tools for problem solving. The openness of the zones seem to stimulate participation and engagement and give room for unexpected ideas from coincidental passer-by. The zones seem to stimulate for shorter meetings and sessions and seem to have an influence on the working procedure and company culture.

One could thus conclude that the concept of activity zones, as a tool for improving creative collaboration, has been verified by acceptance. The company has accepted and used most of the zones, and have a positive experience in the usage. The concepts have changed and slowly been adapted during the process with discussion and testing. This process should continue, and potential areas of improvement should be analysed in future usage. It has been crucial for the implementation of the activity zones that the two managers were positive and open for the concepts. It was important that they could, as internal initiators, motivate and engage the employees in the implementation of the activity zones in the production hall and in the interior of the technical division.

5.6 Vision Lab

In the previous subchapter a company case was presented where the concept of different activity zones was used in a refurnishing project. At the Department of Product Design Engineering, NTNU, a room for relaxation and reflection, called Vision Lab., was built in 1998. A project group, which consisted of 3 students, another employee and me elaborated on the concepts for the room. I was the initiator for the project. It became a room that both students and staff can use. It is a small room of approximately 6-7 m2 that is placed in a corner of the entry hall.

The room may be related to one of the activity zones called the relaxation and reflection zone proposed in section 5.4.10. The Vision Lab is a room for silence where both staff and students can come and find rest and inspiration. The interior

is rather simple. There are carpets on the floor together with cushions. One is sitting on the ground or near the ground, on stools. There is dim lighting, to create a relaxed and cosy atmosphere. The walls have a yellow colour, which is a quite different colour from the rest of the building, see figure 5.11. The idea behind sitting on the floor is to awake a state of simplicity, openness and equality. As children one of the first activities we do is to crawl on the floor. By returning to the floor one changes the physical and mental context. There is less formality and hierarchy between people. It may be easier to be relaxed, playful and reflective.

Figure 5.11. Pictures of Vision Lab. room

When entering the room there is a small anteroom to take off shoes. This anteroom is intended to function as an area of transition and change of mind-sets. Additionally the activity of turning on the lights and bringing the body down to the ground is viewed as an important means to change into a relaxed state of mind. So the idea is that the activities and the room interior are supposed to help and support a change of mind-set. The experience with scenario play, that will be presented in chapter 7, seems to indicate that it is easier to change mind-set and envision a scenario when the transfer is combined with some kind of physical activity that symbolises the change.

As described in section 2.2.8 McKim [1972] views relaxed attention as central for the creative process. In a relaxed state it may be easier to let ideas and the imagination flow. This room is intended as a place where people can withdraw for a while from stress and regain a sense of calmness and presence for the imagination. In the dialectic model for design, proposed in chapter 4, it is stressed that it is important to learn to fluctuate between an inner world of fantasy, images, concepts and an outer world of reality, concreteness and limitations. The room is intended to be a place that stimulates the side of the model which is connected with visions and fantasy. The room was used by student groups in the innovation course, which is described in chapter 8. The experience and feedback from the

students taking the innovation course were that the room functioned well in the early phases of concept development, when they developed value missions and interaction visions for products, which is discussed chapter 8.

It is important to emphasise that the room should not be viewed separately from the rest of the building and surroundings. The students have their own desk and workplace nearby and on the same floor the engineering workshop is also situated, where the students can construct prototypes. In relation to the concept of activity zones it is argued that it is often the change between relaxation / reflection and construction / hard work that stimulates creative thinking.

This room is an example of how the concept of relaxation and reflection zone may be solved in a concrete way. There are plenty of other ways of creating and forming such a zone, another way was proposed in section 5.5.2. The zone was build in this way partly due to the room that was available. The room has now existed for a couple of years, and is used fairly frequently by different students at the department.

Chapter 6

Project staging & team framework

Nothing worse could happen to one than to be completely understood

- C. G. Jung

URN:NBN:no-2324

This chapter is concerned with the project staging and team framework. Factors influencing the collaboration in design teams are studied. Questions of interest are: What team factors are influencing and setting the stage for creative collaboration in design teams? How may one stage the project to stimulate creative collaboration in design teams? These questions were investigated based on the in-depth interviews of design consultants and employees in companies.

The chapter starts with reviewing the role of atmosphere and attitude for collaboration in design teams, based on the material from the qualitative interviews. In subchapter 6.2 the problem connected to sectional interests, roles and ownership of the project and lack of shared holistic perspective and visions in the team is outlined. Subchapter 6.3 has focus on the problem with different conceptual levels or level of abstraction in design teams and internally in the company in relation to perceiving a product. The conceptual skills of the participants are discussed in relation to the roles, viewpoint, perspective and preference of the participants and in relation to the general atmosphere. The need for a shared expectation of innovation level and focus is also discussed. In subchapter 6.4 the concept of having happenings and events in the design process is proposed and discussed. Two types of happenings and events are proposed. The first type is related to milestones in the company, when one is ending a phase and moving into a new phase. The second type of event is conceptual workshops where external designers and customers are invited to participate.

6.1 Atmosphere and attitude

Based on the qualitative interviews there is an investigation and discussion in this subchapter about the importance of atmosphere and attitude for collaboration among participants in a design team. This subchapter is part of research focus which is to investigate the factors and elements that are influencing and forming the setting of the stage for creative collaboration in design teams.

6.1.1 Feeling comfortable

In the interviews all the respondents comment that the atmosphere is crucial for a good collaboration and for a successful project. The respondents told that it was important to create an atmosphere where the participants felt comfortable, loose and relaxed. Meetings should not be too formal, and many participants try to create a relaxed, informal atmosphere through for instance initially telling stories and jokes. This is discussed in subchapter 7.1. For the external designers it is important that they feel they are welcome and that they feel integrated in the company.

It is viewed as important that the atmosphere is of such character that the participants feel they can ask "stupid questions", and that there is an atmosphere and attitude that give room to try and fail, and that there is room for play and trying out. Many respondents view the initial moods at a meeting as important. One designer said: *"The moods and atmosphere that are there initially when you sit down, when you come in to a meeting are very crucial for the outcome."* Another designer made the link between trust and atmosphere: *"Mutual trust is central and I think one develops such trust much easier with a relaxed atmosphere than with a formal atmosphere."* The wrong atmosphere initially may thus potentially lead to a wrong path and damage an entire meeting. One designer expressed that it was important to have fun and one should take the responsibility for that to happen: *"As a design consultant you have your own responsibility for having fun. If you are enthusiastic you get others involved and then it becomes even more fun."* These findings, emphasising the importance of atmosphere and group climate, are supported by previous work, see sections 2.4.5 and 2.4.6.

6.1.2 Matching together

Just about all respondents comment in the interviews that it is important with the personal chemistry, that there is a personal match, that they understand and feel comfortable with each other. This is the case both between employees working together internally and between internal employees and external designers. In the hiring of designers the company chooses designers they feel they can work well with, where they feel there is a good chemistry and shared understanding. Like one PD-employee said: *"The most important thing is that we match, that the dialogue functions, that communication is there, right away. Without that we do not reach far. We must talk the same language, we must understand what they say and mean and they must understand what we mean."*

Several of the respondents from the different companies mentioned that they had dropped designers because they felt that the atmosphere and chemistry was bad, even though the concepts the designers brought forth were good. One PD-employee described the importance of chemistry in this way: *"We have examples that the ideas of the designer were excellent but that the chemistry between us was so bad that we chose to say no thank you to the product."* From the interviews it is clear that personal chemistry is viewed as central. The question is then how much one may influence this chemistry, and how much lies in the inherited characters and personalities. Will it be so that some people will not work well together even if they used plenty of time to change their own attitude and if they learned to collaborate in a more optimal way? Anyhow, it may sometimes be hard to replace

people, and what seems fruitful to study here is how one can stage to improve collaboration, based on the existing conditions.

6.1.3 Building trust and respect

The companies were using the same designers over and over again. When the employers in the company got the question of why they did so they answered that they felt the designer understood the company and came up with concepts and ideas that were valuable for the company. Several of the respondents also mentioned that the chemistry between these designers and the employees in the company was good, they understood each other and had respect for each other. Many respondents pointed to the importance of trust and respect for each other. One designer said it this way: *"Selling of industrial design has to do with building trust over a longer period of time."* In such a way a long-term collaboration had some parallels to a long-term relationship and friendship. The participants invested time in getting to known each other and as time went by they became more and more confident with each other. Another designer said: *"A central success criteria for a design team is that one initially accepts that it is also a social process and that one initially gives time to get to know each other and develop mutual trust. "*

In a good collaboration the relationship over time becomes personal, the participants care about each other as humans, besides that they are working together. This is a sign that the collaboration is working well. One designer told: *"I experience in relations to several of those I have worked with that you get a personal relationship, that you have established more than just the pure business aspect."* In some situations the external designers meet the company employees in their spare time; they become friends. In general the value of personal relations with trust and respect seems to be an important factor and should not be underestimated. This is the case both between team members internally and between the external design consultants and internal team members. Previous results support these findings [McDonough 2000]. Chung [1989] has also emphasised that a long-term relationship between designer (external or in-house) and a design-aware senior manager is an essential requirement for successful new product strategy.

6.1.4 Having knowledge of human nature

Besides having the ability to draw, visualise and come up with good concepts a clever designer seems often to be a clever judge of character, he has a good knowledge of human nature. Some designers will with experience sense and

recognise the different archetypes and characters in a company. They will recognise and sense the different cultures in the company and know what to say at the right time. As one designer said: *"It has a lot to do with what people you meet, you recognise the people from company to company, the different human characters, how they think and what they are preoccupied with."* A clever and well functioning designer may also have the role of an external catalyst and connector and help to get internal employees from different divisions to collaborate better together. On the other hand, according to several respondents, a designer that is not functioning so well may reinforce the tensions and polarities that already exist in the company.

The knowledge of human nature may probably be equally important for a product development manager or a production manager. One PD-employee said, in relation to designers: *"When you start to know these people then you sense signs of weakness and strength and how they respond to it."* So, personal experience over time working with different characters and cultures may be an important factor for a good collaboration. Some people, either they are designers, PD-employees or P-employees have also a special knowledge of humans which can be very important in team collaboration. It is not only the organisational practitioner that should have special knowledge of people, as described in section 2.4.8.

6.1.5 Taking the right attitude

In the interviews several of the respondents told that it was important and crucial to have the right attitude among the participants to get good team collaboration. Several of the respondents said that it was important to be humble and have the attitude where you believed in the ability of the other participants and actors in the development project. It seems also important that the participants have the attitude that they want to build confidentiality and trust, that there is a fundamental willingness to collaborate and understand the other participants and actors in the team. This might correlate with the concept of genuine interdependence, presented in section 2.4.1. If the actors in the team do not feel the need and interest in collaborating, the attitude will also easily be less good.

6.1.6 Open attitude towards the company

In relation to the attitude of designers both PD-employees, P-employees and designers emphasised the importance that the designers tried to understand the needs of the company. It was important that the designer came up with concepts that were relevant for the company. Successful designers seemed to be able to

come with interesting, new concepts that fitted with the strategy and philosophy of the company. They had the attitude and ability to pick up and understand the intentions of the company.

Several P-employee mentioned that it was important that the designers had the attitude and willingness to understand the needs and problems in production. Many of the PD-respondents and P-respondents mentioned designers who were not willing to follow the product through, who just liked to make the major lines and then expected the company to find ways to produce it. One P-employee told it this way: "*When the designer is satisfied and has put the last line on the drawing I have often the impression that the designer then expects that the product is ready to be produced*." Apparently, some designers have had the attitude that preparing the product for production and developing a rational production process is something others should do, that this part of the development process is less important compared to the early phases. Such an attitude would easily inhibit fruitful collaboration. A few P-employees said also that both engineers from the product development department and designers could show lack of respect towards operators in production due to different educational background. They did not always listen to the feedback and signals coming from operators and this was maybe partly due to the fact that they were not well educated.

Many employees from the company talked about arrogant designers who liked to feel they were superior to others, who had a strong ego. They talked about an attitude among designers, where the designers liked to view themselves as big artists where the work they did was "law"; they were not willing to make changes. One P-employee described a superior attitude among some designers where they overestimated themselves and underestimated others. He said: "*When you meet down-to-earth people you have a problem to get acceptance if they see that you have such haloes and white wings around that they do not feel fit to you* ."

It is important that the designers have a willingness to listen to the people in production and company in general, that they have an attitude where they are willing to take signals and that they are willing to collaborate and let the other participants of the team contribute conceptually. Several P-employees mentioned that it was important that the designers took time to visit the factory where the product would be produced, tried to look at the possibilities and limitations there and had some pictures in mind of the factory when they were designing the new concepts.

6.1.7 Feeling welcome

Many respondents, both PD and P-employees and designers mentioned that it was important to create an atmosphere and way of being in the company so the designers felt welcome and could give of their best in the development process. Several designers said that, as a designer coming from the outside, one could feel rather vulnerable. One designer said: *"It is a vulnerable, exposing process because you say something about how you interpreted and understood what you heard. And you visualise and expose yourself. It is very important with the relational psychology and that one feels the chemistry is attuned. That one has established a common understanding for product development."* It was favourable if the designer felt they were trusted, and that the company managed to care and appreciate the designer. Several respondents, also in the company, mentioned that many companies had an attitude where they kept the designer too much on the outside. They did not involve the designers as they could. The designers had sometimes just a few persons they could relate to in the company. There would then easily be more misunderstanding since information did not go directly but through several persons.

Several designers mentioned that it was important that the company had an attitude where they showed they were willing to pay for good ideas, and that they gave enough time for maturing, experimenting and trying out. The way they spent the money and were running the project showed how they respected the designers. One designer mentioned also that it was important to have an attitude that respected that the process of developing concepts was a struggle and that one was willing to acknowledge that.

6.1.8 Challenging the others

Provocation and challenge can be an important part of the process of coming up with good solutions. One PD-employee told: *"The way to get good solutions on things is that one disagrees. That we have solutions that provoke, that engage people."* The act of challenging is then an accepted part of the game and collaborative play. Nevertheless, one designer told it was important to create a secure setting before challenging. If the participants felt secure and confident they would tend to be better able to accept and receive a challenge and not get so easily offended by it. So it seems as important that there is a good atmosphere, that the challenges made by the participants in the team may be viewed more as a "serious play" where there is an underlying sense of care and understanding.

The act of challenging may be risky, and participants may get provoked in a negative way. One P-employee told that he experienced too much challenge as negative, that it created a negative atmosphere: *"I mean that if I say something then I mean it. And if someone tries to make a fool of me then I do not give way. And it is negative. It creates a negative attitude."* It seems important that the challenges are made with respect and in such a way that the participants do not feel that they are ridiculous and not respected. From the interviews it also seems like different people have different tolerances for challenges. Some people take challenges more easily on a personal level, while others see it is as a natural part of collaboration. What is accepted as a challenge seems also to be dependent upon the framing and context of the game. This understanding is similar to the concept of "framing" by Bateson in relation to play discussed in section 2.2.2.

6.1.9 Conclusion

As a conclusion for this subchapter it is important for the team collaboration to have a positive atmosphere which allows for trial and failure, and that there is an attitude among the participants of shared respect and understanding in the team. It is important that the different participants believe in the ability of the other participants and actors in the development project. It seems also important that the participants have an attitude where they have a drive towards trust, that there is a fundamental willingness to collaborate and try to understand the other participants and actors in the team. Challenging seems also to be an important part of collaboration. Nevertheless, it seems that it is important that there is an underlying feeling of care and understanding for each other. It seems thus important for the different participants that the others have an understanding for their situation and problems. In this respect it is also crucial that the different participants can see the advantage of collaborating and getting the best out of each other. One needs mindful engagement and genuine interdependence among the participants in the team, as described in section 2.4.1. If not, challenging can easily be offensive. A central question will then be how one may improve such shared understanding and respect. Exercises, for instance in role change, that may help in this matter will be proposed in section 6.2.10 and also in chapter 7.

6.2 Roles, ownership and sectional interests

In this subchapter 6.2 the significance of roles, ownership and sectional interest and the need for shared visions and holistic perspective in design teams is described and discussed, based on the insights and viewpoints gathered in the qualitative interviews. The concept of*flexible role structure* is introduced as a tool for improving collaboration where there is a certain overlap in roles, at the same

time as there is a general understanding and respect for the different roles and perspectives in the design team.

6.2.1 Taking different roles and viewpoints

In the development project the different actors in the team come from different divisions with different roles and responsibility. These actors will tend to have a focus on the project that is depended upon their original task and responsibility and how they traditionally are evaluated by the company. People from production that are participating in teams will easily be occupied with rational production, people from the marketing department will easily be occupied with the potential for sales and market potential, the designer will easily be occupied with the aesthetic aspects of the product and so forth. In general the different participants will have different viewpoints and perspectives to the task. As it will be discussed in subchapter 6.3 the designer and P-employee will generally look differently at the same concept or product. In general the P-employee will have a tendency to look for deficiencies and mistakes, while the designer often is looking for possibilities, different options, etc… So even though the different participants are looking at the same problem and concept they will look for different things. There will be a semantic difference in perception [Monö 1997], see section 2.3.3.

6.2.2 Having ownership in the project

Several respondents pointed that it was important with an ownership to the projects. The different members of the team should feel for the project and for the product. One designer said: *"If you don't feel for the product then it doesn't go well. Not only you, but the entire team must feel for the product."* It seems like people from production who are supposed to partake in different projects often lack the feeling of ownership. One P-employee expressed it this way: *"You do not get engaged so much. You do not get an ownership, not in the way it is here. You have too much distance and we meet too seldom."* He went on saying: *"A whole month can go without getting information about how the project is going. This is too much time."* He finally said: *"If I were more involved I would maybe come with ideas and be more a companion and not come purely as an adversary to the project. What you feel is that you try to stop everything. If you say that this does not work then we must stop the product and begin again from the start. So then I just let things go even though I see that it will be difficult."* Several P-employee expressed that they get involved too late. One P-employee expressed: *"When you have something to say it is too late. It does not really matter since the whole framework is already set."*

From the above quotes it is clear that the participants from production division in the teams do not feel they are fully part of the process. They do not get enough involved in the project and do not get an ownership and real participation in the project. They will therefore more easily tend to be more negative and sceptical. This will then have great influence on the project and the collaboration in the team. Additionally, participants who have not been part of the process and the decision making will not understand so easily the reflection and process that lies behind. One PD-employee described it this way: *"External people do not see the process that lies behind, the creativity that lies behind, or the evaluations and thought process exchanges that are necessarily happens in such a process."* The need for a feeling of ownership and real participation in the team is also described as a central factor influencing collaboration in literature [McDonough 2000].

6.2.3 Locked in own sectional interests

A majority of the respondents mentioned in the interview that a main problem in the team collaboration is that one quickly gets stuck in sectional interest and looses a holistic perspective. Each participant is thinking about his area. This seems to be partly due to the fact that the different participants come from different cultures and that there is a lack of awareness around changing of roles in the integrated team. Furthermore the different participants are quickly occupied and fixated on the area they traditionally are evaluated on. As one P-employee said: *"One can easily focus on own problem area, own sectional interests and work more with that area and promote that area rather than trying to give priority to the main tasks that are important for the group as a whole."* Another P-employee emphasised equally: *"It is very easy to play our daily role in the meeting. Then we sit there with this role without having enough focus on the totality, what kind of meeting, what kind of project we should end up with."*

Both of these P-employees expressed, like many other respondents, that the participants get caught in their daily role and the meeting quickly gets stuck in discussions and argumentation of sectional interest. They also mentioned that there is then a lack among the participants of looking at the problem and task from a holistic perspective. Such lack of holistic perspective and the tendency to get locked in sectional interests is strongly influencing in negative terms the collaboration in design teams.

6.2.4 Sectional interests related to atmosphere

One of the problems is that when the participants get caught in discussions based on sectional interests it is hard to get out of this discussion, because no one wants to feel as a looser, as one respondent said. When the discussion has ended in a 'blind alley' the atmosphere will also not be good. When the participants do not feel accepted and trusted by the other participant they get easily stuck in a fixed role structure, have fixed opinions and are less collaborative. A negative atmosphere may again lead to a stronger polarity where each participant is focusing more and more on his own sectional interests. As one P-employee told: "*There is probably a tendency here, like other places, that when things get heavy you make them worse and pull them further down. There is not somebody who is clever enough to pull us up.*"

When a participant feels insecure and does not feel accepted or understood he will tend to stick more to his own knowledge and his own interests. There will then be less chance for redundancy and creative coupling [Bastick 1982]. As one P-employee told: "*We see in many connections in our system that we get too strong polarities that prevents us from having a creative meeting.*" Later on in the interview he went on by saying: "*There may be such strong individual interests that the discussion gets locked.*" In sections 6.2.9-6.2.10 concepts and exercises for loosening up this fixed role structure and sectional interest will be suggested.

6.2.5 Having a holistic view

Many of the respondents mentioned that instead of getting caught in long discussions based on sectional interests with too strong polarities the group should be cleverer to come up and see the problem and task at hand with a holistic view. One of the P-employees experienced it this way: "*We see that we get incredibly long discussions on details instead of managing to come up with a holistic view so we get further… We lack a dimension that allows us to lift ourselves.*" A PD-employee pointed out just about the same phenomena: "*The problem is that most people, myself included, have difficulty in getting a bird's eye view, a global perspective, especially in an early phase, but also later. Instead we are very quickly drawn into a concrete phase where we focus on the problems of each individual.*" He continued: "*People from sales think about the sale they lost yesterday when they think about new products. And for production any new product represents new problems. They would rather produce what they always have produced because it is familiar.*"

So there is a need for a holistic perspective and shared vision. One P-employee remarked that if they managed to lift themselves up it might also help for the motivation: *"If we had managed to lift ourselves up more we would probably also have managed to obtain a higher degree of motivation in the projects too."*

6.2.6 Holistic perspective dependent upon role

A problem that arise when discussing holistic perspective is that the perspective that the participants view as holistic will depend upon the role and viewpoint they are having. The designers said several times in the interview that they represent the holistic view. Like one designer said: *"It is we, as designers, who must care for the holistic perspective in the process."* Another designer said: *"The difference in concept between a designer and an engineer is that they often have different approaches. It is often the designer that has a tendency to win with strong concepts because he has a holistic viewpoint."*

The designers often mentioned that they represented a holistic viewpoint, but in fact this holistic viewpoint will be based on their own perspective and preferences. A PD-employee mentioned that they had to think in holistic terms. He argued that they struggled to communicate a holistic perspective to the designers, about the whole value chain of the product: *"It is not easy to get a designer to share this holistic perspective, because the designer is very occupied about optimising his product separated from the greater total picture… We use a lot of energy in the development process to communicate the need to see things from a greater framework*."

Equally, the P-employees talked about a holistic perspective viewed from the perspective of production. The same will be the case for a participant from sales who will think of a holistic perspective based on optimal sale and distribution. So when the different participants talk about a holistic perspective it will be based on their own perspective, viewpoint and role in the development process. The different participants will have a different understanding of what is a holistic perspective.

6.2.7 Creating a shared vision

Even though the participants have a different view of what is a holistic perspective they mentioned the importance of coming to a shared understanding before getting too caught in their own sectional interest. They use metaphors and images like "moving up", "see with a helicopter perspective", "lift each other up". Several of

the respondents mentioned that they should be cleverer in creating a shared vision, that all of the participants in the team agreed upon. It is in this respect claimed that no one can manage to create a holistic team vision by himself. The whole group must create this vision and holistic perspective. This seems to be a challenge. One PD-employee expressed: *"To manage to pull such multidisciplinary team up to a level there we can sit together and look downwards or look outwards with a shared vision. To manage to create these visions for a new product without getting concrete too early, to avoid killing a creative process with everyday problems: this is very difficult"*. This idea of a shared vision in a team seems to have something in common with the concept of having a shared goal, as presented in section 2.4.6.

6.2.8 Vision-based model as a discussion tool

It is proposed that the vision-based model from chapter 4 can be of help as a shared tool and discussion framework for the creation of a shared perspective and vision in a project team. It is hard to lift up and get a shared perspective if the participants have no idea of what it means by having a shared vision and perspective. In this matter the main model, combined with the integrated development model proposed in chapter 4, may function as a basis for a discussion between the participants in a team. This was also the way it functioned between the team participants in the innovation course at NTNU and the product innovation course at DTU, described in chapter 4. The integrated development model also indicates the different possible perspectives from production, research and development and marketing. The model indicates a way of making abstractions and visions. As will be proposed in subchapter 6.3 the model may also visually show some of the problems connected to the calibration of abstraction and conceptual level between the different team members.

6.2.9 The concept of flexible role structure

In this section the concept of flexible role structure as a support for creative collaboration is proposed, based on the some of the insights made in the previous sections concerning sectional interests and lack of holistic perspective.

Zaccai [1998] argues that a overlap of roles is central for collaboration and for innovation. He writes: *"This overlap is not considered redundant or inefficient but instead adds new dimension and depth of knowledge to the role of each discipline. This overlap actually stimulates innovation and adds overall efficiency to the entire development process."* Bastick [1982] writes that redundancy and overlap is an essential element for intuitive thought. If the different actors do not have the

ability to take each other's role and perspective it will be difficult to have a fruitful bridging of knowledge and create a shared understanding. The use of empathic projection and the ability to be flexible and take another perspective is here viewed as central. The different parts must in this connection have some experience working and seeing the problems and tasks from 'the other side'. Rigid role structure and too much sectional interest, which were described as a problem by the respondents, will give little creative coupling. This lack of creative coupling is illustrated in figure 6.1.

On the other hand it is equally important that the participants in a team feel secure about their own role. This means that the team does not end up in an unclear situation where everyone wants to do everything, but that the different participants in the team value the different expertise and roles in relation to the development project. It is proposed that a role structure that is too unclear will also lead to less 'creative coupling', see figure 6.1.

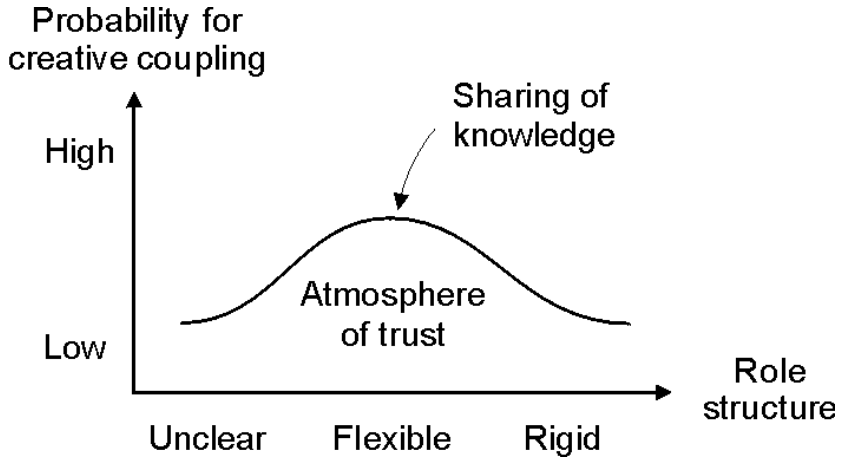


Figure 6.1. Proposed correlation between creative coupling and role structure

So the concept of flexible role structure is proposed, where there is a certain overlap in role, but at the same time a general understanding and respect for the different expertise and roles. Thus, in such an ideal situation, the different team members will feel respected for their profession and roles and at the same time have an ability to take the perspective and role of the counterpart, thus giving room for 'creative overlap'. Such a situation will nevertheless often require an atmosphere of trust and openness where both parts feel comfortable and secure with the situation. The question is if training through exercises may help in this matter. The next section discusses the use of such exercises in a design team.

6.2.10 Exercise in change of role

In relation to the concept of flexible role structure it is suggested that one may use exercises in design teams where there is conscious play in change of roles. These exercises will give the participants training in viewing the problem and project from another perspective and viewpoint.

In such exercises the members are asked to look upon and take the perspective of the other members in the team. The designer may be asked to describe the perspective, worries and challenges for another participant in the team and vice versa. Generally, there will be a difference when the member himself has to describe his perspective and when the other members should try to take his perspective and describe it. Such a simple exercise may help to loosen up the strong sectional interests and fixed roles. It is important that such an exercise is presented in a way so it does not reinforce polarity but on the contrary may help to create a shared understanding. In this sense the focus in such an exercise should be on the desires, perspectives and needs of the participant rather than on the mistakes of the other participants, which can easily create self-defence and stronger polarity. Furthermore, for the successful implementation of such an exercise it seems important that the participants have open attitude and are willing to try. Prior to such an exercise it is also important to create a relaxed and playful atmosphere. One may therefore need a trained facilitator for such an exercise. The role of facilitator will be discussed thoroughly in chapter 7.

When referring to the exercises described in chapter 7 the exercises proposed here would be mostly process oriented, rather than problem oriented. Such an exercise is meant to help the team spirit and collaboration, rather than helping to solve the design task. The idea is that when the different participants feel that the other participants really understand them and their situation they can more easily let go of their irritations and be less inclined towards their own sectional interest.

Such role-play exercises were used in the innovation course at NTNU, where different students played out conflict scenarios with different roles, like the ones found in design teams. In one exercise, that was used twice in the innovation course, 5 students played a team which was developing a lamp. The roles in this "virtual" team was an industrial design consultant, a manager from production, a marketing responsible, a sales manager and project leader from the product development department. Each student got one written page where the project history and their specific role were described. All of the students had name plates. In the descriptions of the project history different unsaid conflicts were indicated. In the role play the project manager had invited for a meeting to present different concepts that had been developed by the design consultant. Conflicts arose due to

different impression and experiences of the concepts. After a while the students were asked to resolve the conflict without taking the "simple way out", they had to find solutions without wiping over the underlying reasons for the conflicts. Later they played similar conflicts, but then they played that were different students working in a team, where for instance one of the students had not done the work he was suppose to do. Some of the situation in the role plays were therefore quite close to their own teamwork situations in the course.

The response from the students to these exercises was very positive, the students gave the feedback that such exercises made them increasingly aware of the potential conflicts in a company. The session created a lot of laughter in the audience. Several students told that it was nice to play out conflicts rather than being in real conflict. Several of the students told that they could clearly recognise situations from collaboration in teams. Some students commented that it was nice to be able to play other roles than they were usually having in teams. When they played out the conflicts they could become aware of the situations, which was more difficult when it was a real conflict. By switching roles the students learned to approach these roles with a flexible attitude. As presented in section 2.2.6 Kupferberg [1996] writes in relation to play: *"The play forms a sort of free space in the human condition, a space where we can work on difficult problems and attain deeper comprehension through putting parenthesis around reality."*

As described in section 2.2.7 pretending and make believe play among children seem to help children to take a more flexible attitude than without such play. This might also be the case for participants in a design team. Through such play they can learn to take a flexible attitude and not get so fixated in their usual roles. Nevertheless, playing with roles might also be dangerous and might even reinforce conflicts if it is not done in a proper manner and if the setting in advance is not relaxed and comfortable. It is therefore viewed as important that one has good facilitators for such exercises. The role of the facilitator is discussed thoroughly in chapter 7.

6.2.11 Conclusion

In this subchapter 6.2 the significance of roles, ownership and sectional interest in design teams was described and discussed, based on the insights and viewpoints collected in the qualitative interviews. In a design team the different participants will have different roles, perspectives and viewpoints based on their functional background and competence. It is important that all participants in a team feel ownership to the project, and this does not seem to be the case in many companies. According to many respondents many design teams struggle with strong sectional interests and polarities which lead to long discussions and unproductive conflicts.

A negative atmosphere with a lack of playfulness and trust may also reinforce these sectional interests. It seems important that the team manage to come with a shared holistic view, vision and perspective as a shared basis for an integrated development process. The vision-based model and integrated development model described in chapter 4 may here function as shared tool and framework for discussion, since it indicates different possible perspectives and ways of making abstractions.

The concept of flexible role structure is introduced where there is a certain overlap in roles, but at the same time a general understanding and respect for the different roles and perspectives. It is proposed that a flexible role structure in the team is important for creative coupling and collaboration. As a help to lower the sectional interests and polarities and improve team spirit it is proposed that one can use exercises in teams where there is a conscious play in change of roles, where the different participants take each other's roles and perspectives. Such exercises functioned well in the innovation course at NTNU. It is then viewed as important to have good facilitators for such exercises.

6.3 Conceptual level, skills and focus

This subchapter reviews and discuss the importance of different conceptual level, skills and focus in design teams in relation to creative collaboration, based on the qualitative interviews. The problem with different conceptual level in team collaboration is discussed in relation to roles, viewpoints, ownership, atmosphere, preferences and general project expectations.

6.3.1 Being on different conceptual level

In all the companies that were studied respondents talked about the problem of different conceptual levels as a source of frustration and hindrance in the team collaboration. Both designers and product developers experienced that people from production and marketing often lacked the ability to abstract and imagine from a sketch or a rough prototype how the final product may look like. They experienced that people from other divisions, such as the production and marketing divisions got caught in details that they thought were not relevant for the phase in the project. One designer expressed it this way: "*To get different players on the field that are not used to thinking in abstract terms, and that all the time relate any idea or thought to something concrete and willingly kill it as fast as possible, that is an exercise. It is an exercise in being a pedagogue. Positive reinforcement is usually what works*."

Several PD-employees also mentioned that one could get negative feedback from the people in the marketing department on a conceptual model or prototype because it was in a wrong colour. A PD-employee told: "*You can say as much as you want to not look at the details, don't look at the finish, don't look at the colour. Look at it with a diffused view and imagine how it can be if it is done correctly and reasonably. Then people still come and say: "Should it be grey or black?" You can say it so clearly, but they do not manage to cut the details out*." A man from production could ask why they had used this and this material and so much material on the prototype while for the PD-employees the importance in their mind was just to have a prototype that showed the main idea, concept or functionality. Several of the designers described how a conceptual idea easily could be killed due to early focus on a small detail. As one designer described it: "*We know how quickly a conceptual idea may be killed. For instance the production man says "this stamp we do not have and this I can not do down there". This can be a tiny detail in the great totality, and can kill a whole meeting.*" When relating to the vision-based model proposed in chapter 4 one can clearly see from this quote that the feedback lies on another conceptual level that is further down in the triangle. The conflict lies in that they are perceiving the concept and product on different levels of abstraction: the contextual, the principal and the material level. In addition they have different viewpoints and perspectives, as discussed in subchapter 6.1. The model for integrated product development, proposed in section 4.4.6 illustrates both the different level of abstraction and the different perspective in a team.

The different conceptual levels and perspective may lead to polarity and function as a hindrance in the team collaboration. According to one respondent, the tension due to difference in conceptual level may sometimes also be constructive and give creative tension. This seems to be in cases where there is a general positive attitude among the participants, and where there is a shared respect for the different members in the team, as discussed in subchapter 6.1.

6.3.2 Conceptual skills

Several of the PD-employees and designers mentioned that to give feedback to concepts and having the ability to abstract is a skill that needs a lot of training. One designer said: "*The ability to avoid seeing on a drawing or sketch as something done requires a lot of training.*" A PD-employee told about conceptual skills and his frustration in presenting concepts: "*You get many irrelevant rational evaluations that create unnecessary disturbance. To evaluate a sketch, a product concept or an idea is a skill in itself…You should have the ability to see behind the product. You should have the ability to abstract how the product will be looking*

from a sketch that is a bit loose or a model. And if you do not have that ability then you will often judge the product according to what you physically see. "

Another PD-employee told about the experience of presenting conceptual boards to the marketing and production department: *"When we started to talk about chaos, humans, communication it became too abstract for these engineers and economists. They didn't understand what we were doing; they wanted to see the product. They didn't see the importance of the development work."*

From the interviews it appeared to be a general frustration among the PD-employees and partly also among designers that the people from other departments had not the ability to abstract and see beyond a drawing or model. When relating to the vision-based model one could say that they were apparently not able to see the concept from the contextual and principal level. Nevertheless, this was often not their daily work and they could often have little training in such practice, like the case was for the designers and PD-employees. As described in chapter 4 it may require some training to work with the abstract levels of a product. Furthermore the viewpoint and perspective to the product was related to the role, ownership, participation and responsibility they had in the company, as it will be discussed in the next sections.

One designer said that it was important that the different participants felt free to make suggestions they had in mind, even though it might be "irrelevant noise". If a participant did not come out with his suggestions or remarks he would just have those in his mind and not be able to participate fully and be attentive. As a designer you want all of the actors and team members involved, he said.

A few respondents mentioned that the conceptual skills of the employees would be related to the closeness these employees had to the development project. If the daily work of the employees was usually far away from the design process and if they had little experience working with concept development their understanding would also usually be limited. A person in the product development department, who was working all the time with concepts and development projects, would have developed his conceptual skills, and be used to working conceptually.

6.3.3 Conceptual thinking based on the expected role

A PD-employee, who was an engineer, told of his experience that the designers often had a desire to have a monopoly on the creative part. He also got remarks from the company where people said that he was an engineer and should not try to be creative. Similarly, a P-employee said that they stayed a bit in the background at the start of projects because they often got accused of not giving room for

creativity: *"We from production get easily accused for not giving room for creativity, new thinking and new materials. Therefore production holds back and waits for what comes up."*

Even though it is acknowledged from several respondents that people from production can come with creative solutions in relation to production techniques and production processes the general view and impression both from many designers and PD-employees is that production is conservative and is often inhibiting new solutions. One designer said that it is important to have a different attitude towards people from production and start to listen to them more actively. He said, when relating to production: *"The problem is those that are least in the field, those that always are on the periphery of the things that happen and who should have been heard but do not get heard. And therefore it becomes a part of their culture that they always are lagging behind and come with negative remarks that this should have been done differently at an earlier stage"*. He also commented that it was important that the different team members should not leave behind their role, but use it in a creative, constructive way: *"You should not leave behind your role, because that's the reason you are there. You should let it be a creative, constructive part of yourself and not a limiting factor."*

6.3.4 Viewpoints and conceptual ability

The relation between different viewpoints and conceptual level seems to be important. People from production usually have the role of looking for deficiencies, find what is missing and correcting details in the development of the product. As one P-employee expressed it:

"*What we put focus on is very often what is missing, we ask questions about what is missing. We do not ask questions about the goodness, the totality, possibilities. We see that it has 14 deficiencies and shortcomings, what are you going to do with them? And that means deficiencies that the constructor has not at all yet seen. He is at an earlier phase. It is clear it is a challenge to be on the same wavelength."*

This P-employee experienced that it was crucial that the participants knew on what level and phase they were in the project. He continued by saying: *"The question about deficiencies must come, but it has to come at the right time. The designer and product developer come with questions concerning deficiencies very often too late which leads to big consequences to go back and make corrections."* Another P-employee said: *"Everybody tries to see the negative in it, at least in the beginning. Tries to see the negative to get it better. Why haven't you done it in such a way, why haven't you done it in such a way…"*

So to a certain degree it seems that the ability to see conceptually is influenced by the role and responsibility you have in the company. This semantic differentiation when viewing a product or concept was discussed in section 2.3.3. The ability to work conceptually is thus not just based on the skills of the employee. The role and natural inclination to a participant from production is to have in mind the production and look for deficiencies when viewing the concept. As mentioned above this is an important and crucial ability if it is used in the right way and at the right time in the development project. It still does not necessarily mean that a participant from the production or technical division can not think conceptually. By consciously changing the role and putting the employee in another setting and framework where he is measured on other aspects than traditionally, a P-employee might think more conceptually and abstractly about a problem at hand.

6.3.5 Changing and taking a different role

It is important in this relation to see that several of the P-employee mentioned that it was crucial that the participants changed their role when being involved in the design team, that there is conscious change from the normal role the employee was having in the company. Like one P-manager told:

"*In a project group you have the role of a project participant, that means you have a share in responsibility to come up with a totality, and this share in responsibility you shall practice through the knowledge you possess. It is a different type of role than to go in production where you make continuous decisions that give quick results that are relatively direct. In a development project you have to live with the insecurity, you have to live with the unknown and that is a problem for many in the area of production*."

Thus, he mentioned that it is important that P-employees and other team members who are not used to working conceptually learn to be comfortable with a greater degree of insecurity. When referring to the model of design in dialectic tension from chapter 4 it means that they are able to work and be more comfortable than previously with the left part of the circle. He also pointed out that people from production are suddenly picked out and placed in a design team without any mental preparation. He said: "*We are not clever enough, we just nip out people and put them into projects and say that now they are going to work in the project and contribute. Now you are the production man in the project. And then they sit there and try to hold on and secure the existing framework*." So it seems to be central that the participants are prepared mentally when entering into a integrated design team and that the different participants have a shared understanding and knowledge of what is expected at the different phases in the project. When relating to the vision-based model in chapter 4 one will often have a stronger focus on the

upper levels of the model in the early phases and it is important that the different participants can take a role and viewpoint that fits to this specific phase in the project. In the late phases it is equally important that the designer and other participants can take the role needed for a final realisation of the project.

6.3.6 Conceptual skills related to atmosphere

As it was discussed in subchapter 6.1 the atmosphere seems to be crucial for good collaboration. A few P-employees mentioned that the atmosphere between the participants may also influence their ability to work conceptually. If there is a bad chemistry and atmosphere there will be a tendency that the polarities between the participants get enforced. One P-employee expressed it this way: "*One often does not have good collaboration in such groups, it is maybe therefore one is on different conceptual levels*." Bad atmosphere and team spirit may reinforce the potential differences in conceptual level. A production employee who feels insecure will tend to focus on the aspects related to production that he feels secure about. The same is the case for a PD-employee or a designer, one gets a fixed role structure. If a P-employee has little experience in working conceptually he needs to feel secure to do so, because it is not his major competence. To be in an associative and playful state requires that one feels secure and that it is accepted to say foolish things, as several students expressed in the innovation course, see chapter 7. If you are insecure and do not feel appreciated you will take less risk and dare less. You will hold more on to the knowledge, perspective, viewpoint and skills you are familiar with. So in a setting where there is lack of trust and shared team spirit the potential polarities and sectional interests will easily be reinforced.

