SALU YLIRISKU

Frame it simple!

Towards a Theory of Conceptual Designing

Aalto University

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Doctor of Arts dissertation

Abstract

This study develops an empirically and theoretically grounded explanation of conceptual designing. Conceptual designing is a concept-mediated planning activity that is typically collaborative and involves the use of semiotic resources such as talk, text, figures, pictures, visualisations, diagrams, sketching, and gesturing. Central to conceptual designing is the intent to articulate high-level simplifications, design concepts, which guide the strategic decision-making over a thing-to-be-designed and inform detailed designing.

The original main contribution of the study is an explanation of conceptual designing in terms of *project-specific learning*. It is assumed that the changes in the ways a project team articulates, talks about, refers to, and makes changes to a thing-to-be-designed, are indicative of project-specific learning. A novel method for the investigation of project-specific learning is presented, namely Framing Analysis of Design Articulation (FADA), and a set of analytical concepts for the investigation and conduct of conceptual designing are introduced. With FADA it is possible to investigate designers' construction of semiotic resources, which are necessary when designers create a framing strategy for their project. As the result of investigating two real projects the study sheds light on to the deep dilemmas inherent in conceptual designing as well as delivers concrete insights for its facilitation.

The work is conducted as part of the practice-based tradition, and aspires to be associated to such works that have been able to make a doubly methodological contribution; to the methodology of studying design practice by introducing theoretical insights, methods, and analytical concepts; and to the approach that designers employ in conducting conceptual designing. The key benefit of the present work for designers is the uncovering of the importance of the preliminary activities of developing semiotic resources for the construction of the design concept, i.e. the value of *priming*, and the significance of preliminary structuring of attention and articulation through what will be called *pre-framing*.

Preface

On his visit to our university Klaus Krippendorff (2010) presented the various issues that human-centred designers need to take into account and address in designing, and argued that design must

- acknowledge the multiple worlds of its stakeholders,
- address the increasingly virtual nature of its targets,
- be human-centred and employ interactive conception of the meaning that artefacts may acquire in use,
- define itself in communication, and
- be a leader in material culture, not servant of industrial interests.

After his presentation I asked him about the communication challenge that designers are now facing, in roughly the following in way: "Humans have not changed in their biological structure over the last two thousand years, but the social and technological structure of human environment has. What kind of a super-human must a designer be in order to deal with this ever-increasing complexity?" After pondering for a moment Klaus replied, "Just be human. It should be enough."

But what does this mean in the context of conceptual designing? Within the field there are no systematic theoretical frameworks that would explain how it is actually possible to be 'just human' and be successful in the changing environment of designing. Designers are now facing a reality, where it is increasingly difficult to discover the relevant issues for a project at hand and develop elegant designs that reflect a deep understanding of the inherent dilemmas in a simple way (Friedman & Stolterman, 2011). Donald Norman (2010) argues that design education must change to respond to the changes in the human environment:

> *"In today's world of ubiquitous sensors, controllers, motors, and displays, where the emphasis is on interaction, experience, and service, where designers work on organizational structure and services as much as on physical products, we need a new breed of designers. This new breed must know about science and technology, about people and society, about appropriate methods of validation of concepts and proposals."*

The motivation to understand conceptual designing is not merely academic, it bears a strong business incentive too. Global changes in the business environment are making it increasingly important for businesses to be innovative. Design scholars have begun to use terms, such as 'conceptual age,' 'creative age,' and 'connected age' to talk about the current era. Pacione (2010, pp. 7–8) concludes that these notions are pointing towards a common agenda:

> *"the recent radical shift to a globally connected economy, and the abundance, outsourcing, automation competition, and complexity it is heralding, are creating the need for a new kind of human and new kinds of organizations especially competent in design."*

This kind of agenda calls for a new understanding of what the design capability in this new age is. The main objective of this study is to develop a theoretically and empirically grounded explanation of conceptual designing. The approach chosen for the present study is to explain conceptual designing in the point of view of communication and learning, which are essential skills in the successful conduct of designing in the changing environment. An underlying intent throughout the study is similar to that of Szymanski and Whalen's (2011), the production of work that can function as a resource for further research rather than as a mere end marker of a research journey.

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Extraordinarily big thanks go to my wife Satu for the tolerance of my absent-mindedness, my interpretation of sleeping, and the towering piles of books on our tables in our living room and bedroom, and for the full-hearted support throughout the process. Special thanks for Supermummo for taking care of my daughters Lumi and Helmi while I was tapping the keyboard. Thanks Äijä, Mummi and Vesa for your interest in my work, and your tolerance for my confusing answers about what do I do at work. Iso kiitos Helmille ja Lumille että jaksoitte odottaa. Ihan tyhmä väitöskirjani valmistui viimein!

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The word “learning” undoubtedly denotes
change of some kind.
To say *what kind of change* is a delicate matter.

– Gregory Bateson

1. Introduction

This study focusses on a particular kind of collaborative designing, which I have chosen to call *conceptual designing*. Central to conceptual designing is the intent to articulate high-level simplifications, design concepts. The notion of 'design concept' is used in a variety of disciplines, such as graphic design, fashion, car design, and interaction design with varying meanings. Here a *design concept* is understood as a particular kind of resource for communication that can be employed to organise design action in a coherent manner.

Conceptual designing is close to what is generally addressed under the topic of 'design thinking,' which has recently attracted considerable attention across professions as well as in academia (Badke-Schaub, Roozenburg, & Cardoso, 2010). I will approach the notion of design thinking through the works of Nigel Cross who has investigated the topic over several decades, and whose account of it may be the most comprehensive to date. Cross has been involved both in the development of academic methodology for the study of designing (Cross, Christiaans, & Dorst, 1996), the education of engineering design methods (Cross, 2008), theorised designing as 'designerly ways of knowing' see (Cross, 1982, 2001a, 2007) as well as 'co-evolution' of the 'problem-solution' (Dorst & Cross, 2001), reviewed, analysed and reported relevant academic studies of design methods by other scholars (Cross, 1984, 2001b), investigated the creative strategies of professional designers (Cross, 2002), and reflected and theorised on design thinking (Cross, 2011). He (ibid.) considers design thinking, and design ability, to be a key part of what makes us human. He (ibid.) goes as far as to claim that everything that surrounds us, which is not a simple untouched piece of nature, is designed by people. So, everybody designs and thus designing constitutes part of our humanity.

In his study of 'exceptional' designers (Cross, 2002) and related theorising (Cross, 2011), he identified the centrality of a *strategic* approach to design ability. Designers appear to be "framing the problem" in a strategic fashion. He (ibid.) identified three generic aspects to a successful strategy:

1) applying a systems view, 2) creating a problem-framing, and 3) designing from first principles (see Figure 1).

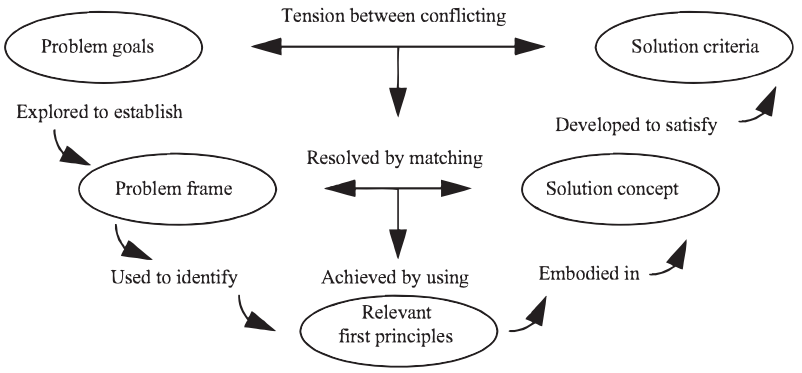

Figure 1. *A model of design strategy followed by creative designers by Cross (2002).*