6.3.7 Conceptual skills and ownership

As discussed in section 6.2.2 the feeling of ownership in the project is important for the willingness to actively participate and collaborate in the project. Several respondents from production who took part in development projects expressed that they did not have enough ownership in the project. In several companies the project participant from production is invited for meetings, comes for a few hours and then leaves again. The lack of involvement and ownership will also influence the desire to work conceptually. The interviews seemed to indicate that if you have not participated in the forming of ideas you would tend to be more negative. Then you are on the outside of the project and will not sense some of the difficulties as an insider and as an active participant.

For the optimal use of the different participants of the team there should be an agreement that the different participants may take part in the concept development. One PD-employee, who also functioned as a project leader, mentioned that it is not the role of people for marketing and production participating in design teams to work conceptually, they should just evaluate and make demands:

"*One must be clear that it is the product developer, the person from purchase and designer that solve the problems while marketing and production make demands. It is important with demands because if you do not have the right demands then you get a product that is not right. But their role is and will be to make demands and not solve the problems. Sum samarium it is the product developer, the project leader who has the responsibility to solve the problem.*"

This quote seems not to be representative for the attitude among all the PD-employees. Nevertheless, it is clear that if such an attitude is expressed and is felt among the participants from marketing and production it seems probable that they then will also be more negative and think less conceptually. It is then not even expected by the other members in the team that they can or should contribute to the conceptual part of the project. With such an attitude one must also be willing to pay the price that these members are generally negative, but this PD-employee wanted nevertheless at the same time the P-employees to be positive and constructive.

6.3.8 Conceptual skills and personal preferences

A few respondents that were designers and PD-employees said that the ability to work conceptually had also something to do with the personality and personal preferences. Some people may have more ability and preference for conceptual thinking than others. Some people have a greater pleasure and acceptance for ambiguity and the unknown than others, the respondents remarked. It is difficult to tell and judge to what degree this ability and preference has something to do with their personality or to what degree it has to do with the role and expertise they are having in the company. Leonard and Straus write that it is fruitful to know about the different personal preferences to get a good collaboration in teams [Leonard and Straus 1997].

It seems though a dangerous approach to have the attitude that others have a personality that leads not having the ability to understand conceptual work. It may be a reason to avoid interaction and collaboration, an excuse to not involve properly the production participants in the design process. This is what a few P-employees said in the interviews. One P-employee said he viewed it as an offence

that P-employees did not have the ability to work conceptually, which he felt was not the case.

Several respondents expressed that people from production could have good suggestions for solutions on production and processes and on finding solutions to detailed parts. They pointed out that production people could also be creative, but in general it was often on a practical and concrete level. So conceptual skills may also be connected to the specific problem at hand and the type of problem that has to be solved. My personal experience in the interviews and in the case described in chapter 5 is that P-employees and people from the technical division can be very creative and conceptual in their thinking, especially in areas that can see relevance to their own work, like their own work space.

6.3.9 Conceptual level and concept representation

The ways concepts are presented seem to be central for collaboration. When presenting concepts several designers mentioned that they had good experience with giving concrete examples and models, so the others could better understand the concept. One designer said: *"Physical models are often better. Production can more easily relate to it, how it may be produced. You may fool both yourself and others with drawings and pictures."* Another designer said it this way:

"*To get an understanding of a concept it is important to make it very concrete. People have general problems in capturing abstractions. To make it concrete and pull it down, I use to call it exemplification, to show materialisation of the concept. They have a big need to see what a product is in real life… I have good experiences with presenting principal solutions on a more abstract level and coming with concrete examples that are spread out in different directions. They are more concrete, but do not lock, since they are shown in a connection where there is a big open room. Then you often get the chance to direct the input from those that are present.*"

This designer told that he showed concepts on an abstract level. When relating to the vision-based model proposed in chapter 4 such representation of the concept may be related to the contextual and principal level. At the same time he came with suggestions on a more concrete and material level. Showing concepts on a abstract level could indicate that there is room for changes. The same designer pointed out that the danger with making concrete representations is that the concept is interpreted as something else than it is:

"*On the one hand in presentation of a concept one needs to make it concrete and materialised so they understand. On the other hand that is also causing problems*

because it is interpreted as something else than it is. If you exemplify a concept then it can be interpreted as a finished solution while it maybe just was a starting point for further discussion, play and improvement."

He suggested that it was important to take time for dialogue and collaborative discussion, which could help to create a shared understanding. Several of the other designers expressed a concern for the difficulty in finding the right abstraction level when presenting concepts: "*We talk about levels in the sketches. There is a major challenge that the sketches should not be too naïve and green and at the same time not too completed.*" The sketches should give room for interpretation. A good sketch may have the quality of being a boundary object, as discussed in section 2.3.5. Boundary objects are objects that allow members of different groups to come together for some endeavour, though their understandings of the object of their mutual attention many be quite different. Successful boundary objects exhibit flexibility by allowing for more specific or restricted reading of codes to be embedded within a more universal one. In such objects there is room for the different actors in the team to have different interpretations.

One PD-employee expressed that the company did not like that the concepts were too much worked out: "*We do not like to get those ideas that are well chewed. To come here with a finished solution is the same thing as to fail, almost. We have to put in the extra link to our company.*" The participants in the company had to feel an ownership for the product and fit it into the product family of the company, even if the designer developed the concepton a royalty basis.

For good collaboration it seems important that the participants in the meeting are able to see the possibilities and open space that are in the concept. This has a lot to do with the way the concept is presented, but it is also connected to the ability to evaluate and observe a concept. As one designer expressed: "*It is important that one can imagine the possibilities and the open rooms that lie in the concept, and that you do not lock a concept from what one says. No, that does not work because of that and that. A concept should have such a strong spine that it can survive in different figurations.*"

6.3.10 Shared expectation of innovation level and focus

Several respondents mention in the interviews that it is important to have shared understanding and expectation of the innovation level in the project. This can be connected to how much focus one should put on the different levels of the vision-based model, proposed in chapter 4. Without shared understanding of innovation level there will easily be conflict and less good collaboration. For an external designer it can be difficult to know clearly what the company is expecting in

degree of newness. One designer said that sometimes the company expected a more innovative solution and sometimes a solution that was more traditional. Furthermore the company and the designer could have a different understanding of what was an innovative solution. What a designer may view as a traditional solution the company may on the contrary view as innovative.

Several designers told in the interview that they experienced that the company was not always honest in relation to what they really want. One designer said it this way: *"They can not always be honest in relation to the briefing they make, they give signals that they are looking for innovative solutions and actually they are maybe ultra-conservative. That is a quick experience we have to make. We have to find out what the company means by innovative, new solutions. And there can be miles in difference in the extremity."* Like another designer he pointed out that a good way to calibrate and understand the degree of newness the company wanted was to have magazines and ask the company in relation to concrete examples. "*You can very quickly ensure yourself against misunderstanding if you have market specific magazines, competitive products and ask: What is an innovative solution for you, is it this, is it that… Make it concrete."* Having concrete examples and discussion around these examples seem to be a good way to avoid misunderstanding. This insight and understanding is similar to what was proposed in chapter 4 in connection with the vision-based model. The students in the innovation course got a shared understanding by referring to concrete examples.

Another aspect that is important for a good collaboration is that there is a shared understanding of innovation focus, that the designer and the different members put their effort on an agreed area of focus. One designer said for instance that it is important that the company pointed out an area of change. *"That the company points out what areas they do not want changes, and point out areas where there lies great flexibility and where they can think that you go through a very thorough round… It is very important to point out limitations and where there is open room."* He also pointed out that one cannot be innovative on all aspects of the product and have to make some selective choices. Another designer remarked that one of the main contributions of the designer is sometimes to help the company to define and clarify where the main focus should be. A third designer said it is important to know on what areas you can provoke and what areas you should not provoke, that the designer understands where the company is flexible.

In the interviews several respondents reported about misunderstanding in area of focus and expectations. So in the staging for creative collaboration it is crucial to have a shared understanding of focus. One designer told that this shared understanding was very crucial: *"I believe the greatest conflict lies in that one is not clever enough to define at the start of the commission / project what the expectations are."* A PD-employee told that it is easier to tackle misunderstanding

of focus if the chemistry and atmosphere is good. He also told that usually there would be less misunderstanding if the chemistry was good, since the flow of information then often was better.

6.3.11 Conceptual work, daily activity and mental fixation

Several respondents said that they had, as employees in the company, a quite stressful everyday life and did not have time for big thoughts and visions. One designer expressed this problem in this way: *"There is often not room for superior thoughts in the daily activities with the daily routines, they reside much more down in the specific problem areas."* He also expressed that the company easily would like to lock the designer in the same everyday life: *"A problem with an internal department for product development is that you get very locked in the everyday life you are working in. Thus you may also have a tendency to want to lock the external person in that everyday life."* In the case of running conceptual projects it is important at the start of such projects that the participants from the company have the ability to change roles and enter into a conceptual thinking mode and not become too fixated by the everyday life. The changing and arrangement of interior, reviewed in chapter 5, might help the participants to make this mental change. Creating conceptual workshops and events might also help the participants in this manner. This is discussed more in the following subchapter.

The problem of mental fixation as an inhibitor for creativity was described in section 2.1.7. Some designers described that the companies are quickly fixated to some specific solutions. That is one of the reasons why some of the designers may be sceptical to work too closely conceptually with the company. One designer said: "*It is hard to work conceptually with the customer because the customer is so fixated on solutions."* He said that it is important to choose the right people from the company to make such collaboration successful. Some designers also told that the companies were loaded with experiences and had locked mind-sets about what worked and what did not work. This is how one designer described it: *"Everybody that is coming here is loaded with experiences and with "it did not work", "we have tried that" and "our competitor does that" and all such things."* He said it is important that the company could reset their minds, and that *"the less mentally reset you are the more stout opinions you have."* It was important that the employees in the company had an open mind and attitude.

Several of the respondents in the company were very aware of this problem. One of the reasons the companies were using external designers instead of just internal designers was to get fresh input or 'fresh blood'. One PD-employee expressed it this way: *"What we use external designers for is partly to get external corrections on what we are doing. So we are not interested that a designer should be too much*

a part of the company. Then we could have employed him permanently." He continued by saying that the company easily can get "houseblind": *"After being in the company for a while you get "houseblind", indoctrinated. We are very happy that designers come in and ask challenging and fundamental questions concerning strategy, policy etc."* A designer gave the same type of reasoning for companies using external designers: *"The strength of establishing connection with external people may often be that you may check existing understanding or norms for problems by getting in fresh blood."* One PD-employee described the designers as sharpening for the company: *"We expect the designer as a real challenging partner. Not just the product, not just the line and the aesthetics but the meaning of the product, what is it strength, what makes it special?"*

In the product development process the designers may thus challenge and help to break loose fixed beliefs, attitudes and values and come with new perspective and ideas which is central in the development of new products. Many respondents remarked at the same time that the designers should also have an ability to relate to the existing philosophy, product family and production processes. Besides the use of designers, other people could be useful in the development of new concepts and products, such as user groups who would actually be using the products in real life. In subchapter 6.4 it is suggested that users should be brought in on events and happenings, as potential external resources, like the designers function.

One PD-employee was occupied with the idea that the whole organisation should learn to think conceptually, and that it is not just the responsibility and task of the designer and product development department. He said: *"That we as an organisation manage to develop ourselves to think conceptually and that it does not just become a product development department or designers thing but that it is the way we work, the way we sell, that is definitely a problem today ."* He told that the idea of working conceptually should be supported and brought forth by the top management in the company, which was in charge of the overall strategy. The idea that the whole organisation should think more conceptually would require a lot of work, training and learning and should be rooted in the strategy of the top management in the company. In relation to the vision-based model proposed in chapter 4 this would mean that organisation as a whole had the ability to think and work more on the spiritual, contextual and principal levels than nowadays.

6.3.12 The vision-based model as a tool

In chapter 4 it was shown in two courses how the vision-based model was a useful tool for discussion in design teams and for calibrating the level of abstraction in relation to product concepts. The material from the interviews, which is presented in this subchapter, indicates a problem with different conceptual levels among

participants in design teams in companies. It is therefore argued that the vision-based model may potentially be a useful calibration and discussion tool for design teams in companies. The model could help, as a shared framework, to make clear what the focus of the product development process should be and what level of abstraction the team should work on. It is likely that many of the effects of the model reported in chapter 4 from the innovation courses could also be found and observed for a design team in a company. Nevertheless, several factors were reported to influence the lack of calibration of abstraction level in design teams, such as fixed roles, viewpoint, atmosphere and ownership. Some of these factors might be more important in a company than in a course. The model needs therefore to be tried out in company cases. The model has only been shown to one of the top managers in a company and this manager pointed to the top two levels in the model and said: *"These two levels, these are areas we need to work a lot more with in the future. We are not clever enough there"*. Nevertheless, the model has not been tried out in specific company cases, which would be a natural step in further research.

6.3.13 Conclusion

In this subchapter the problem of different conceptual levels or levels of abstraction in design teams and internally in the company in relation to perceiving a product is presented and discussed, based on the insights and viewpoint gathered in the qualitative interviews. The conceptual skills of the participants are discussed in relation to the roles, viewpoint, perspective, atmosphere and preference. It seems that at least part of the difference in conceptual skills is due to different viewpoints and expected roles. The difference in conceptual level may also be reinforced due to negative atmosphere and mood between the participants. It is viewed as important that the different participants in a team consciously change their role from daily practice when entering into a team. Nowadays the companies are not clever enough in mentally preparing team members. It is important that there is a shared expectation and understanding of innovation level and focus in the team. The team participants should try to be at the same level of abstraction and expectation in a project. In this regard the vision-based model proposed in chapter 4 seem clearly to be a useful tool, since it shows different levels of abstraction in relation to a product. Nevertheless, the model should be tried out in concrete cases since some of the conditions are different in a course.

The employees in the company, which includes the internal development department, get quickly fixated and locked due to their daily practice. There is often little room for big thoughts and ideas. External designers often function as fresh input and sharpening for the companies both on strategic issues and on the development of new concepts. They help in the process of breaking mental

fixation. It is viewed as important, especially in the start of conceptual projects, that participants from the company have the ability to change their roles. They should enter into a conceptual thinking mode and thus consciously change their role from daily practice. Creating conceptual workshops and events and arrange the interior for such events might help in such a mental shift. This is discussed more in the following subchapter.

6.4 Staging happenings and events

In this subchapter the concept of having happenings and events in the design process is proposed and discussed as a tool for improving creative collaboration in design teams. Two types of happenings and events are suggested. The first type is related to milestones in the company, when one is ending a phase and moving into a new phase. The second type of event that is suggested is conceptual workshops where external consultants, customers and employees from other companies are invited to participate.

6.4.1 Happenings and milestones

Several of the respondents said that it was important to have happenings around the milestones in the project, that one celebrates the ending of a phase in a project. This would help to create a stronger team feeling, be motivating and also help the team to move on to the next phase in the project. One P-employees said in this regard: "*You lift yourself to another level when you take the next step.*" He felt the company was not clever enough to mark the start of new phases and especially in the handing of the project over to production. He would have liked to have more enthusiasm, shared experience and engagement around such activities than in existing practice:

"*Not just that you sign phase 1 and phase 2. But that you create an experience, you create an expectation. That we brag a bit about ourselves for what we have done so far and create an expectation for the next phase. We are not clever enough there, we are dead, the everyday life is just flowing…*"

In the staging of the project several respondents said it was important for motivation and fruitful collaboration that there were clear milestones in the project. The material gathered in the interviews seems to indicate that the companies were generally little conscious and could be cleverer in staging happenings around internal milestones. Some of the companies seemed to be more conscious about the celebration around the launching of new products, but put apparently little emphasis on the internal milestones.

6.4.2 Degree of external involvement

A question that came up during the interview with several respondents was the degree of external involvement around initiation of projects, happenings and presentations. Several respondents, especially P-employees, would have liked to have more people involved around the milestones and different phases in the project. Internal employees in the company became apparently more negative and sceptical when they heard about the project indirectly. In one company the boss of the P-employees participating in the design team usually barely knew what the development project were actually about. He could then not give support and back up the P-employees, because he did not know what the projects were about.

Some PD-employees, who were not negative to the idea of events and happenings in itself, were more sceptical with the idea of involving too many people in the presentations. One PD-employee had negative experience with involving sales too early, because they would easily sell the product before it was ready. He remarked: *"If a customer asks about a product you know is coming it is hard to keep your mouth shut. We have experienced many times that the product is sold."* In such a situation he experienced that there was an increasingly pressure on the design team, the mood changed, the team had to make too quick decisions just to make the product ready, and satisfaction was easily taken away.

In subchapter 6.3 the problem of different conceptual level was presented and discussed. Respondents told about employees who had not been part of the process that came with critics and comments that did not fit to the phase the project had reached. A PD-employee told about negative experiences in presenting concepts too early for too many people, because the product would easily meet early resistance: *"We have many bad experiences with such early presentations or early involvement on a broad level… The product meets early resistance. You can easily create a predisposed attitude, a negative attitude to the product, and that is not good, because it can be more difficult to give birth in a good way. The product can get killed because you use the wrong cover or colour on the model you showed. "*

Another PD-employee told that presenting for large forum of sales managers was dangerous because the first one that said something easily set the stage for the whole feedback. If the first person who commented about something was very positive or negative the general feedback from all of them would often be on the same line. He felt it had to do with group psychology. What they started to do was to ask the different sales managers afterwards personally and then the impression could be different. Thus, in general it might be crucial to stage the presentation in such a way that the different individuals are allowed to find their own opinions. It

seems to be hard to conclude at what stage in the project concepts should be presented to a wider range of people in the company. It will generally depend upon the degree of innovation, if it is a low or high-risk innovative product.

6.4.3 Staging happenings around milestones

Quite regular happenings and presentations around milestones may help to keep a good progress in the project. This is the experience gathered through the innovation course, see chapter 8. Rather than just having milestones with the deliverance of reports, the use of happenings and events may help to create a shared experience and positive expectation, as proposed in section 6.4.1.

It seems crucial to ask how happenings and events should be made and who should be invited for such events. In the early conceptual phases of a project it seems important that the ones who participate in happenings and presentations have the training and ability to make abstractions and 'see beyond' the physical embodiment of the concept. In such a way one may avoid that the concept gets 'killed' based on wrong evaluation at this stage of the process, as described above. Nevertheless, it may sometimes be hard to define precisely what the level of abstraction the concept has reached. Different people even within the team may have different understanding of the level of abstraction. It is also important with criticism to strengthen a concept. Still, it seems important to educate and make the people participating in the happening aware of the level of abstraction the concept has reached. It may also be of help that these people do not only evaluate the concepts and product proposals, but that they also are invited to contribute with ideas for improvement. As described by one respondent in section 6.3.11 it may be important that the whole organisation learns to think more conceptually and that working conceptually becomes part of the whole company culture.

Later on it will be important to bring in users and customers to try out the concepts and come with suggestions for improvement. This could be done in staged events and workshops described in the following section. It is not the scope of this thesis to outline specifically when such involvement should be made in the design process, but it is important to emphasise that the intentions of the design team should have correlation with the real user and customer needs. The team can easily become blind to their concept and not see major deficiencies. Just like the designers, external users and customers may function as external resources that can give useful and important insights and corrections to the projects during the design process [Binder et al. 1998; Brandt and Grunnet 2000].

In happenings and events it is suggested that one may use and stage scenario play as a way to describe the context and specific user experience related to the

product. Brandt and Grunnet [2000] have reported of two cases where they have used drama to involve users. This may be especially useful in projects where there is a strong user and societal focus. Scenario play as a tool for team collaboration is reviewed in chapter 7. Scenario play may help to create a positive expectation, bring in more fun and a playful attitude so that one manages to create a real event and happening. Furthermore, it may function as a conceptual tool in the design process. The framework needed for using scenario play in the design process is discussed thoroughly in chapter 7.

6.4.4 Conceptual workshops and events

As it was discussed in subchapter 6.3 there are problems of mental fixation by the internal employees due to daily practice and routines. There is also a lack of time for big thoughts and visions due to a stressful everyday life. It is therefore suggested that companies could arrange intensive conceptual workshops and events that are connected to specific projects, but are not related to specific milestones. These events would be of another character than the ones mentioned above. In such workshops external designers and customers could be invited as external resources. Additionally the company could make agreements to share employees with other companies that were not in direct competition. Some product developers from other companies could for instance participate in the workshop. In return the other companies could use some of the employees from the company for their own workshops. Such exchange would help so that the company would have participants in the workshop that had a different perspective to the problems. Such events could occur in places separated from the company or one could arrange the interior for the event, creating for instance a flexible project space, as proposed in chapter 5.

Such an intense workshop, lasting for a few days, could function as fresh input for new ideas, where there is also room for visionary thinking. One could also use such workshops to solve specific, detailed problems in ongoing projects. Teams who are struggling in development projects could get new input through such workshops. It could also function as a positive change from daily practice. Since such workshops are full time activity the participants may more easily put daily practice and routines completely aside for a while and enter into a conceptual mode of thinking for the time being. In a company it will require some organisational work so that some employees are able to take free from daily practice for a whole day or two. It may also require a change in attitude in the organisation towards the acknowledgement and appreciation of such workshops. Finally it seems important for such workshops to have good facilitators. In such workshops one should use extensively different types of play and imaginative exercises such as scenario play, story telling and mental visualisation exercises

that will be reviewed in chapter 7. Such exercises and scenario plays should be integrated into the overall problem solving and design methodology. This integration will be reviewed more thoroughly in chapter 8.

Such events and workshops have some similarity to what the enterprise Danfoss has been practising [Binder et al. 1998]. They argue for a shift from task orientation to more event orientation in collaborative design. In such events and workshops at Danfoss people with different interests, competencies and professional language are gathered and the users are participating as a resource. The evaluation and design happen simultaneously within the meetings, instead of using a review of predefined ideas.

It is not proposed in this thesis that such workshops should replace daily practice of design teams, but that it could function as positive and inspiring change from daily practice. As it is proposed in this chapter it is a concept, and it needs to be tried out in practice with existing companies. The comparable experience made so far is the running of intensive workshops with students in class, both in the innovation course and in other courses at other design schools. Such workshops seem to be quite effective and rapidly give new concepts and solutions. The general feedback from the students concerning such workshops was also positive. It was very concentrated and the students could focus and put effort just on the task at hand. Within a few days they could do the work that normally took several weeks. Such workshops will be described more thoroughly in chapter 8 when a vision-oriented concept development methodology is proposed.

6.4.5 Information technology and meetings / events

In later years there has been a rapid development in the possibilities that lie in information technology in relation to having meetings geographically dispersed over the net, using for instance video and multimedia as support. Besides lowering the cost and time for travelling there seems to be some practical benefit with virtual meetings [Hildre et al. 2000]:

- External experts can participate in the development process
- Be able to design, construct when being physically allocated
- Sub suppliers and collaborative companies may participate actively

It is not the scope of this thesis to have a long discussion and argumentation concerning the advantages and disadvantages of virtual meetings versus physical meetings. This is in itself a major new research area [Hildre et al. 2000]. In the introduction chapter the viewpoint and assumption was made that people will still

need to meet physically in the future. Nevertheless, it seems useful to have a short discussion of the introduction of new information technology and how this will influence physical meetings. If some meetings are virtual and done over the web, due to distance and saving of time and cost, this will also influence the content of the physical meetings.

It is proposed that the use of information technology and virtual meetings will make the idea of physical happenings and events even more actual. When a design team is having physical meetings it will be important to use some of the possibilities connected to physical, face-to face meetings. It is then the view that the way the meetings are staged will become increasingly valued. The use of play, storytelling and visualisation exercises reviewed in the next chapter 7, which help to create more rapidly a shared team spirit, trust and atmosphere, might then become even more important. Olson and Olson [2000] report that critical stages of team work as establishing mutual trust appear to require some level of face-to-face interaction, and emphasise that distance matters. Intensive conceptual workshops and interactive events may give an important basis of trust and shared understanding when the team later is working geographically dispersed.

With the concepts of staging events and happenings it is suggested that general information exchange and preparation may be done with the use of virtual meetings. Shorter, day- to-day meetings may also be held over the net, for instance through videoconference. It is then suggested that interactive work, which is connected to the team process, should be done in physical meetings and workshops. One may then also use information technology as a support in parts of such meetings. For some type of interaction it might be fruitful to take away some of the bodily language and make the participants anonymous to loosen up role fixation in the team. CSCW technology might then be useful and of help.

In this regard, according to Hildre et al [2000] virtual meetings in product development, with the use headsets and multimedia PC, tend to be more democratic compared to physical, face-to-face meetings. Additionally they suggest that there will be less individual ownership for the concepts, and might therefore give room for shared ownership. It is important to emphasise that the face-to-face meetings they are then referring to are traditional meetings without any conscious mental staging or physical arrangement of the meeting and without the use of facilitator. Just as the use of net meeting technology is setting the frame for the meeting the use of a facilitator and the conscious physical and mental staging of the meeting will influence the meeting. A good facilitator who knows how to stage workshops can make the process more democratic than what is normally the case in traditional meetings.

It is the view and position taken in this thesis that there will be an increasingly differentiation between virtual and physical meetings in the future. Rather than saying either-or it is suggested that companies will use both types of meetings in the future. Both virtual and physical meetings will be used in a more differentiated way for their specific strength and advantages. As the CSCW technology becomes increasingly good a design team may increasingly alternate between physical face-to-face meetings and virtual meetings.

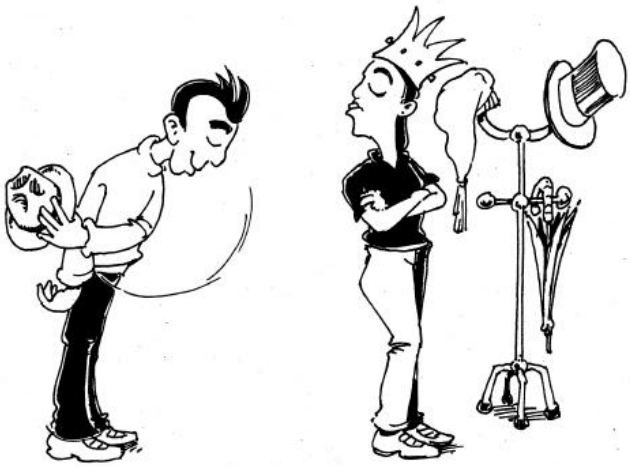
6.4.6 Conclusion

In this subchapter the concept of having happenings and events in the design process is proposed and discussed. Two types of happenings / events are proposed. The first type is related to milestones in the company, when one is ending a phase and moving into a new phase. The second type of event that is proposed is conceptual workshops where external designers and customers are invited to participate. A few respondents argued that happenings / events around milestones are motivating, help to create a strong team feeling and help to move into the next phase of the project. Other respondents, who are not negative to the use of events in itself, are afraid to involve too many external people in presentations due to the risk of selling the product too early and due to too much critical feedback early in the project. It is important to be aware of who is invited to such events and one should be conscious of how such events are arranged and staged. In the early phases of conceptual projects it may be fruitful that the people who participate in such events and happenings have the training and ability to make abstractions and 'see beyond' the physical embodiment of the concept or idea.

It was also suggested that one could have a second type of events, connected to conceptual workshops, since there is often a problem in daily practice and routines to have time for visions, larger thoughts and conceptual thinking. Such workshops and events could be connected to specific projects, but would not be related to specific milestones. In such workshops external designers and customers could be invited as external resources and such workshops should have good process facilitators. In such workshops one should use different types of play and imaginative exercises such as scenario play, story telling and mental visualisation exercises, reviewed more thoroughly in chapter 7. Finally a short discussion is made on the use of information technology and CSCW technology. It is proposed that the increasingly use of CSCW tools will make the idea of events and happenings even more actual in the design process. Face-to-face meetings seem to be important in the process of building trust in the teams. Intensive conceptual workshops and interactive events may give an important basis of trust and shared understanding when the team later is working geographically dispersed.

Chapter 7

Scenario play & mental visualisation



It takes a long time
to become young

- Pablo Picasso

URN:NBN:no-2324

This chapter is concerned with developing tools as a support for the creative collaboration in design teams. The research question that is most central here in this chapter is: How may the company set the stage, both mentally and physically, to improve creative collaboration in design teams in relation to existing practice? In subchapter 2.2 literature was reviewed that emphasised the importance of play and imagination for creative thinking and collaboration. The question is then: How may one use scenario play and imagination to stimulate creative collaboration in design teams? This chapter propose the concepts of using scenario plays and mental visualisation exercises as tools for creative collaboration in design teams. It also proposes a general creative technique, called the imaginative bridging technique, which uses imaginative contexts as tools to create new understanding and new ideas in the design process.

In subchapter 7.1 the attitude and practice towards play and visualisation in companies today is investigated based on in-depth interviews. Subchapter 7.2 proposes the imaginative bridging technique and describes the use of scenario play and mental visualisation exercises in a new innovation course, which put strong emphasis on the interaction experience with products as a focus in the development of concepts. Procedures and critical factors in the use of these exercises are outlined. In subchapter 7.3 and 7.4 the effects of scenario play and mental visualisation exercises in the course are described based on the feedback from the students, observations made in class and video recordings. In subchapter 7.6 mental visualisation exercises are tried out on a specific case and in subchapter 7.7 mental visualisation and scenario play are tried in another industrial case. In subchapter 7.8 the use of scenario play and mental visualisation exercises are finally discussed in relation to use in company projects.

7.1 Play in companies – attitude and practice

In this subchapter 7.1 the focus is on the attitude and practice in relation to play in companies, based on the material collected from the in-depth interviews. The use of play, stories, jokes and different mental tricks and tools as part of team collaboration in meetings is investigated and presented. Such activities are usually not formalised or organised, but more informal and dependent upon the specific people participating in the project and meeting. This subchapter also describes the attitude respondents have towards play and the use of play in the design process.

7.1.1 Stories, jokes and humour

In relation to the staging for collaboration some of the respondents very consciously use jokes and stories to create a good atmosphere. As it has been

mentioned earlier, the atmosphere and mood seem to be crucial for a creative collaboration. Jokes and stories may help in such a way. A designer said: "*Basically, we are sensitive people. We desire to create a good chemistry with our employer so we can have fun, we laugh a lot, we often come with gags to the meetings, and in the projects we create a loose atmosphere so that everyone is on an equal footing.*"

A PD-employee said that they often start and end project meetings with jokes and stories. There is a natural transfer from an initial start to the concrete meeting: "*There are such disconnected matters in the initial phase that slowly solidify to become a concrete meeting*". Another PD-employee pointed out the importance to take time for a little talk around the table to loosen up the atmosphere: *"It is very important to take time for a little talk and personal thoughts around the table. Maybe ask questions that are on the sideline of what one is talking about, tell a good story or loosen up the atmosphere before one begins. Be a little sensitive to whom one is talking to."* The act of telling stories, jokes, being a bit personal is not something that is consciously planned in the companies. It seems to be done by habit and due to an unarticulated need to create an informal and relaxed atmosphere.

7.1.2 Tricks and techniques

In the desire to create a right atmosphere or to improve collaboration some designers would use "tricks" and techniques to change the mind-set of the participants in the meeting and put them in a less critical mood. In two design studios they mentioned that the designers would play different roles in the meeting with the company. One would take the "company role" and be critical, playing the devil's lawyer, while the other would take the role of the designer: *"We have a little bit of role-play, depending on the project and the day's plan, that one is playing the provocateur and comes with objections all the time without it being organised. It has to do with our way of working. We try to take this play out to the companies and sometimes we do it very consciously. By having one as the opponent one creates a discussion. And sometimes it works very well."* Such role-play might help to get the discussion going. When one of the designers is more critical one could say that he takes the "company side" and this might help to make the employees from the company more benevolent and positive, since they feel they are understood.

With the aim to influence the attitude and mood of the participants in a meeting and make them more positive, open and playful one designer said that he would use tricks like saying: *"Nobody enters here without good humour!"*. Or he would tell a man from the production department when presenting a concept: *"This*

concept Jacob, you are too old to understand!". He would say it with a smile on his face and in a playful tone. He would also bring funny and childish objects to the meeting, so they then would start to talk in a playful and jocular tone. He felt it important that the employers were in a positive state of mind when they were going to evaluate and collaborate on concepts. He also experienced that he could say more without offending through the use of humour: *"You can signalise where you want to go without stepping on others."* It was also a way to force through change: *"We use humour and cold flippancy against those who are not motivated for new things."* He pointed out that it was a fine balance and that sometimes his tricks and surprises did not function as intended. Once he served candy for children to the participants of a meeting, and they did not see the humour, they almost got offended. He also told that there was a big difference between women and men, that women apparently were more pragmatic and less playful.

When relating to the theory of Bateson discussed in section 2.2.2 one can see here that the above mentioned designer is trying to change the frame or context for communication through the staging for play and use of tricks. He is trying to change or influence the context and frame for the meeting by trying to set the participants in a more playful and open mood. Depending on the situation and the participants in the meeting this attempt will be more or less successful. The other participants may for instance not see the humour in the use of candy for children. They may misinterpret the intention behind such a suggestion or just not accept the proposal. In section 2.4.2 it was described how group norms are essential in the formation of a team. The norms act as frames of reference through which the world is interpreted. Some proposals or jokes may or may not fit into the accepted norms. The intentions for the play may be misunderstood. Telling jokes and stories may also be described as socio-emotional activities, as described in section 2.4.3.

One designer told that he used mental visualisation prior to a meeting, where he was imagining how the meeting would start and tried to think up the first sentence he wanted to say. He said: *"When I am going to a meeting and I am about to present a new thing then I sit in the car on the way to the meeting. If it is supposed to be outside the design studio, then I sit, visualise and think about one thing and that is the first sentence that I will say. It is incredibly important because you have so many thoughts in your head and with the right sentence the rest comes more easily by itself."* He described that preparation and setting the stage with the first sentence was important for himself so he got in the right track for the meeting.

7.1.3 Inviting for play

Several designers told in their interviews that they sometimes tried to stage plays where they gave the customers new identity or new hats to help to break mental

fixation and give new perspectives. One designer expressed it this way: *"We have tried to awake visions in the customers some times by asking how would Porsche make your product or how would Ikea make it. Try to turn things upside down and say that now we do not think of bicycles… Forget about yourselves, and imagine if Timex or Swatch should make your product, how would they think? Try to give new identity, new hats."* This designer told that sometimes the invitation for such play worked while other times it did not work so well. The designer is here attempting to bring the participants into a different scenario, where they view the product and problem from another context, identity and framework. This way of mental framing has some similarity to the imaginative bridging technique that will be described in section 7.2.4, where one consciously enters into an imaginative context to view the problem from a new angle and perspective.

7.1.4 Awakening enthusiasm through storytelling

When the designers are presenting the concepts it is important that they manage to awake the interest of the company. It is important that the concepts are related to the needs of the company. Additionally, according to some of the interviews, it seems to be important that the designers can tell a story and can give the right associations. One designer told about another designer in England who won a competition in the design of a train. He had no previous experience in designing trains but said that he would build a train that would make *"all children want to become an engine driver again"*. It appears to be of importance that the designers have an ability to tell stories and awake enthusiasm. They would tell stories and awake images not only through their words, but also through playing roles, through playing the user of the product, through their body language and by awakening the fantasy of the employers in the company. Nevertheless, both the designers and the people from the company warn of the danger of overselling the concepts, like one PD-employee remarked: *"There are many that overplay in their desire to talk warmly about the product."*

Equally, when the company is presenting a brief for the designers it is motivating that they have a vision and a story to tell around the design brief. One PD-employee said: *"We imagine the product and start to tell the story around it, how fantastic the product is, how it differentiates from other products, the unique aspects about the product. When you start to play around this and elevate it a bit then you see that it can really create enthusiasm."* At the same time several respondents remarked that there must be a link between the vision and the 'hard core' reality. These viewpoints resembles clearly the one that was presented in connection with the model for design as a creative activity in dialectic tension, in chapter 4. It was then stated that design activity lies in the tension between a vision with its possibilities and a reality with its limitations.

7.1.5 Having order and structure

Several of the respondents mentioned the importance of having structure and order in the meeting, and that one has in mind what one desires to get out of the meeting before starting. One designer said that they plan carefully the order of the meeting: "*When we have a meeting then we think very precisely about in which order we should do the activities and how we should present our ideas and concepts.*" Another designer said that it is important to be orderly to create trust and confidence. One respondent viewed it as fruitful to have a short brief of the last meeting. This is especially important when new people are introduced to the project.

Some respondents said that they like to have an open meeting with not too much structure. They view it as important to give room for spontaneity and improvisation. The degree of structure and order will in general depend upon the type of meeting desired and which phase the project has reached.

7.1.6 The attitude towards play and fun

As it was described in section 2.2.1 there has been a norm and attitude among adults in society where play and fun has often been seen as the contrast to "hard work". This appears also to be an attitude among some (but far from all) of the respondents in the companies. One PD-employee remarked in the interview, when asked about using play in relation to product development: "*This is not play. This is really serious and time costs money.*" He also said: "*That the product development division in our company should be a play division is not interesting.*"

The same PD-employee, who also said it could be interesting to try some play exercises if it could be of help, told that the scepticism towards play exercises also had to do with the image of the division: "*It is clear we do not want to be looked upon as a group of clowns… It is not good for the image of our division. There are so many normal things that we also must comply with. We can not be completely far out.*"

Several PD-employees said that the Product Development department had already an internal image of not being enough structured, of using too much time on each project and not being enough effective. These statements were partly supported by the remarks given by some P-employees. So the idea of introducing play in the product development process, which they easily associate at first hand just as an "unstructured, time consuming activity" may naturally evoke some scepticism.

The above mentioned PD-employee told later in the interview that they sometimes had unplanned sessions where they imagined strange scenarios like having the product floating in the room as a help to develop new ideas and concepts. But he did not call it play exercises, and he seemed to be almost embarrassed to tell about it, describing it as "stupid":

"*We think a bit and have such fantasies… would it be possible to do it like that or like that… We talk and start in a flippant tone… When we talk about a product then we say that we should just have a product that is floating in the room. We shall not have any ground contact with the product; it should float in the room by itself. It sounds completely stupid. You have ideas about things at the start that you in reality do not believe in. But ideas that lie here and spin further and then one person hears about it and he tells it to someone else and then suddenly… I do not say we are for such products that float in the room, but try to think a bit that way…*"

Another PD-employee who seemed generally positive about using more play and play exercises in the development process said that it was important that one had support from the top management, and the optimal situation would be if it was initiated from the top management. It was hard to start such activities if the division did not have support in the organisation.

Czitzentimihalyi [1996] has described the creative state of flow, referred to section 2.1.8 when people are totally concentrated, where there is a deep sense of enjoyment in the work. When people are in a creative state they are in a state of concentration similar to the one found in play. According to Gordon [1961] Synectic theory implies that not all play is creative, but that all creativity contains play (The word Synectic, from Greek, means the joining together of different and apparently irrelevant elements.). As mentioned above, the problem is that the word "play" in our society seems sometimes to give negative associations, even if it is in reality such activities one is sometimes doing to a larger or lesser degree. This was described in section 2.2.1. Sutton-Smith [1997] tells for instance that people will often call different play activities with other names, such as entertainment, recreations, pastimes and hobbies, as it would be *"an embarrassment to admit that they can also be called play"* [p. 4]. Nevertheless, there might be a general change in attitude nowadays towards play and the space for play at the work space [Jensen 1999].

7.1.7 Focused and staged play

The concern among several of the respondent was that more play could be motivating but that it was ineffective and time consuming. The question is then

how play may be effective, how one may use different play exercises to improve the project and make the project more effective. One of the PD-employees said: "*Right away when you start to play it is not productive. There must be some system around it, the play must in a way be directed."* With such a perspective to play it is argued that the play should be staged and have some purpose and direction. There should be time limitations for the duration of a play session and one should have an intention behind having such sessions with play. Furthermore, as one designer said, play exercise or seminars with play should have some linkage to the task at hand. If this is not the case then such seminars will easily be forgotten and just be like amusing activity around "a dinner or celebration organised by firms just before Christmas". He said:

"*Companies that are maybe very engineering oriented, that are just occupied with the specific problem at hand, loose hinges or what ever it is… Such seminars very quickly become like a dinner or celebration organised by firms just before Christmas. It is fun and then it is home again and one does not remember what the funny things were one did at the seminar or workshop…Therefore it is important that such exercises or seminars are connected to concrete objects or the everyday problems that the company is facing."*

On the basis of this quotation one could argue that useful play sessions should have a connection to the problems at hand. With such a perspective one should not approach areas like group chemistry and atmosphere separated from the problems that the company is facing. Exercises that are intended for improving the group climate and atmosphere should also be linked to the specific projects, if possible. Some of the respondents told in the interview that they were tired of "motivation seminars" or seminars where psychologists came and as one respondent said *"tell people to touch each other, play together and afterwards talk about it"*. There seems to be a greater motivation for having exercises when there is a clear linkage to the task at hand. Some respondents view 'motivation seminars' just as a waste of time in everyday life where they often feel pressure and a lack of time.

When some of the respondents were introduced at the end of the interview to the idea of using more scenario play as a tool in product development several of them seemed open to such an idea. One P-employee said that such activities like playing and exaggerating the use of a product could maybe function as a relief and a vitamin injection: *"I see that it is specially challenging when you sit and measure on paper and when you shall transfer this over to a prototype and make it work, that is when the heavy periods are. And then I have a great belief in such activities [like scenario play], that you come with "medicine" and create new enthusiasm. Not with exhausting people, we need a refill of vitamins to make this work."* He continued by saying: *"You could have a theme evening with theatre relating to the new product with crazy ideas and some amusement, some challenges. I think that*

could be an idea for such a project… You could make fun of the new product and give it some deserved bragging in relation to the level in development it has reached. Maybe that could be a real vitamin injection for those who work on it. "

This view connected to play is not the only one expressed in the interviews. Several of the respondents were open to the idea of using scenario play as a tool in product development if it could help the development process.

7.1.8 The need for facilitators

When discussing the staging of play for collaboration three of the respondents said that they needed external help to improve this staging. The company should have facilitators in the arrangement of space, the staging of meeting and for leading exercises that could help both in the team building and in the solving of problems. One P-employee told that they did not have people with such capacity nowadays, and that the project managers did not have the necessary competence. So the attitude among some the respondents is that they acknowledge the need for play, but say at the same time that the use of scenario play exercises must be done in a professional way and that they need external help in the implementation.

7.2 Scenario play and imagination exercises in education

This subchapter 7.2 describes how scenario play and mental visualisation exercises were used in design education for the new Innovation course at the Department of Product Design Engineering, NTNU. The central question is: How can scenario play and mental visualisation exercises help to stimulate creative collaboration in design teams?

7.2.1 Background and course framework

Background for course

As part of the doctoral project a year was assigned for teaching. I developed, together with a colleague, Per Finne, a new Innovation course for the early phase of product development. The course has been taught and held twice at the Department of Product Design Engineering. Students from several different disciplines participated in these courses, such as mechanical engineering, architecture, industrial economy and product design. The students were arranged into project groups, where the different course specialisations were represented.

The course was elective and was intended for students in the 8th semester of study, prior to the last year with their final diploma. Facts concerning the course are listed in chapter 3. Most of the students who took the course had previously experiences with several development projects, so they were used to traditional methods and approaches to development projects. The students had previously no experience with the use of scenario play, story telling and mental visualisation as active, practical tools in development projects. Several of the students mentioned that they had not played theatre and told and written stories since they were children.

Course content

The vision-oriented methodology applied in the course will be proposed and discussed thoroughly in chapter 8. Shortly described, in the course there is generally a strong emphasis and focus on the interaction experience connected with the use of products as a guidance and overall framework in the design process. In the early phases of the project value missions and interaction visions were developed as qualitative tools for the development of concepts. As part of the approach or methodology in the course many exercises such as scenario play, storytelling and storywriting and mental visualisation exercises were actively used. During the course the students made several presentations from the early phase to the final phase. In these presentations the students used scenario plays. During the course many workshops were held where the students got training and had exercises in storytelling and storywriting, both music and theatre improvisation, mental visualisation and many different types of play exercises. As the main teacher for the workshops I functioned as the facilitator and organiser for most of the exercises and workshops.

Research methods

During the workshops and presentations I made active notes and comments. I tried continuously to improve the exercises through feedback from the students. After a session I would ask for an oral feedback from the students and at the end of the course the students wrote a personal essay about their general experience with the development and main content in the course. Additionally the students were asked to answer some questions concerning the course, for instance concerning the use of scenario play and mental visualisation exercises. I used photography and also video recording of the final presentations as documentation. The effects reported and observed using scenario play and mental visualisation exercises are presented in subchapter 7.3 and 7.4. Those results are based on 1) personal notes and oral feedback from the students during workshop and classes, 2) the observations made from video recordings of the final presentations and 3) the written feedback from students based on answers to questions and personal essays. Facts concerning research methods are presented in chapter 3.

7.2.2 Research limitation and focus

In this subchapter two types of exercises and tools used in the course are given special focus; the scenario plays and the mental visualisation exercises. Less focus and attention are given to other types of exercises. It is my clear experience as a teacher that the totality of exercises contributed to the course. This is also confirmed by the general feedback of the students. Nevertheless, the exercises that were most used during the whole course were mental visualisation exercises and scenario plays. Additionally storytelling and storywriting exercises were used quite a lot. One may view storytelling and storywriting as exercises that are somewhere in between the mental visualisation exercises and the scenario play exercises. The mental visualisation exercises are the most introvert while the scenario play exercises are the most extrovert and communicative. As described later in the chapter a specific session in a workshop would often start with a mental visualisation exercises, which then was followed by story writing, and then ended in scenario play. The stories that were written by the groups were then played out by the groups. Storytelling and storywriting also had effects on the design process, which is confirmed by the feedback from the students. The choice has nevertheless been made to focus mainly on the scenario play and mental visualisation exercises, because these exercises can be viewed as the two most extreme. Furthermore, these two types of exercises seemed to be the most powerful and proved to have the largest impact on the design process.

7.2.3 Process and problem oriented exercises

Based on the feedback and observations made in class both scenario play and mental visualisation exercises may roughly be divided into two major areas, based on intended effects. The one major area is described as process oriented exercises. These exercises help to create an informal atmosphere, break down formality, improve the team spirit, create a playful and relaxed atmosphere and generally put people into a collaborative and trustful mood. The reason for having such exercises is to change the setting, mood, attitude and atmosphere. The exercises also make the participants aware of what inhibits and stimulates creative collaboration. In the project they may help in an indirect way like creating a shared spirit and atmosphere, but they are not directly related to the specific work and problems in the project.

The second major group of exercises links to the concrete project. These exercises can help design teams directly or indirectly to get a better understanding of the problem area and help in the process of coming up with potential concepts and solutions. These exercises have their main focus towards the problem area, while

process oriented exercises have their main focus on helping the process and creating a collaborative atmosphere. Nevertheless, problem oriented exercises will usually also help in the team process, they will usually also have a process related effect. As will be described later, exercises that are both process and problem oriented will be favourable for the design process in teams.

In figure 7.1 a diagram is proposed that illustrates four modes in the design process in teams. The upper part of the diagram is related to imaginative and playful modes of design, while the lower part is related to the rational and structural modes of design. The left side is process oriented while the right side is problem oriented. In real life there will not be such a distinct separation as illustrated in the diagram, but the diagram helps nevertheless to give a general orientation. Exercises that are process oriented will fit into the upper left corner of the diagram. As it was described in the introduction in chapter 1 the main focus in this thesis is connected to the upper part of the diagram in figure 7.1. Rather than focusing on rational problem solving and project management the main focus lies on the staging for collaboration and the qualitative, imaginative and playful part of the design process in teams.

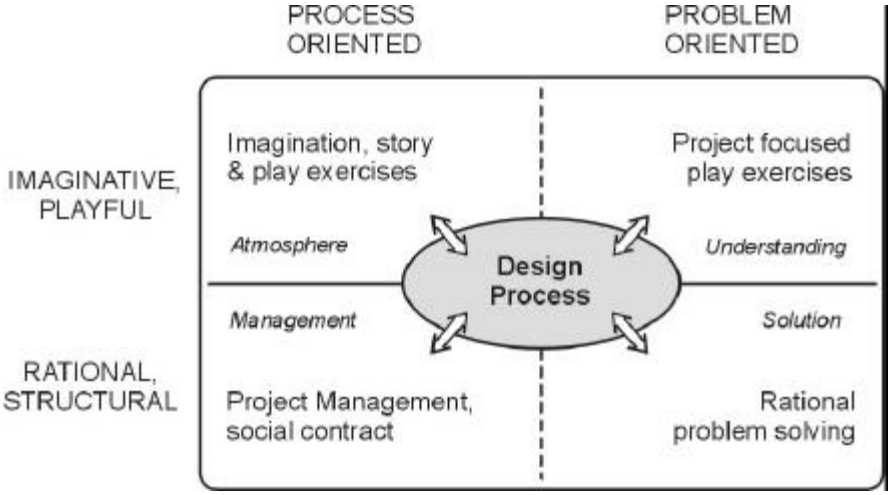


Figure 7.1. Proposed diagram for four modes in the design process in teams

7.2.4 Imaginative bridging technique

Overcome mental fixation

In problem solving and design activity a central ability is to perceive the problem from a new angle and perspective. This may be consciously done by changing the

whole context of the problem and by creating an imaginative context. This may be viewed as a way to overcome mental fixation, which is generally viewed as a problem in the development of new concepts, see section 2.1.7. The act of looking at the problem and need in a different context such as in another culture, time or relationship, can give many new perspectives, associations and insights into the problem area. This is the main idea behind the creative technique proposed and used in the course, which is called the "imaginative bridging" technique, where one imagines another context and perspective to the problem area. One could for instance look at the problem in an imaginative setting 50 years ahead in time, one could approach the problem through the eyes of a child or different company, or one could look and imagine how such problem would be solved in a different culture or by extraterrestrial beings on another planet. Generally, scenarios have often just been connected to possible future contexts. In this technique a future context is just one of many possible imaginative contexts that may help to break loose from fixation and get new insights and perspective into the problem area.

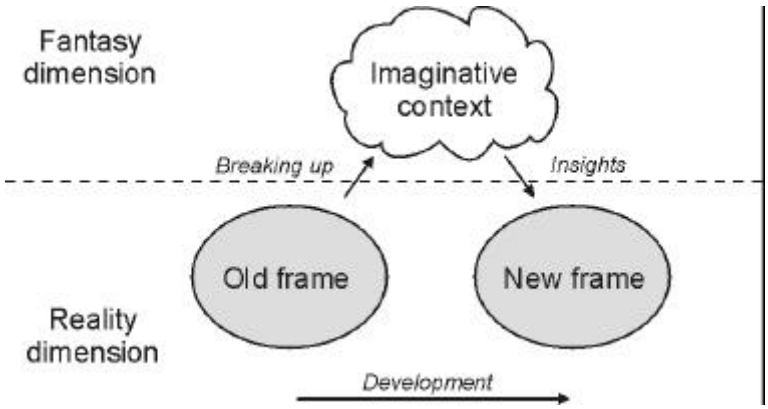


Figure 7.2. Illustration of the imaginative bridging technique

Imagining another context

In the 'Imaginative Bridging' technique one is thus forcefully imagining another context and whole scenario where one looks and perceives the problem from this point of view and perspective. Then later, one tries consciously to take along some of the insight and ideas that came into mind in the "imaginative world" and try to integrate them in the actual context. The technique resembles and is inspired by Synectic theory, where one tries to "make the familiar strange and make the strange familiar" with the active use of different analogies [Gordon 1961]. Gordon writes how a development team would for instance try to solve a problem in a context without gravitation forces. Synectic thinking is the process of discovering the links that unite seemingly disconnected elements. The imaginative bridging technique described in this section is viewed as more general and principal in its form and structure, since one is free to imagine any possible context that may be

useful in the solving of the problem. It is also operational, since one gives clear scenarios to use, see the table below. The technique has also some similarities with the question made by Alex Osborn [1953] as a help to solve problems. Questions asked by Osborn are like: Put to other uses? Adapt? Modify? Amplify? The main difference in these techniques is that one tries, for most of the exercises, to create entire imaginative scenarios and stories, looking at the full context and culture and not specifically at the problem or product.

Intentional play

The technique should be viewed as intentional play, where the participants pretend in a serious way being in an imaginative context. This pretending and focused work on imaginative worlds resembles the description of pretending and imaginative play in section 2.2.6. Such pretending and focus on imaginative worlds forms a free space, where one can forget and break loose from the existing mental blocks and mind fixations. It is a way to disrupt the thought patterns. When one disrupts these patterns, those ideas that create the greatest stimulus to our thinking do so because they force us to make new connections in order to comprehend the situation. This is what Roger Von Oech [1990] has called a "whack on the side of the brain" or what De Bono [1992] has called lateral thinking where one tries to 'shift sideways' when working on a problem to get different perceptions and points of entry. In the imaginative bridging technique one is initially not looking for solutions, but is looking for a different understanding of the context and user situation through imagining possible contexts.

List for possible *imaginative contexts* developed for students, as support in the concept development process:

Change of **company identity**. How would you as an employee in the company Alessi face the task?
Change in **roles / personality**. How would you, as extraterrestrial beings on another planet, use the product?
Change in **time** (Past or future scenarios). Imagine that you are in a Viking settlement. How would the need be fulfilled by these Vikings?
Change of **culture** (Geographical, social, cultural). How would the product be used by people in a village in Africa? How is the need satisfied there?
Change in **user abilities** (Handicapped or old people). How would you, as a person without arms, use the product?
Change in **perspective** (Being the product). What would you personally need if you imagine that you were yourself the product? How is such a problem solved in nature?
Change in **personal relation**. How would you, if you were a child, look at the problem?
Change in **use of senses** (blind or deaf people). How would you, as a blind person, use the product?
Change in **size**. How would you interact with the product if it was 5 meters large?

Change in **natural laws**. How would you use the product under double gravitation force? Or without gravitation force?
Change in **location**. (Under water, out in space) How would you experience this under water?
Change in **elements** available. How would you face the problem with just the use of aluminium?
Change in **user event**. How would the desired interaction with the product be if it was part of a religious ceremony?
Etc.

Introduced by mental visualisation exercise

With the aim to engage the students in working with an imaginative context and scenario I would introduce a mental visualisation exercise, where they "left" their own world, for instance with a space shuttle or balloon, and entered an imaginative, different context. This was done to be able to make the imaginative world real for the students. The balloon or space shuttle functioned as means for making a context transformation. The mental visualisation was supposed to help the student group as a whole to make a successful transfer from the present context to an imaginative context. My experience was that the students needed time and adjustment to really be able to envision themselves in another context. The mental visualisation exercises seemed to help in this manner. They also had a function of "setting the stage" and "initiating play". By participating in the mental visualisation exercise the students also more easily participated and were engaged in the "fantasy play" that followed. The students would for instance be asked to write or directly play scenarios in the imaginative context.

Storywriting technique

A storywriting technique, developed in the doctoral project, would be used in the course where the students wrote on each other's stories in a circle. In one specific workshop session two types of stories were written; system stories and personal stories. The session started with a visualisation exercise were the students approached the Earth with a space shuttle in the year 2040. In the first session the space shuttle stopped at a distance from the Earth. The students wrote system stories about this world viewed from a larger perspective, where they could "get" all information they needed of the Earth from the space shuttle. It was then not a personal story, but a larger system perspective they were describing. In the next story session they would then land with the space shuttle on the Earth and write a personal story where they were interacting directly in the Earth context of the year 2040. Afterwards they were supposed to play out these personal story scenarios with the use of theatre improvisation. Later they were challenged to integrate some of the ideas and insights from the scenarios in their projects.

In other sessions just personal stories would be written, such as when the students were imagining they were themselves the product. Both the system stories and the personal stories would be written in a circle of 4-5 students, where they exchange stories and continued on each other's stories. In such a way the students would get

new stimuli. They were "forced" to enter into new stories and change perspective. They would then often combine elements from the previous story into the new story, and in this process develop new ideas. Storywriting in circles was a tool to create several imaginative contexts within a short period of time.

Integrated in the project

Several of the students later actively integrated elements of the "imaginative bridging" technique in the projects. They came up with concepts and solutions by looking and imagining other contexts. They would for instance imagine and look back to their own childhood and observe what kind of strong experiences they had at that time, or they could imagine and look at other cultures and traditions. One student wrote: *"What we especially had benefit from during the need seeking and the process of looking after concept solutions was to go back to childhood and see what fascinated us then. Furthermore it was very useful to look at old traditions and products. To look at other cultures was also valuable. It was with these three methods that we came up with the three different concept proposals that were presented."* Another student wrote about the technique: *"This is a special way to get going and get many new ideas. To take things out of context sets you free so you can manage to generate more ideas and solutions."* A third student wrote: *"I think it is a good method when you want to envision yourself in different situations. It is an approach I would like to use later."* The technique is a good tool to develop new ideas and see the problem from another perspective. A crucial factor is that the students take the imaginative world seriously and work with it as if it was real. It is also important that the students learn to integrate the technique as a natural way of working in projects. When the students learn quickly to switch context it can be a powerful way to develop new ideas and solve problems at hand.

7.2.5 Description of scenario play exercises

The students used scenario play as part of the presentations during the course. The students had additionally many exercises in scenario play in workshops as part of the course. These exercises were on the one hand meant as a tool for the students to get accustomed with scenario play, so they were used to such play when they had scenario play as part of the presentations. Secondly, the exercises were meant to create a playful and collaborative atmosphere in the class. Thirdly, these exercises were supposed to help directly or indirectly the teams with their projects.

Scenario play exercises

The exercises were related to the different phases in the project, which is connected to the vision-oriented methodology, proposed in chapter 8. The degree of complexity in the exercises increased during the course as the students got more training in scenario play. Several of the scenario play and storytelling exercises

were directly or indirectly inspired by the theatre sport school of Johnstone [1979, 1999]. Several of the exercises were developed by myself and in the interaction with the students during the courses. A couple of times the scenario plays were based on scenarios and stories the students had written in class. Sometimes the students were asked to sketch the products ideas that were presented in scenario plays. Since the plays were so ambiguous and vague they had to use extensively their own imagination in the sketching and the concepts developed would be different.

Other times the students were asked to play out different intended interaction experiences with products. They would then for instance play different interaction experiences with the use of abstract, undefined boxes. In similar play sessions they would use whatever tools and objects they found available at the moment. The objects used could have a very different symbolic meaning and function in the play than it had usually. In figure 7.3 a table is for instance turned upside down and has become a concept for a multi-furniture. This usage of objects, which have a different meaning in the play, is one of the ambiguous characteristics of play, as described in section 2.2.1.

Figure 7.3 Scenario play with table as multi-furniture

The scenario sequences and play were initiated and ended in specific manners like by entering and leaving the room or opening and closing a door. It was observed and noticed that it was important both for the players and the audience that there was a symbolic start and end of the play. A physical movement like opening a door prepared the players and audience for the play. When the students were just sitting at the same place they had trouble making the imaginative transformation into a state of play. The credibility of the play was also improved with simple symbolic means like for instance the use of a hat and other simple clothing objects. Furthermore it also seemed to help the play that the scene or arena was staged in a simple and symbolic way prior to the play.

Scenario play presentations

Scenario play was used as part of three presentations in the project. It was used as part of the presentation of the interaction vision, which is a vision that describes the intended user experience through words, poetic images, pictures and bodily expression. In this phase the students had not developed a specific, final concept, but just developed interaction visions that described and expressed the intended quality of the user experience. They developed three, different scenario plays as part of the interaction vision, see figure 7.4, as an example. In this scenario play presentation the students did not use words, but only sounds / music and movement and expressions through the 'silent' use of their body. Such scenario play was thus experienced as fairly abstract compared to scenarios that included dialogue. When relating to the vision-based model in chapter 4 scenario play can be described as working with concepts on a more abstract level than product sketches and concepts, in relation to the product. Just like one may present a set of sketches on the principal level it is possible to represent a set of short scenarios that indicate different possibilities and can function as an underlying framework for the concept development. In the early phases of the design process it was viewed as fruitful that the student team used scenario play with same sincerity as they used product sketches.

Figure 7.4 Example of play in the interaction visions

In the next presentation the students had developed preliminary and general ideas and concepts. In these presentations they then used simple tools and objects in the scenario plays, see figure 7.5, left side. In this phase the main focus did still not lie on the product itself, but more on the interaction experience between the different users and between the users and the product. In this presentation the students used also dialogue and simple objects in addition to body movement.

In the final presentation the students had developed a mock-up or simple prototype of the product. In the scenario play they then used the product actively and they used normal conversation with words in the scenario. The final play was supposed to be fairly concrete and realistic, see figure 7.5 right side, as an example. The aim was that the plays in the different presentations should be related to the phase of the project and the degree of abstraction connected to this phase in the project. Even though the means are very concrete, the play should be more ambiguous and open up for different interpretations and imagination in the audience, and thus indirectly give room for new ideas. The scenario play should match the level of abstraction in the project and is related to the different levels of abstraction indicated in the model for a vision-based approach to design, proposed in chapter 4. In subchapter 8.3 the link between the scenario play and the vision-oriented methodology is clarified. In subchapter 7.3 the feedback and evaluation from the students concerning the use of scenario play as a tool in the design process is presented.

Figure 7.5 Scenario play of concept at an early phase (left) and at the final presentation (right).

7.2.6 Description of mental visualisation exercises

In this section the way the visualisation exercises were lead will be described. The different degree of guidance in such exercises will also be discussed.

Preparation for the visualisation

In the following paragraph an example from the innovation course, spring 1999, is given which shows how I did prepare and lead a specific mental visualisation exercises. This example given here is a type of exercise that is not directly linked to the design project, it is a process oriented exercise. I started the session by telling the participants that I would lead such an exercise. I told the approximate

duration of the exercise, and some of the intentions for doing the exercise. In the course such exercises were often coming between other types of exercises, like for instance story writing and scenario play. I asked the participants to sit well and upright in their chairs, with both feet on the ground and their hands on their knees. I believe it is important that the participants have a good body posture when I lead them into a visualisation exercise. I view the changing of the body posture and becoming aware of the body as a mental preparation of the exercise. Additionally, the right body posture should help and support people in staying focused and present during the exercise. Then I asked the participants to close their eyes. I asked them to feel the weight of their body against the chair and sense how they were feeling inside. "Are you tired after a long day or are you excited?" Then I asked them to get in touch with that feeling. I asked them to sense and put focus on their face, head, shoulders and the rest of the body. If there was tension somewhere I asked them to let that tension go. Then I asked them to focus on their breath and to feel the breath going in and out. The focus on the breath lasted for about 20 seconds. After this introduction I started the visualisation exercise. This visualisation exercise was an imaginative journey and started in this way:

"*Imagine you are walking on a beach on a warm summer day. You are just wearing a shorts and T-shirt. You feel the heat of the sun on your bare feet. You are hearing the sound of the waves from the beach and can smell the odour of seaweed. The warm wind is blowing, you can feel it on your body. Above you there are a few seagulls flying in the air, you can see far away a kite moving in the air…*"

I tried to awake strong sensory experiences. I used many images and tried to stimulate many senses. The better the images are and the better you manage to stimulate the senses the more the participants will feel that it is real and thus be enwrapped and involved in the story. Especially at the start of the visualisation exercise it appears to be important to give many sensory impressions to transfer the consciousness of the participants into a strongly experienced imaginative world. In other cases where I brought the participants back to childhood experiences, where they were interacting with products and objects, I also used strong sensory images. In this exercise I tried to make them fully aware of the space and surrounding for the imagination. When I had managed to put the participants into the imaginative world I started to lead them through the entire story. It was important that I gave enough breaks and did not rush the session. At the same time there should not be too much silence for a longer period of time because then some of the participants could fall out of the visualisation exercise.

Returning from the visualisation

Just as important as leading people into a relaxed, imaginative state is leading them back into the "real world". After I had told the story I brought the students

back, both physically and mentally, to the starting point of the story. I ended up by bringing the students back to the same trail. In this exercise I used a strong sensory images to bring people back from the imaginative world; the image of biting a lemon. I feel it is important that this last sensory experience is not stressful, but that it might give a dramatic change that can naturally lead out of the session. I then said something like:

"*As you bite the lemon, as you feel the sour taste of the lemon in your month you are coming back to your body, you are slowly coming back to the room at the university. You are again feeling the weight of your body against the chair and you can sense your own breath going in and out. You are in your body… And slowly you can open your eyes.*"

At the ending of a session I told the participants to wake up, get in touch with their body and breath. In the phase of coming from the imaginative state back to the "real" state I also used sensory images. I asked them to become aware of their own body, such as the breath and the weight of their body. It is a way of bringing them back in a soft and not rude way. Some students in the session took quite a long time before they opened their eyes. The students then shared some of the experienced they had made during the exercise. The students were surprised to see that they had created different images from the same story.

Sometimes I had exercises with the students lying on the flour. Then the students would often be lying for almost a minute before rising up. My observation is that it was harder to bring people back to the "real" world than to bring them into an imaginative state. In the course the students became more and more fond of the visualisation exercises, there was little reluctance against the exercises. On the contrary, the students seemed to enjoy the exercises. The feedback from the students concerning the exercises will be described thoroughly in subchapter 7.4.

7.3 Effects of scenario play

In this subchapter 7.3 the effects of scenario play in the course, according to observation and feedback from the students, are presented and discussed. The effects of scenario play may be divided into two main categories: Process and problem related effects, as described in section 7.2.3. In the following sections the process and problem related effects are described and discussed. In subchapter 7.4 the effects of mental visualisation exercises will be presented.

7.3.1 Process related effects

Personal development
The scenario play exercises worked on a personal level for the students. They made them more confident and relaxed in standing in front of an audience. One student wrote: *"An important reason for taking the course, was that it gave me exercise in standing in front of an audience. So the use of scenarios was something that I valued greatly."*

The scenario play exercises combined with other exercises have helped to bring forth the playful side in the students, or "the child" as one student remarked. This had also helped in the communication with others: *"I feel I have developed myself as a human, I have a much more natural attitude towards bringing forth the child in me (which I, by the way, previously thought was gone for ever) and play with thoughts and ideas. I have a much more relaxed mentality in "making a fool of myself" in front of others. To be a bit stupid in the right way will often get other humans to relax more, and remove many of the barriers that inhibit us from communicating naturally."* It is concluded that the scenario plays function as means for personal development of the students.

Increased motivation and enthusiasm
The use of scenario play and other play exercises created a lot of laughter, the students experienced it as fun and as a good way to make development projects amusing and fun. One student wrote: *"Most of the methods have potentials to make a development project much more pleasurable and attractive than previously. I can imagine many creative and amusing sessions together with future working partners."* When looking through the video of the final presentation one can clearly see that scenario play creates a lot of laughter and enjoyment both among those that presented the concepts and the audience, see figure 7.6 as an example.

The students created and played comic user situation where they encountered the product as users in a social setting. Sometimes they overplayed a bit the reactions of the users and the specific character of the users. It helped to give the group a distance and perspective to their own product, and *"distance to study the result"* as one student remarked. It was an occasion to play with their own "baby" and concepts, and experience the product in a "live setting". This was both amusing, motivating and instructive since it gave them better understanding of the intended use.

One student remarked that the scenario play helped to create enthusiasm around the project. Through scenario play the group got a stronger relation to the project

and to the problem area: *"The significance of trying out things in practice by playing it out in theatre was very valuable. To play out in theatre gives room for new, creative ideas and viewpoints for the product. It also creates closeness to the product and an enthusiasm. For our group it has been an important part of the process towards a final concept. For me personally has playing theatre been incredibly fun and the best in the course."* It could clearly be seen from the video recording that scenario play really created enthusiasm and positive attitude towards the project. One could observe, especially later in the course, that the students really had fun and enjoyed themselves when playing the theatre scenarios. As described in section 2.1.6 motivation is a central element for creative thinking and activity. Involvement and engagement are also central in the state of flow, described in section 2.1.8. So when the scenario play made the students motivated and engaged towards the project it might also indirectly help to make them more creative and lead to better results.

Figure 7.6. Engaged students in the scenario play

Improved atmosphere, team spirit and shared attention

Several students reported that the scenario play exercises had helped to loosen up and break down the shell of embarrassment between the participants. One student wrote: *"The exercises has been a lot of laughter and a lot of fun. The exercises have contributed in breaking down the shell of embarrassment and formality and gradually give a shared feeling internally."*

Many students reported that the scenario play, combined with other exercises in class, helped to create a shared involvement and team spirit in the group. One student wrote: *"The exercises in class I believe had a lot to do with my experience in the group that we were willing to listen to each other, and were not afraid to throw out ideas however stupid and little considered they were. We trusted each other, and were not afraid to say something stupid. It was a new and uplifting*

experience." Another student wrote that the playing helped the group to co-ordinate and get focused: *"To play the interaction without connecting it to a product was probably the most fun. Even though we did not rehearse much in advance, we talked our way through the process. From this part of the process the group started to get co-ordinated and interested in working more effectively. "*

Some students pointed out that the scenario plays were very instructive since everyone had to participate in the setting, so it forced the whole group to be active: "*The theatre scenarios have been very instructive since they forced everyone to participate in the setting. They got everyone to contribute with new ideas and thoughts."* Scenario play exercises with improvisation forced the students to be awake and present, and follow closely what happened either when one was playing or observing: *"The exercises where we had to play different roles gave me a lot. A lot because one had to project oneself into unknown areas. This improvisation forced me to be awake and follow closely what happened. "* This need for being awake and present was especially true when the students improvised in scenario play, which required full attention from their part.

In general it was observed that the different scenario play and other improvisation exercises created a playful, open and receptive mood among the students. They felt after a while very confident and secure enough to take risks and overcome their own limitations. One participant remarked during the course: *"It feels like we have known each other for years, even though this is not the case, since we have known each other for only a few weeks. But we feel so confident with each other. "* Such an atmosphere and mood of sharing is in itself important for getting a good collaboration between the participants, see sections 2.4.5-2.4.6 and subchapter 6.1.

7.3.2 Problem related effects

Improved internal communication and understanding

Several students remarked that the scenario play and presentation helped the students to improve their understanding of their own intentions, ideas and concepts. Through having short scenario plays they were forced to become more aware of their choices and of the consequence for the users. By using their own body and by playing different users the students improved their own understanding, it increased their own awareness of the user situation. As one student wrote: *"The theatre scenarios helped in the way that we saw problems that we did not see before we played them out. The theatre also helped so that during the presentation we strengthened the purpose for the products that we were approaching, but which was still not too concrete."* Another student wrote: "*Through scenario play one could more easily see what kind of atmosphere and situation the concept created."* A third student wrote: *"I thought it was a bit far-*

fetched to use scenario play in the presentations, but discovered quickly that it was a very effective way to emphasise and underline what we were thinking about. "

Several students expressed that using scenario play in the group functioned as a healthy break and change from the ordinary work with the project. It helped to loosen up the atmosphere. Rather than just talking about something irrelevant, scenario play functioned as a useful break and change in the project. This is expressed in this feedback: *'We have not used scenario play so much outside the presentations, but then it has been a good break and change. Additionally it has strengthened our views and helped us to see possibilities in the process."*

The scenario play helped the group to get a shared understanding. When working with a vision the different students in a team had a different understanding of the notions and needs connected to this vision. One student commented:*It' was a challenge to materialise the vision so that the product was in accordance with the different people's understanding of the vision. We experienced how difficult it is to express ourselves concretely enough, when working with abstract notions. "* When the students played out the desired interaction vision in play they became more aware of the different interpretations they had of the vision. Scenario play helped the students to calibrate and create a shared understanding and it helped the group to develop shared images. One student wrote: *'When we presented the visions we had to think a bit about products (at least the main ideas) and this put us on the path to a final concept. Here scenario play was probably of help. "* Another student wrote that in the early phase the scenario play forced the group to agree upon what kind of interaction experience they wanted to have. It was much more binding than just abstract words, and forced the group to have shared understanding of the words: *"When we were supposed to play the interaction abstractly it also forced the group to agree upon what we had in mind with the interaction. It was no longer just words."*

Help for external communication of project

Several of the students mentioned that the use of scenario play in presentations helped them to understand better other concepts and the intentions of those who had developed these concepts. They could then see the concepts in 'real life' user situations, and scenario play evoked many more associations and thoughts than just rational presentations with the use of boards, pictures and text. It was especially useful in understanding the desired atmosphere and intentions behind the product. One student writes: *'Scenario play has had great effect when one has looked at other groups. It has given a live presentation in the thoughts and atmosphere around the product. It evoked several aha experiences."*

The scenario play also helped the students to articulate their concepts. By playing a real life situation, they could more easily communicate the desired experience

and intentions. One could say that it is hard to communicate a user experience just rationally; it should be communicated as an experience. One student expressed the usefulness of scenario play as an external communicative tool in this way: *"When the group worked together I felt the group had a shared understanding of the problem and the solutions, so internally in the group we did not have so much use for scenario play. But when communicating the work with outsiders the scenario play functioned as an effective and entertaining way to get others acquainted with the project."* Another student remarked: *"In the presentations scenario play has been of good help. It has contributed in strengthening the message, and as an audience it has been easier to see what the groups wanted to develop. "*

When presenting the intentions, ideas and concepts through scenario play it gave the audience a greater chance to get their own experience and make their own opinions and thoughts about what was presented. They were initially less conformed by the opinions of the group that was presenting. Since the audience was free to get their own impressions, they could sometimes get other impressions than the group had in mind and see aspects about the product that the group themselves did not see or were not completely aware of. One student wrote:*"It gave the other groups a greater possibility to create their own thoughts about what we were presenting. Sometimes we could use and used these thoughts in our proceeding work."*

Tool for creative and conceptual thinking

Many of the students told that the use of scenario play helped in the process of coming up with new ideas, as one can already observe from the above mentioned quotes. In the act of playing, the interaction quality and the product in use new ideas came into mind. For instance, they saw new possibilities and problems. This was especially the case when the scenario play was less planned and not so detailed and gave room for different interpretations and understanding. One student wrote: *"Such visualisation works so well because it becomes so concrete while it at the same time is kept on an abstract level. We all get an experience which is a bit different, so it works well to bring forth new ideas. "* It might also be important for the creative process and the development of ideas in an early phase that the scenario play is not linked to any specific, concrete product. One student wrote: *"If we had to play the scenario play with one specific product in mind I think that the development of the concepts would have been too linked to existing solutions."*

One student mentioned that scenario play gives room for experimentation, without getting too much locked in one thought: *"I think it has been of great help in the creative process because it is easier to experiment through play. If one uses words to describe an interaction very early in the development project, there is a tendency to get locked in those thoughts just then, but scenario play gives more*

room for change. And that one gets feedback during the process in the form of reactions from a group of people can be good to encourage that one works further with the concepts." The play, which forced the students to be more aware of the social setting and the interaction with the product, gave them new associations and ideas, both when they were playing themselves and when they were watching as an audience. When looking at a play, some students would make associations to similar situations they had experienced personally. This became clear in the discussion afterwards, where the students mentioned and articulated the different associations and ideas that came into mind during the play. In the sharing of these different associations, images and new ideas also often emerged.

7.3.3 Reflection on critical factors for scenario play

Framing the play

As a facilitator for the scenario play exercises and other improvised exercises I noted that it was important that I showed concrete examples at the start of each session in how such a play could be performed. In some ways one could say that when I could "make a fool of myself" it was easier for the students to do so afterwards. As the facilitator I created the framework and room for what was possible, I created the "standard". As the facilitator I also has an important role in motivating, as described for practitioner in organisational change, see section 2.4.8. My experience was that when I was holding back the play as a facilitator the participants would more easily do so too. It was nevertheless important that I did not overdue and became too professional in the play example, because it could then cause the students to become nervous. One could say that the example I played where part in setting the stage and framing the play, like it was discussed in section 2.2.2.

What seemed to also be an important part of the preparation for scenario play was the physical arrangement of the space in both the exercises and the presentations. In this arrangement and staging the students moved the furniture, created a space and brought forth some specific objects needed for the play. In this activity it seemed that the students also prepared themselves mentally for the play that was forthcoming. By arranging a stage for play one is creating a temporal performance zone, which is one of zones in workspace proposed in chapter 5.

The short refurnish of the room and the reflection that usually followed a play seemed equally like a natural way to round off the play session. It is a way of returning to the 'real world', recover and get a perspective and distance to the play. This reflection and discussion was experienced by me as a facilitator as a natural and important part of the entire session. The session became then a type of

reflective practice [Schön 1983], where the students have a 'reflective conversation with the situation', see section 2.8.1.

Motivating the participants

My experience as a teacher and facilitator for the exercises was that the students had generally had a positive attitude towards the use and trying out of exercises in class. Several of them could be uneasy, anxious and sceptical at the start, since the exercises and methods used in the course were new to them. The culture that is formed in a class influenced also the general attitude towards exercises. The different individuals in the class influenced the culture and were a part in setting the stage. I experienced that some individuals could have a strong influence on the atmosphere in the class. If some individuals with strong influence were very positive and took an initiative for trying a scenario play exercise the rest of the group would more easily follow. On the contrary, if one individual was more reluctant and asked critical questions then he could also influence the entire group in such a way that it often became a bit harder to run the exercise. Sometimes I would then adjust and change the exercise so I got a full "willingness" in the class. This experience and observation of group variety and need for adjustment was not just connected to scenario play exercises, but was more or less connected to all the exercises in general. The adjustment and change are linked to the contingencies for the change situation described in organisational change literature [Cumming and Worley, 1997: 142-151], see section 2.4.10.

Adaptation and training

Both the scenario play and other improvisation exercises required some training and adaptation before the students felt comfortable. The students had not previously played theatre in front of others. At the start the students were stiff and not so relaxed when they were playing scenarios. They were afraid of making fools of themselves in front of others. As the students got more training and felt they mastered improvisation they enjoyed more using such exercises. This feedback describes well this transformation and adaptation: *"The exercises in visualisation and improvisation have functioned better and better as we in the course became used to them and became secure with each other. In the start it was pretty rough, embarrassing and scary, but at the end it was a lot of fun… It created a very special team spirit and atmosphere between us."*

Influence on project

The use of scenario play seemed to have an influence on the projects as a whole. The students became more aware of the story they wanted to communicate for the product. They probably also made choices of concepts that could easier be connected to social interaction and could set the frame for a good story. The use of scenario play seems to be especially fruitful in projects where the social interaction around and with the product is central. One student wrote: *I 'think that*

the use of scenario play had a great influence on the type of product that we came up with, because scenario play works better in situations with movement and emotional interaction between humans, which is a big part of our product." Another student expressed that the use of scenario play could be useful in any projects where the focus was on the user-interaction or where the aim was to detach yourself from existing solutions: *"This project had a strong focus on the interaction, but to play abstract scenarios I believe can be just as useful in other projects, either to detach yourself from existing solutions or to have a focus on the interaction experience."*

Potential danger with scenario play

In a few sessions the observation was made that some of the students got so involved and had so much fun with the play that they almost forgot the time they used. It felt then like "letting the new born calves out on the field" for the first time. It seems important to give clear limitations in time for the duration of the presentation and play. As the students get more professional with the play they might also learn to restrict themselves better. As a facilitator one might have to stop a play due to its length, but then it is important to tell this possibility in advance so the students are prepared and understand that the stopping of the play is also a natural part of the play session. Learning to keep the time limit is part of learning to become professional.

A second potential danger that was observed a few times with play exercises was that the students started to be more excited with the story around the product rather than the product itself. It is important to outline that the play should help to describe and give an experience of the concept or product, and by making a story around the product both the players and observers may understand and get an experience of the concept. The students should thus learn to use the play in a professional way, and that the central focus for the play should be the user experience, the concept or eventually the product.

7.4 Effects of mental visualisation exercises

In this subchapter 7.4 the observed and experienced effects of mental visualisation exercises in the course are presented and discussed, according to observations and feedback from the students. Similar to what was described with scenario play the effects of mental visualisation exercises may be divided into two main categories: process and problem related effects, as described in section 7.2.3. In the following sections the process and problem related effects are described more thoroughly.

7.4.1 Process related effects

Awaking fantasy and past experiences
Several of the students reported that the visualisation exercises helped them to awake their own fantasy and creativity. By leading the participants by words, they had to awake their own fantasy to create their personal mental images. As one student wrote: *"The visualisation exercises have been liberating, they have awakened our fantasy, they have made us feel creative, and helped us to go new and exciting directions."* Another student wrote: *"I felt that the visualisation exercises were unfamiliar at the start, but gradually I felt that they went better with some training. I actually felt it was a good tool and help to put myself in different situations, atmospheres and let my fantasy flow and to bring forth old memories from childhood. It was a pleasant way to draw back into oneself and get relaxed.*"

In some exercises the students would be guided back to childhood experiences and previous experiences where they for instance interacted with products in a social setting. When looking back at their own childhood to specific memories they could get in touch with the playfulness and "childlike nature" they had as children. Some students told that looking back at childhood to strong interaction experiences with products helped them when they were trying to develop new concepts with strong interaction experiences. The students told about strong memories with specific products in their childhood. The process of trying to take along some of the qualities in these experiences was inspiring and motivating for the students and created enthusiasm for the project. One student said: *It was interesting and challenging to dig into childhood. That is probably something one should do more.*" Mental visualisation exercises may help to bring the participants in touch with experiences that they usually do not think about or have in mind.

Relaxation and concentration
Several of the students reported that the visualisation exercises were very relaxing and helped concentration. When they were stressed and had problems to focus, such exercises helped them to calm down and be present for the task at hand. As one student wrote: *"Here I experienced that I was able to obtain higher concentration with self-involvement and increased sensitivity and awareness around the problem area."* The focus on their own breath, the release of tension in their body and the guidance into mental images, connected to the problem area, made them more relaxed and concentrated. This is similar to what McKim [1972] has called relaxed attention, see section 2.2.8. The creative state is viewed as being connected with a state of full presence and concentration, see section 2.1.8, and mental visualisation can help to put the mind in a concentrated and focused state.

The exercises can also be challenging, and require concentration and involvement. As one student wrote: *"The exercises were great. It was a bit difficult to concentrate on visualisation exercises at the end of a long session."* Especially at the start some students could get sleepy during the visualisation exercises. This tendency diminished as the students got more training in such exercises during the course.

Increased personal involvement
Leading the students back to interaction experiences with products in their childhood had also the effect that they got a more personal relationship to the project. They could more easily relate to the project and product since they could associate the problem with their own personal experiences. This can be important for the sense of ownership and enthusiasm for the project. This potential effect may especially be useful in a project where some of the members do not feel they have a relation and ownership to the project, and where some of the members are too dominant in the team, as in the specific case presented in subchapter 7.6.