What Cross (ibid.) calls the *systems view*, is attention to the broader context of designing, to the whole situation rather than to detail, enabling designers to discover the most important relations. For example, when starting to design a new door handle, innovative designers attend to its broader context investigating how the handle may connect a door to a broader set of activities, spaces and organisations that are around. Cross (2011, p. 76) states that designers explore a 'design problem' from their own perspective and "formulate or *frame the problem* in a way that stimulates and pre-structures the emergence of design concepts". For example, designers of the door handle could be led to the realisation that it is not actually the handle that should be designed, but the way in which protected spaces are accessed. Such a framing is fundamental to the development of design solutions. The *first principles* are fundamental rules that a design needs to comply with or be driven by. These rules guide the generation of ideas as well as the detailed formulation of them. As an example of such rules, Cross (ibid.) mentions the physical principles that establish the down-force for a racing car. Designers of race cars must appreciate these rules in order to take advantage of down-force.

One aspect of designing, which has attracted little attention in Cross's works, is the use of materials as part of the enterprise. He (Cross, 2001b) recognises the important role of sketching for the development of early ideas, but also the way in which the materials of designing function to bring insights across events into a particular situation. Conceptual design-

ing may also progress over long durations; e.g. over months. The detailed analyses by Cross focus on separate experiments that last up to two hours, see (Cross et al., 1996). A design experiment that lasts less than two hours may not reveal what happens in longer projects. Cross (2011) recognises that designers work on multiple lines of thought in parallel and that the use of paper is important in the work. It is thus likely that materiality plays a significant role in the ways these parallel streams of thought are brought together in a design concept. Materials appear as essential means through which the persistence of ideas is sustained, and thus, it would be likely that this aspect of materials should attract significant attention in the studies of designing. Cross's analyses, however, do not expose how this happens.

The framework set out by Cross (2011) holds central to it a division between the 'problem' and 'solution'. Dorst and Cross (2001) explain the process of designing in terms of co-evolution of the problem and solution. Cross (2001b), however, deviates from this terminology when addressing 'creative' design. He (ibid. p. 17) recognises that "problem framing, co-evolution, and conceptual bridging between problem space and solution space seem to be better descriptors of what actually happens in creative design." Approaching designing in terms of 'conceptual bridging' and 'problem framing,' has strong resemblances to the work by Donald Schön, e.g. (Schön, 1983). In his pragmatist theory of designing, Schön (1983) employs the notion of 'frame' to talk about the conceptual structures that guide designing. The notion of 'frame' enables talk about the conceptual materials of designing as resources without assigning them a particular role as a definition of a problem or a solution; see e.g. (Schön, 1984).

Design problem, however, is a notion used by designers when they talk about the process, and as such may help in making valid empirical accounts about the ways they see the situations that they inhabit; see e.g. (Goodwin & Duranti, 1992). Design problems may hence have an actual role in designers' interaction, in so far as they conceptualise and present their own work in terms of problems and solutions. However, in the early phases of designing, when the initial framing for designing becomes outlined, there may not be problems to start with, but the problems need to be constructed. And this construction process might not be best conceptualised in terms of problems, but rather, as I will argue, in terms of communication and learning.

When seen as communication and learning, the focus of analysis will be turned towards the construction and use of resources rather than in the structure of the assumed problems. Goodwin's (2000) work, which studies the use of communicative resources in interaction is especially valuable for the present study. Goodwin (ibid.) studied how situations become structured by the communicative actions of the participants, and explored this in relation to the resources they employ and construe. Central to Goodwin's theorising in the field of language and interaction is the notion of *semiotic resource*, which he defined as (ibid. p. 1490): "e.g. a range of structurally different kinds of sign phenomena in both the stream of speech and the body, graphic and socially sedimented structure in the surround, sequential organization, encompassing activity systems, etc."