Improved atmosphere and team spirit
Sharing a mental visualisation exercise can in some ways be compared to going and watching a movie together; it may be viewed as a shared experience. In a mental visualisation exercise the participants will listen to the same story, but will often create slightly different images. The images that the students make will be related to their own past experiences. After an exercise the students were invited to share some of the experience and images that had come into mind during the exercise. The sharing and discussion of such images, which in some cases were quite personal, influenced the atmosphere and strengthened the spirit in the class.

Some visualisation exercises, which for instance are connected to playful states of mind, influenced the mood of the students and put them in a more open and receptive mood, which was important for collaboration. The students may thus be transformed, at least temporarily, into a playful and imaginative state of mind where they are in the mood for playing. If they originally were in a critical, suspicious and sceptical state of mind visualisation exercises can help to change this mind-set.

7.4.2 Problem related effects

New awareness and understanding
Some students reported that the mental visualisation exercises helped them to see new situations and perspectives to the problem area. During the exercise they could observe and become aware of other details than they previously had in mind. One student wrote in this regard: *"I think the visualisation functioned very well*

after a while. To close your eyes and put yourself into new situations and new environments made you start to think about other details than you previously had thought were important. I think it is very useful and I hope I will not forget to use it in new projects."

Evoking new ideas
After a mental visualisation exercise the students were invited to talk and share the experience and images that came into mind during the exercise. Usually each student had created slightly different images from the same visualisation exercise, they had made different associations to the same story. When talking and sharing these images some students told that new ideas emerged that could be a combination of the different images that were shared. There could also be new associations that came into mind when sharing the images, and trying to understand each other's experiences. Through the discussion with other students they could also become more aware of different perspectives and approaches to the same problem, which eventually could give them new ideas for the problem at hand.

7.4.3 Reflection on critical factors for mental visualisation

Getting the goodwill and acceptance
From my experience in leading visualisation exercises it seems important that the participants are open minded and that they have agreed to take part in the exercise. One of the first times I did such an exercise in the Vision Lab (this room is described in chapter 5) I just asked the participants, which were not students, to close their eyes and then I started the exercise without telling much about my underlying motives. I also did not tell the duration of the exercise. The participants were not given the time to mentally prepare themselves for the exercise and I did not personally ask for the permission or mandate for leading them in such an exercise. The feedback from the participants was then of a mixed character. My impression was that a few of the participants felt they were manipulated and they were then reluctant to partake in the exercise. I did not have their goodwill and permission. These participants had problems getting into the exercise. Others did not have any problem with my lack of telling motives, duration and permission and had pleasure in the exercise.

In general, from my experience in leading such exercises it seems important that you get acceptance from the group, that you tell the duration and some of the intention for having such exercises. At the same time my experience is that one should not tell too much about the specific exercises in advance. It is important that such exercises should awake feelings and spontaneous images. If the participants know too much about the exercise in advance they may easily get less

experience from the exercise, because they then will know too well what images that will be given. These exercises are supposed to awake their playful and imaginative side rather than their critical and analytical side. Usually I would tell some of the intentions behind the exercise after I had lead and done the exercise. The participants will then have their own personal experience they can relate to when they hear about the underlying intentions. What I am then saying is not just impersonal knowledge, but knowledge they can relate to as their own experience. My personal observations and experiences are that discussion around visualisations are then more interesting and useful for the participants.

Clear and consistent images

One of the experiences I gained in leading mental visualisation exercises is that it is important to use consistent and clear images during the visualisation. Each participant will create his own images based on his own past experiences and personal associations. Once I was leading a mental visualisation exercise, which was not linked to the project, (process oriented exercise) where the participants were supposed to visualise that they were walking on a trail in the forest. They came to a tree, touched the bark, smelt the odour of the bark, and then looked up at the tree through the leaves and the sky, listening to the soft rustling of the leaves in the wind. Two of the participants had visualised right away that the tree was a pine tree or a conifer. One of the participants told me afterwards that he then fell out of the visualisation exercise while the other managed to change the image and stay engaged in the rest of the exercise. In this case I should have made clear in the description what type of tree I had in my own mind.

Another time I was leading the participants in a (process oriented) visualisation exercise where they were supposed to be in the desert, walking alone with the heat of the sun. They came to an oasis with palm trees and a pond. They dipped their feet into the water and then dove or jumped into the pond. The problem was then that two of the participants had visualised the pond as being very shallow. They could not dive into it; they would hit their heads and body at the bottom of the pond. In this case both the participants manage to change their images and take part in the rest of the visualisation exercise. In this case I should have described the pond more specifically as being deep.

It seems to be fruitful to tell the participants before starting the exercise that they may get images in their mind that may conflict with the images that I give to them, and tell that this is normal and fully acceptable and shows that they are being active and creating images themselves. Furthermore, it seems fruitful to tell the participants that they should try to not get stuck by these conflicting images, but try to let go and continue to follow the story as well as they can manage.

Degree of planning

In the leading of visualisation exercises there is a question of how planned the session should be. I experience it is important to have thought through the major line in the story and that you have an overall framework for the story. At the same time I experience as important that I am actively visualising and creating the story in my mind as a facilitator. I do not like to plan too rigidly the mental visualisation exercises, for instance by reading directly the story from a manuscript. I believe that one is a more engaged storyteller when one doesn't know all the details of the story in advance, when there is an element of surprise. Nevertheless, one needs to plan so one can leave room for the unplanned.

It is important that the facilitator of such exercises is secure and natural and that the exercises do not seem too unplanned. As a facilitator I must have a will and belief and lead the exercise with confidence. My personal experience is also that when I am leading the visualisation exercises I should also myself actively imagine the journey so that I have engagement and involvement in the pictures and images created. At the same time one should leave room for different interpretations, so that the participants may create different personal images along the visualisation journey.

Level of guidance

A factor that is important to discuss is the level of guidance in the visualisation exercises. In general the level of guidance will depend on the purpose and intentions of the exercises. With some types of exercises the intention is mostly to put the participants in a relaxed and attentive state and the effect is supposed to be process related. The exercise may then not have such a direct link to the problem area one is studying. In an initial phase where the participants are not so used to visualisation exercises it may possibly be fruitful to use exercises that have a high level of guidance. As the participants get use to the technique of visualising, one can use exercises that require more self-guidance.

There are several types of self-guiding visualisation. In one of the exercises I lead the participant into a situation and context and then they have to find their way back by themselves. Another type of self-guiding visualisation is where I ask people to go back to specific situation in their life where they had a strong experience, for instance with the use of a product. I ask them to sense the situation, the surroundings, the feelings, the people involved and what about the product that gave such a strong experience. I would ask if they for instance could sense any sound, the lightning, the colours; the whole context in which they were using and interacting with the product. I would lead the visualisation with the focus on interactions with several different products and for different types of experiences and moods. In the visualisation exercise the product could be quite specified or described in terms of qualitative properties.

URN:NBN:no-2324

Adaptation and training

In the feedback several students wrote that they needed some time to get accustomed to the visualisation exercises. They were not used to closing their eyes, imagining and looking inwardly. Several of the students, who had no previous training, needed some time before they felt comfortable with such exercises. One student wrote: *"In the start the visualisation exercises were difficult, but after a while I learned to be totally involved in the story. They then evoked my fantasy and made it easier to continue with what we had to do afterwards."*

As a facilitator for the exercises I could clearly see the change in attitude during the course connected with exercises. At the start I experienced that the students were a bit nervous and sceptical. They were not used to closing their eyes in a classroom where they started to imagine and have inner visualisations, but gradually they became comfortable with such exercises. Some students would then later by themselves come to me and ask if I could lead them in new visualisation exercises, it was almost as if they expected it. When I said that we were going to have such an exercise the students would later in the course by themselves close their eyes. Sometimes when I gave them some images and fantasies where I did not ask them to close their eyes, some of them would still do so by themselves. The need for training and adaptation can be related to this comment by one student: *"I believe the very free visualisation exercises become more powerful with training, to be able to let go and just listen and let thoughts wander in stead of trying to control thoughts."*

Especially for some participants it was important that they could see a clear link between the visualisation exercises and the project at hand. One student, who was very product oriented, remarked that he felt he had problems with several of the visualisation exercises since he did not see a clear link to the project. So, when relating to the model in figure 7.1, it is important that at least some of the visualisation exercises have an approach with a close link to the concrete problem at hand. Furthermore, one student reported that the exercises that were closer linked to their own experience, such as mental exercises linked to childhood, were the easiest to follow: *"Personally, I feel that the visualisation exercises where you [as the facilitator] played and made the link to our childhood were the easiest. In those we could think more freely so that we could find a situation we remembered well and could try to imagine ourselves back in the situation."*

7.4.4 The role of the facilitator

My own personal experience and observations is that the facilitator for both the scenario play and mental visualisation exercises has an important role. This is especially the case for mental visualisation exercises, since the facilitator is the one who leads the story and gives many of the mental images to the participants. The way such an exercise is led is crucial for the outcome, it requires that the facilitator has the ability to use good images and that he or she gives space for the participants own imagination. New impressions and images should not come too slowly and not too quickly. My experience is that it is also important that the facilitator himself envisions well and has a focus and involvement that capture the attention of the participants.

In scenario play exercises I experienced that it was important that I, as a facilitator, could give examples and show possible ways of playing out scenarios. This was especially the case at the start, when the students had little or no experience of playing theatre. I noticed that my attitude and enthusiasm was important in the initiation of the exercises. In some situations I function as an initiator and role model.

Since the facilitator is setting the frame for both the scenario play and the mental visualisation exercises there is a danger that he or she can manipulate the participants in directions that are favourable to himself. My experience was that mental visualisation exercises were a powerful way to create strong, shared images. It is therefore important that the facilitator tries to create images that reflect the intentions of the whole project group. The group or team should agree upon the type of mental visualisation exercise. It may be fruitful to have some evaluation of the exercises afterwards to hear if the participants felt it was useful. It is central that the practitioner or facilitator of the exercises involves the participants, has an open communication and does not force the participants into exercises. Such rules were also described in connection with a practitioner in organisation change, see section 2.4.8. It is important for the success of the exercises that there is full participation and goodwill in the group, as discussed in section 7.3.3 and 7.4.3.

7.4.5 Conclusion

Both the scenario play and mental visualisation exercises have process and problem related effects. In table 7.1 an overview is listed of the effects that were presented in the previous sections. The conclusion is that both scenario play and

mental visualisation have shown to be tools for stimulating and improving creative collaboration in design teams in a class setting.

Table 7.1. Overview of identified process and problem related effects of scenario play and mental visualisation exercises

	Scenario play	**Mental visualisation exercise**
Process related effects	1. Personal development 2. Increased motivation and enthusiasm 3. Improved atmosphere, team spirit and shared attention	1. Awakening fantasy and past experiences 2. Relaxation and concentration 3. Increased personal involvement 4. Improved atmosphere and team spirit
Problem related effects	1. Improved internal understanding in the group 2. Better external communication 3. Creative and conceptual tool	1. New awareness and understanding 2. Evoking new ideas

7.5 Will this work in industry too?

In subchapter 7.3 and 7.4 the effects of scenario play and mental visualisation exercises were outlined, as described by the students and observed by me as a facilitator in the innovation course. When discussing the relevance of such exercises in industry it is important to remark that the context in school and industry are different in several ways. In this subchapter some of the perceived differences are outlined.

7.5.1 School as a "playground"

In school there is generally more room for trying out, for playing and discovering, there is not such a pressure on time, efficiency, earning and cost. One designer,

who also was teaching at a design school, described the school setting as a "playground" in the interview. In school and in the student projects the main focus is on learning and the development of skills and knowledge. This is equally true for the innovation course. The students who participate in the course are partly aware in advance of the content and objectives of the course, and they select the course by own choice, since it is an elective course. So the students who attend the course will generally be fairly open minded and be willing to try out tools and methods that they have not used before. By enrolling in the course they have indirectly agreed upon participating in different types of exercises. Such an agreement will have to be different in a company. This will be discussed more in subchapter 7.8.

7.5.2 Personal relation and history

Not all the students who participate in the course know each other in advance, while in a project group in companies the participants will often know about each other in advance. This may be viewed as both positive and negative. Since some of the students in the course do not know each other there is a process of getting to know each other and becoming comfortable with the situation before they dare to be open. At the same time there is no previous history and conflicts that may influence the running of exercises and workshops. In a company where the participants know each other well there may be underlying conflicts and power struggles that may strongly influence the whole setting and the willingness of the participants to partake in exercises. Furthermore, since the participants come from different divisions sectional interests and internal positioning may also influence the setting.

7.5.3 Company culture

In a company there will often be a culture in the way work and activities are done. There may be a history with both success and failure where the company has tried different procedures and activities that were possibly not successful. It may therefore be harder to try to realise real changes. The exercises and tools should therefore be adapted and adjusted so they fit and are not too foreign from the company culture. The willingness to try out new tools will also be connected to the specific state the company is in at the present moment. It is easier to implement changes if the staff and the management in the company have already seen the clear need for change by themselves.

The attitude and willingness towards play will vary from company to company. Several respondents mentioned in the interviews that the trying out and use of new procedures and exercises is also dependent upon the choices and values of the top management in the company, it is part of a strategic choice of the company. It is hard to introduced new procedures in product development if the top management does not support and give room and space for such activities. There must be some time and money available for successful adaptation of new tools.

7.6 Specific case at Danfoss

I had the opportunity to organise a workshop at the company Danfoss in Denmark, where mental visualisation exercises were used in a specific case. I functioned as the facilitator. In this subchapter 7.6 this case will be described and some of the reported effects, based on notes and feedback from the participants, will be presented.

7.6.1 The problem and challenge

The original problem for the workshop was to develop new handles for valves to be used in water works and waste water plants. The new handles should be better and simpler to use than the existing ones. The handles are used to close or open valves. The group which participated in the workshop consisted of five people besides me as the facilitator, see figure 7.7. A designer had worked for a longer period trying to come up with new solutions. At the time of the workshop he had already developed several concepts. The intention with the workshop was partly to find possible other concepts and get other people aside from the designer more involved in the project.

Figure 7.7 The group participating in the workshop

7.6.2 The session

Before the session with the mental visualisation exercises the groups watched a video that the designer and a social anthropologist in the group had made in user field studies. The video showed how operators in different factories are describing how they are using the handles in practice. In the video we also saw several concrete examples of how they used these handles and we saw some possible difficulties and deficiencies with the existing solutions.

Figure 7.8 Picture captured from video recording during the mental visualisation session.

In the session that followed several mental visualisation exercises were used, for instance where the participants were asked to look back in their childhood and find specific interactions with products. One of these interactions was connected to general closing and opening mechanisms and another one was connected to different types of handles like door handles. They were asked to look at the specific setting, what was specific with these interactions, why they remembered specifically these handles, how they were to touch and hold, what was the sound etc. Through such exercise I was trying to get the participants in touch with past experiences. Indirectly I was also trying to get the different participants, aside from the designer, personally engaged and involved in the project and problem. Based on these experiences the different participants were asked to write down qualitative keywords that could be connected to the experiences and to the quality of these experiences. A discussion then followed where the participants shared some of these keywords and experiences, relating them to the problem at hand. At the end of the session the designer presented some of his developed concepts for handles which was followed with a discussion.

7.6.3 Observations and participants' feedback

The feedback from the participants concerning the use of visualisation exercises was positive. The designer was positive because he felt that the other participants understood more than previously how he was working himself, since they had recalled in the exercises specific qualitative experiences as an inspiration for the problem at hand. He said he used such visualisations himself when he was trying to come up with new ideas and get a qualitative relationship to the problem. One of the other participants said that he now had more arguments in the discussion with the designer. He also said that with their own experiences and reflections around these experiences the rest of the group could meet and challenge the designer in his own world. The other participants had developed their own personal images and references in relation to the design task before they discussed the suggestions from the designer.

Several of the participants said that visualisation exercises were new to them. One remarked that it helped and was crucial to have a facilitator in the visualisation exercise so one could really relax, focus and concentrate on the specific problem. During the following discussion several of the other participants came with suggestions and ideas connected to the handles that were based on experiences that were brought up or made during the visualisation exercises. It was clearly observed in three occasions that participants used some of the experiences and images from the visualisations in the argumentation and discussion with the designers. The discussion after the visualisation exercise brought forth some new ideas in both the designer and in the rest of the participants.

7.6.4 Effects of the session

The most important effect with the use of mental visualisation exercises was probably that it made people present and focused, that is created a shared space of experience in the sharing of personal experiences and that it seemed to help in this occasion to get the rest of the group, aside from the designer, engaged and involved in the project. The participants got their own relationship and involvement with the problem before the designer presented his solutions. Rehal [1998] has studied the communication in the early phases of collective design processes, related to architecture. The architect or designer has a strong ability to visualise his ideas through drawings, and this can inhibit that the users and the rest of the team develop their own images, because they get conditioned by the images of the architect. The user communicate almost exclusively with words while the architect also uses drawings and images. Rehal writes: *"If the architect presents his / her drawings before the user has had time to mentally represent what he or*

she wants to communicate, then there is a risk that the user will not be able to develop his / her own representation. The user will have difficulties to free himself thereafter from the representations presented by the architect." In this regard mental visualisation exercises can be means so that the other team members are stimulated to create their own images by themselves before they see the visualisations of the designer. This seems to be one of the main effects from the session. Rehal also suggests the use of visual images in this process so that the other team members find references for their own wishes. The use of visual images as tool for collaboration will be discussed further in chapter 8.

During the sessions the different participants were asked to try out the existing product. The designer was holding the valve connected to the handle while another tried to turn the handle, see figure 7.9. This practical trying out of the product was observed to have the effect that it created laughter and a shared experience of the problem. Furthermore it was personally experienced by the facilitator as a positive change from just sitting in chairs for a long period of time. This is similar to some of the effects of scenario play in the innovation course described in section 7.3.1.

Figure 7.9. Trying out the existing handle

7. 7 Specific case in Oslo

I was invited to lead a workshop in Oslo for the development of new concepts related to the food industry. In this workshop scenario play and mental visualisation exercises were used among other exercises as tools for creative collaboration. The experience from the workshop and the observation and feedback concerning the use of these tools will be presented.

7.7.1 Framework for the workshop

The participants in the workshop were researchers from three different Norwegian research institutes, Matforsk at Ås, outside Oslo, Norkonserv from Stavanger and Fiskeriforskning from Tromsø. Additionally there were participants from SPIN, the centre for product development in the food industry, who took the initiative for the workshop. The centre was originally started to stimulate and initiate product development in the food industry with a basis in these three research institutes.

The goals and intentions for the workshop were both process oriented and problem related. On the process side the workshop was supposed to help to build stronger relations between the different actors from the different institutes that were participating in the workshop. On the project or problem side the goal with the workshop was also to end with 10 new proposals for product development projects. I was the facilitator for the workshop, and had some initial talks and preparations with the manager of SPIN, where the major course of the workshop was set. Both scenario play and mental visualisation exercises were used during the workshop. Additionally different short play and body exercises were used during the workshop as a means to create a relaxed and informal atmosphere.

Figure 7.10. Different products were brought to the workshop (left picture). Participants played different scenarios connected to small and quick meals, like here in a car (right picture)

The participants were asked to bring along different food products that they liked or felt inspired by. They were also asked to take along some magazines and pictures of products as inspiration. Additionally many different products were brought to the workshop space, see figure 7.10. During the session the groups were asked to go and serve themselves with food products and use different products as an inspiration for the concept development in the group work. The workshop was staged in such a way that there was group work with quite frequent presentations for all the participants in the workshop. The ideas that were worked out were presented on large papers that were taped on the wall. Each group had its

own area with papers on the wall. One could view this type of presentation as a sort of gallery, with some similarity to the gallery method described in section 2.3.5. The participants were stimulated to use mind-mapping techniques and yellow post-its on large pieces of paper as a tool to structure and stimulate the development process.

7.7.2 The exercises

At the start the participants were divided in 3 groups of 4 people which consisted of members from the three research institutes and from SPIN. After some initial "warm-up" exercises a session started where each group was supposed to look at trends and scenarios of user behaviour in connection with food. This may be viewed as related to the contextual level in the vision-based model described in chapter 4. They were supposed to have a focus on both the main meals and also at smaller meals in between the main meals. As an initial help the session started with a mental visualisation exercise where the participants were supposed to look at different situations during the day where they were eating food, and connect their personal lifestyles and needs to general user trends. Then the group went on working and looking for general trends and tendency connected to food consumption. After the groups had developed and presented the trends and scenarios they were asked to play out two scenarios where users were having smaller meals in between major meals, see figure 7.10 as an example. The scenarios were supposed to be short with a duration of about one or two minutes. The participants got just a few minutes to prepare the scenarios, and it was supposed to be rather spontaneous.

Later during the workshop session the participants were lead in a longer mental visualisation exercise with focus on relaxation. This was in a phase when it was observed that the participants started to feel tired and needed a change and refill of energy. This exercise was held in another room, right by the workshop room, and was fairly dark. After an initial relaxation of the body and focus on the breath the participants were asked to envision a place where they enjoyed being. They were supposed to envision the whole context, the smell, the sounds, the surroundings, the colours, the people around etc. They were asked to stay in this place and envision that were really present at this place with their body and mind. This visualisation continued for about a minute where the participants were regularly given some help and stimuli to keep the mind in focus. Words were slowly said like: *"What are the sounds…? Try to hear the sounds… And try to look around. What is it that you like so much about this place?"* After a while the participants were asked to slowly regain consciousness in their body and their breath. Finally they could open their eyes. The whole exercise did not last more than 4-5 minutes.

During the workshop different play exercises were also used where the participants for instance were supposed to move and use their body. These exercises were also meant to be a change and recreation from the brainwork and thinking. The intention was that the participants should not sit too long in a chair without moving their body. A mental visualisation exercise was additionally held where the participants were lead to envision a future context. Afterwards the participants wrote stories in a circle from these envisioned scenarios, where they were forced to write further on each other's stories. The stories were later used as an inspiration for the concept development.

7.7.3 Observations of exercises and workshop

The scenario plays created a lot of laughter in both the group and in the audience. After sitting for while and analysing user behaviour and needs, a few respondents commented personally to the facilitator that it was useful to play out the scenario with their body through movement. It was interesting to observe that the session started more formally where the first group kept the time limits of just 1-2 minutes per each scenario. During the sessions it was observed that the plays "took off". The participants got very involved in the play and at the end the groups had problems to keep the time limit, apparently because they were having so much fun and got so involved in the play. The participants who were playing became after a while more spontaneous and "crazy", in the sense that they dared to do a lot more and would overplay the roles.

It was generally observed that the participants in the workshop became more relaxed and felt more comfortable as the workshop proceeded. The workshop was rather intensive and at the end of the day several of the participants expressed that they felt tired.

The researchers from the different institutes were not used to collaborating so much together. They had often been in competition for the same customers and industrial partners. The manager of SPIN expressed personally to me during the workshop that the participants were still holding back and were a bit afraid to share ideas, due to insecurity in regard to competition and ownership to existing projects. I proposed that he should tell this to the participants, which he did. This was done over halfway in the workshop, after the participants had had several exercises and were starting to feel more secure with each other. It was experienced that this short appeal to the participants had a positive effect. It was sensed and observed that the participants were in a somewhat even more collaborative mind-set afterwards.

7.7.4 Type of feedback from the participants

After the workshop, about a week later, the participants were asked to give feedback concerning the workshop and the use of exercises in the workshop. This was done through a short questionnaire, with 7 questions, that was sent out by mail. The questions concerning the mental visualisation exercises and scenario play were framed in this way:

What was your impression of the visualisation and relaxation exercises (where you closed your eyes)?
What impression and experience did you get from the short scenario play, where one was supposed to play user situations?

Besides these questions there were questions concerning the workshop, the use of products, the use of storywriting exercises, the use of play and body exercises and a question concerning further work and progression. 10 out of 12 answered the questionnaire. One participant did not answer due to the fact that he was off work on maternity leave, and the manager of SPIN, who also participated in the workshop, did not answer. Most of the written feedback from the participants was translated to English. The material was then analysed, where the intention was to present the different perspectives and viewpoints in relation to the use of scenario play, mental visualisation exercises and general play and body exercises in the workshop. In the following sections the feedback concerning scenario play and mental visualisation exercises and the general use of exercises is presented and described.

7.7.5 Feedback concerning visualisation exercises

Most of the participants gave a positive feedback concerning the use of mental visualisation and relaxation exercises, even though it was very new to them in such a setting. Several of them remarked that the exercises had helped them to regain energy and get more relaxed. One wrote for instance: *"The relaxation exercises helped so I lowered my shoulders, and cleared my thoughts due to more relaxed muscles. I felt almost that the circulation of blood to the brain got better."* Another participant remarked also that the exercises helped to get more concentrated, and that without such exercises it would have been difficult to keep up the whole day: *"It was enjoyable to relax and let thoughts fly. I noticed that I became a bit more concentrated. If not I would probably have been unable to keep up through the whole day."* Several of the respondents remarked that the exercises were stress reducing and one participant wrote that the exercises*"broke up the sequences well."* One participant also expressed that just closing the eyes made it

easier to relax: *"I think that the practise of closing the eyes made it easier to relax completely."* In the relaxation exercise, where the participants were supposed to find a setting they enjoyed, one participant described how he was completely in another setting and state of mind. He was fishing in a river and was just about to catch a big trout when he was asked to regain consciousness with his body. He told that he would have liked the exercise to be a bit longer so he could have had time to catch his fish. This participant told later that he already had training in meditation.

Several of the participants expressed that they appreciated such visualisation and relaxation exercises, but that they needed training. One wrote: *"Visualisation exercises are a method that we all should begin to use in a busy work day, but it is a matter of training. The sequence with the relaxation in the round room was really great. It could have been longer."* Another wrote: *"With training we can become cleverer and I am convinced that it can be an important tool for rethinking, creativity and innovation. Visualisation connected to storywriting was fun, it was maybe through storywriting that I first discovered that effect of visualisation."* This feedback seems interesting because some people sense first the effect of such exercises as a "stage setting" tool for group work in later stages of the process.

One participant wrote that the visualisation exercises function as a good initial tool for a discussion: *"I feel it is a technique that functions very well prior to group discussions. It gives us time to think more nuanced and visually about the experience connected to the product."* In this regard one participant also remarked that such an exercise took away some barrier for participating in group work: *"Visualisation helped me to take away some barriers to participate, but this is hard to evaluate clearly. Personally I felt it was fun to see other sides of persons that I normally only know from the objective side."*

One participant expressed that visualisation exercises were good tools for focusing the mind into a frame for working more creatively: *"The visualisation exercises functioned very well for me. It was of good help to disconnect from the stressful situation one arrives from, so it is easier to think creatively. It is easier to be creative "on command" with such a type of introduction."*

Finally, one of the participants seemed less positive, he remarked that the visualisation exercises were *"little inspiring"*, without giving further explanation. It might have influenced his impression that he came late to one of the first exercises. When looking at his overall feedback he appeared to be quite product and solution oriented, so it might be possible that the visualisation exercises were too "floating" and not enough concrete for him. In general, when relating to the feedback from the course in subchapter 7.4 it is clear that some people may need

more time to adapt and learn to appreciate and experience the usefulness of such exercise. It is nevertheless also important to not close for the possibility that some people will generally have less preference and more problems with the use of such exercises. Some people may have more problems with the process of closing their eyes and creating images in their mind.

In general, the feedback seems to have some similarity with the feedback from the course, described in subchapter 7.4. The participants in the workshop seem to put more emphasis on the positive effect connected to relaxation and stressing down. This seems to fit with the fact that they often have a stronger feeling of stress in everyday life than students have and that the workshop in itself was quite intensive.

7.7.6 Feedback concerning scenario play

The feedback from the participants concerning the use of scenario plays was also generally positive. Several of the participants experienced the scenario play as fun and as a good tool to quickly become aware of a situation. One wrote: "*There were many fun and recognisable situations.*" Another wrote: "*It was fun, and it put us quickly into a situation that is important in relation to new foodstuff.*" A third participant wrote: "*It was fun to look at others, it was engaging for everybody.*"

Some of the participants commented that scenario plays might help to bring forth ideas. One wrote: "*The plays had different qualities and some of them had a lot of humorous elements which is really nice. If the plays are good they can contribute to new ideas in relation to product development.*"

In the workshop no time was given to discuss the plays, due to shortage or pressure on time. One participant commented that it would have been nice with a discussion afterwards. It was expressed in this way: "*It is a good tool, but we should have had more time to comment on the situations and scenarios afterwards.*" This comment fits well with the experience made in the running of the innovation course. The discussions afterwards, connected to both a scenario play session or a mental visualisation exercise, are just as important as the play and exercise in themselves. It is important to give time for such a discussion. Such exercise can be a good starting point for a reflection, discussion and idea development in the group.

The scenario play was challenging for some of the participants. As described in subchapter 7.2 some participants may need training before they feel comfortable with such exercises. The participants can easily feel vulnerable standing in front of others. The following feedback reflects this: "*I'm not too fond of scenario play*

and those types of performances. I feel a bit stupid." For such play to become natural some of the participants may need time to adapt. In this sense a workshop lasting for just one day might for some participants be too short. It is also possible that some people are generally less comfortable with playing in front of others. It is also important to stage the play in a way so that the participants feel as comfortable as possible. Furthermore, it is important to place such play not too early in the workshop so people have time to become secure with each other. One participant commented in this regard: *"The play was well adjusted to the program since the group was already becoming more secure towards each other. "*

It seems also crucial that such play does not become too "foolish". As described from the observation some play became a bit too crazy and wild and the amusement and story around became more important than the insight connected to its use to the product. One participant also commented on this in the feedback: *"I think it is exciting as a method, but there was a bit too much foolishness in the workshop, my group had not planned any play, we just played a few ideas by ear. Two plays became too much. And maybe an example in advance would have helped us to create a good scenario play."* As expressed by this participant an example might help to better set the standard and frame for the play, and might possibly also make people feel more secure about what is expected.

In general, the feedback seems to have some similarity with the feedback from the course, described in subchapter 7.3. Scenario play was in this workshop just a short session compared to the course. In the course the students had time to adapt, which was not the case here. It might also to be the case that it is important that the play is rather concrete and effective, and that people can quickly see the problem related effect of such exercise. The school is in this sense more a playground than what a company is, as described in subchapter 7.5.

7.7.7 Feedback concerning general use of exercises

Many of the participants commented that the scenario play and general play exercises functioned well as a variation during the day and made the workshop less exhausting. One participant wrote: *"The division of the workshop into different phases made the day less exhausting, and it was easier to think creatively than expected."* Another participant wrote in relation to the play exercises that were put into the program: *"I was most surprised by the plays that were put into the program. It helps well in the sense that it clears your mind prior and during the sessions."* A third participant wrote: *"I liked the change between concentration and play, and was most surprised that I did not get more tired in my head."* A fourth participant wrote: *"Such exercises are a welcome break in a heavy thought demanding session."*

Several of the participants expressed that the scenario play and different play exercises during the workshop helped to loosen up the atmosphere and helped to create a shared feeling of trust. One of them described it this way: *"It was a positive experience with the play exercises. We are quite stiff-legged and this loosens up and creates confidence and trust. Trust is maybe viewed as the most important factor to create innovation."* Another participant wrote: *"Such exercises work as recreation and contribute to the socialisation between the participants."* A third participant wrote that he was very surprised over the positive attitude among the participants. The exercises seemed strongly to influence the general mood of the participants and it was observed that it was setting them in a positive, playful and receptive mood or state of mind.

One participant commented that the success with the use of exercises will depend strongly upon the facilitator who is leading the workshop: *"It depends a lot upon who is leading such an exercise, with the wrong person it can become artificial and halfway. With right leadership I think it is fun, it functions as rest for the "top floor", increases the team feeling and hopefully also the creativity."* The use of different play exercises was also described as challenging, especially since the different participants did not know each other in advance. A participant remarked, in relation to play exercises: *"It was challenging, especially with so many unknown people."*

One participant commented that it was important that there was a link between the exercises and the task at hand. In relation to the play and body exercises this participant wrote: *"Some of the exercises were not connected enough towards what we were supposed to develop."* Two participants commented that the play exercises were also a bit too long. One of them wrote: *"Play is a good tool to get closer to each other. Some sequences became maybe a bit too long."*

7.7.8 Summary / Conclusion

For an intensive concept development workshop like this one where the intentions and goals were both process and problem related the use of scenario play and mental visualisation exercises appear clearly to be fruitful tools. Just like in the course described in subchapter 7.3 and 7.4 scenario play and mental visualisation exercises seem to have both process and problem related effects. Many of the effects described from the courses seemed to be the case also for this workshop. The participants in this workshop put more emphasis on the relaxation and stress reducing effect of mental visualisation exercises and seemed generally a bit more concerned with the link between the exercises and the task at hand. In such a context it seems important that the exercises are short and effective. Nevertheless,

it seems also important to give time for a short discussion and reflection after the exercises.

7.8 Reflection and discussion

In this subchapter 7.8 a final reflection and discussion is made concerning the use of scenario play and mental visualisation exercises as a potential tool for creative collaboration in company projects. The questions asked and discussed are: What are the crucial factors for the implementation of such exercises in companies? Furthermore, what are the benefits of integrating such exercises in company projects?

7.8.1 Attitude in company

A crucial aspect in the integration and use of scenario play and mental visualisation exercises is the general attitude among the participants towards trying new tools and procedures in the design process. For many employees in traditional companies the use of scenario play and mental visualisation exercises would be quite unusual and different from their current practice. Like it was described in section 7.1.6 some people have the attitude that imagination and play is not serious and a waste of time, even though they are using unplanned play and imagination in their work. Such use is not planned, staged or systemised and it is not called imagination and play by itself.

It is tempting to ask the question: Will you get a conservative man from production to play theatre scenarios and follow visualisation exercises with closed eyes? And will he see the benefit in such an activity? This is a difficult question to answer, but the conclusion drawn in this thesis is that it is possible and probable. I have personally lead companies in seminars and workshops in creativity and I have many times been surprised to see how willing and open people can be if they are in the right setting and environment. It seems crucial that the exercises have some linkage to the task and problem at hand, see the description in section 7.1.7 and the conclusions drawn the case in subchapter 7.7. At least in the introduction of such exercises it is important to have facilitators who can stage and lead such exercises, see section 7.1.8. Furthermore, it seems important that the top management in the company supports the use of such exercises in the design process, see section 7.1.6. It seems also important that one has clever facilitators who are sensitive to the needs of the group and additionally know how to lead and stage such exercises so they are of best use for the group and company.

7.8.2 Combining mental and physical preparation

In relation to the motivation and attitude towards changes it seems important to have a phase of preparation where one talks with the participants of the team in advance and brings forth their scepticism, needs and worries. It seems important that the different participants are aware and open for the use of new tools in the teamwork and that they can come with suggestions that may make the exercises more optimal for their use. It requires therefore also that the facilitator has a right attitude which is open for suggestions and improvements. Participation in the change process and motivating for change is viewed as central in organisational change [Cumming and Worley 1997], as discussed in sections 2.4.8-2.4.9.

As discussed in chapter 5 it would be fruitful in the introduction of such exercises and tools to also make changes in the interior and work space. With a more optimal workspace, like through having the possibility to stage or use a performance zone, the task of introducing scenario play may be lowered. It is the conviction in this thesis that a change in work procedures and use of exercises should preferably be followed by a physical change in the interior and vice versa.

7.8.3 Type of project and adaptation

The usefulness and benefit of scenario play and mental visualisation exercises will depend on the type of project, as it was indicated in section 7.3.3 for scenario play. Scenario play and mental visualisation exercises seems most useful in projects where there is a strong focus on the user experience and where qualitative aspects of products are acknowledged and viewed as important. This would involve projects with products where the differentiation between the products was not so much technical but more based on aesthetics, user experience and social values. Still, it seems to be too limiting to relate these tools and exercises just to such projects. In any projects where there is some interest and focus on the user experience scenario plays may be beneficial. It is also important to underline that the use of scenario play and mental visualisation exercises does not only have a potential effect in the solving of the problem, it has also a potential process related effect. When viewing this insight to the extreme one could therefore say that there will be a potential usefulness of scenario play and mental visualisation exercises in any development projects where people are working together in teams. Additionally, one may also use role-play in the team to improve team collaboration, as discussed in chapter 6.

Both the scenario play and the mental visualisation exercises should be adapted to the specific context and culture in the company. Furthermore, they should be

adapted to the specific type of project. There seems to be a big challenge for the facilitators to find scenario play and visualisation exercises that are optimal and useful for the company in relation to the problem at hand. The exercises that are part of a change process should in general match the readiness for change, the capability for change, and the cultural context. Furthermore the exercises should not lie far beyond the capability of the facilitator, as described in section 2.4.8.

Just like in the course, the use of such exercises and tools will also require a period of training and adaptation of the participants before they may feel comfortable with the use of such tools. In the initial phase of introduction it is proposed, based on the experience and observation in class, that both scenario play and mental visualisation exercises may cause some reluctance, anxiety and discomfort in some of the participants. This was observed in the feedback from the case in subchapter 7.7. It is therefore important to motivate for the changes, create a vision for the change and develop political support for the change. Furthermore it is important to manage the transition and sustain momentum, by providing for instance resources for the change and build support systems for the change, as described in section 2.4.9.

7.8.4 The use of scenario play - where and when?

An important question to address is where and when in a project it might be useful to use scenario play in companies. On the one hand it may be fruitful to have short scenario plays in team meetings, as a change from just sitting in chairs for hours. There are few rational and useful arguments for the fact that people are sitting static and fixed in the same chairs for hours in meetings. This thesis supports the view described in section 2.2.9 that creative activity is also anchored in the body and is not just a mental process. With such a view one also learns and gets new insight through bodily activation and trying out and through the active play of different user scenarios.

Besides the usefulness of scenario play in small teams it is proposed, based on the results presented in subchapter 7.3, that the use of such play may be quite beneficial in the presentations of a project for external people. This appears also to be the case in event sessions and happenings promoted in chapter 6, where one invites users and customers and external people from the company to participate and contribute in the sessions, like Brandt and Grunnet [2000] has proposed. As it was reported in subchapter 7.3 the use of scenario play creates a personal and intimate form of sharing between the participants and is a tool to communicate more clearly some of the underlying intentions for the observers. Additionally, it also gives more room for the observers and audience to get their own impressions and ideas connected to the project. This is especially important when one is trying

to communicate the intended user experience of the product. The event sessions and happenings proposed have some similarity to the presentation events in the innovation class when the students used scenario play as part of the total presentation of their projects.

The use of scenario play as a way of presenting projects may also require a change in attitude from the audience and from users participating in the session. The introduction of such tool may thus have an impact on larger parts of an organisation. When the participants in a session do not know each other so well it might be fruitful to have less improvisation and more planned play sessions. So in such sessions the scenario play becomes mostly a way of presenting and communicating concepts and product suggestions. In a workshop session lasting for a longer time it would be possible to have more interactive sessions, where the audience may participate more in the play and in the forming of the story connected to the product. In general, when the design team is working alone scenario play may be used more as a conceptual tool and be more explorative. Scenario play exercises may then help to get ideas and a better understanding of the user context. This proposed variety and scale of play from experimental, flexible to mostly repetitive and "safe" is similar to the description of Berg [1999] on play, presented in section 2.2.3.

7.8.5 Interventions and target for change

It is important to mention that the use of scenario play and mental visualisation are target of interventions (section 2.4.10), which will not only have effect on the project team, but might also influence the department and whole organisation. Furthermore such intervention should not be isolated to human processes issues, when relating to the four interrelated organisational issues: Strategic issues, technology and structure issue, human resources issues and human process issues [Cumming and Worley 1997]. The students reported that the use of scenario play had an influence on the direction of the project. Such interventions are therefore strategic issues for a company. They will also be related to the last two issues, especially the human resources issues. These issues is discussed in section 7.8.9.

7.8.6 Adaptation to company context

In subchapter 7.3 and 7.4 it was described how scenario play and mental visualisation exercises could have both process and problem related effects in the innovation course. On the one hand these exercises were useful for the team spirit, the atmosphere, the awakening of fantasy and motivation and on the other hand

they were useful as creative and conceptual tools. Scenario play was especially useful as a support for internal and external communication.

In the course the students and I managed to create after a while a special atmosphere of openness and playfulness. In a stressful environment in a company with constant expectations and deadlines this might be more difficult to obtain. It is important when thinking about the context of a company to take into consideration the time pressure, cost, personal relations and history, as described in subchapter 7.5. This does not mean that such exercises will not have a similar effect in design teams in a company, but that some effects with the use of such exercises may be stronger while others may be less important. Many of the exercises can be adjusted and adapted and be quite short if this is the desire of the company.

Both mental visualisation exercises and scenario play will potentially have process and problem related effects in design teams also in companies. Such means will support the creative collaboration in teams, bot by influencing the spirit, mood, motivation for the project and will help a team to awake imagination and come up with new ideas. The two case in subchapter 7.6 and 7.7 supports this conclusion. Scenario play will also be a tool for internal and external communication. Still, to obtain such effects the exercises should then be adapted and adjusted to the specific needs, tasks and culture in the company. The way the adaptation and adjustment is done will also be part of a strategic choice of the company.

As described above there must be a general attitude where the participants are open for trying new procedures and tools. Furthermore, such exercises and presentations must be effective and not take too much time. One must have thought and had in mind the intended benefit of such an exercise prior to its actual use. The facilitator must be flexible and sensitive to feedback and manage to adapt and integrate the exercises to the specific situation at hand, similar to what presented in section 2.4.8 in relation to the skills of a organisational development (OD) practitioner. In the following sections some effects that might be more important in a company setting compared to a school or class setting are presented.

7.8.7 Change in role structure

In the case described in subchapter 7.6 it was described how mental visualisation exercises could help to get some of the participants more involved and engaged in the project. When relating to the three types of dialogue, discussed in section 2.3.8, one could say that mental visualisation is stimulating the inner dialogue among the participants. When the participants are having a visualisation exercise they all close their eyes, relax and have to look more inwardly at some personal

experiences or make some personal images. Such an exercise may therefore take away the mental focus from the external power struggle and positioning and may influence, at least temporarily, the fixed role structure between the participants, which was described in chapter 6. Through the sharing of personal experiences or images of products the participants may see and observe other sides in each other, stimulating interpersonal dialogue (section 2.3.8). They may for a period of time forget or see behind "the mask" or fixed role structure. The activity of sharing personal experiences, which they for instance had as children, may help the participants to keep in mind that they all are humans with needs and desires even though they at work have specific roles and positions in the development of products. The role structure and sectional interest seems not to be so dominant in a school setting. Process related effects that may influence the power struggle, role structure and positioning might therefore possibly be more important in a company setting than in a class or school setting.

The designers in the design teams have usually the strongest ability to visualise through sketches and drawings. The images and desires of the designers will therefore easily tend to dominate over the images of the other participants in the team [Rehal 1998]. They will therefore often naturally have a prominent or dominant role. The use of mental visualisation may then help so that the different participants can create and visualise their own images and get their own relationship and involvement to the task, as it was described in the case in subchapter 7.7.

The use of scenario play may also become a visualisation tool that is more democratic than sketching and drawing, and is stimulating interpersonal dialogue. In visualisation by drama the roles between the participants in the team will change, the designer might not have more experience or be an expert in the use of such a visualisation tool. Furthermore, as the students wrote in the feedback, several of the participants in the team has to contribute and be engaged at the same time in the play and the creation of images, so they are able to create a total scenario. In such a way scenario play might help to change and break loose the segmented or fixed role structure, which was described in chapter 6 as being one of the main problems in design teams. So both mental visualisation and scenario play are ways to develop concepts and ideas were all of the participants can be more directly involved.

7.8.8 Release of stress and concentration

Many of the respondents in companies told that they often felt stressed at work and felt they were running from one place to other, with telephones ringing and with the experience of being constantly disturbed. This feeling of stress, burden

and pressure seems to be greater than in the school setting, where students have a lot more time, fewer obligations and more room and time for trying out, reflection and learning in their process. This increased feeling of stress, combined with more mental illnesses among employees due to stress, is well documented [Eriksen 2001]. In interactive service work emotional exhaustion is becoming a growing problem among the employees [Forseth 2001]. Mental visualisation exercises for teams in companies seem in this matter to be a good tool to make people relax, focus and concentrate on the task, as it was discussed in section 2.2.8 and conclude from the case in subchapter 7.7. Such exercises do not have to take more than just a few minutes, which therefore may be quite effective in the aim to take away stress from the participants and make them more present. Furthermore, if a mental visualisation exercise can help to loosen up the fixed role structure, make people more relaxed and concentrated it will in itself be worth while. Mental visualisation exercises may therefore potentially have even greater process related effects in companies than in a school setting.

7.8.9 Scenario play exercises for wellbeing and recruitment

Some of the effects of play and imagery were described in the sections 2.2.7 and 2.2.8. Besides that scenario play and mental visualisation exercises help to create a better collaboration between the participants and also help in the concept development it will also give the participants more satisfaction and wellbeing at work. One could therefore say, when relating to the target for interventions by Cumming and Worley [1997] described in section 2.4.10, that one of the target for interventions will also be human resources issues. Some of the trends in industry nowadays seem to be that companies have to fight to get the best work force and employees; the company should be attractive for the employee. Several respondents also expressed that the company had to be attractive and interesting for recruitment and daily work. In the book "The dream society" Rolf Jensen [1999] talks about companies that are moving from the idea of "Hard Work" to the idea of "Hard Fun". In the attempt to get the best employees the companies have to offer work where play and fun are integrated. Fun in the sense that it is developing, entertaining and engaging, writes Jensen. Work should no longer be martyrdom. Thus, setting the stage for play and imagination exercises may also help to make the work life of the employee more stimulating and rewarding.

7.8.10 Process tools beyond just argumentation

Scenario play, storywriting and mental visualisation exercises are means to go beyond just argumentation and persuasion to make participants in teams more

open, trustful, receptive and collaborative. In this thesis it is argued and shown that it is not just by rational argumentation alone that one may open up for collaboration and a creative atmosphere and attitude in the participants. Sometimes such argumentation and persuasion actually functions the opposite way because people then feel forced to change and play a role. Nevertheless, such simple argumentation seems often to be the essential remedy in management literature for improving team collaboration.

The process of leading the course has on the contrary supported the idea that it might be better to use techniques where one for instance awakes childhood experiences and emotions, where one awakes openness and playfulness through for instance inner visualisation exercises and through the use of scenario play sessions. Through exercises one may, at least temporarily, actually influence the mood and attitude of the participants and lead them into a more receptive, playful and collaborative mood and state of mind. It is hard to argue and make participants understand the value of playfulness and collaborative mood if they do not experience it themselves and cannot relate to it personally. The experience made from teaching the innovation course is that the participants have to have concrete experiences themselves. The challenge is thus to change the mood and attitude of the participants by powerful exercises rather than just by rational argumentation and through the use of words. This mental change, which is possibly just temporal, may be accomplished for instance through the use of exercises that by nature stress them down, make them more present and lead them into personal experiences and altered moods through the awakening of their imagination, through the use of associations and images and through different types of focused play exercises.

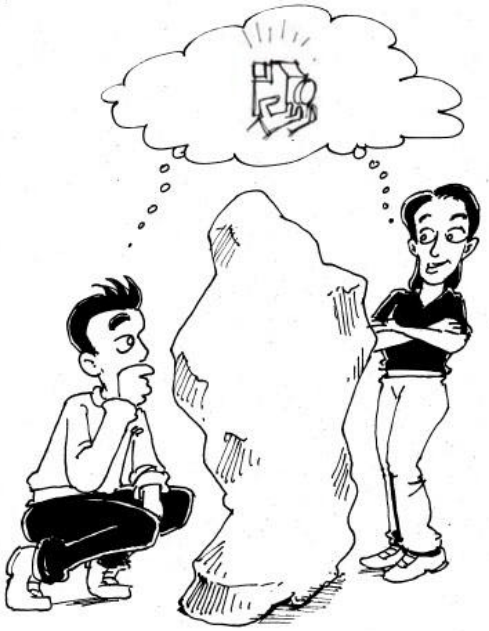
7.8.11 Conclusions

Scenario play and mental visualisation exercises have both process and problem related effects on team collaboration and seem to stimulate creative thinking and visualisation. This is the conclusion based on the results and feedback from the innovation course and from the two industrial cases presented in this chapter. The specific effects of scenario play and mental visualisation exercises reported from the course are presented in table 7.1 in section 7.4.5. In industry both scenario play and mental visualisation exercises may help to loosen up the fixed role structure and get all participants involved in the contribution of images and ideas. In industrial practice mental visualisation exercises seem to be especially important as a tool for relaxation and concentration in an often stressful day. It is important that such tools are adapted to the specific company setting. The target for interventions will be related to both strategic issues, human resources issues and human process issues for a company. Scenario play, storywriting and mental

visualisation exercises are means to go beyond just rational argumentation and persuasion to make team participants more open, trustful, receptive and collaborative in projects.

Chapter 8

Vision-oriented methodology



The real voyage of discovery
consists not in seeking new landscapes
but in having new eyes

- Marcel Proust

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This chapter is concerned with the following question: What kind of methodology may help to stimulate creative collaboration in the early phases of the design process? A vision-oriented methodology is proposed for the early conceptual phase in the design process. This methodology is closely related to the vision-based model that was proposed and discussed in chapter 4.

In subchapter 8.1 some definitions are made concerning concepts, the concept development phase and methodology. Viewpoints among the respondents from the qualitative interviews are presented concerning an early stage in the design process with more room for play and focus on user experience. In subchapter 8.2 some of the viewed drawbacks and limitations with traditional and existing design methodology are presented and discussed. The vision-oriented methodology, intended for the context of companies, is proposed in subchapter 8.3. The methodology, as it was used and taught at the innovation course and workshops is described in subchapter 8.4. In the following subchapter 8.5 the student evaluation of the methodology is presented and discussed. In subchapter 8.6 there is a discussion of the application of the methodology. It is proposed that part of the methodology may well be used in intensive workshops and this is discussed finally in subchapter 8.7.

8.1 Definitions and introduction

8.1.1 Methodology for concept development phase

Ulrich and Eppinger [1995] divide the product development process into five phases: Concept development, system-level design, detail design, testing and refinement and production ram-up. The vision-oriented concept development methodology proposed in this chapter is specifically related to the concept development phase in the total product development process. The methodology may possibly also be used in creative workshops and events that are part of the system and detail design phase.

8.1.2 Definition of methodology

With a vision-oriented methodology the initial focus and attention for the concept development is not initially the product itself. The initial focus lies on a vision for a desired user experience when interacting with other humans, with the product and with the environment. By looking at figure 8.1 the focus in the methodology can be seen. Traditional concept development methodologies [Ulrich and Eppinger 1995; Roozenburg and Eekels 1995] have after identifying customer needs a primary focus on the product (label 1) with the establishment of product specifications. The methodology described in this chapter has the initial focus on the interaction between different users (label 3), the interaction between user and product (label 2) and the interaction between the users and the surroundings (label 4). The surroundings include

other products that naturally may be related to the user situation, and will influence the user experience. The user's interaction experience is thus connected to the interaction with the whole surroundings, where the product is one of the elements. When relating to the vision-based model described in chapter 4 the initial point of focus and framework for making concepts is connected to the spiritual and contextual level. With this perspective one tries to develop products that support and invite for activities, interactions and sensations that give users the intended experiences.

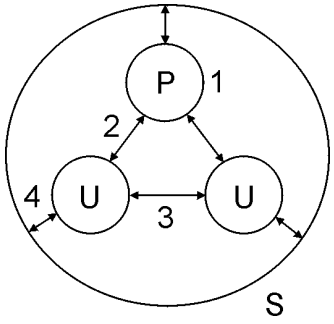

Figure 8.1. Interactions between the users (U), the product (P) and the surroundings (S)

In traditional concept development methodology one creates a specification list prior to the concept generation. In the methodology outlined in this chapter one develops value missions, interaction visions and scenarios as guidelines and point of focus for the initial concept development.

8.1.3 Definition of concept

When discussing concept development it seems important to define what one means with a product concept. In the book of Ulrich and Eppinger [1995] a product concept is fairly detailed and well worked out. It lies quite far down the triangle in the vision-based model that was presented in chapter 4; one has considered aspects of the product that could be related to the material level in the model. In this thesis a product concept may be less worked out, it is a manifestation and initial materialisation of an idea for a product. The way Ulrich and Eppinger [1995] looks upon a mission statement could almost be defined as a very abstract concept, since the main overall idea related to the new product is already defined. The way the mission statement is determined and developed is not clearly outlined by Ulrich and Eppinger.

8.1.4 Definition of 'abstract' and 'abstraction'

Since the word 'abstract' and 'abstraction' is used extensively in this chapter it might be fruitful to have some definitions from dictionaries. In Webster's dictionary [www1] it is written that abstract comes from the Medieval Latin word 'abstractus', which the past participle of 'abstrahere', meaning "*to drag away*". The word "abstract" is also defined as "*disassociated from any specific instance*" or "*expressing a quality apart*

from an object". In similar way Wordsmyth [www2] defines "abstract" as "*regarded apart from the concrete*" and "*expressing a quality or characteristic without regard to a particular instance or object*". As a noun 'abstract' is also defined as "*the concentration of the essential characteristics of something greater; essence*". Abstraction is defined as "*the act of removing or separating*".

In this thesis terms are used like "*level of abstraction*" and "*more abstract than*". When such terms are used it is in relation to the product that is under development. The value mission, which is presented during the development process, is viewed as more abstract than the initial concepts presentation. This is in relation to the product or concept under development. In the value mission one will use concrete means such as pictures, images and body sculptures. Nevertheless, in relation to the physical concept or product under development this presentation is more abstract or "removed" or "dragged away" than the concept presentation. The value mission is communicating "the essential characteristic / essence" or "underlying values and intentions" of the concept. Buur and Andreasen [1989] has made a division into two dimensions: 'undetailed – detailed' in one dimension and 'abstract – concrete' in another dimension. In this thesis this division is not made. The dimension that is most of interest is the 'abstract – concrete' dimension in relation to the product. Even though it is possible that a division into two dimensions could be fruitful in some discussions of concepts, such a division is generally viewed as making the process more complicated and theoretical than necessary. It is argued that little is gained in this context by making such a division.

8.1.5 Viewpoints towards an experience-oriented stage

In this section some of the thoughts, attitudes and viewpoints from the respondents in the interviews concerning a possible early stage for more play and focus on user experience are presented. The respondents were asked questions at the end of the interview concerning such a possible stage, prior to working directly on the product. This subchapter presents some of the feedback and views from the respondents concerning such an idea.

Many of the respondents told that the companies usually did not have such specific initial focus in projects. For instance, one PD-employee said that the user experience was discussed during a project, but that it was not a specific part of the agenda in an initial phase. He expressed it this way: "*It comes up often in the discussions, during the product or project meeting, but we do not sit down and say that we will discuss experience.*"

Many respondents in the companies expressed that they were generally positive and interested to focus more on user experience initially in projects or prior to projects. One PD-employee expressed however that it was important that they had support for trying out such methodology with top management. The need of support from the top management for changes is also emphasised in organisation development literature

[Cumming and Worley 1997]. He said that it would help a lot if the company had a visionary leader, and it was important that the use of more play and focus on experience should be approached in a professional way. Another PD-employee said that a preliminary phase with the focus on user experience could give a much more solid platform for the entire project. A third PD-employee told that their product development department now was actually trying to change the initial focus from product to humans. He said: *"We are now trying initially to change the focus from thinking product to thinking humans, how people meet, how they work, the need for each human being and group at the working place."* This PD-employee said that such an approach seemed to be much more motivating for the design team. He said nevertheless that they (the PD department) were struggling because they did not have real support and understanding from the top management in the company.

Several of the P-employees, who are often seen by others as being more product fixated (see chapter 6) expressed also the importance of looking beyond the mere product. One P-employee said for instance: *"It is important that we can free ourselves from all thoughts about products, we must look behind and see how we can find the ingenious thing which will give the customer a positive experience."* Another P-employee expressed in this regard that it would be important to select the right people from production in an early conceptual phase. As described in chapter 6 it is also viewed as important that people from production who are participating in conceptual meetings have the ability and willingness to change their role and perspective to be able to work more conceptually.

One designer remarked that Norwegian companies did not give room for a playful, more imaginative phase: *"We do not give room for a playful phase. It has something to do with the whole structure in Norwegian industry, we are a lot of small companies with relatively low profitability."* The general impression from the interviews was that there were several reasons why the companies did not initially put more focus on the user experience and give room for a conceptual, playful phase in projects or prior to projects. One of the major reasons seems to be the pressure on time and the pressure from ongoing projects. One designer would in this regard have liked to have the product development located at a different place from the everyday trouble and stress. He said: *"We have often said that the product development department should lie far away from the everyday tedium and run more conceptual projects to a certain stage. Have a rich abundance of thoughts there one could pick out from."* Another reason for this initial focus seems to be working habits; they are used to working in a particular way, and they do not have a methodology that may show how such a user experience-oriented stage may be arranged. A third reason is cost and money saving. The companies may be afraid to use time and allocate resources for a conceptual, more playful and imaginative phase since such a phase is more fuzzy, not so concrete and predicable than other phases, and may at first seem as a waste of time.

The designers were particularly positive to using more time in the initial phases of a project and put more focus on the user experience. The focus on user experience is also connected to a perspective, role and way of thinking that is close to what the designers

often are used to. Several designers said for instance that the initial phase in a project could be crucial for the outcome. One of them said: *"The early phase, the need and idea phase, the better it is argued, belaboured and matured, the better also the following development process will be… That you have an idea foundation that gives many possibilities and is basically so strong that you know it will cover real needs in the marked."* Another designer expressed in a similar way: *"I believe the thoughts and the synergies that come up at the start of the project are crucial for the end result."* A third designer said: *"I could like to try projects where one uses more time for the preliminary phases that in many cases go very quickly and in other circumstances are dropped completely. Because I think there is so much of importance that comes up here that one would benefit by putting in more resources."*

One designer told that the aim of designing for an optimal user experience could help serve as a good guiding factor and basis for evaluation in the design process. He said: *"Designing for an optimal user experience will on the one hand be a guiding factor in the design process. On the other hand I think it is very good criteria for evaluation when you are confronted with the situation where economical criteria, production criteria, technical criteria, aesthetic criteria are conflicting. In the end it should be the user's experience of the product that is decisive."*

As a conclusion, the general impression from the interviews is that the companies are becoming increasingly aware of and concerned with the need to put more focus on the user experience, and seem open to try methodology that put more focus on the user experience. Several of the respondents also commented upon the problem of making product specifications too early in the development process and giving room for a flexible and fuzzy front end in the initial phase.

8.2 Traditional and alternative design approaches

In this subchapter some of the viewed limitations and drawbacks with traditional concept development and design methodology will be summarised, based on the description made in subchapter 2.7. The alternative design approach of Hekkert [1997] is also presented and discussed.

8.2.1 Main drawbacks with traditional methods

In subchapter 2.7 some of the viewed limitations and drawback with traditional concept development and design methods by Pahl and Beitz [1993], Ulrich and Eppinger [1995] and Rozenburg and Eekels [1995] were presented. Some of the main points outlined were:

1) The design methods are very rational and linear, with a progression through discrete stages, where creative thought can largely be contained within a single box that contains conceptual design or synthesis.

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2) The design methodology is viewed as largely independent of the designer or design situation. Little is said about the surroundings and space where the design team is meeting.
3) The design methods are viewed as independent of the user context. The user context will just be one of many criteria in the specification phase.
4) Product specifications come prior to synthesis, so one is specifying the solution space prior to the development of concepts. This will easily lead to fixation to existing solutions.
5) The methods are not in themselves connected to motivation, engagement and inspiration. Such aspects are viewed as separated from the methodology.
6) The methods are according to several authors not so much used in industry and they do not embrace tacit knowledge.
7) In the methodology nothing is mentioned about the use of the body as an integrated part of the development process. All activity is supposed to happen in the head.
8) The methods put little emphasis on the specific team composition and aspect connected to creating a shared team spirit and shared vision as an integrated part of the methodology.

8.2.2 Further discussion on traditional methods

In addition to the above points, the traditional methods do not mention or say very little about the use of scenarios, play and mental visualisation as active tools in the design process. In the previous chapter 7 such tools were reviewed and described as fruitful for creative thinking and collaboration in the design process. The traditional design methodologies are also not concerned with the context in which the group is meeting, as discussed in chapter 5, and do not view the arrangement of room and space as part of the design approach. One may imagine that the researchers that present these methods imply that the design group is sitting around traditional tables in traditional meeting rooms. The importance of the space and room is barely outlined and mentioned in these traditional design methods.

The methods are, as above mentioned, very rational and say generally little about the group process. The authors of such methods do not seem to make a link between motivation, inspiration and the design methodology. It is a claim made in this thesis that a method and way of approaching a design task should in itself also be motivating and inspiring for the designer or design group. In such a way the chances are greater that the team will actually use the method. As described in section 2.1.6, motivation and inspiration are central elements for creativity and creative collaboration.

The viewpoint in this thesis is that one should develop some kind of specification for most products. The question is at what stage in the project. In the concept development methodology proposed in this chapter one develops missions and visions prior to the concept generation and use product specifications later in the development process. In traditional methodology specifications are supposed to come prior to the concept generation. When a design team is starting too early with product specifications and

requirements it is argued that it may kill the playfulness and also the motivation and inspiration for the project, which is central for creativity and conceptual thinking. Additionally, as discussed in section 2.7.4, when one is setting product specifications in an early phase one will easily lock the solution space for the product to existing mind-set.

Product specifications are generally related to the principal and material level in the vision-based model (in chapter 4) and are thus directly linked to the solution space for the product. The development of missions and visions, which are described later in this chapter, are related to the spiritual and contextual level in the model, and may be viewed as a focusing tool and guideline in the development process. The focus in visions is on the user context, the user needs and the user's interaction with other users, the environment and the product. In figure 8.2 the difference in approach is proposed and illustrated between the traditional concept development methodology and the methodology proposed in this chapter, which uses missions and visions as initial guideline in the concept development.

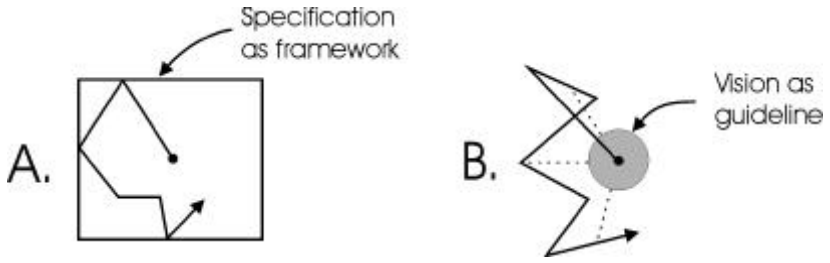

Figure 8.2. Two ways of approaching concept development.

8.2.3 Design approach by Hekkert

In this section the design approach by Hekkert [1997] is presented and discussed, since this approach has been used as an inspiration for the development of the methodology presented in this chapter. In many ways this approach seems to fulfil some of the drawbacks experienced with traditional methodology.

In the later years, several authors have suggested that design methods and approaches should be more vision-oriented, qualitative and user-experience oriented towards the design task, see subchapter 2.8. Hekkert [1997] and colleagues developed a design approach, called the ViP (Vision In Product) approach, that puts more emphasis on the development of a user-product interaction vision and product vision as guiding principles for the design process. Inspiration for this approach came from interviews with designers, and their way of approaching a design task. It is based on "*the generation of a product vision, a view or understanding of a new relationship between a future product and a future environment*". This approach consists of four steps:

1. Destructuring or breaking down the old context
2. Creating a new framework or context

3. Developing a vision for the user-product interaction vision and a product vision
4. Generating concepts based on the interaction vision and product vision.

The destructuring step consists of breaking down the old problem space where the designer tries to get hold of all kinds of knowledge, conventions and assumptions regarding the problem. In the next step the intention is to create a new framework or context. This can be based on unease with the current situation or drawing a picture or scenario of a future context. The next step is to develop a vision for the user-product interaction vision and a product vision. In courses and workshops where this approach has been used the interaction vision and product vision consisted of qualitative keywords, eventually followed by some chosen visual images. The interaction vision could consist of words like power, responsibility, sensuality, efficiency and would be connected to the qualitative aspects of the relationship and interaction between user and product. Equally, the product vision could consist of words like soft, aggressive, distant, sharp, transparent and would be connected to the qualitative aspect connected to the product. Based on these two visions new concepts should be derived, where the visions are guiding principles and a basis for evaluating the concepts.

8.2.4 Discussion of ViP approach

The ViP approach is viewed as an important step and contribution in the direction of design approaches that put more emphasis on the user experience and contextual aspects of products. Nevertheless, some shortcomings and drawbacks in this approach will be discussed in this section, as a background and source of motivation for developing a methodology, presented in the following subchapter 8.3.

Strong focus on keywords
In the ViP approach there is a strong focus on the use of keywords to describe the vision, which is the guiding tool for developing concepts. In the first innovation course the main focus in the visions were also keywords. The problem is that qualitative keywords are very abstract and do not necessarily challenge the designer or design team to have a conscious understanding of the words and see the consequences of these keywords in practice and concrete situations. Furthermore, when the keywords stand alone, without any concrete visualisation and concrete examples, they easily tend to be personal, and it may be hard for external people to understand what the designer or design team has in mind. It is hard to have any discussion on such a vision since it is so abstract, and every person will make his own interpretation of the words based on his own experiences. This problem will be especially pronounced in companies because the development work is not done so much individually, but a lot through teamwork. It is the viewpoint taken in this thesis that a stronger focus on the use of concrete images, metaphors, short sentences and sequences of images in stories, both poetically, visually and bodily, will make visions more concrete and easy for others to understand. It will also make the visions more motivating and real. Just the use of language is problematic for the interdisciplinary dialogues, since there is not only one

language but rather an aggregate of language games [Lundequist 1984]. Words need therefore to be complemented by the use of images [Rehal 1998].

Step from vision to concept
With the use of mostly abstract words and eventually some visual images it may be hard for the design team to move from a vision to a concrete concept that should incorporate the vision. In the running of the innovation course it was observed that the step from vision to product concept is the crucial and difficult step. The visions proposed by Hekkert are viewed as good tools for the qualitative evaluation of concepts, but as less good tools as a source for exploration, conceptualisation and the development of concepts. This will be clearer in the following subchapter, where the methodology is presented.

Relation to company context and design phases
In the approach there is not much emphasis on how the approach should be related to a specific company situation and to existing methodology. In what type of projects is it valuable to use such an approach? How should it be related to existing practice? The approach does also not indicate how or when specifications and design criteria should be incorporated to the design activity, which seems to be crucial in real development projects for companies. There is therefore a danger that the approach may lead to concepts that do not fit to the real needs of the company. It will be argued that the approach lacks a specification-based stage as part of the procedure.

Focus of interaction vision
In the approach the designers should develop a vision for the interaction between user and product and a product vision, but there is no apparent focus on the interaction between different users and between the users and the environment/ surroundings as a conscious, potential part of the vision. In the approach there seems also to be no apparent focus or emphasis in the interaction vision on the kinaesthetic aspects connected to experience, proposed in the vision-based model in chapter 4. The overall interaction experience is not described as a sequence of action and activities evoking potentially several different user experiences.

Communication of vision
The approach has no apparent emphasis and focus on how the visions should be communicated optimally both internally in a team and to external people so they may sense, experience and understand the intention and content in the vision. How may others have a true understanding of the intentions in the visions? From the running of the innovation course this seems to be a central question.

Closely related visions
In the approach the design teams should develop both a vision for the user-product interaction and a product vision. It is the viewpoint taken in this thesis that this may easily lead to too many words. Confusion between the interaction vision and the product vision may be the result. In the first innovation course the students developed both an interaction vision and a product vision. It seemed then that some students had

some difficulties in differentiating between the two visions. The product vision seemed additionally to take away some of the attention and focus from the interaction experience and lock the students too early into defining the properties of the product, rather than focusing on the total user context, interaction quality and experience.

Focus on spiritual aspects
The ViP approach does not seem to consciously challenge the designers or design team to have a reflection on spiritual aspects such as underlying values, identity, myths, intentions and purpose. Such aspects are related to the spiritual level in the vision-based model, proposed in chapter 4. This may lead to concepts that do not have a reflection and basis on deeper values and intentions.

Supporting exercises
In the approach by Hekkert practical exercises and training for working abstractly are not emphasised as an important part of the learning process. The experience drawn from the innovation course (discussed in subchapter 8.4) is that without such training it may be hard for some students to work in an abstract and vision-oriented way.

Overlap in phases
In the ViP approach one avoids working with concepts in the early phases. The question is if the designers or design team gets more fixated by the ideas they have in their head since they are not allowed to express them. In the methodology proposed in the next subchapter it is accepted and even recommended that the design teams write down product ideas in the early phases. Rather than talking about separate phases it is emphasised that the main focus in the different phases lies on different levels of abstraction. In the innovation course it was observed that the development of concepts helped the student groups to get a better understanding of the vision and better see possible consequences of the vision at an early stage. Rather than moving a linear way from an abstract vision to a concrete product concept one should move up and down in abstraction many times, as discussed in chapter 4.

The active use of the body and play exercises
Just like it was emphasised with traditional methodologies the ViP approach does not mention or put focus on the use of the body as a tool for concept development. The conscious use of play and visualisation as tools for conceptualisation is not described as a part of the approach.

8.3 Vision-oriented methodology

In this subchapter a vision-oriented concept development methodology will be proposed and presented. The methodology consists of the following main elements:

1. *Development phases*
2. *Arrangement of space*
3. *The use of exercises*

4. Workshops and events
5. *The vision-based model*

The arrangement of space was discussed and reviewed thoroughly in chapter 5, and will be brought up again when describing the course in subchapter 8.4. The use of exercises was discussed and reviewed in chapter 7, and will also be brought up again when presenting the course in subchapter 8.4. In chapter 6 the concept of having events and conceptual workshops was discussed and will be discussed in relation to the development phases. The vision-based model and how it is used was proposed and discussed in chapter 4. It will be central in the discussion of the methodology. In the following sections the different development phases in the methodology will be proposed and discussed.

8.3.1 Suggested development phases in the methodology

The proposed development phases in the vision-oriented methodology are presented in figure 8.3. The first phase proposed is the development of a context and trend overview. The following phases, the development of a value mission, interaction vision and initial concepts are part of what is called a vision-based stage. The last three phases the development of target specification, refined concept and development plan are part of what is called the specification-based stage.

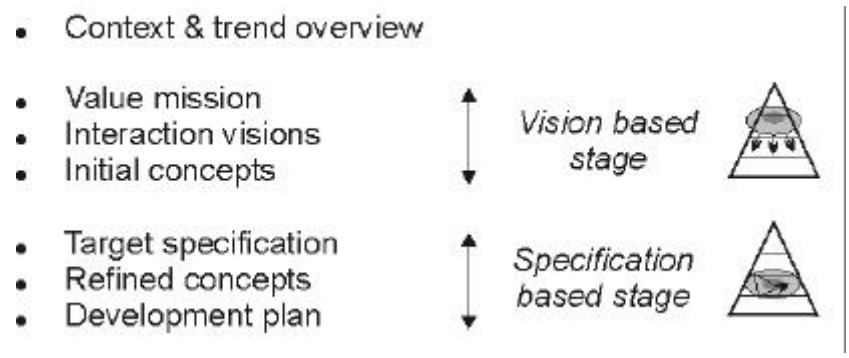

Figure 8.3. Suggested development phases in the methodology

Not fixed linear approach
The different development phases, proposed in figure 8.3, are phases that a team may choose to do. Depending upon the project some phases may be dropped or given less attention. Within each phases there are specific things to do. The phases are not linear, in the sense that one has to start with the first phase and then moves to the next. In the development process it is recommended that the design team should alternate between different phases. For instance, after developing specifications the team may return to work with the initial concepts and also make changes to the value mission and

interaction vision. As one starts to develop initial product concepts and gets a better grip of the problem the mission and vision will often change. The mission and vision should continuously be updated. It might also be fruitful to return to the context and trend overview after the development of initial concepts, when the team knows more what type of concept they are aiming for. In real projects it is also well possible that one alters the sequences in the phases, starting with developing product concepts then developing a value mission and interaction visions. As a design team becomes acquainted with this methodology they may find ways of approaching the design tasks where they move back and forth between the phases. In some projects, which are related to redesign, it may be best that a design team drops the vision-based stage and goes directly to the specification-based stage. Too much focus on the vision-based stage may take unnecessary time if the team already knows what type of project and product concept they are supposed to develop. Different ways of approaching the methodology will be discussed more in subchapter 8.6.

In the methodology evaluation is not a separate development phase. Evaluation will be an ongoing process in all of the phases. There will for instance be an evaluation process in the value mission development, in the interaction vision development and in the initial concept development. In traditional methodology [Pahl and Beitz 1984; Roozenburg and Eekels 1995; Ulrich and Eppinger 1995] evaluation is a specific task along the way, but in this methodology synthesis and evaluation are interrelated and closely linked and not separated into different boxes. This methodology views design activity more as reflective practice, with a 'reflective conversation with the situation', as proposed by Schön [1983].

The first part of the methodology is called the 'vision-based stage', while the other part is called the 'specification-based stage'. The differences with traditional concept development methodology are especially important in the vision-based stage, with the development of value mission, interaction visions (with provocative and goal visions) and initial concepts prior to the setting of target specifications. In this stage there is a main focus on user experience, scenarios, underlying intention and values. It could thus be viewed as a vision-based and playful stage prior to traditional concept development methodology. The vision-based stage has resemblance to the approach by Hekkert, even though there are some fundamental differences, which will be outlined in this subchapter. The specification-based stage has resemblance to traditional concept development methodology like the one described by Ulrich and Eppinger [1995].

Divergent and convergent subphases

Each development phase from the development of value mission to the development of refined concepts will have divergent and convergent subphases. It will be important to give room for an initial divergent subphase where one is less critical and then have a subphase where the team is more critical and selective. This is illustrated in figure 8.4.

One could describe the divergent subphase as a phase for searching, "evaporating", coming up with associations and ideas in the head, and creating for a while a state of chaos. In this phase the group should be less critical, open for 'crazy' ideas and mostly interested in coming up with suggestions and generating many different ideas, somewhat similar to the initial phase in brainstorming, suggested by Osborne [1953]. The convergent subphase would be the phase where the team should make evaluations and selections and be more critical. One could describe this subphase as a "condensing" phase where the team creates order and made selections. The idea of divergent and convergent subphases should be understood in a general way. It is not always so that a design team will start a new phase with a divergent subphase. The team will also fluctuate between divergent and convergent thinking during a development process. Nevertheless, general speaking, a phase will often start with an associative, open and "evaporating" subphase while it will end with a critical, evaluating and selective subphase.

In the innovation course one group described its own process as an ongoing, circular 'order and chaos' process, making the coupling to the model for the creative process, in chapter 4. The group had to go through these subphases, even though for each process they were on a different level of abstraction, since the value mission is for instance more abstract than the refined product concepts in relation to the product. The degree of broadness in each phase would generally depend upon the type of project and on the time available for such a phase. When relating to the illustration in figure 8.4 one could thus say that the width in the search in each phase could be different.

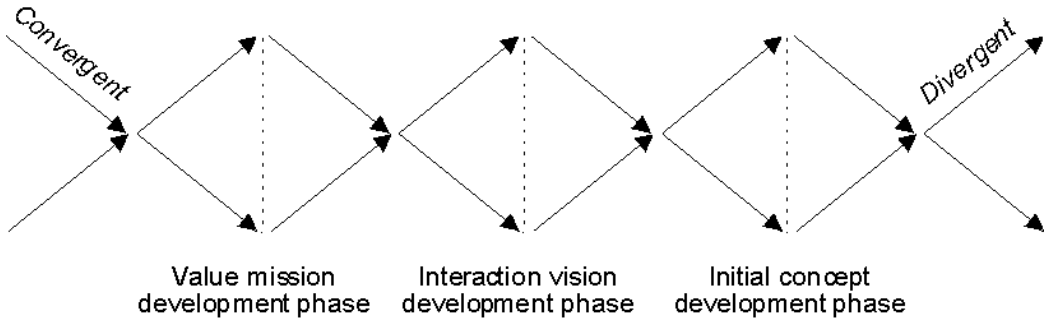

Figure 8.4 Divergent and convergent subphases within each development phase

In the following sections each development phase will be described with main focus on the phases within the vision-based stage, since these phases are viewed as the main contribution to the area of concept development methodology in product design and development.

8.3.2 Context and trend overview

Existing user context
In this phase the task is to look at the existing user context in relation to existing products. In this phase one is trying to understand the existing product (and competing

products) in relation to the different levels in the vision-based model. What kind of activity and interaction is the product connected to? What kind of fundamental needs can be connected to such products? What are the underlying values, myths and intentions? How do the existing solutions satisfy the customers? In this phase one may try to make interviews of customers concerning the product, as Ulrich and Eppinger [1995] have suggested in the phase of identifying customer needs. In the research the design team may also ask and use different types of experts that may contribute with insights and ideas to the design task. It may furthermore be fruitful to participate and observe customers using the existing products and note down potential lacks and needs for improvement. Video recordings of users in action might also be a good way to collect material and understand user needs [Buur et al 2000]. With attention especially on the contextual and spiritual level the team may try out the existing products as users and sense what kind of interaction experience they give and see what kind of interaction with other humans they are stimulating. It will be fruitful in this stage that the design team tries to empathise with the users and try to involve themselves with the user context and situation. Furthermore the team may try to reveal the underlying values and intentions behind the existing products.

Future trends

In this phase it is also suggested that one should try to study and look at future trends concerning the activities connected with the product, similar products and with society in general. Such future trends can be based on literature search, on feedback from the customers themselves and from reflections made up in the team. Questions that may be fruitful to ask will be like: What will become more important in the future, what are the changes that are seen in life style and customer behaviour, what are the changes in competing products and other types of products? What do we believe is central in future activities and in future interactions with products? What are becoming more important values? One should also ask what kind of values, image and user experience the company wants to communicate and have as part of their future brand and corporate identity.

Focus on interaction

In the case where the company is intending to develop new product areas and families, which is not already existing, the design team should try to focus on activities and interactions both between users and between different users, and put less attention on the products. It is then especially crucial that the team is able to relate to the contextual and spiritual level in the vision-based model when they are studying and looking at different products. This attempt to focus on the contextual and spiritual level in relation to existing products and to visualise and look at future trends is also a way to break loose and get beyond the existing conditioning and the existing solution space. The focus in this phase should also generally depend upon the degree of novelty the company desires in the project. If the company wants radical innovation one may eventually look at more radical and far-sighted suggestions for future trends.

In this development phase the aim is to get an understanding of the existing context and the underlying needs, not least on the contextual level and the spiritual level. The

aim is to get an understanding of the trends in the marked, both in the area of the existing product and more in general. With a good basis and understanding of the existing context, combined with an understanding of future trends it will be easier to move into the other development phases, which will be the development of the value mission, and interaction visions or initial concepts.

Final material
This phase may end into a list of needs, which may be both very abstract and concrete, related to the spiritual, contextual and principal level in the vision-based model. It is fruitful to show the needs connected to images and statements given by the users in the context. This phase may also end into some general guidelines about future directions, trends and scenarios as a frame for developing the value mission and interaction visions.

8.3.3 Value mission

The value mission in this methodology consists of 3-4 keywords, combined with visual images that visualise the main underlying values connected to the identified needs. Such a value mission is related to the spiritual and contextual level in the vision-based model. In the development of such a mission it will also be fruitful to have the strategy of the company in mind. At the same time, the mission should be project specific. The value mission will be based on the context and trend overview. In the innovation course the value mission was presented together with this overview.

In the innovation course described in subchapter 8.4, the students were also asked to make different bodily sculptures to express the mission through the use of the body. The expression through the use of the body challenges the design team to become more conscious and aware of their mission and furthermore helps to communicate the mission through concrete expression. The mission may also consist of some short sentences describing the underlying value and purpose relating to the fulfilment of the user needs. It can for instance consist of short aphorisms, expressing some fundamental insights.

Focus on spiritual level
The process of working with such a value mission assured that the team took into account the aspects connected to the spiritual level. The intention with the development of such a mission is, among others, to force the design team to reflect on the fundamental, existential needs of the users in the context. One may also view the development of the value mission as part of the group process and as a preparation for the development of the interaction visions. One student in the innovation course gave this feedback that can support this interpretation: "*Through the development of the*

interaction visions we became a lot more free than in the development of the value mission. This helped us to open so wee could see things from different angles."

The suggested **value mission** can be expressed through a combination of:

1. *Qualitative keywords*
2. *Visual images*
3. *Bodily sculptures and expression*
4. *Short sentences and aphorisms*

In this methodology the value mission is usually developed prior to the visions. Kunde [2000] uses the term mission and vision in a similar order as here (the mission prior to the vision), but it is then related to companies. He describes that a company mission should create "*higher involvement*" and should be connected to values and attitudes. It is the foundation and is connected with "*the soul of the company*". When relating to the company he describes that the company vision on the other hand should be "*a leading star that one should strive after*", it should be "*a mental image of a desired future situation*". In the course one student described his experience of the difference between the mission and vision in this way: "*My experience was that the mission made the possibilities broad while the vision made the process more clear and focused.*"

In relation to the mission for a product the value mission is intended to be the underlying foundation for the product and is connected to the fundamental needs, values and purpose. It can be related to the spiritual level in the vision-based model in chapter 4. One student wrote: "*The interaction vision described how the product is used in the context while the value mission described the values of the product in the context in use*." Another student wrote: "*It is good to have the value mission as a platform for the development of the interaction visions*." The interaction visions are supposed to be both guiding principles and conceptual tools, helping to describe an overall image with scenarios for the intended user experience. It may be viewed as more concrete, active and specific than the value mission. One student expressed the difference in this way: "*The value mission lies in the bottom of the interaction visions. The interaction visions are a sort of enlarging and exemplification of the value mission.*" A bit similar another student wrote: "*The difference lies in the level of deepening, exemplification and the use of senses.*" A third student wrote: "*The interaction visions were more active than the value mission and contributed in such a way that we got more involved in the design task.*"

In some projects where the underlying values and intentions already are decided one may drop the value mission and work just with the interaction visions, having the spiritual intentions in the "back of the head".

8.3.4 Interaction visions

In this phase the design team should develop interaction visions. The development and depth in the visions will depend upon the general time available for this stage and on the type of project. The visions should be developed based on the insight made from the context and trend overview. In the methodology it is proposed that two types of interaction visions should be developed: *Provocative visions* and a *goal vision*. This is illustrated in figure 8.5.