The notion of 'external representation,' which is employed in the field of cognitive science, see e.g. (Hutchins, 1995; Kirsh, 2010; Rumelhart, Smolensky, McClelland, & Hinton, 1986), is a closely related concept to 'semiotic resource'. The concepts of external representation and semiotic resource reflect different histories of the fields, and function to highlight somewhat different issues. Semiotic resource grows out of the ethnomethodological tradition, which investigates the ways in which human interaction gains its organisation, see e.g. (Garfinkel, 2004; Heritage, 1984), and treats the materials of the studied situations as potential resources that people employ in order to orchestrate their interaction. 'Semiotic' implies that a resource has a role in communication. External representation, in contrast, bears signs of the computing-oriented history of the origins of cognitive science; see e.g. (Rumelhart & Ortony, 1976; Rumelhart et al., 1986; Schank & Abelson, 1975). Representation was a means to emphasise that cognition is about a world that became *re-presented* within a cognitive system encapsulated within the human head. Once cognitive scientists realised the significance of the material world for cognition, they needed to find ways to talk about things that matter for cognition *outside* the skin, hence 'external' was necessary to make the location of the representation explicit (Hutchins, 1995).

In the above I argued that while the methodological development, design studies and theorising by Nigel Cross are invaluable for our current understanding of the field, which I have referred to as conceptual designing, there are some important areas in which his theorising might be complemented. Cross, nevertheless, is not alone in the study of conceptual designing. Below I have gathered five different streams of research that have addressed conceptual designing from different points of view.

Five approaches to the study of designing

I have identified five different approaches towards the study and explanation of designing, which are relevant for the current work. The approaches are partly overlapping. The *first* of these consists of practitioners' scholarly accounts of their field, (such as, Cagan & Vogel, 2002; Keinonen & Takala, 2006; Kelley, 2001; Pahl, Beitz, Feldhusen, & Grote, 2007; Ulrich & Eppinger, 2003), which are often used as education materials for design students. This approach also includes studies that aim at contributing to the development of potential, and to designers' understandings of the meaning of their methods, such as 'design probes' (Mattelmäki, 2006), 'mood boards' (Lucero, 2009), 'video card game' (Buur & Søndergaard, 2000), 'hands-on scenarios' and 'video-action walls' (Buur, Vedel Jensen, & Djajadiningrat, 2004), 'interaction relabeling' and 'extreme characters' (Djajadiningrat, Gaver, & Frens, 2000), 'inspirational collections' (Keller, 2005), 'design games,' (Brandt, 2006; Vaajakallio, 2012), and assist them to understand the limits of their methods (Lee, 2012). This approach is driven by a will to develop the field of designing, to go beyond the practice; see e.g. (Ljungblad, 2008).

The second approach consists of theoretically-oriented explanations of designing, which outline the field in terms of some abstract concepts. Designing is *seen as* something, for example, as the 'taming of wicked problems' (Buchanan, 1992), as the 'co-evolution of the problem-solution' (Dorst & Cross, 2001), as 'inquiry' (Gedenryd, 1998), as 'performance' (Jacucci, 2004; Binder et al., 2011), as 'reflective practice' (Schön, 1983), as 'symbolic information processing' (Simon, 1996), as the 'construction of representations' (Visser, 2006), as the use of 'practice-bound imagination' (Hyysalo, 2010), and as the 'application of a systematic process of problem-solving' (Lawson, 1990). Common to these works is the work to develop an abstract and polished synthesis (schemes, models and concepts) on the basis of earlier written works, theories and philosophies, and possible experiences in the field. Also common is the description of designing in a theoretically-oriented manner, apparently an intent to develop theoretically deep accounts of what designing is.