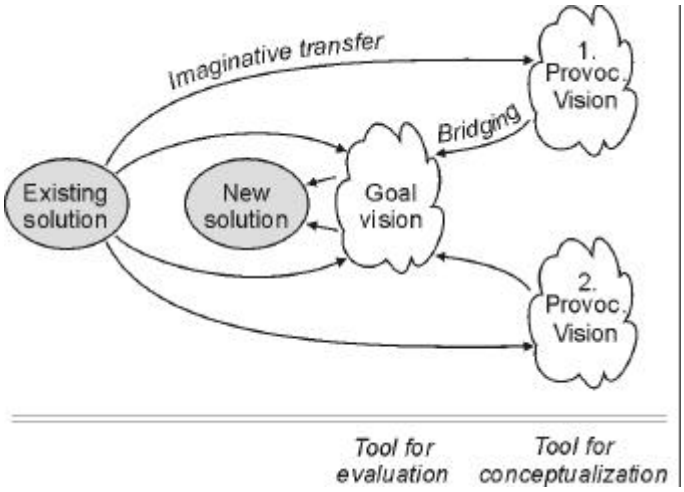

Figure 8.5 Illustration of the development of the interaction visions

The goal vision is a tool for evaluation and reference in the design process, as proposed in figure 8.5. The goal vision should contain the intended interaction qualities, based on the need finding and analysis made in the context and trend overview. Such interaction quality should incorporate the interaction between the different users, the interaction between the user and product and the interaction between the user and the environment, as illustrated in figure 8.1. The provocative visions are on the other hand supposed to be tools for conceptualisation, imagination and enlargement of the solution space and the understanding of the problem. One student wrote in this regard: "*The provocative visions made the solution space larger.*" The provocative visions should function as mental laboratories for conceptual thinking in the concept development. In the provocative visions the context and framework is imaginative and different from the development context, which is related to the goal vision. This is illustrated in figure 8.7.

In the provocative visions one should take elements from the goal vision and bring them further out and make exaggerations, almost to the extreme. In this regard one student wrote: "*It was nice to bring things out to the outmost consequence that can*

give new ideas and thoughts for the goal vision." Several students expressed that the provocative visions helped to get a better understanding of the goal vision. One of them wrote: "*We got a better picture of the goal vision through the provocative visions.*" Another wrote: "*To work with a goal vision while you at the same time are developing provocative visions helps so you stay in focus and can see the relation between the extreme and what you really want.* "

How far out the provocative visions should be will depend upon the type of project. The provocative visions are tools to break the fixation to existing solutions, which is a general problem in relation to creativity, as described in section 2.1.7. In this regard one student wrote: "*The division between the provocative visions and the goal vision helped so we felt more safe to create debauched and abstract provocative visions. One knows that they should be so. At the same time it felt good to also develop a goal vision, because we then could pull the thoughts back 'down to earth'.* " In this quote one can also read that since the provocative vision are supposed to be a bit 'far out' and different from the goal vision the students feel safe to enter the play and be 'crazy', playful and imaginative. The methodology is therefore inspiring for play and imaginative thoughts. The methodology is nevertheless taken seriously since the team should also develop a 'serious' goal vision, as a counterbalance. They have the 'serious' goal vision as reference. This is important. In a design team consisting of many people from the company it seems that the major challenge in the development of new concepts is often to break loose from existing fixation, as discussed in chapter 6. One designer remarked in this regard that the different members from the company would usually try to bring the concepts towards the normal. The development of provocative visions will then stimulate for play and imagination, and help to bring forth ideas that are more radical.

Make the familiar strange

It is important that the provocative visions should be inspiring and provocative for the thought process, and give new ideas for the development process. One student wrote about the provocative visions: "*To be able to develop a new product I think it is important to pull things out in several directions. Some suggestions should be conservative and while others should be "far out". Then one will hopefully land somewhere in between.*" The challenge for the design team is to develop provocative visions that they experience can help and give inspiration and new perspective in the concept development, even though the final concept might not be directly carrier of the provocative visions. One student wrote: "*The goal vision is something we will try to achieve with the product. The provocative vision is something behind the product that may or may not be achieved*." It is also important that there is a link between the goal vision and the provocative visions. The provocative visions should not be drawn out of the blue, but more reinforce desired elements from the goal vision. There should therefore be a clear link between the provocative visions and the goal vision. In the innovation course it was observed and experienced that some of the provocative visions by the students were not enough linked to the goal vision and were therefore not used much in the later phases of the development process. The development of these vision became then mostly just mind exercises. One student wrote: "*I feel that*

some of the provocative visions were a bit too far out to be a framework for new products."

The provocative visions are a way to integrate directly the imaginative bridging technique, described in chapter 7, into the vision-oriented methodology. They build on the viewpoint and experience made in Synectics theory, which says that one should "make the familiar strange, and then make the strange familiar" [Gordon 1961]. The provocative visions may be viewed as a systematic approach to make the familiar strange. The number of provocative visions that are developed in the concept development may vary, depending upon the task. It seems reasonable to suggest two or three visions, which draw elements of the goal vision out in different directions and extremes.

Fantasy contexts and scenarios
It is proposed that one should develop fantasy contexts and scenarios as central element of the provocative visions. Such scenarios should be build up by short stories, images and drawings. The fantasy context can for instance be connected to another time, for instance ahead in time. The visions would then have some resemblance to the visions developed in backcasting techniques. The fantasy context could also be a mythic world with brownies, elves and trolls. It could furthermore be another planet with beings or creatures that are more or less similar to human beings, but who have developed a quite different culture and way of interacting with each other. It is proposed that in the stories the team should not focus too much initially on the products, but more on the overall context, values and culture. In the innovation course the students developed scenarios and stories from other cultures and other time periods (both back in time and far ahead in time). The focus lies then mainly on the spiritual and contextual levels in the vision-based model in chapter 4.

The suggested **provocative visions** can be expressed through a combination of:

1. *Short story describing the fantasy scenario and context*
2. *Qualitative keywords*
3. *Visual images and drawings*
4. *Short scenario play with sounds*

Content in goal vision
In the methodology the goal vision should consist of qualitative keywords, poetic and visual images, metaphors and scenario plays. It may also be fruitful to create a short video film and scenario that is expressing in different ways (form, movement, expression, sounds and tactility) the intended experience. The qualitative keywords can be words like challenging, playful, sensual, intimate, rough etc. The poetic images and metaphors can be images like: "the warm cup of tea in the hand", "enwrapped in the featherbed", "walking in wet sand", "twisting the cloth", etc. The link between the

keywords and the poetic images can be in this way: “Intimate like a sleeping child against the chest” or “intimate like a soft teddy bear around the arms of a child in bed.” The scenario plays should be made with bodily movement, gestures and expressions and the use of sounds & music, but with no use of words, which would make it too concrete at this stage, see chapter 7. In such scenario plays one may relate the interaction experience to different moods and characters within the same users, rather than relate it to different standard user characters and archetypes. The need and the interaction experience of the users may differ depending upon the initial mood and character of the users. Is the user in a tired and introvert state or is the user in an extrovert and happy state in the specific user context when he is interacting with other humans, with the product and with the environment? The intended interaction experience may embrace different initial moods and characters of the users or be specifically connected to one mood and character.

The suggested **goal vision** can be expressed through a combination of:

1. *Qualitative keywords*
2. *Visual images, also in sequences*
3. *Poetic images and metaphors*
4. *Short scenario play with sound*
5. *Short video cuts*

Keywords, images and scenarios

In the development of the visions it is recommended that one should alter between keywords, poetic / visual images and stories / scenarios. This is a technique that has been developed during this doctoral project. The scenarios can be viewed as a sequence of images in a context. The scenarios can give many images and keywords, which can lead to new stories. Different qualitative keywords can on the other hand be associated with several images and lead to many different stories. The change and switch between these three forms of representation seem as a quick and effective way to come of with many ideas and create a shared understanding of the vision in a team. In the last innovation course in spring 2001 the students were taught this technique, and the students used the technique as a help in the development process. The relation between the qualitative keywords, the visual / poetic images and the total scenario is illustrated in figure 8.6.

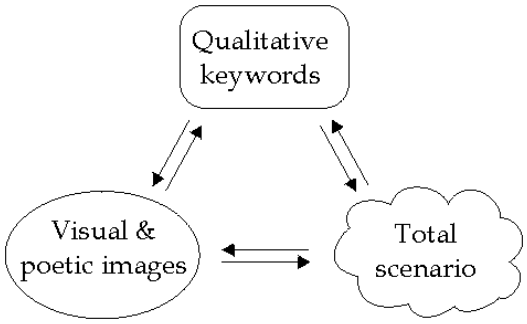

Figure 8.6 Switching between keywords, images and scenarios

Creating a shared understanding

Both the poetic and visual images in the visions should be connected to the interaction between humans, between humans and products / objects and eventually between humans and the environment, like situations in nature. The visions should also be connected and associated with the interaction connected to existing products, as a basis for discussion. The use of scenario play, poetic and visual images and the association to specific product examples may help the team to get a shared understanding of the vision and help to communicate out this vision. As one student wrote in the course: ”*Through the development of visions the group reached to a shared goal. Many ideas were buzzing in the heads of the group.*” Through poetic and visual images and bodily expression it may become easier to discuss and sense the intentions and image in the vision. It is through concrete images that the team can come to an agreement and understanding of abstract words. Additionally scenario play (or/and video cuts) with bodily expression, gestures and the use of sounds can give a feeling and experience of the intended experience. It is also viewed as important that the team is experiencing the vision not only through their head, but also through the use of their body and senses.

Concrete product examples

It is the general view in this thesis that to be able to have a clear understanding, both personally and within groups, of the spiritual and contextual level it is important to use concrete examples. Thus, in the attempt to understand and communicate aspects that are connected to the spiritual and contextual level one should use examples that are on the principal and material level. The main focus is still on the contextual and spiritual levels, but these abstract levels can only be understood and truly shared through concrete examples and concrete images. It is therefore important that the design team can move up and down in abstraction, as described in chapter 4. When communicating concrete examples the challenge is that the receivers understand that the specific examples are not connected directly to the concept themselves, but that they function as tools to communicate some of the qualities in the underlying goal vision, on a more abstract level. This indicates that the receivers and audience should have the ability to make abstractions from the examples, and they need to have some conceptual skills, as discussed in chapter 6.

Sequences of activities
It is viewed as important that the design team tries to see and stage the vision as possible sequences of different interaction experiences. The scenario plays seem to be a powerful way of viewing the vision in terms of different possible sequences of activities and interaction experiences. The qualitative keywords in the vision can function more as general abstractions and overall reminders of the essence in the intended interaction experience. Every person will get a different understanding of the vision by just reading and hearing the keywords. Furthermore, the keywords will not in themselves express the intended experience. The development and presentation of visual and poetic images and the use of scenarios and sequences of activities (both through stories, scenario play and possibly video cuts) will additionally help to awake many associations and ideas for possible product concepts.

Write down product ideas
In this methodology the design team should already in the early phases write down, draw and visualise possible images and ideas that eventually come to mind in the process of working with the visions. One should thus not forcefully postpone ideas and concepts that naturally are brought to mind in the process. The ideas might help the team to get a better understanding of the intended visions. When the ideas are expressed it is proposed that it is easier to let them go and put them aside. It is therefore proposed that it is fruitful to have short idea development sessions on product ideas in this development phase, even though the main focus lies on the development of visions. Such idea sessions with brainpool and brainwriting were held in class. The response was overwhelming positive. "*Very positive*", "*Great to get come up so quickly with many ideas*" was some of the feedback from the students.

The use of exercises
During the development of visions it is proposed that one should use mental visualisation, storytelling and scenario play exercises as training and as tools to awake the imagination and get a better grip of the intended interaction experience. Furthermore such exercises will help to strengthen the team spirit, as discussed in chapter 7. The use of exercises is one of the central elements in the overall methodology. One may additionally use books and web sites to get inspiration and ideas for the visions. Finally, one may use photos and video cuts of user situations that one feels are carrier of qualities in the intended interaction experience.

8.3.5 Initial concepts

Mission and visions as support and guiding tools
In this phase in the methodology one may generate product concepts using the mission and visions as a source of inspiration and as guideline tool. As earlier mentioned the provocative visions should then function as help for enlarging the solution space and give new ideas, while the goal vision should mainly function as a help for guidance and making evaluation. The idea is that one may develop ideas and concepts within the provocative visions and then transfer elements from these concepts in the attempt to

develop concepts that fit the desired goal and development context. One may also develop ideas directly from the goal vision, see figure 8.7.

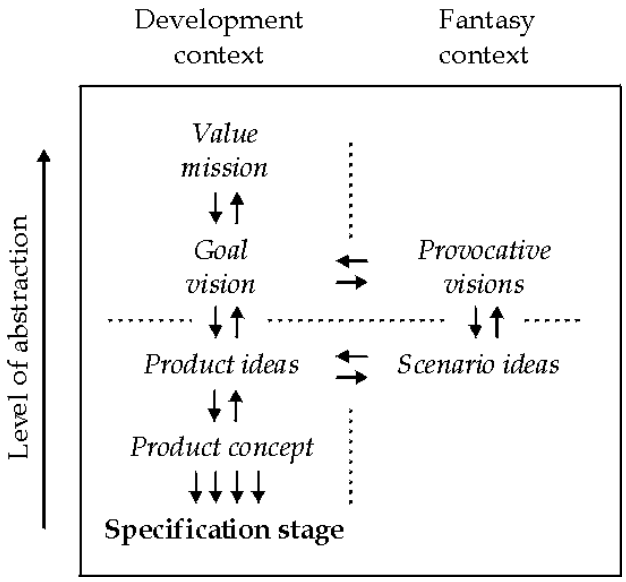

Figure 8.7. Development process on different levels of abstraction

The level of abstraction is in this phase especially related to the transfer from the contextual to the principal level in the vision-based model described in chapter 4. Even though one uses very concrete means in the value mission and the interaction vision, such as body sculpture and images, these presentations are viewed as more abstract in relation to the final concept and product than for instance the initial product concept presentation, as discussed in section 8.1.4. Nevertheless, to be able to represent abstract thoughts and ideas for values and interaction experience, one has to use very concrete means. If not it is very difficult for others to understand the intention of the design team.

Books as inspiration

In this phase it is proposed that one should use extensively books, magazines and web sites on the net of existing products and concepts and try to connect them to the interaction visions, as a source of inspiration and way to generate ideas. Books for instance with abstract images may awake the imagination and give ideas for concepts. One may additionally manipulate, change and imagine the provocative visions to different user situations and scenarios where the user has a need for interacting with the product.

Transfer and force-fit

The idea is that one may use the provocative visions as mental laboratories to develop different product ideas. One may imagine and visualise different user situations in the scenario and see what ideas for products that this awakes. Later one tries to transfer some elements from those concepts to the goal vision and development context. One of the great challenge in the methodology is then to be able to make this bridging and transfer of the concepts developed from the provocative visions back to the goal vision

and development context. There is a potential danger that one either stays in the fantasy scenario or is quickly locked back to the existing context. As described in the dialectic model in chapter 4, design as an activity lies in the dialectic tension between fantasy and reality, visions and application. In this phase the challenge for the design team is to work in the tension field between the provocative visions and the goal visions. It is central that the team is able to make the bridging between these two worlds. Tassoul [1998] describes in the use of a backcasting technique, that there often lies a challenge in making the force-fit back to the intended context: "*At some point, we need to come back from fantasising to distilling useful principles and integrating these into our design or 'force-fit'. This part is tough for untrained participants.* "

Other creative techniques
It will also be useful to use creative techniques such as brainstorming, brainwriting, different types of forced relationship and mind mapping as a tool and help for developing concepts. In this concept generation work one should try to develop many different concepts. One should try to postpone criticism and rather try to get engaged and involved in different ideas for concepts. One should also try to change, if possible, weakness in the concepts to strengths. In the process of improving and coming up with new concepts it may also be fruitful to try to combine different concepts and ideas.

Ideas versus concepts
In the process of developing ideas and concepts, it might be fruitful to distinguish between product ideas and product concepts. A concept may often be carrier of many ideas and one may also describe a product idea as more general and less worked out, while with a product concept the general function, form and principle are described. The experience made in class is that in the process of developing product concepts from the interaction visions the students had sometimes a phase of development in between that could be described as developing product ideas. This is illustrated in figure 8.7.

Concept evaluation and presentation
In this phase one should also evaluate the concepts based both on the intended mission and goal vision, and based on the feedback and experience of the customers. It is suggested that the team should try out the concepts with customers and get feedback from them. It is quite possible that the mental models developed by the team do not correlate so well with the mental models of the actual users. Figure 8.8 illustrates this point. It may also be fruitful to involve the customers not only in the evaluation, but also as a help to come up with ideas, like Binder et al [1998] has suggested. It may be fruitful to make simple, physical mock-ups and props of the concepts so that the customers may get a better understanding and experience of the concepts [Ingildsen 1998; Brandt and Grunnet 2000]. One may also eventually visualise the concepts through the use of simple CAD drawings and renderings. It is then important not try to make the concepts more finished than they actually are, and present the concepts in an open way that signalises that they are unfinished concepts that may well be improved.

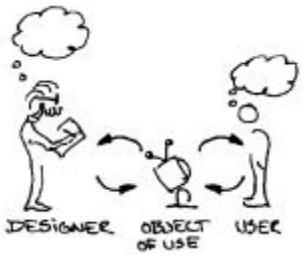

Figure 8.8 The mental models of the user and designer (Illustration: T. A. Øritsland)

In the methodology the presentation of the concepts should also be made through scenario plays, which may better express the intended interaction experience. One may also use short video cuts to show how the concepts should fit into the natural, intended environment. In these drama and video scenarios one may use just sounds or one may also use dialogues between intended users. The presentation form will depend upon the level of abstraction in the concept.

The initial **concept presentation** can be expressed through a combination of:

1. *Sketches and drawings (possibly visualised through CAD)*
2. *Simple mock-ups for scenario plays*
3. *Scenario plays with sound or/and dialogue*
4. *Short video cuts and pictures*

In figure 8.9 an overview is given of the types of presentation tools proposed in the methodology for the value mission, interaction vision and initial concept presentations. All these three presentations are linked to the vision-based stage, which is the stage that is described most in detail in this chapter. The focus in relation to the vision-based model is also indicated at the right.

Type of presentation \ Presentation tools	*Theatre*	*Words*	*Images*	*Artifacts*	Focus
Value mission	Body sculpture	Keywords & aphorisms	General images	---	*Spiritual*
Interaction visions	Scenario with sounds	Keywords, poetic images & contextual stories	User interaction images	Abstract boxes for play	*Contextual*
Initial concepts	Scenario with words, sounds & props	Product description & user stories	Principal sketches	Simple props & mock-ups	*Principal*

Figure 8.9. Type of presentation and presentation tools for the vision-based stage

8.3.6 Target specification

In this phase the design team should make a rough specification list, based on the feedback of the customers on the initial concepts and based on the initial, identified needs of the customers and stakeholders. The team should also try to revise and reformulate the interaction vision on the evaluation and feedback from the customers on the initial concepts. In the presentation of the specification list and reformulated vision the team may eventually "play out" the vision, also in this phase.

If the design team has not developed initial concepts, but starts directly with the formulation of the target specifications such specification should be based on the identified needs of the customers and stakeholders from the context and trend overview phase.

8.3.7 Refined concepts

In this phase the design team should refine concepts. If the team has used the vision-based stage they should adjust and adapt the initial concepts based on the specification list and the reformulated goal vision. Furthermore, in this phase the design team should also try to develop new concepts that seem to fit to the target specifications. The idea is then that with the basis in already existing concepts it will be easier to develop new concepts. The great challenge will often be here to bring elements from the initial concepts into new concepts that fit more to the specific demands of the customers, company and stakeholders. At the end of this phase it may be fruitful to create mock-ups or / and CAD drawings of the most promising concepts. When presenting the concepts it is also proposed at this phase that the design team should use scenario plays to communicate the interaction experience and put the concepts more into the intended user context. It is also at this phase recommended that one should invite users in presentations, workshops and events, as a way to improve even more the product concepts. Finally it is proposed that the design team should evaluate and make a selection of one or a few concepts based on the feedback and interaction with the customers and on an evaluation based on the specifications and the reformulated interaction vision.

8.3.8 Development plan

In this phase the design team should develop a full development plan, similar to what Ulrich and Eppinger [1995] have emphasised in their book, so the company has enough material to decide if they should start a development project with the clear aim to complete the project and finally launch the product. Such a development plan should incorporate the value mission, the interaction vision, the revised product specification list, sketches and mock-ups, the economic analysis of the product, the development schedule, the project staffing and the project budget. It might also be fruitful to have

video recordings of the different scenario play and of interviews with potential customers concerning the product concept. This development plan should round off the concept development and eventually lead to the system design phase. The development plan should be clear and formulated in such a way that the company has enough information to decide to invest or stop further work with the project.

8.4 Methodology used in education

In this subchapter the concept development methodology used in the courses and workshops is described. It is the vision-based stage of the methodology that has been mostly tried out in the innovation course.

8.4.1 The course & workshop setting

Where and for whom?
The concept development methodology presented in the previous subchapter was developed and used in two innovation courses at the Department of Product Design Engineering, NTNU, Trondheim, where I functioned as one of the two main teachers. This course lasted over a semester with the approximate duration of three months. The students that attended the course were in the 8th semester from product design, architecture, industrial economy and mechanical engineering, and most of the students had previous experience with traditional development projects and methodology. Several facts concerning the innovation course is found in chapter 3. A short version of the methodology has also been used in a workshop lasting for a week at the National College of Art and Design in Oslo. This workshop was held for the 3rd year design students. The same short version methodology has furthermore been used at a concept development workshop for 4th year industrial design students at Aalborg University, Denmark. This workshop lasted also for a week. Finally, as this thesis approached its final form, the first phases of the methodology were tried out for a third time in the Innovation course at NTNU. In this course, a few students were also participating who had background in anthropology, psychology and music studies. An overview of the course and workshops is given in figure 8.10.

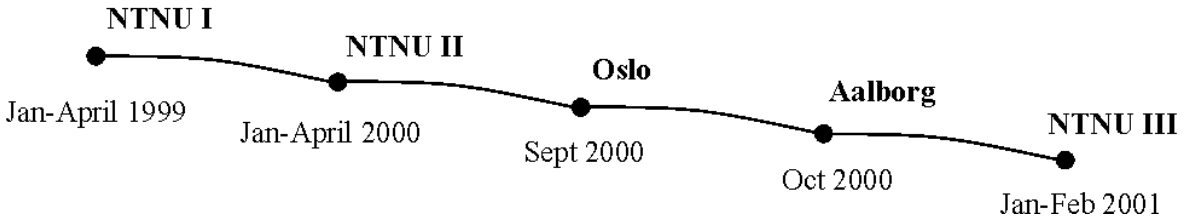

Figure 8.10. Courses and workshops held in vision-oriented concept development

The vision-based model, described in chapter 4, was used as a general guideline and tool in the design process in all of these cases. Most of the feedback from the students in this thesis are gathered from the spring courses at NTNU.

Continuous improvements and changes
During and after each course and workshop the concept development methodology has continuously been improved. This improvement has been based on oral and written feedback from the students and from personal reflection and experience made by myself in the process of trying out different tools and methods, as discussed for action research in chapter 3. In the presentation of the methodology a differentiation is sometimes made between early and later workshops and courses since new elements were added or changed in the process of developing the methodology.

In the first course the methodology was closer to the ViP approach of Hekkert [1997] described in subchapter 8.2 than it was in the later course. In the first course the students developed both interaction visions and product visions. The use of provocative visions was first introduced in the last course in spring 2001. In the first course body sculpture / scenario play was not used in the value mission and interaction vision presentations, but only for the concept presentations. The value mission was originally called the need mission. The use of poetic images and metaphors was first introduced in the workshop in Oslo and has then been used later. In this workshop the students were also challenged to relate their vision to concrete product examples.

No specific company
In the innovation courses and in the workshops the students did not have to relate the development of concepts to a specific company. The topic chosen for the development of concepts was fairly broad; the students focused for instance on developing concepts connected to topics such as everyday rituals in homes. In the last year course (spring 2001) the design task was to develop product concepts related to food and drinking, where the students had to select the context; either office, home or institution. With a wide starting point, not linked to a specific existing product concept, the students would be less fixated towards existing solutions. In a company setting the connection to a specific product segment will usually be much stronger and specific. This will be discussed more in subchapter 8.6.

Main elements in methodology
As presented in subchapter 8.3 the methodology consists of the following main elements: Development phases, arrangement of space, the use of exercises, workshops and events and the vision-based model. In the following section a short discussion of the arrangement of space for the innovation course is made.

8.4.2 Arrangement of space

During the whole innovation course at NTNU in Trondheim we would meet at a specific room at the Department of Product Design Engineering. This room was fairly

large and could be arranged depending upon desired activities. In relation to the concept of activity zones proposed in chapter 5 there were no fixed activity zones. The different activity zones were arranged quickly when needed. When the student were performing scenario play an area in the room became the stage for this play. It thus became a performance and play zone. As discussed in chapter 7 the preparation of the room was viewed as part of the mental preparation for the play. When we were having visualisation and relaxation exercises the students would either sit on chairs or sit / lie down on the floor with blankets. The space became then a relaxation zone.

When the students were having idea sessions in class they would sit around tables and use for instance large sheets of paper to write and draw on. The room became an idea development zone. These sheets would then sometimes be taped on the walls, thus transforming the room into a gallery. In the room along the wall would be different simple and abstract mock-up for scenario play. Other objects for play would also be available. Even though this was not structured and organised one would say that these zones where such objects were gathered functioned as library zones. When the students had to build quickly a mock-up they would go to the engineering workshop, which was near by. The engineering workshop functioned then as a construction zone.

Figure 8.11 The audience with external examiner at the final presentation

During the courses different ways of arranging the room were tried out. In some presentations the audience watching the scenario play would sit on the floor, as one can see from figure 8.11. This was the final presentation with external examiner. For several exercises all chairs and tables were set against the wall to have a large, open space available. The conscious arrangement of the room and space, with the link to the different exercises and activities, was viewed as a central element of the whole methodology.

In the following sections the different development phases used in the course are described. Later, in section 8.4.8, a short description of the different exercises used in the courses is presented.

8.4.3 Need finding and development of value mission

The concept development process in the course started with a phase of need finding. The students started to note down needs related to everyday life and to different specific activities during the day, which were relevant to the overall topic. The students presented some of these needs, which often were fairly practical and functional. The students were then asked to find the more underlying needs behind the functional and practical needs. They were in this aspect asked to develop a value mission, which consisted of three keywords and some images. The keywords chosen were often existential, such as interdependence, stability, need for dynamic, need for knowledge, affirmation etc. Figure 8.12 shows an example of selected images and keywords for a value mission from the course. Through the process of finding a value mission the students became aware of the fact that most practical needs, such as the need for eating, brushing teeth, taking a shower can be related and abstracted to social, spiritual and existential needs.

Figure 8.12. Keywords and images in a value mission from the course in spring 2000 (belonging, stability, variation).

In the workshops at Oslo and Aalborg and in the last course (spring 2001) the students were asked to create three “frozen” body sculptures and expressions with the use of their body that could communicate the value mission. The body sculpture was a more concrete way to communicate the value mission than just the use of words and images. It also require more commitment. In the process of developing the sculpture the students had to work and collaborate together, since they all had to take part in the forming of the sculpture. They were also asked to relate the value mission to different situations where they felt that elements of the value missions were fulfilled. The value mission put emphasis on aspects that can be especially associated to the spiritual level in the vision-based model in chapter 4.

In the last innovation course, in spring 2001, the topic was fairly specific, the students were supposed to develop product concepts related to food and drinking rituals and activities. They made early the choice of context they were supposed to study (offices, home or institutions). In this case the students went to the specific context, interviewed users and made photos of the environment and the situations when the users were eating. They participated for instance in the lunch break at different offices. Based on

an analysis of the user feedback and their own observations they then made an description of unsatisfied needs and created a value mission. The general feedback from the students was that it was interesting to go out, observe and make interviews in the context they were supposed to develop product concepts. The project became more real and this seemed to be motivating for the students.

The development of the value mission assures that the team reflects on aspects connected to the spiritual level in the vision-based model. In addition, the value mission, developed prior to the interaction vision in the course, functions as a good start of the project when the students do not know each other in advance. It is not so demanding and specific as the development of the following interaction vision. The groups managed quite well to come to an agreement on values and intentions they found as important for the concept development process. Several students wrote that the value mission functioned as a shared basis and platform for the development of the interaction vision, see section 8.3.3.

8.4.4 Interaction vision

In this following phase, for the first two years, the students developed just one interaction vision. This vision was similar to the goal vision proposed in the previous subchapter. Besides developing this vision they used the imaginative bridging technique, described in chapter 7. The imaginative bridging technique was nevertheless not directly integrated into the methodology. In spring 2001 the students developed both goal visions and provocative visions.

Keywords
When the students developed the interaction vision, they were supposed to use the value mission and the initial need finding as a basis. The interaction visions put an emphasis on aspects that can be associated to the contextual level in the vision-based model. It should embrace both the interaction between different intended users and between intended users and the product. In the course the vision consisted among others of 4 to 6 qualitative keywords that expressed an intended interaction experience. Such keywords could be words like challenging, playful, soothing, intimate, personal etc. In figure 8.13 an example of an interaction vision is presented with keywords and images from the course. In this example the different images and keywords were on separate posters and could be moved around separately to create different possible sequences of experience and scenarios. The combination of the different keywords should indicate and embrace an overall vision. In the later workshops it was suggested that one could also use short sentences rather than keywords if this felt more appropriate.

Visual and poetic images
Additionally, the students were supposed to find several visual images, poetic images and metaphors as part of the interaction vision. The visual images are similar to what is used in mood boards. The poetic images could be related to the interaction between

different users and to the interaction between users and product. Such poetic images and metaphors could be like “teddy bear for adults”, “the taste of fresh lobster”, “diving into a wave”, “the warm cup of tea in the hand”, “kissing a frog”, “enwrapped in the featherbed”, “walking in wet sand”, “twisting the cloth”, “feet on the table”, “my dream universe” etc.

Figure 8.13. Example of keywords and images in interaction vision (Sharing, control, genuineness, impulse, feedback, challenge)

Product examples and scenarios

In the later workshops they were also challenged to find different products that they felt invited more or less to some of the type of interaction experiences they were seeking for the products. Finally, they were asked to develop and play short drama scenarios that communicated and expressed the intended interaction experience. In these scenario plays they were asked to just use body expression and gestures, without words but with sounds and music. Such scenarios became thus fairly abstract and the idea was that they should relate to the level of abstraction in the concept development process. When relating to the vision-based model in chapter 4 the level of abstraction would be connected to the contextual level.

By avoiding the use of words in the scenario plays the students had to communicate the vision through other means than they were used to do. They were challenged to communicate the vision more as a scenario of expression rather than it becoming just a presentation with rational argumentation. The interaction vision had a strong focus on needs and experience, and an important part of the intended experience was related to the use of different senses, such as tactility. The use of visual images and especially poetic images was also means to communicate the intended interaction experiences more intuitively and less rationally. It is argued that it is first when the quality of the vision is put into a specific context and expressed through for instance poetic images and through scenario play that one may get an experience, engagement and understanding of the vision. The observation was that scenario play and the conscious use of specific images helped strongly in communicating the vision, see the next subchapter 8.5.

Active relationship
The use of poetic images, combined with the link to concrete products and the use of scenario play also forced the students to get an active relationship to the vision and make concrete connections and associations to this vision. The process of finding concrete images and metaphors for the vision was thus viewed as an important element in the overall concept development. In this process they had to connect and associate the quality in the vision to interaction experiences and situations they had experienced themselves or had observed with users. The vision was thus not just something they fabricated theoretically in their head. They could actively relate the vision to different concrete sensations, images and experiences where they also had their own body and senses involved. They could thus be able to relate to the vision empathetically and through personal analogy. Furthermore, through the use of scenario play and poetic images the students were challenged to communicate these images, sensations and experiences. This evoked a shared experience between the players and the observers in the presentations. As discussed in chapter 7 each individual had his own understanding of the different, abstract keywords. Through the use of scenario play and the sharing of images and stories the group created a shared understanding and experience of the vision.

Sequence of activities
The students were challenged to view the vision as a sequence of different activities and situations, involving different experiences and moods. They were asked to try to manipulate, play and arrange the qualitative keywords in the vision in different order and see what possible scenarios that eventually came to mind. The scenario play was experienced as a concrete means to visualise the vision in different possible sequences of action and scenarios.

Write down ideas
Like in the methodology proposed in the previous subchapter, the students could write down, draw and visualise images, ideas and product concepts, related to the principal level, that eventually came into mind even though they were working mainly on the vision for the products and not the concepts themselves. What was viewed as important was that they did not have the main focus on the product concepts, but focused on the vision for the overall experience, and that they could put aside concepts that came into mind. The main focus in this phase was thus lying on the interaction experience. The process of coming up with product ideas could nevertheless help the students to get a clearer understanding of the vision. In the workshops in Oslo and Aalborg and in the last innovation course (spring 2001) we also had rapid idea sessions on product concepts in this phase. This was done so that the students could write down some of the concepts and ideas they were already carrying in their heads. In this regard one student expressed: "*The short concept development sessions in the early phases functioned well. One got an indulgence for the ideas that one previously was carrying around.*"

Imaginative bridging technique
The development of the interaction vision could also be described as the development of the 'interaction concept' on a more abstract level, where the physical product concept was mainly not yet defined. In the development of the vision for the first two innovation courses the students also looked at future scenarios and / or other contexts, for instance other cultures where one was having similar or analogical needs, thus using the imaginative bridging technique. In the development of the vision several students told that it was very useful to look and get inspiration from many different catalogues with existing products. In the process of developing the vision the students were also led in different mental visualisation exercises, that were for instance connected to their childhood and to different imaginative contexts and situations, as described in section 7.2.4. In the innovation course for spring 2001 the students developed both a goal vision and two provocative visions in this phase, as proposed for the methodology in subchapter 8.3. In this way the imaginative bridging technique was integrated directly into the methodology.

It is important to emphasise that the total interaction vision, as used the two first years, was not the qualitative keywords, nor the scenario plays, nor the stories, nor the poetic and sensory images, nor the different visual images, drawings and photos, nor the use of sounds. The visions were to be understood and experienced as a combination of all these different ways of representation, where the totality is describing and communicating the intended experience. The qualitative keywords and short sentences may indicate the main direction and intention in the vision. Nevertheless, it is only through the use of bodily, visual and poetic images and expressions the students could sense and understand what concrete association and meaning they had connected in their heads to the abstract notions and keywords. It was also only through the use of specific product examples or concrete interaction examples that the students were able to really discuss the visions and get a feeling and understanding of what the others had in mind. So even though the focus at this stage was lying on the contextual and spiritual level in the vision-based model the students had to relate the vision to images, concepts and products connected to the principal and material level. Such connection functioned as a means to better understanding what they had in mind on the abstract levels.

8.4.5 Initial product concept

After the development of visions the students in the innovation course in the first two years started to develop product ideas and concepts where they used the value mission and especially the interaction vision as qualitative guiding tools. As help in the development process they also used creative techniques such as mind mapping, forced relationship, brain writing and brainstorming. Additionally, they used the imaginative bridging technique, described in chapter 7. They would look at different activities and habits, connected to the general topic, during the day and see how such activities could be better satisfied when integrating their vision. They would also in the later workshops connect the poetic images from the vision to different activities and see

what kind of associations and ideas that came to mind. In the last innovation course they would use the technique of switching between keywords, images and scenarios, described in subchapter 8.3. The students were also asked to forget the mission and vision once in a while and just look at the activity and develop ideas using different creative techniques. The vision would be so much in back of their head that they did not have to be always conscious of it in the development process. The image in figure 8.14 was used to illustrate the change of focus towards activity and creative technique. Additionally they used many, different books and web sites as inspiration that showed images of nature, products and interactions between humans and interactions between humans and products. They would then try to associate the pictures and images to the vision they had developed. The vision functioned as a general guidance, focus and sense of direction in the development process.

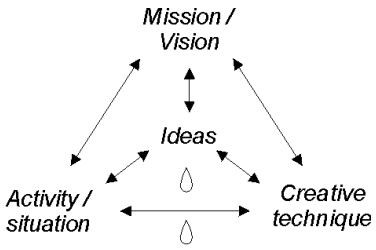

Figure 8.14 Link between activity, vision, ideas and creative technique

Objects for inspiration

In the workshops in Aalborg the students were encouraged, in the process of developing concepts, to bring along amusing objects and products they could use to associate from. The students were very positive to this idea. In this regard one student expressed: "*It is a good idea to have fun things around you. It is inspiring and fun to play.*" They also went to different shops, after recommendation, to get inspiration.

Working procedures

As the students started to develop concepts they were encouraged to see how such concepts could be connected to other situations during the day. They were also encouraged to try to combine different concepts, which can be viewed as a sort of forced relationship. It was observed that the different groups would often have preferences for different methods; some groups would for instance use a lot mind mapping and just draw, write and arrange ideas and use post-its on large pieces of paper. As the groups started to develop concepts their internal visions could change from the original one they had made and written. If this was the case, they were asked in the later workshops and course to adjust their written mission and vision so it correlated to their shared 'mental vision'. It was important that the vision was an active tool and that it was continuously updated. In the initial concept presentation they presented three concepts, with a choice of one concept. They were asked to have in mind the intended interaction vision as they evaluated ideas for products.

Props for play

In the presentation they also played scenarios that communicated the concept in use. In the scenario play they used simple objects, props and accessories as supporting tools for the play. As discussed in chapter 7 the use of such objects, props and accessories may help the group to enter into the intended scenarios and make this scenario more real. Brandt and Grunnet [2000] have also observed that simple props can help to make a scenario much more real. When the students did not have simple mock-ups of the product they used other objects and products as tools for communicating the interaction experience connected to the use of the product, as discussed in chapter 7. Besides the scenario plays they would present drawings, sketches and some words describing the concepts.

8.4.6 Refined concepts

In the later phase the students worked out the chosen concept, made functional mock-ups and had a final presentation where they played out scenarios with the product in use, now also using dialogue as part of the play. In figure 8.15 are shown two examples of the final mock-ups in use. The first product is a water station for offices and the next product is multi-furniture for homes. In the workshops lasting for a week the final scenario plays were dropped due to shortage of time.

Figure 8.15 Examples of final product mock-ups in use, innovation course of spring 1999 and 2000. "Waterstation" with fruits for office and rocking "multi-furniture" for home.

In the innovation course of spring 2001 the students developed a rough specification after the initial concept presentation where they clarified the specific user group, and made some specifications concerning the product. Before the final presentation, which has not yet been, they will also test the concept and mock-up against the target user group and present the feedback of the potential user groups in their final presentation. In this way they return to their initial starting point, since in this course they started with making interviews and observations of users in their context.

8.4.7 Frequent presentations

Along the whole courses and workshops the students had minor presentations for the class or just for the teacher(s) where they presented partial results from need findings to the final concept. The attitude in the running of the course was that the different groups could learn, and get inspiration and ideas from each other through the presentations. The experience and observation was that regular and frequent presentations helped to keep the pace in the project. This was especially important in the more intensive workshops lasting for only 4-5 days. Such presentations also functioned as an inspiration; the groups could see what the other groups had made, and indirectly get new ideas for their own work. As discussed in chapter 7 the use of scenario plays as part of the presentation seemed to be especially useful as a communicative tool, it created a shared experience and positive expectation in the class. As one student wrote: *"I understood several things both through our own presentations and through the presentations of the other groups. Such presentations generates many ideas."*

8.4.8 Exercises along the development process

During the whole course or workshops the students had many different exercises such as mental visualisation exercises, scenario play exercises, storytelling exercises, creative technique exercises, music improvisation, drawing exercises, play exercises etc. The exercises were connected to the different phases in the project and development process. As proposed in subchapter 8.3 the use of exercises should be viewed as a natural part of the concept development methodology. It was an important element in the learning process and in the adaptation of the methodology. Several of the exercises had both a process and problem oriented effect, see chapter 7. For instance it was central in the running of the course that the students got training in scenario play before they played out their scenarios for their visions and for the product in use in presentations. Such training would include different fantasy and play exercises and general scenario play exercises. The importance of such exercises for the methodology is described and discussed in the next subchapter 8.5.

8.5 Evaluation of methodology in course

In this subchapter some of the main feedback from the students concerning the concept methodology in the course will be presented. The feedback is collected from the first two innovation courses, except for the evaluation of the goal vision and provocative vision which is collected from the last innovation course in spring 2001.

8.5.1 Fun, playful and motivating

Several of the students mentioned that the way of approaching the design task was more fun and motivating than what they previously had experienced through traditional methodology. One student wrote: "*Most of the methods have potentials to make a development project much more pleasurable and attractive than previously. I can imagine many creative and amusing sessions together with future working partners.*" Another student expressed the importance of play in a project: "*Even though I always have appreciated play in projects, I have not understood until now how important it is.*" A third student expressed equally: "*We managed to take along the amusing and playful aspects all the way to the end, without losing the seriousness that was required.*" A fourth student wrote: "*It was a very challenging and exciting way to work. I hope I will find colleagues that can think in the same way. It is a way to play into solutions and it is a bit shocking when the work seems like play!*" A fifth student wrote: "*I think it is fun and interesting to work with these visions. I feel that many new things are brought up that one has not thought about when others see our visions through scenario play and images.*"

Some students expressed in their feedback that working in a more vision-oriented way contributed to the engagement in the project: "*To think visionary at the start of a project has contributed in an engagement around the project.*" Based on the observation of the students in class and the feedback from the students it seemed that the methodology in the course, which was more vision-oriented and naturally included playful exercises connected to the project, was more motivating, engaging and fun than traditional methodology.

8.5.2 Shared basis for development and evaluation

The development of visions seemed to have helped the group to create a shared basis of understanding for the concept development process. One student wrote: "*It has been exciting to see how the work with the mission and vision for ritual has created a strong shared basis for the concept development.*" The focus on the vision also seemed to help to evaluate the concepts. Another student wrote: "*The clear focus on the vision has helped us to evaluate and eliminate poorer solutions, and contributed so that everyone worked towards the same goal.*" A third student made a similar point: "*During the group project work I have seen the necessity to evaluate ideas continuously according to the vision and the framework that were set at an earlier stage. When different people have different views concerning decisions it is important to focus on the shared vision and idea to be able to come to an agreement.*" So it seems that the vision has helped to create a shared basis of understanding towards the same goal and intentions and has functioned as a tool for evaluation of the concepts.