The third approach is characterised by the setting of initial assumptions about the practice that they explain in terms of some theoretical concepts that have been outlined *a priori* to the study. For example (Hey, 2008; Hey, Joyce, & Beckman, 2007; Hey, Yu, & Agogino, 2008) expected to discover 'frames' in designing, (Valkenburg & Dorst, 1998; Valkenburg, 2000) as-

sumed a set of assumed categories of activities, i.e. 'naming,' 'framing,' and 'moving,' and (Günther, Frankenberger, & Auer, 1996) anticipated designing to start with a 'design task' and be comprised of 'problem solving phases,' 'subfunctions,' and 'product characteristics.' Armed with these expectations the analysts following this approach can analyse large sets of data efficiently. The grounding of these anticipations, and the relationship of the expectations to the studied practice, is critical for the validity of this approach.

The fourth approach describes designing in great detail and appreciates its self-organising, unique, and mundane everyday character, and focusses on the *resources* that designers use in their practice. Examples of this approach are Bucciarelli's (1994) ethnographic study about designing in a design engineering company, Mondada's (2011, 2012) expositions of how designers employ materials in their embodied interaction, and ethnomethodological studies that reveal patterns of designers' interaction on the basis of very close scrutiny of the methods that they employ in their practice (Heinemann, Landgrebe, & Matthews, 2012; Matthews & Heinemann, 2012). Because these works are "unapologetically empirical," according to Matthews and Heinemann (2012), any analytical conclusion must be empirically drawn from what matters for the participants of the studied practice. This approach refuses to make initial assumptions about design practice, and any assumptions on the practice must arise from the practice itself. And abstracted phenomena that are used to explain the practice must be explicated through their manifestation in the embodied interaction of designers, i.e. in the ways displayed by the studied practitioners' action.

Examples of this stream of work are those by Murphy, see (Murphy, 2003, 2004, 2005), and that of Tholander, Karlgren, Ramberg, and Sökjer (2008). Murphy built his analyses of the interaction at an architecture office on the model provided by situated cognition, see e.g. (Clancey, 1997; Hutchins, 1995; Lave, 1991), enhanced by new developments in interaction analysis e.g. (Goodwin, 1995, 2000). He (Murphy, 2004) argued that "imagination can be *viewed* in some circumstances *as* a goal-oriented activity in which people are imagining for some consequential purpose." The terms 'view as' are emphasised in order to underline the theoretical, or conceptual, metaphor that Murphy uses. Together Murphy's philosophically and theoretically firmly grounded explanation of designing in terms of joint imagination, combined with his detailed analysis are the reasons I consider this work to belong to the fourth rather than to the third category

of approaches. Notable in Murphy's work is its distance to the discourse that takes place amongst scholars who teach designers. Murphy does not use any sources in this field.

The fifth approach, which is closest to the present, is doubly methodological – i.e. this approach contributes both to the developing design methodology as well as to the academic methodology for the study of designing itself. I have identified a number of works that belong to the practice-led research, or research through design, (see Koskinen, Zimmerman, Binder, Redström, & Wensveen, 2011), which have achieved this challenging goal. Kurvinen (2007) and Kurvinen, Koskinen and Battarbee (2008) studied design interaction in detail by applying an ethnomethodologically informed process. They conceptualised the methods that designers use in terms of 'prototyping social interaction,' which is suggestive of a design method and can be brought back to the field of designing, for example developing such means as 'experience prototyping' (Buchenau & Fulton Suri, 2000). The design background of the authors is visible not only in their academic literature sources, but also in the way the conceptualisation relates directly to design practice: prototyping is one of the central means through which designers learn.

The fifth approach is close to the approach that became described as the 'design methodology' in the 1960s, see (Cross, 1984). The approach was largely driven by scholars who were at the same time involved in the education of a new generations of designers. Examples of the doubly methodological works are those of Akin, (1984/1979) which develops new academic video analysis method in order to improve designing and the ways it is being taught, and the works of Lawson (1980, 1984, 1990) which employed novel experimental settings to the study of designing and outlined structured strategies for design practice. Also belonging to this is the work by (Bødker & Buur, 2002) that introduced the idea of 'design collaboratorium,' which presents an incentive to develop novel means to conduct and study design co-design.

Other examples of the fifth approach are the works of Tuikka (2002), Battarbee (2004), Agger Eriksen (2012) and Heikkinen (2013). Tuikka (2002) develops computer-supported generation of design concepts at the same time as contributes to the academic use of activity theory to explain design work. Battarbee (2004) conceptualises the academic notion of co-experience and devises methods through which it is studied in concrete design work. Agger Eriksen (2012) investigates the materials of the co-designer through an exemplar approach and argues for seeing designing

in terms of 'rematerialization'. The work develops both novel ways to conduct design work as well as displays new ways of academic study of design practice. A similar contribution is made by Heikkinen's (2013) 'Design Credo,' which develops an account of how personal tool-making (designing) can be seen as personal theory-building. Typical to these works is a designerly interest in improving design practice, which is done through detailed reflection on personal experiences in its conduct. They both function as exemplars, see (Binder & Redström, 2006; Koskinen et al., 2011), of academic research of design, and thus, contribute to the development of the methodology of the study of designing.

1.2. Research questions

The current research was driven by a desire to explain what happens in conceptual designing in terms that would convey its most distinctive features both to the communities of design research and design practitioners. Practice-based research builds on my personal engagement as a conceptual designer, and it centres on the much-used notion of 'frame'. The study investigates two central research questions:

- What is the role of semiotic resources for the construction of a design concept in situated interaction?
- What are the strategies that designers employ when actively framing, or setting frames for conceptual designing?

1.3. Structure of the thesis

Chapter 2 reports a historical review of developments in the practice of conceptual designing and argues for an increasingly significant role of conceptual designing for design organisations. The focus is on the point of view of practitioners, and the chapter uses historical accounts and as well as academic books for designers as its material. On the basis of the review, the chapter outlines characteristics of contemporary conceptual designing and the key roles that design concepts play in the practice of designing. Product conceptual design, design concepts, and tentative definitions of conceptual designing are discussed towards the end of this chapter.

Chapter 3 moves on to a more theoretical level, and reviews accounts that are geared towards developing a foundational explanation of designing and design thinking. It begins with an analysis of the problem-centred

conceptualisation of designing, and progresses towards a frame-focussed discourse that has its roots in pragmatist philosophy.

Chapter 4 presents the theoretical contribution of the study. It outlines the definition for conceptual designing, introduces the notion of 'frame' and Bateson's idea of the levels of learning. The chapter develops a view about conceptual learning, and argues that learning could be indicated by differences in how people re-articulate the things that they address in their communication. The chapter also introduces the key theoretical assumptions, i.e. priming and crux events, as well as the central conceptualisation of conceptual designing as project-specific strategic learning.

Chapter 5 presents the research method that was used to analyse the empirical data. The focus of the chapter is the explanation of the method as well as the introduction of the data that was analysed through the method. Notable in this chapter is that the method was created as part of the present research. It was necessary to create a new method, because the empirical and theoretical discoveries indicated that such a method does not yet exist that would suit the purpose of the present study.

Chapters 6–8 present the analyses of the empirical data. They comprise of two main parts: one (a coarse analysis) focusing on the activities before the key event where a design concept was constructed, and thereafter (a detailed analysis) investigating the socio-material interaction that resulted in the articulation of what are considered as design concepts.

Chapter 9 draws together key findings from these two projects and explicates issues that are relevant for the explanation of conceptual designing. The focus of the chapter is on the phenomena that were discovered to work for successful conceptual designing.

Chapter 10 draws together the empirical and pragmatic contributions of the work. It argues that the present study displays a deeper and wider picture of conceptual designing than has been conveyed by any single work to date. The chapter concludes with a description of the value of the work for design practitioners.