One student expressed that working on different levels and with words and images helped to optimise the group project. He described it this way: "*It was good to work on the concepts at different levels, since this gives a better basis for comparison and*

additionally was a part in the process of forming a shared language internally, and in this way optimised the group project. Thus, I see the work with words and images as a way to create a shared language within the group."

8.5.3 Deeper understanding and new ways of thinking

With a strong focus on needs and understanding of needs in the methodology several students remarked that they got a better understanding of needs through the course. One of them wrote: *"I really like the approach of moving from an abstract need to a concrete product. It makes me think more about what I really want in a product. Usually one just gets hooked by the buying culture, without having to think what one really needs. I think this approach will lead to better products. It will also be easier to sell these products because you know more fundamentally why the customer has a need for the product."*

In the process of using the concept methodology in the course some of the students have learned new ways of thinking. One student wrote: *"I have learned many fundamental ways of thinking and ways of working that can be fruitful in all types of work."* Another student wrote that the course had evoked fundamental questions about themselves and the world: *"The course has evoked some fundamental questions about how we work and perceive the world. This has evoked extensive thought processes…There are always aspects connected to the course that we go around thinking about."*

The methodology with the focus on exercises on deeper needs helped some of the students to change their way of thinking and be less 'straight forward'. One student expressed it this way: *"The course has really helped me to not think so straight forward and in single-track. I believe I will be less afraid to solve problems and situations in a more untraditional way in the future."* Another student remarked: *"It was a positive experience to be so abstract and work with "floating" notions. I think it will be a strength, that one has arrived, in an abstract way, closer to a vision for the product."* A third student wrote: *"This has been a new world to me. I usually think in much more concrete terms than this. Usually I seek product solutions right away. I our work there has been several phases we had to go through before we reached a goal. This has been both interesting and instructive."*

8.5.4 Awakening creativity and unexpected thinking

Several students remarked that the methodology helped them to approach the problem in new and more creative ways. One student described it this way: *"The course has shown a new approach where one attacks the problem in a different way and thus becomes more creative."* Another student described how the value mission and interaction vision helped to open up the mind: *"Both the value mission and the interaction visions were of useful help since they opened up the mind and contributed*

to more creative and imaginative thoughts. One could say that the map for later concept development was then set forth."

One student emphasised the extensive use of exercises in the methodology as an important tool for increasing creativity and imagination: "*The strength in the concept development methodology lies clearly in the extensive use of fantasy type of exercises, which contribute to increasing creativity in the development phase. The physical exercises combined with different objects (both physical and virtual) contribute to the understanding of the concepts that one should develop, but function also as an inspiration for new concepts."* As the students expressed the exercises also helped to give an increased understanding of the concepts. In section 8.5.8 the importance of the exercises for the methodology is described further. The idea of a vision-oriented design approach emphasising and stimulating creativity was also described in section 2.8.2.

8.5.5 Unusual approach

Some students expressed in the feedback that the methodology and approach to the design task was very different from the usual, specification-based approach, and that this difference, especially initially, could be challenging. On student expressed this view using a metaphor: "*As a student with technical background who is more used to problems that are defined and usually not so flexible, it felt sometimes that I had got the task to take an omelette and produce whole eggs. Many times I had very little idea of what was coming next."* Another student wrote in a similar way: "*I have previously worked with projects where we start with an idea and adjust it to the needs and demands. In this project we started with the needs and came to an idea and concept at the end. I think it was instructive to learn and try this process and will take it along with me in coming projects."* Several students wrote that they were a bit anxious early in the development process, because they did not know where they were heading and how the final concept would be.

One student expressed that the method he/she had learned in the course functioned as a supplement to traditional methodology: "*I see the methods as a supplement to what I have learned previously, so I have a total set of methods to draw from."* The vision-oriented methodology taught in the course is also generally meant to be a supplement to traditional methodology, which has a focus on the specification-based stage.

It is important to be aware of the fact that the methodology used in the course is quite different from traditional methodology. In the implementation in a company setting one might therefore experience some reluctance and scepticism because employees are not used to work in such a way. Several students told that they appreciated more the methodology when they started to see concrete results in the project.

8.5.6 Need for adaptation

Several students expressed that it took time initially to get started using the methodology, especially when they did not have experience with such methodology in advance. One student expressed it this way: *"This form of project used in this course takes time to get started."* Another student asked the question if all the time used in the value mission and interaction vision phases was a good investment of time. One of the reasons why it took time to get started was that they experienced that it was a new way of approaching the design process. It would take less time if they had previous experience with the methodology. Nevertheless, the question is very relevant. It is important to try to optimise the methodology so it takes a minimum of time in the initial phases. It might not always be efficient to develop a value mission and interaction vision. In teams who are used to this approach and know each other in advance it may for instance be fruitful to combine the mission and vision, and maybe also integrate directly the work with the visions in the initial concept development phase.

Several students also mentioned that the approach in the course was very new to them and that they needed time to get adjusted and understand the methodology. One of them wrote: *"Visual thinking was something completely new for me. I was a bit sceptical to it at the start, but now when we have developed a product that we are satisfied with, I look back on it as very positive."*

Some students mentioned that they felt insecure at the start about where the project was heading. They were used to working in more concrete ways initially and have a specification and well-defined problem to work from. One of them wrote: *"As we worked with the project we were pretty unsure about what would come next, and many times it was very difficult with a progression from abstract mission to concrete product. In contrast to this, when I look back on the whole process the progression seems a lot more natural. The connection between mission, vision, concept and product was more clear than we could have thought in advance."* The need for adaptation was not just related to the steps in the methodology, but also to the vision-based model and the different exercises that followed the methodology, as was described in chapter 4 and chapter 7.

8.5.7 Challenge in the methodology

Some students expressed that one of the challenges with this methodology was to manage to develop a shared understanding of the vision in the group. Several students mentioned that sharing many images seemed to be crucial for developing a shared understanding, since just the keywords were by themselves too general and abstract. One student expressed it this way: *"To find the same words for feelings is difficult. We had different interpretations of the words. This became clear when we put images to the interactions. Images were a very useful tool."* Another student wrote: *"The use of images helps so the words and notions become more tangible and comprehensible. An*

image helps to give nuance to the notions and may eventually lead to finding a better word and notion." A third student wrote: "*It was important to choose precise images for the words, they created a shared framework of reference."* The importance of using images to have a shared understanding of abstract notions and words was emphasised by many students.

Several students described that one of the major challenges with this methodology was the critical phase when they moved from the visions to the product concepts. The extensive use of images that could be connected to concrete products and situations and the use of scenario play appeared to be tools that helped in this bridging, besides the use of different creative techniques. Concerning the use of images, concrete products and situations one student said: "*In this method you work from the very abstract and move downwards. Then comes a moment when I feel it is important to change and move from the bottom and upwards, to find concrete products and relate them to the vision and to the more abstract ideas."* As the methodology has evolved, the use of images and concrete examples as part of the methodology has become more and more important. Another important tool to make the bridging between the vision and the product concept is to have creative sessions on product concepts in the value mission and interaction vision phases. When the students started on the initial concept development they then had already several potential ideas. The students gave very positive feedback to such sessions. If a team approaches the methodology in a too much vision-oriented way without working at all with concrete product ideas the step to the initial concept development phase will be large. The danger is there that the students develop visions that they actually do not manage to fulfil in the later product concepts.

A critical factor in the methodology is that the students take the play and work with visions seriously, and that they are open to try such an approach. In the course and in the workshops this did not seem to be a problem, the student seemed to have a positive attitude. Nevertheless, in a company context this factor might be critical in some cases.

8.5.8 Exercises in class as important in the methodology

Several of the students remarked that the different exercises in class (scenario play, story writing, mental visualisation, music improvisation and play exercises) that were part of the methodology, were very important for the outcome and success of the methodology. The exercises helped in the reflection and learning process and created a special atmosphere and sharing in the class. This long quotation describes how one student viewed the importance of the use of exercises:

"*I have become more acquainted with the other students in this class compared to most other courses I have, and not just with those within my own group. I believe this is because everything was based on interaction, we had to give and take from each other, instead of sitting and listening all the time. In most of the exercises we were forced to communicate with each other and share our creative thoughts, something*

which is a bit more personal than sharing thoughts and meanings based just on logic and reasoning. By participating in the shared creative environment in the classroom we got a clear impression of each other's personality and therefore got better acquainted with each other, whether we tried or not. This helped when we started to work with the concepts in the group. If you are well acquainted with the other people that you are working with, then it is easier to come up with ideas that maybe seem completely crazy at the start, but actually are a big contribution to the whole concept development process. I think it helped a lot that we were used to sharing in front of people in the exercises we had in class."

The course was held with small workshops and events and it was viewed as central to set the stage for a positive expectation when the students were coming to class. This was also observed as being the case. One student wrote: "*The classes were always hours we were looking forward to. There was always something new in motion, and it was really staged for a positive atmosphere and new impulses."* Another student expressed the shared language in the class, which influenced also the group project: "*Through supervision and development of a shared language in the class it probably became the best collaboration I have ever have participated in."* It seems clearly to be the case that the extensive use of exercises in the courses and workshops contributed to shared atmosphere in the class and seemed especially important for the team in the early phases of the project. Many of the exercises in class had strong process related effects, which indirectly influenced the team collaboration.

According to several students the exercises also helped them to understand better the emotional aspects of products. One student wrote: *"I see the small exercises as good tools to stimulate fantasy and creativity during the process and secondly as help to understand the more emotional aspects connected to products and concepts."* As also described in chapter 7, the exercises seem to have a series of effects and are a fundamental part of the entire methodology.

8.5.9 Feedback on the use of provocative visions

The spring 2001 the students developed two provocative visions in addition to the usual interaction vision, which in this course was called the goal vision. The intention with this introduction was to integrate the imaginative bridging technique into the methodology. Previously, in earlier courses, it was difficult to tell the students how provocative and challenging the visions should be. By making a division the students could be both more provocative and more reasonable than previously in their visions. The feedback from the students concerning the use of provocative visions was very positive. The development of such visions helped the students to become more aware of the content in the goal vision. One student wrote: "*We got a better picture of the goal vision through the provocative visions."* By working with a fantasy context the students became more conscious of their desired goal context.

The provocative visions helped to awake the fantasy and imagination of the students. Such visions set the stage for play. The students had to develop imaginative worlds and scenarios, which were a bit radical and 'far out'. A few students told that the provocative visions helped to break loose their fixation on early solution that they had made. One student wrote: "*Already at the lunch we followed at the company I came up with some ideas. I had therefore already created an image in my head. Everything we have been through has actually disturbed this image, and taken the focus away from the concrete. It does not mean it is negative. I have just had some problems to create fantasy scenarios about something I have already a pretty clear image about. I think I learn a lot here in many ways. And I think the final product the group comes up with will be marked by the work that has been done."* Another student wrote: *"It is interesting to work in a way where you give yourself time to pull things out to the extreme*." At the same time they had to relate these provocative vision to the goal vision, which was 'down to earth' and connected to their target context.

The tension field between the provocative visions and the goal vision seemed to create many ideas. One student expressed his experience in this way: "*The value in the link between the goal vision and the provocative visions is that one generates incredibly many ideas. A problem is that one gets extremely many thoughts in the head, and it becomes challenging to co-ordinate the group. The more thoughts we have the more we have to keep in check*." What appears to be most stimulating for creativity and the concept development process is not the provocative visions by themselves, nor the goal vision, but the tension that lies in between these two types of visions. In chapter 4 it was argued that design is an activity that lies in a dialectic tension field. The dialectic model in chapter 4 visualises this tension, for instance between fantasy and reality. Even though the goal vision is not 'reality', there will be a tension between the goal vision and the provocative visions and this tension and the fluctuation back and forth seem to awake new ideas and stimulate creativity.

It was observed that the provocative visions created a lot of laughter and were experienced as fun and exciting by the students. Many exciting, engaging and fun situations and scenarios were created that the class later spontaneously would talk about and return to. One student wrote: "*It was fun to stretch the provocative scenarios far out, and try to find out positive and negative descriptions of how such a reality would feel. The goal vision became very concrete, even though it was also something to head for*." Another student wrote: "*It was very exciting with the provocative visions and how the work functioned in this part of the development process. "*

The conclusion drawn is that the integration of provocative visions in the interaction vision has been very useful and will be used in further courses and workshops both with students and with companies where the aim is to develop new concepts and business areas. It has clearly strengthened the methodology. Nevertheless, the provocative visions are more extreme than the goal vision so it seems important to motivate and tell the usefulness of such visions in advance. For the successful application of provocative visions it is crucial that the participants in a team take such an approach seriously and have an open attitude.

8.6 Application of methodology

It is important to outline what type of projects the vision-oriented concept development methodology may best be applied to. Furthermore it is important to ask what the benefit may be to use such methodology, and what the challenge seems to be using such methodology. This subchapter will discuss these questions.

8.6.1 Innovation-oriented projects

The vision-oriented methodology with the development of mission and vision rather than specifications prior to the product concept generation may be useful in innovative projects where the company has the intention of developing new concepts that can hardly be specified in advance. This would be project where the goal was to enter novel business areas. The initial, vision-based stage of this methodology could thus be used prior to traditional concept development methodology, like it was presented in the previous subchapter. In some types of projects it could even completely replace traditional methodology, where one jumps directly from the vision-based stage to the development plan in figure 8.3, dropping the development of target specifications. Such a strategy seems to be most reasonable for low-tech products that are fairly simple. The methodology could also initially be combined with traditional methodology as a qualitative, vision-based tool, where one develops a vision simultaneously with a target specification. In many projects one will already have a notion of what the concept and solution should be. It is nevertheless the viewpoint in this thesis that when working with product specifications a vision could help to keep in mind the intended user experience related to the more contextual and spiritual level, and help to “lift” the team up.

In the methodology described in the previous subchapter one slowly creates a direction and focus in the development process. One starts from an abstract level in relation to the product and slowly become more concrete and focused towards the product as one gets a better insight of the user context and user needs. In the methodology one puts strong focus on the experience of user and the user needs, not just rationally, but also spiritually and emotionally. As described in subchapter 8.5 the students mentioned that they got a better grip and understanding of needs through the use of the methodology in the course.

The development of the mission and vision may be described as part of the initial concept development, but on an abstract level, connected to the contextual and spiritual level in the model. The interaction vision could be called an ‘interaction concept’. In traditional design methodology one starts directly on the principal level after trying to identify user needs. One is making product specifications prior to the concept synthesis. According to several students in the innovation class the top two levels in the vision-based model are understood as a mysterious “need and problem

cloud" in traditional design methodology, see chapter 4. In figure 8.16 an illustration is made that visualises such a description.

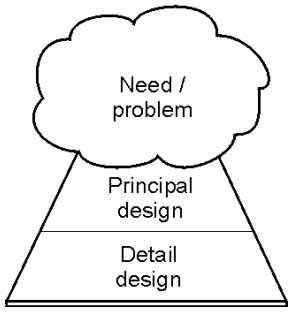

Figure 8.16. A simplified illustration of the perspective in traditional design methodology

Very simplified, one could view the illustration as the perspective in traditional design methodology. The top two levels in the vision-based model are more linked to fields and professions such as social anthropology, sociology and drama studies. When starting to work with product specifications one is working directly on the principal level. The authors of these methods then write that it is an iterative process, one can change the specifications and then have a new concept synthesis. It is the viewpoint in this thesis that it will still often be difficult to find new, innovative solutions when the whole design process originally started on the principal level and when it is based on the original mind-set of the customers and design team. As described in section 2.1.7 creative solutions can easily be inhibited by an initial mental fixation or by the way the problem is formulated. Especially in more high risk, innovative projects, it is proposed that one should initially move higher up in abstraction to be able to break loose from the original conditioning and open up the existing solution space. With a different starting point on the spiritual and contextual level one may more easily end up with unexpected, new concepts.

The argumentation is here made that this methodology is appropriate for innovation-oriented projects which require a high amount of novel thinking and deeper understanding of needs. One of the benefits of using such methodology is thus to come up with concepts that would most likely not be possible with more traditional concept methodology.

8.6.2 Strength and limitation

Both the strength and limitation with the methodology presented in this chapter is that one may initially develop in the vision-based stage concepts that both the customers and the design team did not expect or have a notion of in advance. If one had started with writing a list of specification based on the initial mind-set of the customer and design team, many of the concepts derived using the vision-oriented methodology would not have matched to these specifications and would thus most likely not have been developed. In the vision-oriented methodology one is allowing a phase of more

play, imagination and focus on user experience initially before locking the development process in a solution space with specifications. The initial concepts developed with such methodology may thus not fit and be hard to adapt to the product specifications. There is therefore naturally a risk that the concepts generated and developed may not be used or will need strong modification and adaptation before they can be connected to a project plan and be used as a framework for an integrated development project. The company may use time and money on a project that it is hard to tell in advance what the outcome will be.

The initial concepts developed may also function as a source of inspiration and association for later concept development. Other times the concepts developed using this methodology may be exactly what the customers were looking for, but did not manage to articulate, perceive or describe. The new concepts that have been developed may also fulfil needs that the customers just became aware of when they saw and experienced the concepts. The company has to try to discover a niche of latent customer needs [Markides 1997]. Some needs may often be hard to articulate because they are needs. The moment the needs are articulated they change character into demands and wants. As Rolf Faste [1987] expresses it: *"If needs are something that are missing, they will be difficult to see, especially when one moves higher up in the needs hierarchy. Needs are obvious after the fact, not before."* [p.2]

8.6.3 User-experience oriented projects

The vision-oriented concept development methodology presented in this chapter has a strong focus on the user experience in connection with the contextual use of products. The methodology has thus an initial user- and societal- oriented focus rather than technological oriented focus. Therefore, at first hand, the methodology seems to be most useful in projects where experience and aesthetics are viewed as central and where qualitative aspects of products are acknowledged. This would for instance involve products where the differentiation between the products was not so much technical and functional but more based on aesthetics, user experience and social values. Nevertheless, it is the belief and viewpoint in this thesis that the methodology is also useful for other types of projects, where one seeks to integrate aesthetics and user experience as part of the design process.

According to several authors [e.g., Kunde 2000; Jensen 1999] qualitative and immaterial aspects of products are becoming increasingly important as part of the product branding and external communication of the company. Users are increasingly looking for more than just the functionality of the product, they are looking for deeper satisfaction and personal experience. Furthermore, users are increasingly looking for products that are carriers of values they can identify with. The process of developing concepts which are carriers of deeper values might also be beneficial in a time where values related to sustainability and eco-friendliness are becoming increasingly promoted both by users and by the society in general. With such a perspective one may say that qualitative and holistic aspects of products that are hard to put into a product

specification list will be increasingly important also for products that traditionally have had a technological orientation. As already mentioned the first part of the concept development methodology described in this chapter, the vision-based stage, may be used prior to more traditional concept development methodology. It may also be combined with traditional concept development methodology where this methodology puts emphasis on user experience, while the other traditional methodology puts emphasis on taking into account all the product specifications needed, based on the identification of user needs and feedback of the different stakeholders.

The argumentation made is that this methodology is especially appropriate for projects which have a strong user- and societal oriented focus and where the user experience is viewed as a central part of the product. Since the user experience and the immaterial aspects of products seem to become increasingly important in many types of products, it is argued that the methodology may be appropriate for many types of projects, whether the methodology is used completely or just partly.

8.6.4 Shared mind-set and focus

In the process of working and creating a mission and vision prior to the concrete product concept development a design team may more easily manage to create a shared, overall mind-set and understanding, as some of the students described in subchapter 8.5. One may therefore avoid some of the too strong tensions and polarities in sectional interests that may easily occur if one starts directly with defining product specifications after identifying customer needs. The problems of sectional interest, lack of shared perspective and visions in design teams in a company were outlined in chapter 6. The goal vision may be used as a shared qualitative tool for evaluating the concepts in a later phase, as it was described in subchapter 8.4. When the group is disagreeing they can return to their mission and goal vision to find a shared agreement and basis for evaluation.

8.6.5 Shared team contribution of images

Rehal [1998] has described how the architect and designer may often influence too much the development process in integrated teams since they have a strong ability to visualise their ideas by drawings and sketches. In the previous chapter 7 it was argued that mental visualisation and scenario play might help so the other participants in the team might bring forth their images, and thus contribute more to the development process. In the methodology proposed in this chapter the value mission and interaction vision phase are used prior to the initial concept phase, and do not involve much sketching and drawing. In the interaction vision phase it is for instance proposed that one should use visual and poetic images, stories and scenario plays. Such visualisation do not require sketching skills, and are means for communication that are less ambiguous than just words, due to language barriers. With such a procedure the other participants will get more involved in the visualisation and can contribute more with

their own images. This is equally true when users are brought into workshops as collaborators in the design process.

Rehal [1998] has proposed a method with the use of images as a complement to words to get the actors in the company more involved. He writes: "*The actors within the company would thus have the possibility to articulate their pre-conception graphically, first for themselves and then within the group to develop common concepts, before the architect or other consultants enter the process.*" He also writes that "*the use of images in an associative way would enrich communication and make it possible for actors to better express what is tacit, implicit or difficult to articulate with the everyday language*." He showed that the use of images helped the actors to think and develop ideas in a more complex way than it would be possible to do with verbal language alone. Furthermore, images have proven effective in experiments in promoting communication and reflection of insights in simulated collective design situations. The reasons for this were that 1) images stimulate inner dialogue and are necessary so the individual can develop inter-subjective dialogue, 2) images enables communication across language barriers and 3) images make possible for users to conceptualise their own ideas before the architect (or designer) enters the process. The results by Rehal support one of the conclusion made in this thesis, namely that bodily, visual and poetic images (both frozen and in sequences) are important supplement to words for stimulating creative collaboration in design teams and that such tools help so that the participants in a team, which are not designers, can communicate their ideas and images prior to sketching.

8.6.6 Increased motivation and fun

The students viewed the methodology as more fun, engaging and motivating than traditional methodology. The use of scenario play, story telling, play exercises and the development of provocative visions as an integrated part of the methodology may help to make a project more pleasurable and motivating. In a company, where the employees get conditioned by everyday life the use of scenarios and plays may be inspiring and help to give "fresh blood" to everyday life and to the project, as a few of the respondents also suggested in the interviews. As discussed in section 2.1.6 motivation is central for creativity.

8.6.7 Broadness in the design task

In a course setting at the university the design task will often be more open than in a company setting. The question is how broad the design task should be approached. In the innovation course the design task was formulated rather broadly. It is possible to narrow and focus the field for the design task by for instance saying that the students should develop concepts that can be connected to specific activities like the dinner ritual. Such formulation will still give breadth to the design task. If the design task was connected specifically to wine drinking for the dinner ritual the design task would have

been made even narrower. Nevertheless, such design tasks are still all connected to activities and needs around these activities, rather than to specific products. The students are for instance not told to develop a traditional wine opener, though this could be an appropriate design task.

In a company setting the design tasks will usually be related more or less to existing products, and the broadness of the design task is initially much more limited. In such a situation it will be important to break down the existing problem space and look behind the existing solution. Such an activity is related to the initial phase where one is looking at the existing context and identifying customer needs. One should then look at the contextual and spiritual level and see what type of activity and interaction the existing product is related to and what the underling values and intentions are. One is then initially broadening the design task and going behind the mere product. The amount of effort the design team is using on the upper two levels in the vision-based model will depend upon the degree of intended novelty in the project, which is part of a strategic choice of the company. Some projects are intended to be innovative, while other projects are connected to redesign of existing products. Nevertheless, even for the redesign of products it is fruitful to have some awareness and focus on the contextual and spiritual level, so the user's experience may be optimised.

8.6.8 Initial approach in the design task

The methodology proposed in this chapter should be understood and used in a flexible way. Some design teams might choose to start right away to draw and develop product concepts after the initial phase of research and understanding of existing context and customer needs. When referring to figure 8.7 a design team might want to start a concept development process directly working with product ideas and product concepts, even when they are aiming at developing completely new ideas and concepts. Such strategy might work for some design teams, if they also have the ability to not get fixated on the initial ideas and concepts and also manage to create shared goals, visions and understanding in this process. Nevertheless, it seems to be hard to develop concepts if one does not have some kind of shared visions, framework or specifications as orientation. Equally it seems hard to develop visions if one does not have some kind of tangible product or user situations.

The question is if the team should start with visions prior to the development of product concepts or if one may articulate and develop a mission and vision during or after first developing the concepts. The first approach is to start in a broad and abstract way and then become more specific and concrete. The second way is to start being fairly concrete and then secondly set the concepts in a larger frame and context and make abstractions. In the discussion made both in chapter 4 and this chapter 8 it is outlined that the most important is that one is able to make abstractions and look beyond concrete concepts and equally is able to come with concrete suggestions to abstract notions and images. It is thus viewed as fruitful that the design team has the ability to move up and down in abstraction, and integrate all the levels in the vision-

based model proposed in chapter 4. The intention is that the methodology should be a flexible and open framework that invites for different possible usage, depending upon how each designer and design team works best and especially dependent upon what type of product and project that one is working on.

8.6.9 Need for adaptation in company

As it was mentioned in subchapter 8.5 the use of the methodology in a class setting required some training and time for adaptation by the students. Several of the students mentioned that they became more and more positive as they saw the outcome through the use of the methodology. It is reasonable to suggest that such need for adaptation and training will be equally or even more the case in a company setting. The participants in a company will often have an established way of working out concepts, consciously or unconsciously, and will have many routine and daily rituals connected to work practice. In a company there will be stronger bonds and roles and there may often be some internal power struggle and sectional interests in the teams and in the company, as described in chapter 6. The routines and established bonds and roles indicate that it might be harder to implement new methodology and tools than it is in a course, as it was described in chapter 7.

The methodology, which is presented in this chapter, has a fairly abstract phase with a development of value mission and interaction vision. This phase may be quite challenging for participants who have the role and are used to think in very concrete terms and to being very product oriented. It might thus well be the case that there will be some ‘resistance’ in the implementation of such methodology. It is then important to tell the participants who have trouble with thinking abstractly that this is especially connected to one phase in the development process, and that they try to live with the insecurity of not knowing the actual concept, as was discussed in chapter 6. This is part of the motivation in creating a vision for change, as described in section 2.4.9. Furthermore, it will then be especially important to use concrete examples and images in the process. It will also be important to choose the right people for such work, as was indicated in section 8.1.5.

It is clearly the view in this thesis that such methodology, with the use of for instance scenario play, is possible to implement in the concept development process in companies. What is important, as it has been discussed in chapter 7, is that there is a good preparation and that the participants get informed and involved in the change, as described in section 2.4.8. Furthermore, it is important that there is support in the top management for such changes. As indicated in section 8.1.5 the implementation of such methodology will be easier if there is a top management with a visionary leader who is supporting such change.

8.6.10 Adaptation of methodology

It is not only the design team and employees in a company that should learn, get training and adapt to the methodology. The concept development methodology should also be adapted and adjusted to the specific company context. Both the value mission and the interaction visions may be adapted to fit to the design team. They may drop one or two elements in the suggested presentation form. If it is too difficult to get the participants to work and play out scenarios the team may focus mainly on the use of visual and poetic images and keywords. The methodology should also be connected to the branding and product strategy of the company.

Facilitators
In the initial application of the methodology it seems very important to have facilitators who are sensitive and can adapt and make changes based on signals that the participants are expressing. At the same time it seems important that facilitator has an understanding of the fact that some of the participants may need time to adapt and thus may be more negative at the start. Each participant will go through his own process when being introduced to a new methodology. Since the methodology requires, with the use of scenario play, some personal involvement and exposure it may be scary for some of the participants, as the case in subchapter 7.7 indicated. It is therefore important to create a secure and comfortable setting, through the right use of exercises. There lies furthermore a great challenge in organising and finding exercises that may create the 'right' associations and images in the participants. It is also important that the participants can relate to and personally identify with the framework for the exercises. Different groups may need different images they can identify with. The facilitator may for instance lead the participants to memories of playful situations and indirectly set them in a more playful state of mind.

Open-minded
My personal experience as a facilitator through the running of workshops for classes and companies is that it is quite important to be flexible, sensitive and open-minded. If the facilitator is open and sensitive then the participants will most likely also be more open. The conduct of the facilitator may therefore be crucial to the outcome of such workshop. The importance of a open minded practitioner or facilitator was also described in section 2.4.8.

8.6.11 Outcome of the methodology

A new concept through the use of the above mentioned methodology may involve a change in context, the story will be different and the interaction between users and between the user and the product will be different. By setting focus and making a conscious change on the spiritual and contextual levels, the designer or design team is making a new orientation, focus and overall framework for the generation of concepts, which may lead to radical new solutions on the principal level. One might then affect and also change the user's habit, way of acting and way of interacting both with each

other and with the product. For radical new solutions one may even change the underlying values and purpose which are connected to a specific activity. One may thus stage and set consciously a framework in the design process for a different interaction between users and between user and product than the existing one.

The development of the mission and visions is the first step in this process and may be viewed as an abstract concept development on the spiritual and contextual level. One could describe the value mission as a kind of value concept, while the interaction vision could be described as an interaction concept. New interaction qualities and needs may be difficult for the users themselves to articulate. Later, when one has developed preliminary, concrete concepts that are intended to be carriers of a story and interaction experience, one can use the customers to evaluate and improve the concepts. In such a case the customers are not coming with suggestions and evaluation based on the old products, but on concepts that may lead to a leap in change compared to the existing products.

It is not the aim of this methodology that the preliminary concepts that are generated, based on the visions, necessarily fit perfectly to the existing company and customer needs. The concepts should fit to the strategy of the company. When having different, vision-oriented concepts one can look and see what elements about these concepts that seem relevant and interesting to bring along to the next concept generation phase. If the main idea and concept has a strong core it will often be possible to adapt elements of the concept later so it fits more exactly to the needs of the customers and company. The ideas and concepts that are brought forth in the initial concept development phase may also function as an inspiration for the next phase. When one is already having some concepts or ideas it is then easier to define and make a rough, preliminary specification list. If one starts initially with a specification list prior to the concept generation one will easily be conditioned by the existing context. The creation of the specification list might then be viewed as the most creative task in the concept development process, because one is then forming and locking the solution space on the principal and material level and creating a mind frame for this solution space. As discussed in section 2.1.7 creative solutions are easily inhibited by preliminary mind fixation.

In development projects which are intended to be less visionary and conceptual, where one is having well-defined needs and demands or where the task is more related to redesign of existing products, it may be more reasonable to establish target specification prior to the generation of product concepts. In such a case one may drop the vision-based stage and start directly with establishing target specification after identifying customer needs. Nevertheless, it is still suggested that the designer or design team should in projects with a strong user orientation also develop an interaction vision (keywords, poetic images, scenarios, metaphors) as a superior qualitative tool that can be combined together with the more concrete specification list.

The integration of the methodology proposed in this thesis will have influence on several levels in a company. The use of the methodology will be an intervention which

will not only have effect on the project team, but might also influence the department and whole organisation. Such intervention should not be isolated to human processes issues, when relating to the four interrelated organisational issues: Strategic issues, technology and structure issue, human resources issues and human process issues [Cumming and Worley 1997]. Such interventions are also connected to strategic issues and human resources issues for a company.

8.7 Intensive workshops

It is proposed that one may use the concept development methodology in intensive workshops lasting for a couple of days. In the following sections some viewpoints concerning the staging and structure of such intensive workshops are made.

8.7.1 Phases in methodology for workshops

It is proposed that the early vision-based stage of the methodology, see figure 8.3, should be tried out in intensive workshops, lasting for a couple of days. It is in this respect proposed that a large part of the context and trend overview should be made prior to such a workshop. It would thus be fruitful to have made a research of customer needs, of the existing context and of future trends prior to the workshop, and have this knowledge and empirical information as a basis when one started with the workshop. It is especially the vision-based stage in the methodology presented in subchapter 8.3 that is suggested to be worked out in intensive workshops. The workshop may end with a session where customers and users take part in the evaluation and presentation of the concepts and where they also may partake in the development of ideas for improvement of the concepts, as Binder et al [1998] has suggested and tried out. The mental models of the users may be quite different from the one developed by the design team, see figure 8.8. The concepts need therefore to be tried out early in the concept development by different users.

Additionally one may have intensive follow-up workshops for the specification-based stage in the methodology where customers, stakeholders and users again are brought in for the evaluation and improvement of the concepts.

8.7.2 Location and context for workshops

The intensive workshops may be held in specific project space and location, arranged and prepared for the event, as suggested in chapter 5. One may also choose to have such a workshop in a location which is not part of the everyday company locations. The “freshness” in location and the arrangement of the interior may help to prepare mentally the participants for the workshop. It may help in creating a positive expectation. If the workshop is located at the company it is central that the participants

have no typical, daily obligations during the workshops. This means that they should not have any telephone calls, meetings or dialogue about their daily activity, but concentrate fully on the concept development at the workshop. They should be able to enter completely into a conceptual and playful state of mind where they are able to work with scenarios and new concepts. If their minds are occupied with the daily management and obligations in the company it will be harder to make them think in a more conceptual and visionary way. Such workshops need quite a lot of prior preparation, organisation and also allocation of resources from the company, so that the participants can be free of daily duty during the workshop. Cumming and Worley [1997] describe how many change processes may stop due to lack of resources allocated for the change.

In the workshops lasting for a week in Oslo and Aalborg the groups were largely working in the same room. Both the students and the teachers experienced this shared location as positive and synergetic. The groups got impulses from each other directly and indirectly, and the intensive feeling of workshops made the students concentrated and attentive. The workshop room was arranged for different activities and exercises along the week, similar to what was described in relation to the arrangement of space in section 8.4.2.

8.7.3 Participants and roles in workshop

In such a creative workshop it might be fruitful to have participants from different departments in the company, such as participants from production / technical department, from the internal product development department and from the marketing and sales departments. It will then be important that the participants are prepared in advance for the fact that the workshop will be conceptual, where the company is looking for new ideas and concepts. It will also be important that the participants are made aware and motivated for the fact that they should change roles from their daily, traditional role, as it was described in chapter 6, and be prepared to work more conceptually. This might help so that the different participants are working on the same conceptual level or level of abstraction.

As part of the preparation it seems important to create a positive expectation and motivation among the participants towards the workshop. Awakening such motivation is important for creating change [Cumming and Workey 1997]. As discussed in chapter 5 some food and drink in a modest way may possibly also help to set people in a more positive and generous state of mind.

The suggested number of people participating in such a workshop will depend upon the size of the company and the type of project. Nevertheless, it is positive that one may manage to have at least two teams in such workshops. In such a situation the one team can play out and present the visions, scenarios and intended use while the other team is observing and watching. In the innovation course the students commented that

they learned and got much inspiration from observing and watching the presentation and scenario plays of other teams.

8.7.4 Organisation of people in workshops

When running such a workshop it seems useful to change between different modes of work:

1) Individual
2) Two and two
3) Groups (4-6 members)
4) Plenary sessions

It seems important to have sessions where each individual has the possibility to reflect and work alone. Running workshops both in class and for companies has taught me that some individuals have a tendency to dominate and talk too much in groups. By having individual sessions and sessions where two and two work together, the silent and reserved participants are given more space to bring forth their ideas and insights. The use of mental visualisation exercises, discussed in chapter 7, is also a way in which the different participants can get an individual relationship and engagement for the problem.

It is also important that design problems are discussed in groups and finally in plenary sessions. The experience made by me as a facilitator was that it is fruitful with a change between these four different ways of working during a workshop. The change seems to be refreshing and motivating in itself.

8.7.5 Exercises in workshop

In such workshops it is important to have initially several exercises to loosen up the atmosphere and create a shared feeling among the participants. It may also be important to give the participants simple training and exercises in scenario play and abstract thinking, as it was the case in the course. Such training will make it easier for the team to play out its own scenarios. It is important not to call it training, but just call it exercises that are part of the concept development process. In this way one may avoid that the participants feel that they are ‘at school’. The use of exercises will also have a process oriented effect, as discussed in chapter 7, and thus help to create a shared team feeling and atmosphere at the workshop.

8.7.6 Intensive workshops versus long courses

The workshops that were held for design students in Oslo and Aalborg were intensive workshops, lasting for 5 days. In a company it is more probable that workshop lasts

only for 2-3 days, since it is hard to get employees free from obligations in many days. One of the positive experience with the workshops in Oslo and Aalborg is that the students could concentrate more on the task, and work fully just with the topic of the workshop for some days. In the course at NTNU lasting for three months the students had several other courses they were taking at the same time. In this course the students would meet at the most a few times a week. Some of the students in these courses also commented that too much time would pass between each session. They would therefore need some time to get concentrated, engaged and involved in the task. Other projects were running in their heads. In the intensive workshops the students would be "living for the project" for some days. Due to the intensity, the short deadlines and the general workshop spirit they would manage to do a large amount of work in a few days. In such workshops I would be present most of the time and help the students with the development process. In the 3 months course the students would sometimes come to my office for advice, but I would generally not follow and support the group process so closely. The advantage with the long course is that the students had more time to reflect over the process. It seems that the courses over three months had stronger influence on students than the short workshop lasting for a week.

My experience is that the methodology proposed in this chapter may best be tested and tried out in companies through intensive workshops over a few days rather than projects lasting for months. In such workshops facilitators can be available most of the time and help in the process. For a few days a company can manage to get employees free from other obligations so they can concentrate fully on the workshop. The employees can in such a workshop be introduced to the methodology. At least as the first attempt to use the methodology in companies intensive workshops seem to be an appropriate way to approach companies.

8.8 Summary of chapter

In subchapter 8.1 some definitions were given concerning concept, a concept development phase and a vision-oriented concept development methodology. Some of the thoughts and viewpoints of the respondents in the interview were presented concerning an early, initial stage in the design process with more play and focus on the user experience. The general impression from the interviews was that the companies were becoming increasingly aware and concerned with the need to put more focus on the user experience, and that they saw the potential problem with making product specifications too early in the new development projects.

In subchapter 8.2 some of the viewed limitations and drawbacks concerning traditional design methodology were described, outlined and discussed. Traditional methods are viewed as being largely independent of the user and design context. In such methods product specifications come prior to the concept generation, which will easily lead to fixation to existing solutions. The methods are furthermore not in themselves connected to motivation and inspiration, which are a central element in creativity. The methods put little emphasis on the shared team spirit and team composition and are

little concerned with the use of the whole body as part of creative and conceptual thinking in the development process. The methods do additionally not seem to have play, imagination and visualisation as an integrated part of the methodology. In this subchapter the ViP design approach by Hekkert was also presented and discussed. This approach is more vision-oriented, where one is supposed to develop an interaction vision and product vision in a new context rather than product specifications prior to the concept generation. The ViP approach was viewed as an important step and contribution in the direction of design approaches that put more emphasis on the user experience and contextual aspects of products. Nevertheless, some weak points and drawbacks in this approach were observed and described. This subchapter may be viewed as a preparation for subchapter 8.3 where the vision-oriented methodology is proposed and discussed.

In subchapter 8.3 the vision-oriented methodology for concept development was proposed. This methodology is linked to existing methodology and adapted to the context of companies. The methodology consists of two stages, a vision-based stage and a specification-based stage. The vision-based stage is similar to the one that was used in the innovation course, described in subchapter 8.4, with the development of a value mission and interaction visions (goal and provocative visions) as guiding tool and inspiration for the concept generation. The vision-based stage presented in the subchapter 8.3 is nevertheless more linked to a company setting where the company is already having a family of existing products and where one is seeking to understand customer needs in relation to these products and also look and envision future trends. In the second stage, the specification-based stage, target specifications are integrated and combined with the vision as a framework for the development of concepts. In general, this methodology has a stronger focus on play and user experience than traditional methodology.

In subchapter 8.4 the vision-oriented concept development methodology used in the teaching of the innovation course and in student workshops was presented and discussed. The different phases in this methodology were the need finding phase, the development of a value mission, the development of a interaction vision, the development of initial concepts and the refinement of concept. In the presentations scenario plays were used as part of the methodology. In the visions different poetic and visual images and metaphors were also used. The vision was furthermore related to existing products and the students were asked to develop different, possible scenarios connected to the vision. As part of the methodology exercises were used extensively as a support for the process.

In subchapter 8.5 the student feedback and evaluation of the methodology was presented. The main points from the feedback were the following: 1) The methodology with the development of visions and the use of exercises in the presentations was described as fun, motivating and engaging by several of the students, compared to more traditional methodology. 2) The use of visions helped to create a shared basis and goal in the team when developing concepts and also helped in the evaluation of the concepts. 3) The methodology gave a deeper understanding of needs and evoked new

ways of thinking among several of the students. 4) The vision-oriented methodology helped to awake creativity and unexpected thinking. 5) The methodology was experienced as quite different from more traditional design methods, and was thus challenging. 6) Some of the students expressed that it took some time to get started and that they needed some time to adapt to the methodology and the way of thinking connected to the methodology. 7) In the process of creating a shared understanding and experience of the vision it was viewed as important that the team used concrete images as a framework for discussion as part of the methodology. The extensive usage of images and concrete products was also viewed as central in bridging the gap between vision and concept. 8) The different exercises both in class and in the presentations, which are seen as part of the overall methodology, were viewed as central and important for the outcome and success of the methodology. 9) The introduction of provocative visions seems to strengthen the methodology.

In subchapter 8.6 a discussion is made in relation to the application of the methodology. The vision-oriented concept development methodology seem useful in innovative projects where the company has the intention of developing new concepts that can hardly be specified in advance. The methodology seems furthermore to be useful in projects where the user experience is viewed as central and where qualitative aspects of products are acknowledged and viewed as important. The strength and limitation with the methodology is that one may initially develop concepts in the vision-based stage that both the customers and the design team did not expect or have a notion of in advance. The concepts may therefore need strong modification and adaptation in the specification-based stage before they can be used as a final framework for the development plan. With the initial focus on mission and vision it is argued that the design team may more easily manage to create a shared mind-set and understanding. The use of such methodology may therefore help to avoid too strong polarities and sectional interests. The methodology, which has a strong focus on play and visions, seem also to be more engaging and motivating than traditional methodology. It is argued that participants using the methodology will need some training and adaptation and that the methodology should also be adapted and adjusted to the existing company context.

In subchapter 8.7 it was suggested that the vision-based stage in the methodology may be used by the company in intensive workshops lasting for a couple of days. It is then important with good preparation. The employees who are supposed to participate in the workshop should for instance be mentally prepared and motivated in advance for conceptual thinking and for intensive days. It is furthermore viewed as important to stage the workshop and meeting space in advance, when the workshop is held at the company. The participants should be free from other daily obligations during the workshop. As part of the workshop and methodology one should integrate and use exercises where the participants get training in scenario play and abstract thinking. Such exercise will help to create a shared team feeling and atmosphere at the workshop. Intensive workshops seems as the best way to introduce the methodology to companies.

Chapter 9

Summary & conclusions

The best way out is
always through

- Robert Frost

URN:NBN:no-2324

This chapter gives a summary of the results in the different chapters of this thesis. Conclusions concerning results and research methods are made and suggestions for further research are proposed.

9.1 Summary of thesis

This subchapter gives a summary of the major concepts, models and methods proposed in the different chapters of the thesis.

Chapter 4:

In chapter 4 three conceptual models were proposed. The first model proposed that the creative process was an evolutionary cycle going through order and chaos. It was argued that the insight and awareness connected to this model could help a design team to better understand the general nature of the creative process. It could also give increased acceptance in a team for phases that involved discomfort, breaking up and chaos as natural elements in the design process. The second model proposed that design was a creative activity in dialectic tension. The insight and awareness connected to this model may help a design team to become increasingly aware of the dialectic tensions that are often part of design activity. It may function as a framework for discussion in a group, and may help to bridge the traditional tension between the 'soft' and 'hard' approaches to design. It may therefore also help to stage for collaboration in design teams. The last model, which is called the vision-based model, may help a design team in several ways. The feedback of the students showed that the model could help a team to work more abstractly than usual and loosen up existing product fixation. It could help a team to get a better overview of the totality of products on different abstraction levels and help to see the connection between the "soft" and "hard" aspects of products. It could additionally help as a general framework for discussion and help to calibrate the team to the same conceptual level, as also discussed in chapter 6. These three conceptual models are viewed as tools that can help to improve creative collaboration in design teams. The experience made in class was that the models were quite useful and powerful in an educational context.

Chapter 5:

In chapter 5 the space and interior for team collaboration was investigated. Two major concepts were finally proposed: *Flexible project space* and *activity zones*. Both concepts are related to the arrangement of space and interior and are viewed as tools for improving creative thinking and collaboration in meetings and workshop events. The concepts of activity zones have been tried out and adapted in a concrete case at the technical division of a Norwegian company. The feedback given indicates that the zones have had a positive contribution for the work environment. The activity zones seem to have an unifying effect and strengthen the team spirit in the technical division

and they seem to function as supportive tools for problem solving. The openness of the zones seem to stimulate participation and engagement and give room for unexpected ideas from coincidental passer-by. The zones seem to stimulate for shorter meetings and sessions and seem to have an influence on the working procedure and company culture. It is argued that the concept of activity zones has been verified by acceptance. In general, the arrangement of flexible project space and activity zones needs to be adapted and adjusted to the company context, building and culture, and employees need to get training in the use of such space and zones. By the conscious arrangement and use of activity zones and flexible project space it is argued that companies may help to improve creative collaboration in design teams, compared to existing practice.

Chapter 6:

In chapter 6 the project staging and team framework were studied. The concept of flexible role structure was introduced where there is a certain overlap in roles, but at the same time a general understanding and respect for the different roles and perspectives in a team. It was suggested that a flexible role structure is important for creative coupling and collaboration. The problem with sectional interest in design teams was outlined. As a help to lower the sectional interests and polarities and improve team spirit it was suggested that one could use exercises in teams where there is a conscious play in change of roles and where the different participants take each other's roles and perspective.

The problems of being on different conceptual level and having different conceptual skills in design teams were outlined and discussed in relation to meeting atmosphere, ownership, expectation and viewpoint in the teams. The need for a shared expectation of innovation level and focus was outlined as central for team collaboration. The concept of having happenings and events in the design process was proposed and discussed. Two types of happenings and events were suggested. The first type is related to milestones in the company, when one is ending a phase and moving into a new phase. Such events are viewed as being important for the motivation and team spirit in the team. The second type of event that was suggested is conceptual workshops where external design consultants, customers and employees from other companies are invited to participate. Such workshops were viewed as fruitful for creativity in a company where daily activity and routines easily could dominate. It could help to set employees into a conceptual mode of thinking and function as inspiring change from daily practice. The comparable experience of workshops that has been made so far was the running of intensive workshops with students in class, both in the innovation course and with workshops at other schools. Such workshops seem to be quite effective and rapidly give new concepts and solutions.

Chapter 7:

In chapter 7 the use of mental visualisation, story telling and scenario play exercises was reviewed as tools for improving creative collaboration in design teams. It was described how scenario play and mental visualisation exercises have both process and problem related effects in the innovation course. On the one hand these exercises were useful for the team spirit, the atmosphere, the awakening of fantasy and motivation and on the other hand they were useful as creative and conceptual tools. Scenario play was furthermore viewed as especially useful as an internal and external communicative tool. Mental visualisation exercises for teams were also good tools to make people relax, and at the same time focus and concentrate on the task. The use of scenario play, story telling and visualisation exercises was viewed as means to go beyond just the traditional argument and remedy for collaboration that participants in teams should be open, trustful, receptive and have the right attitude towards each other. This chapter also proposed a creative technique, called imaginative bridging, which was used in the innovation course. It was argued that this technique helped to break existing mind fixation and functioned as a general help to come up with new ideas and concepts. Both scenario play and mental visualisation exercises were tried out in industrial cases, and had also in these cases process and problem related effects. It is important that such exercises are linked to the problem at hand.

Chapter 8:

In chapter 8 a vision-oriented methodology for the early conceptual phases of design was proposed and discussed. The methodology integrates different tools reviewed and presented in the previous chapters such as the conceptual models in chapter 4, the arrangement of space in chapter 5, the use of happenings and events in chapter 6, and the use of scenario play, story telling and mental visualisation exercises in chapter 7. This is visualised in figure 9.1.

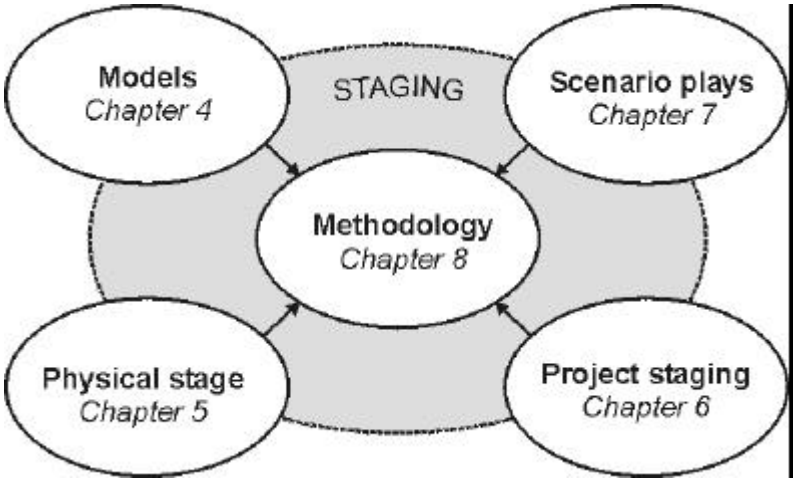

Figure 9.1. Elements from the different chapters integrated into the methodology in chapter 8.

The methodology consists of two stages; the vision-based and specification-based stage. It is linked to traditional methodology through the specification-based stage. In the vision-based stage the development of value mission and goal vision functions as initial reference and point of focus for the concept development process, while the provocative visions function mainly as help for conceptualisation. The vision-based stage of the methodology was tried out in an innovation course. It was experienced by the students as fun, playful and motivating and helped to create a shared basis for the concept development. It helped the students to think in creative and unexpected ways and was viewed as different and challenging compared to traditional methodology. The students needed time to get adapted to the methodology. The exercises that followed the course were viewed as a central and important element in the methodology.

It was argued that the methodology could be useful in innovative projects where the company had the intention of developing new concepts that could hardly be specified in advance. The methodology seemed furthermore to be useful in projects where the user experience was viewed as central and where qualitative aspects of products were acknowledged. The strength and limitation with the methodology was that one could initially develop concepts in the vision-based stage that both the customers and the design team did not expect or have a notion of in advance. The concepts could therefore need strong modification and adaptation in the specification-based stage before they could be used as a final framework for a development plan.

With the initial focus on mission and vision it was argued that the design team could more easily manage to create a shared mind-set and understanding. The use of such methodology could therefore help to avoid too strong polarities and sectional interests and therefore improve collaboration in design teams. The methodology, which has a strong focus on play and visions, seem also to be more engaging and motivating than traditional methodology. This is central since motivation seems to be an important condition for creativity and conceptual thinking. It was suggested that participants using the methodology would need some training and adaptation and that the methodology would also need to be adapted and adjusted to the existing company context. A good way to introduce the methodology would be in intensive workshops.

9.2 General design approach in thesis

This subchapter presents an overview of the general design approach and tools that are proposed in the thesis.

9.2.1 General design approach

The models, tools and methods reviewed in this thesis in chapters 4, 5, 6, 7 and 8 are connected to an overall approach to the design process, which may be viewed as more process oriented and playful than traditional design methodology. This means that in

this approach there is for instance more emphasis on the group process, motivation, atmosphere, mood and shared visions and experiences in a team than in traditional methodology. It has been argued that the design approach should in itself embrace such factors. The methodology should for instance be inspiring and motivating. It is also an approach that puts increased emphasis on the spiritual and contextual aspects connected to products, referring to the vision-based model in chapter 4. The underlying values and the emotions and experience of the users when interacting with each other and with the product are viewed as a central guiding factor for the design process. It is emphasised that such qualitative aspects should be played out, experienced and expressed actively in the design process through for instance visualisation, storytelling and scenario play, and not just reviewed theoretically and rationally. As it was argued in chapter 8 aspects connected to the spiritual and contextual level are viewed as being partly forgotten, neglected or undervalued in traditional design methodology. It is also argued that the vision-based stage of the methodology proposed in chapter 8 is lacking in traditional design methodology.

9.2.2 Integrating the body and surroundings

This thesis concludes with the view that creative activity and collaboration is not just a rational and verbal process happening in the heads of the design team, independent of the surroundings and the body. Too much focus on the rational sides of human beings, where the body is neglected, can have a detrimental effect on creativity, argues Gulbrandsen [1997]. It is the view taken in this thesis that design teams should develop product concepts in an increasingly empathic way with the active use of their body and senses and that the physical surroundings are influencing the team collaboration. The conclusions concerning the positive effects of scenario plays, as reviewed in chapter 7, and the arrangement of space and active use of different body postures for meetings, as reviewed in chapter 5, embrace and support this point of view. It is emphasised that the arrangement of meeting space and surroundings and the use of scenario play should be viewed as part of the total design approach and methodology.

9.2.3 Qualitative tools and development phases

The concept development methodology proposed in chapter 8 is mostly connected to the concept development phase in a product development process. Different qualitative tools proposed in this thesis such as scenario play, storytelling and mental visualisation exercises (chapter 7), change of role and role play (chapter 6), and the arrangement of space for workshops or meetings (chapter 5) are on the other hand not just related to the early concept development phase. Such tools and ways of organising the design process may be used all along the design process from the initial concept development to the launching of the product. They seem especially useful during happenings and events along the development process, such as creative workshops and specific presentations connected to milestones, as proposed in chapter 6. Such qualitative tools are therefore less dependent upon the design phase, even if is suggested that such tools

should be used actively in connection with the concept development methodology proposed in chapter 8.

9.2.4 Paradigm and worldview

The methodology and general design approach proposed in this thesis may be viewed as belonging to a different paradigm and worldview than traditional methodology. The worldview is significantly different in relation to the attitude towards how humans should collaborate together and how design projects should be carried out, embracing directly aspects such as play and improvisation, physical space, the use of body, the use of senses, event sessions, atmosphere and motivation, imagination and visions. It is also different in relation to how products are perceived and developed. In such a paradigm the spiritual and contextual aspects of products are viewed as essential in the development of new products. The vision-based stage proposed in chapter 8 is furthermore not just a separate addition to traditional methodology, but represents a different paradigm and worldview that view product as "social actors", and emphasises that design teams and companies have a social responsibility, in a time where a consciousness and concerns around ecology and underlying values are and should become increasingly important [Daly and Townsend 1993]. The concept of paradigm is here not applied to a research perspective, like it was applied in chapter 3. It can also be applied to practical activities, such as education and working life, according to Gulbrandsen [1997]. This is the case here.

9.3 Conclusions concerning research questions

In chapter 1 four research questions were presented. The first two questions that were posed were related to the status quo and existing practice in companies:

Q1. How are the different actors in a design team nowadays interacting and setting the stage for creative collaboration in the development of new concepts and products?

Q2. What factors or elements are influencing and forming the setting of the stage for creative collaboration in design teams?

Through in-depths interviews and observations made when visiting five different companies these two questions have been under study. All the chapters 5, 6, 7, 8 started with the presentation and discussion of the existing practice in companies, like the arrangement of space (chapter 5), different factors influencing or inhibiting collaboration in teams (chapter 6) and the attitude and use of play and visualisation exercises in meetings (chapter 7).

As reviewed in chapter 5 the respondents view the interior of the meeting space as influencing the collaboration. Nevertheless, the general awareness concerning the arrangement of space seems to be rather low. People meet in traditional rooms with

conference tables and chairs with one white board and flippover. There is also in most of the companies little focus and awareness around the eventual influence of food and drink. Furthermore the companies visited have no system for the storage and use of their own products and competing products as supporting means for creative thinking and collaboration. In the interviews several of the respondents mentioned that they enjoyed having meetings and workshops at other places, for instance at the design studios. The change of meeting place could help to change the mind-set and give new input in the process.

As reviewed in chapter 6 the role of atmosphere and attitude among the participants in design teams is viewed as central for collaboration. In the interviews the problem connected to sectional interests, roles and ownership of the project and lack of shared holistic perspective and visions in the team was outlined as being central for collaboration. It was also reviewed that in design teams and internally in the company there is also often a problem with different conceptual levels or level of abstraction in relation to perceiving a product. The conceptual skills are linked to the roles, viewpoint, perspective and preference of the participants and is also connected to the general atmosphere. The need for a shared expectation of innovation level and focus in the design team was revealed as important for collaboration.

As reviewed in chapter 7 designers and employees in companies were using play, stories and jokes as means to stimulate collaboration, to set an informal atmosphere and to influence each other. Such activities were usually not formalised or organised, but more informal and dependent upon the specific people participating in the project and meeting. The attitude the respondents had towards play and the use of play in the design process was ambiguous. Activities which could be viewed as play were often described in other words.

Chapter 8 presented some of the thoughts and viewpoints from the respondents in the interviews concerning a possible early stage for more play, imagination and focus on user experience. The general conclusion was that the companies seem to be open for the integration of more play and focus on the user experience early in the project as a way to enhance creativity and creative collaboration. Several of the respondents also commented on the problem in existing practice with making product specifications too early in the development process.

The second set of research questions posed in chapter 1 was related to the potential improvement of creative collaboration in design teams in relation to existing practice:

Q3. How may the company stage, both mentally and physically, to improve creative collaboration in design teams in relation to existing practice?

Q4. What type of models, tools and methods may be used to improve creative collaboration in design teams?

In chapters 4, 5, 6, 7 and 8 different models, tools and methods have been proposed and reviewed that are intended to improve the staging for creative collaboration in design teams. As described in chapter 1, the intention in this thesis was not to come forth with hard proofs, but to come with suggestions and conclusions based on phenomenological analysis of the empirical material. Several of the models, tools and methods proposed in this thesis have been tried out in the innovation course. The analysis of the feedback from the students and the observations made in class give the conclusion that the models, tools and methods seem to be useful and powerful in an educational context, and that they have therefore been verified through approval by the students.

The vision-based model, proposed and reviewed in chapter 4 has been tested and tried out in two innovation courses. It has also been tried out in a product innovation course at DTU in Denmark. The conclusion was that the model was of help for discussions and for communicating with others on the same level of abstraction. It helped the students to focus on the more abstract levels, which were a bit unfamiliar, and to not get so quickly fixated to product solutions. It also helped the students to see the connection between abstract and concrete aspects of products, and understand better the social, contextual and spiritual aspects of products. It gave new awareness and a change in attitude. The students needed some time to adapt and get accustomed to the model. In chapter 6 it was concluded that the model could be a fruitful tool and framework in the discussion in a design team, and help the team to calibrate to the same level of abstraction. It could also help a team to develop shared visions and integrate abstract aspects of products in the process. It is argued and concluded that the active use of the model can help to improve creative collaboration in design teams.

Scenario play and mental visualisation exercises were also tried out as tools for the staging of creative collaboration in the innovation course. Both scenario play and mental visualisation exercises seem clearly to have process and problem oriented effects and seem to be powerful tools for the staging of creative collaboration in design teams. The success of such exercises might nevertheless depend upon a good facilitator who has the ability to engage and motivate. Mental visualisation exercises were tried out in two specific company cases and these cases also indicated the potential usefulness of such tools for staging creative collaboration in industrial practice. Scenario play was tried out in one industrial case and the feedback for such tools from the participants was also positive. The process and problem related effects were confirmed in these industrial cases.

The concept of activity zones, proposed in chapter 5, has been tried out in a concrete industrial case, and is verified through acceptance by the company. It is concluded that the conscious arrangement of space and interior may help to improve creative collaboration in design teams. Such arrangement of space must then be adapted to the existing company context and culture.

The vision-based stage of the vision-oriented methodology, proposed in chapter 8, was tried out twice in the innovation course. Parts of the methodology were also tried out a

third time. The methodology was experienced by the students as fun, playful and motivating and helped to create a shared basis for the concept development. It helped the students to think in creative and unexpected ways and was viewed as different and challenging compared to traditional methodology. With the initial focus on mission and vision it was argued that a design team could more easily manage to create a shared mind-set and understanding. The use of such methodology could therefore help to avoid too strong polarities and sectional interests and therefore improve collaboration in design teams. The methodology, which has a strong focus on play and visions, seems also to be more engaging and motivating than traditional methodology. This is central since motivation seems to be an important condition for creativity, team work and conceptual thinking. The development of provocative visions and fantasy contexts as mental laboratories for the design teams were reported as fruitful tools for creativity and conceptual thinking. When a design team has had some training in the use of the methodology and when it is adapted to the company context it is concluded that the use of it may improve creative collaboration. Nevertheless, it is emphasised that such a methodology has its strength and advantage for innovation-oriented projects and for projects with a strong focus on the user experience.

The above conclusions tell that the research questions have been studied and partly answered. Tools, models and methods have been developed that can improve creative collaboration in design teams within certain project conditions.

9.4 Evaluation & conclusions of research methods

As discussed in chapter 3 the research methods used in this thesis are of qualitative nature. The two areas of inquiry are in-depth interviews and action research. In this subchapter conclusions are made concerning the two research methods.

9.4.1 In-depth Interviews

The first area of inquiry of empirical material was in-depth interviews. As described in chapter 3, the aim in this thesis was to use a phenomenological analysis of the empirical material, where the different life worlds and perspectives of the respondents were presented, compared and discussed. Rather than seeking for one viewpoint the aim has been to review different viewpoints and try to discover what their common dominators were in relation to the topic of research. It is the conclusion that this task has also been carried out. In each of the chapters a discussion is made based on the different viewpoints and perspectives of the respondents.

As discussed in chapter 3 the interviewer and researcher interacts closely with the respondent and will directly or indirectly have influence on the total framing and on the direction of the results. Nevertheless, in qualitative research the investigator and the investigated “object” are not viewed as independent entities. In this research paradigm the research cannot stand on the outside and take away the influence on the

respondent or the influence the respondent is making on him. The importance is that the story that is written is experienced as credible and acceptable.

In the analysis of the interviews the KJ-method [Kawakita 1982] was used, with labelling of quotes. With such analysis the idea was that the material could find its own structure in a bottom-up process. It was observed that new understanding of the interviews were brought forth through this process and this analysis helped to let the material "speak". The conclusion is that using this method is a better procedure than putting the material right away into categories that fit the initial mind-set.

A way to have a quality control of the final material would have been to have the respondents read through the transcribed material and through the conclusions that were drawn out of the material. Several of the respondents were during the period given the possibility to look through the transcribed interview. Nevertheless, most of the respondents were so occupied at work that they did not have time to correct and make changes, even when they were personally called and asked. When the respondents made changes these changes and corrections were of minor character. It would have been fruitful if the respondents had read how their quotes from the interviews had been used in the thesis. It would then have been possible to clarify if the interpretation made was in clear agreement with their own point of view. However, there was no time for this procedure, and with so many respondents and so much material it is argued that it would have been tedious work. It is possible that it would have been a better choice to select fewer people for interviews and follow them up more closely. This would have given less material and insight, but might have given a higher quality assurance of the results and conclusions.

It is possible and even probable that important information concerning the field of study has not been collected during the interview sessions. There is also no clear guarantee that important information might have been dropped in the analysis of the interviews. Furthermore, there is no guarantee that the material collected has not been coloured in the analysis or that there might have been some misunderstanding and wrong interpretation in the analysis. Nevertheless, it is believed and argued that the material from the interviews presented in this thesis has become a credible story and that the respondents would generally recognise the stories and conclusions that are made. Even though the material is qualitative and context dependent it is believed that some of the general conclusions drawn from the material are possible to reproduce within similar frameworks. It is for instance believed that the problem with different conceptual levels between participants in teams is possible to detect and find in other companies. These generalities will nevertheless have to be related to the specific context and culture.

The in-depth interviews were an appropriate method of inquiry for this thesis, which touched an area of research which was very qualitative by nature. This method brought forth a great deal of material and is furthermore a well accepted method within social science research. If for instance standard questionnaires had been used it is the clear

impression that many of the insights collected would not have been uncovered and it would have been difficult to get so deeply into the life worlds of the respondents.

9.4.2 Action Research

The second area of inquiry was done through action research, mostly in the innovation course. The material was gathered through verbal and written feedback, reflection and evaluation from the students, besides observations and video recordings.

As discussed in chapter 3, in action research the researcher sacrifices an objective perspective for richness and deeper encounter with the information. Like it was described for in-depth interviews there is no guarantee that the material collected and selected has not been coloured through the analysis, even though this has not been the intention. There has been no conscious intention to manipulate the material. On the contrary, the aim has been to review the different opinions, viewpoints and life worlds of the students and then draw some general conclusions based on phenomenological analysis.

In the course the students gave their feedback to me, as the teacher and facilitator. It is then important to ask the question if the feedback might have been different if it had been given to someone else. The students were asked to be honest in their critique and feedback concerning negative sides of the tools, models and methods used in the course. Nevertheless, it is likely that the feedback was somewhat coloured by the fact that I was the facilitator and teacher. The feedback was also probably coloured by the mental models and ways of thinking that the students learned and were taught through the course. As reviewed in chapters 7 and 8, the attitude among several of the students changed during the course.

The students were not asked to give anonymous feedback, but it is possible that this might have had an influence on the results. Nevertheless, with the personal and intimate interaction in the course the students might have felt such procedure as a bit artificial. It is possible that it would have been fruitful to ask for feedback from the students several months after the course had ended, and then look if the response would have been different. In this case the students would have had greater distance to the course and the methods and tools taught there. They would then probably not have been so much formed by the mental models in the course and the good atmosphere and spirit in the class. It might also have been a good idea to get a written feedback and evaluation early in the course and see how this evaluation differed from the final evaluation. Such a method of inquiry might have given an insight into how their mental models were influenced and changed during the course. Unfortunately, the idea of using such a method of inquiry was developed after the course ended.

The students in two innovation courses and in two other workshops gave a quite consistent and positive feedback concerning for instance the usefulness of the vision-based model, scenario play, mental visualisation exercises, storytelling and the general

methodology. This consistency is viewed as strengthening the results and conclusions. Even though the students might have been influenced by the fact that they gave feedback to me as a facilitator, it is the clear impression through observations and discussions that the students were generally sincere and honest in their feedback. The fact that several students have applied for the course due to recommendations from earlier students may be viewed as a sign that these former students were satisfied with the course. It may furthermore be viewed as an indirect and retrospective acceptance of the methods and tools used in the course.

Most of the material collected from the course has been written directly by the students. There was therefore no need to let the students read through the material. Nevertheless, just like for the case of the interviews, a possible improvement of quality assurance would have been to ask the students to read through some of the conclusions drawn from the material. This might have helped to see if the interpretation that was drawn correlated with what they themselves felt and had experienced. This idea of improvement was also thought about late in the doctoral project, after the courses ended. Such a procedure should have been declared and accepted by the students during the running of the course. The students should have viewed such feedback as part of taking the course, because it was experienced in general to be very difficult to get written feedback from the students after the course was ended.

The case from DTU, where the students used the vision-based model by own initiative and gave positive feedback concerning the model is strengthening the results concerning the model. It is also strengthening the other results and feedback from the course since the feedback given to external people was not so different from the feedback given to me as a teacher and facilitator. The major difference was mostly that the students found new areas of application of the model that the students in the innovation course had not given, and that I had not seen so clearly. So it is possible that new areas of application could be found for other tools that were presented in the course if it was taught and presented by other teachers.

After these areas of potential improvement are proposed it is the belief that the final results and conclusions drawn from the feedback and evaluation actually represent the general impression given by the students. It is also the belief that the general results from the course concerning the use of scenario play, storytelling and mental visualisation exercises can be reproduced. It requires nevertheless a teacher or facilitator who has some experience leading sessions and who has the same ability to be open, engaging and motivating for the students. Furthermore the teacher needs the ability to link and stage the exercises to the design tasks.

The conclusions are made that essays and written feedback to questions, combined with observations and video recordings of the final presentation, seem to be an appropriate method of inquiry for such a course where new tools and methods are tried out and where the personal, subjective experience of the students is viewed as essential. As mentioned above, for future research it would be valuable to get written feedback and evaluation early in the course and a few months after the course ended.

In such a way it would be possible to see how the life worlds and mental models of the students changed during the process. It would also be valuable, after the analysis of both the in-depth interviews and the feedback and evaluation of the students, to have them comment and evaluate the conclusions and how the material had been used. Such procedure might have given a higher quality assurance of the results.

9.5 Further Research and Work

9.5.1 More case studies

The presented outcome and proposals are largely based on the collection of empirical material from two main areas of inquiry. The first area is qualitative interview of industrial design consultants and employees from the internal product development and production divisions in companies. Through such qualitative interviews some of the apparent main problems and obstacles for creative collaboration in design teams, as they were expressed by the respondents, has been investigated and studied. In the interviews the respondents have also commented and given feedback to proposals made by me as the investigator and researcher.

The second area of inquiry of empirical material is through student observation and written / oral feedback from students concerning models, tools and methods that have been applied through the running of the courses and workshops. As previously described one may view the course context as an open ground for trying out different tools, models and methods. Compared to the company setting one could almost view it as a 'play ground' with less restrictions on factors such as time. There is less risk involved in trying out new models, tools and methods in the class setting. Furthermore one could say that the working routines and roles will often be less segmented and fixed in a class setting.

In this thesis different concepts, models, tools and methods have been developed for improving the staging for creative collaboration in design teams. This is based on the empirical material and on reflection and argumentation. It seems clearly to be the case that in the transfer from the class context to the company context the models, tools and methods will need to be further adjusted and adapted. The interviews also revealed a different context in the companies than the one that was observed in class. It is therefore possible that some tools and methods are less useful in the school context than in the company context and vice versa. In the different chapters in this thesis there has been an attempt to bridge the gap from the school context to the company context, where proposals have been made for the company context.

It seems that the natural next step in further research would be to test more thoroughly the models, tools and methods in concrete cases and projects in companies. Through such testing one would be able to see in a clearer way how some of the suggestions and concepts proposed in this thesis would actually work in industrial practice and

how and to what degree they may need to be adapted and changed. Further research should therefore be conducted in the implementation of the concepts in concrete industrial cases, which have so far been tried out with students in courses and workshops. The concepts that have been tried out partly in specific cases, such as the concepts of activity zones and the use of scenario play, storytelling and mental visualisation exercises need also to be tried out more extensively than the case is in this thesis. This will help to reveal further strengths and weaknesses to the concepts, and will give deeper understanding in how such concepts may need to be adapted and adjusted for optimal use and benefit.

9.5.2 Narrowing the field of study

This thesis has had a rather broad and qualitative approach to the object of study, namely the staging of creative collaboration in design teams. Several tools and factors for improving collaboration have been studied and reviewed, such as a vision-based model, the staging of space, the use of play and visualisation exercises, the use of events in the design process and an overall vision-oriented methodology. As argued in chapter 8 and in subchapter 9.2 one should view all the different tools as part of the overall concept development methodology. In future research it could be fruitful to narrow the research and focus on fewer, selected areas and topics. Nevertheless, it is then important to have in mind when making such a choice that the different factors are closely linked, for instance the arranging of space is closely linked to the mental staging, as discussed in chapter 5. As reviewed in the introduction in chapter 1, the staging for creative collaboration is a complex field of study where many factors are interrelated and seem to influence. Many organisational conditions that are central for the creative collaboration in teams have not been studied here. It seems difficult, viewed from a qualitative and phenomenological research perspective, to isolate too many specific factors. As McCracken [1988] writes: *"The qualitative research normally looks for patterns of interrelationship between many categories rather than the sharply delineated relationship between a limited set of them."* [p.16]. It is therefore important, when one is narrowing the field of study, that one takes into account the interrelation between different factors and categories.

9.5.3 Specific areas for further research

When having the criteria from the previous section in mind it is suggested that further research connected to the staging for creative collaboration could be narrowed to the following areas, which have already been under study in this thesis:

A) Arrangement of space
This area of research was addressed in chapter 5, where concepts such as flexible project space and activity zones were proposed. It is an area where not much research has been carried out previously. The positive results and conclusions from this thesis indicate that this is an area that deserves further attention. It would be especially

interesting to see how a change in the interior would influence over time the company culture.

B) The use of exercises
This area of research was addressed in chapter 7, where the effect of mental visualisation, storywriting and scenario play on team collaboration were presented and discussed. The results from this thesis indicates that this is an area that deserves further attention. It is suggested that one may also try out other types of exercises, such as play exercises, music improvisation exercises, storytelling exercises as tools for improving creative collaboration in design teams. The process and problem related effects of exercises should then be studied carefully. Furthermore, the specific link between the exercises and the general methodology proposed in this thesis is an area that needs further attention.

C) Intensive conceptual workshops and events
In this thesis it was suggested in chapter 6 and 8 that one should use intensive conceptual workshops and events in the design process, where external user groups and employees from other companies were invited to participate. The experience made so far from such workshops in education indicates that this is an area that deserves further attention.

D) Conceptual level in design teams
In chapter 6 it was concluded that the problem with different conceptual levels among participants in design teams and in the company was inhibiting creative collaboration. It was also concluded that the vision-based model, proposed in chapter 4, might help as a calibration tool. The use of the model as such tool, especially in industry, deserves further attention. The problem with different conceptual level seem also to be linked to the roles the different actors play in a team. It is therefore proposed that the use of role-play to loosen up fixed roles and perspective in design teams may be an interesting area for further research.

E) Concept development methodology
In chapter 8 the vision-oriented methodology was proposed. This methodology should be continuously improved. It seems to be an interesting area of research to get more experience and empirical material in the use of the vision-based stage in this methodology, and also study more the link towards the specification-based stage. Furthermore it would be interesting to further study how one may optimise the arrangement of space, the use of exercises, the staging of events and the use of different representation tools in this stage, which all are an integrated part of the methodology. It may also be interesting to see if some representation tools, such as scenario play, are more central in certain types of projects.

9.5.4 Methodology and company

A)Implementation of methodology and company culture
An area for future research and work could be to study how the integration of general methodology proposed in this thesis would influence a company culture. The integration of such methodology seems to be connected to a whole worldview and perspective where for instance play and visualisation are increasingly acknowledged. Questions that seem relevant are: How would an increased focus on the spiritual and contextual aspects of products, the arrangement of the interior space, the increased use of events and workshops and the active use of play and visualisation exercises change the company culture over time? What kind of resistance would the implementation of such change evoke and what kind of internal support from management is needed to implement such changes? How strongly is the success of the implementation dependent upon the attitude of the employees in the company? What kind of existing company culture is needed to implement successfully such methodology? And how may the methodology and tools be applied and adapted in a way that is effective and of most use for the company? How would the implementation of such methodology influence over time the values, intentions and strategy of the companies? And how would the use of such methodology be reflected in the final products?

B) Methodology and company strategy
As discussed in chapter 1 the concept development phase is central in the total development process. This phase is concerned with a number of critical, strategic decisions that have great impact on the performance of the product development. As indicated in chapter 8, evaluations and decisions made in this phase should be linked to the strategy of the company and the type of brand and corporate identity the company wants to promote and have. It would be interesting to study the different phases or activities in the vision-based stage and see how it is possible to make a good link to the company strategy. The development of value missions and interaction visions in a specific project will be influenced and will also influence the existing strategy of the company. It could furthermore be interesting to study how a good link between the company vision and the specific interaction vision for a project could be and how strong such link should be.

C) Methodology used on technology-driven projects
It has been argued that the vision-oriented methodology proposed in this thesis is especially appropriate for projects which have a strong user orientation and focus. An area of future research would be to study what elements of the total methodology that could be useful in projects which are basically technology driven. For such projects the product will still be developed for some kind of end users. Questions that seem relevant are: How may elements from the methodology be integrated and adapted in projects which have a starting point in technological innovation? What tools developed in this thesis are of most use in such projects?

9.5.5 Information technology and virtual meetings

For further research it would be interesting to look at the different concepts proposed in this thesis in relation to the increasing use of Computer Supported Collaborative Work (CSCW) technology. How may a team for instance use play, storytelling and visualisation exercises in virtual meetings? May one arrange the virtual meeting space using some of the concepts proposed in chapter 5, such as activity zones, whiteboards, flexible sitting posture, and the use of competing products and drawings? Is it for instance possible to envision different activity zones in a virtual meeting space, similar to the ones that were proposed in chapter 5?

In further research it may also be useful to have a clearer understanding of the strength of both physical and virtual meetings and see what kind of activities and exercises that need to be done in face-to-face meetings and workshops. It would be fruitful to find the right balance between physical and virtual meetings, and define clearly what factors in physical meetings that may not be achieved in virtual meetings and vice versa. It may also be fruitful to look at combinations of virtual and physical meetings, where for instance some participants, who are geographically dispersed from the physical meeting or workshop, are present through video conference sequences. Finally it might be interesting to see if computer systems can be created in an increasingly intelligent way so that they act to a larger extend as “facilitators” for group sessions.

9.5.6 Implementation of obtained knowledge

In the previous sections recommendations for further research was suggested. In this section recommendations are made about how the obtained knowledge in this thesis may be implemented and distributed to the research society, to manufacturing companies and to the general public.

A) Consultation and running of workshops
A good way to implement and distribute the obtained knowledge is to run workshops for companies, where the methodology is used and adapted for the specific company setting. Besides the two workshops described in chapter 7, one workshop was held for a company where parts of the methodology was used. The workshop was made confidential, so the result were not used in the thesis. Lately, agreements have been made with companies for new vision-oriented workshops. Besides the running of workshops the obtained knowledge may be implemented and distributed through direct consultation with companies. It would also be valuable to work with the interior in companies in the coming future.

B) Writing a handbook
A fruitful way to distribute the obtained knowledge would be to write a handbook that different companies could use in their development process. Such writing, which would also include many practical exercises, is a possible project for the future.

C) Publishing in design journals
Much of the results from this thesis has not yet been published in journals and conference proceedings, since these results were obtained at the end of the doctoral project. Such publications seem to be a natural step further along the way, which would help to make the results more available for the research society.

D) Courses for students
A good way to share the obtained knowledge is to run new workshops and courses for students. The students may later, when they are done with their education, implement some of the methodology and tools in companies.

E) Sharing with the press
Parts of this doctoral project has already been presented in majors newspapers in Norway. I have also been interviewed several times on both the major broadcasting radios and televisions in Norway. The theme of this thesis seems to be of interest for the larger public. My clear impression is that the press has been interested in the work of this thesis. Further work should be done in sharing the results with the larger public. Nevertheless, it is important to have in mind that the results should not be presented too simplified and polarised, which is the danger when addressing the daily press.

URN:NBN:no-2324

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Erik Lerdahl: Leken og kvalitativ konseptutvikling. *Idsign*, 4, 1999 (In Norwegian).

URN:NBN:no-2324

List of abbreviations

CSCW – Computer Supported Collaborative Work

DTU – Danmarks Tekniske Universitet / Technical University of Denmark

IPD – Institutt for Produktdesign / Department of Product Design Engineering

IMM – Institutt for Maskinkonstruksjon og Materialteknikk / Department of Machine Design and Material Technology

IT – Information Technology

KJ – Kawakita Jiro

NFR – Norges Forskningsråd / The Norwegian Research Council

NTNU – Norges Teknisk-naturvitenskapelige Universitet / The Norwegian University of Science and Technology

OD – Organisational development

P – Production

PD – Product Development

SPIN – Senter for Produktutvikling i Næringsmiddelindustrien / Centre for Product Development in the Food Industry

ViP – Vision in Product (Design approach)

2D – Two dimensional

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Appendix A:

Check list / Manual for In-depth interviews

(Short English version, translated from Norwegian)

Background

1. Personal background / carrier
2. Story of company, why survived?
3. Differences designer – product development – production
4. Good project – characteristics
5. Multidisciplinary, design teams, strength - weakness
6. Role of designers

Meeting atmosphere & room

1. Meeting atmosphere
2. Role of humour, surprise
3. Rituals (coffee, pictures, stories)
4. Optimal meeting form
5. Quality of room
6. Atmosphere in room
7. Project room

Tension – conflict

1. Tension in projects
2. Different level of expectation, calibration
3. Critical phase in project
4. Difference pragmatic / aesthetic approach – viewpoint
5. Role of provocation
6. Ownership
7. Involvement of production early
8. Decisions in design process

Idea and concept development

1. Presentations of concept
2. Feedback on concepts
3. Mental models
4. Open up for creative process – how?
5. Develop new ideas, techniques
6. Work conceptually together

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7. Difference in conceptual level
8. Creative workshops
9. Open for absurdity early phase
10. Strategy for creativity and innovation?

User experience

1. Role of user experience
2. Communication of experience
3. Discussion of experience
4. Own early phase for discussing experience
5. Design context for user experience – viewpoint
6. Contribution to society
7. Forming a better society – viewpoint

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Appendix B:

Progression of doctoral project. Important happenings

1996:

August - December	Self-study in creativity, writing on a script on the subject
November	Sigurd Støren called and told that he had obtained financial grants for a doctoral project, with the title "Creative processes in the interaction between product design and production".

1997:

January	Start of doctoral project, Dept. of Machine Design and Material Technology, NTNU
January - May	Took several courses, for instance in Design Methodology and Product Development, as part of the doctoral project.
July	1) Moved over to Dept. of Product Design Engineering, NTNU. 2) Participated in two weeks workshop at KTH, connected to creativity in Engineering Design Education. Teachers from Stanford. Several exercises taught here were later used in the Innovation course.
August	Led a weekend workshop for the professors at the Department of Machine Design and Material Technology, NTNU, on creative collaboration.

1998:

January	Finished large self-study in creativity, as part of the doctoral project.
April - July	Stay at the Faculty of Industrial Design Engineering, Delft, the Netherlands. Wrote the first draft for research questions and research focus. Had many important discussions with employees at the faculty, who helped me to get a stronger focus.
July - August	Developed questions and manual for in-depth interviews of employees in companies

Sept. - December	1) In-depth interviews. 2) Preparation of Innovation course together with Per Finne
1999:	
January - May	1) Running of the Innovation course for the first time at the Department of Product Design Engineering, NTNU, together with Per Finne. Action Research. 2) In–depth interviews. Transcription of interviews.
June	First contact in relation to Luxo case
August	Finished transcription of interviews
September – January 2000	Stay at the Department of Control and Engineering Design, DTU, Denmark. Had many important and good discussion with Mogens Myrup Andreasen, who helped to give stronger focus on the thesis. Wrote the second draft for research questions. Translation and analysis of the in-depth interviews. 2) Workshop at Danfoss, Denmark.
2000:	
January – April	Running of the Innovation course for the second time at the Department of Product Design Engineering, NTNU. Action Research.
February	Start to write on chapters of the thesis
September	Running of a weeks workshop in concept development at National College of Art and Design, Oslo
October	Running of a weeks workshop in concept development for design students at Aalborg University, Denmark.
November	First draft of thesis ready, with all chapters
December	1) Feedback on the draft from colleagues at the Department of Product Design Engineering and from Marvin Rausand. 2) Running of workshop in Oslo for food industry.
2001:	
January – April	Running of the Innovation course for the third time at the Department of Product Design Engineering, NTNU.

May	Defence of doctoral thesis