Chapter 11 summarises the methodological contribution. Methodology is seen as the development of theory, methods, and concepts for the making of discoveries in some field of enquiry. The chapter spells out the improvements that have been made to academic methodology for the study of conceptual designing. Related academic work is discussed.

Chapter 12 reflects upon the significance of the work and recaps the most important contributions both to the academic study of conceptual designing as well as to its practical conduct.

2. A short history of conceptual designing

This chapter outlines the historical background for the current study and argues for an increasingly significant role of conceptual designing for design organisations. Conceptual designing already has a substantial history, dating back to the renaissance and further. However, reliable evidence from further in history is very scarce. Recently the role of conceptual designing has drawn attention due to global changes in socio-technological environment (Pacione, 2010), and is reflected in the recent focus on innovation and creativity. This chapter reviews some of the most important milestones in the history of conceptual designing, and develops a picture about the realm especially from the point of view of practitioners in the field. Product concept design and design concepts are discussed in section 2.8.

The chapter is written to support, not only learning about the history of conceptual designing for the building of an academic argument, but also, learning insights for conducting conceptual designing. Hence, hopefully it is of interest to practitioners in addition to academics.

2.1. The roots of conceptual designing

The term "Eureka!" is attributed to Archimedes, who is said to have cried it out when realising how to prove a complex shape to be pure gold (Hirshfeld, 2009). The legend tells how a bathing experience resulted in the discovery of Archimedes' principle, and the phrasing has ever since epitomised experiences of disparate ideas cohering into a simple theory. And it will be employed in this study as well to refer to the key moments of insight in conceptual designing, cruxes as these are called later in the study. Archimedes, who is said to have been interested in wide array of domains including geometry, irrigation, ships, and pulleys, created simple designs that addressed complex problems in an elegant manner. One of the most famous conceptual designs known to be conceived by Archimedes was the idea of the water screw, which has been replicated multiple times in modern machines (ibid.). Nevertheless, history about Archimedes actually

inventing the water screw is contradictory. Dalley and Oleson (2003) argue that what is especially interesting in the history of the water screw is its complete absence in the cultures in Mesopotamia and Egypt, and there are also fragments of evidence that the water screw was actually conceived earlier in Assyria. Dalley and Oleson (ibid.) conclude that it is impossible to be certain about the origin of the idea of the water screw, since historical accounts on ancient technology are often unclear, mistaken, and tendentious. Gruber (1981) reminds that the first record of Archimedes' work is from the texts of Vitruvius, some three centuries after Archimedes had died. Regardless of this, it is clear that the idea of the water screw was actually developed at some point of history, and that it has been resorted to repeatedly over time, and can still be found even in contemporary industrial machinery, such as the screw conveyor used to move grain.

The first substantial evidence of conceptual design thinking that includes both verbal and visual explanations of designs from the first-hand source can be found in the notebooks of renaissance engineers, most notably those of Leonardo da Vinci (1452–1519). His work is marked by an extraordinary wealth of novelties that might be called design concepts, and these include such ideas as the airplane, the helicopter, the parachute, the submarine, the automobile, and even the bicycle (Pedretti, 1987). This list of design concepts is so radical and unforeseen that it raises but one question: How is it possible that a single man authors so many design concepts that would hundreds of years later turn into innovations that revolutionise human transportation in several realms? What was Leonardo's secret? If this could be known, maybe it would also help current designers to focus on those issues that underlie da Vinci's work.

Leonardo, like his contemporaries, such as Filippo Brunelleschi and Francesco di Giorgio, was trained through apprenticeship, through which he learned to prepare and use materials that were required to make drawings, paint pictures, and produce sculptures in stone and metal (Ferguson, 1993). This kind of schooling prepared him to make judgments about the materials on the basis of his *sensual* observation. Ferguson (ibid.) writes that it is difficult for the contemporary engineer to understand that Brunelleschi designed the great dome of the Florence Cathedral without assistance of scientific calculations. Brunelleschi's knowledge was developed in the world of art, like Leonardo's, not in the world of science.

During his life da Vinci was involved in various areas of work. He is considered as an artist, architect, inventor, philosopher, and even a scientist (Galluzzi, 1987a). He studied nature carefully and developed his own

principles that he called the "elements of mechanics," which were movement, weight, force, and percussion. According to (Galluzzi, 1987b, p. 76) da Vinci combined theoretical foundations with practical applications, using mechanical principles as his point of departure, and he explored partial problems by sketching these into detailed views. Leonardo carefully followed the principles, which he had internalised through his active and prolonged engagement in refining them, as he developed his ideas.

Leonardo da Vinci's work pivoted around his visual sketching. There is evidence that he also used prototyping to make conclusions about the properties of the designs (Galluzzi, 1987b). Leonardo used a particular way of articulating his ideas, which made a difference as compared to the existing presentations. Marinoni (1987, p. 118) writes:

> *"Leonardo was heir to the dreams of Taccola, Fontana, Guido da Vigevano, and many other, anonymous, investors; but he replaced their crude sketches with more convincing images – images that had moved out of the realm of fantasy and into the realm of potential realization."*

The technique that Leonardo used in his engineering drawings was a combination of a general image of the overall view, which was accompanied with the most important technical construction details (Galluzzi, 1987a, p. 51). Leonardo also used the new graphical innovation of linear perspective to convey and explore his ideas (Ferguson, 1993). And, with many of his ideas, he developed a model to test them. He was devoted to exploring how things could be automated, and sketched numerous studies of a mechanism with remarkable visual effectiveness. He also actively came into contact with experts in different fields, such as arithmetic and geometry, as well as searched for texts where he could learn more about his interests. There is increasing evidence that the roots of many of the ideas that Leonardo used in his drawings can be traced into earlier notebooks by other authors. (Ibid.)

There are many aspects to the way Leonardo da Vinci operated, which can be argued as contributing to why he performed so well. Two issues appear especially significant for the current argument: First, he utilised sketching to bring to light new issues, and second, he progressed to create designs in a principled manner. Particular to his ways of sketching was that he proceeded with a new kind of accuracy. He also gathered the issues addressed in the sketches from several connected domains. With these techniques, he was able to become aware of novel details in unprecedented combinations. Da Vinci's ideas about natural forces and mechanics functioned as guiding principles to give coherence to his thinking so as to simplify ideas.

Da Vinci's well-preserved drawings tell about his method to develop ideas gradually by articulating initial ideas on paper as rough sketches. The articulation of the ideas appears to have evolved intricately over the re-articulation of the ideas that grew increasingly sophisticated in this process. The work of artisans may be seen in many respects to be similar to this way of working. It stands in contrast to how drawings started to be used in connection with the planning of complex organisational constructs, where drawings were used as the first-hand medium for designing, instead of embodied interaction with other materials, as was done with the planning of the bastions for Italian army that were hastily designed to protect against the newly invented cannons by the French. Ferguson (1993) recognises this as the moment of demarcation between design by drawing and what he called artisan design.

2.2. Industrial speed blindness

With the advent of industrialisation in the late 1800s and early decades of the 1900s, the role of engineering design became more pronounced in rapidly advancing economies. New products were created much faster and for broader audiences, which resulted in the rationalisation and streamlining of designing. Users of products, as well as the settings in which the users used the products, became increasingly represented in design studios rather than experienced by designers (Jones, 1992). The sensitive appreciation of users in their settings waned and representations, such as the famous anthropometric characters described by Dreyfuss (1967), became the substitute for first-hand contact with living contexts of use. Ergonomics (Human Factors in the U.S.) provided designers with rational and quantitative support for decision-making and supported the efficient consideration of human matters in designing, especially from the 1960s through to the '80s. Bannon (1991) characterised the transition as the movement from 'human actors' to 'human factors.' As a response to the development, Green and Jordan (1999) articulated an updated version of human factors focusing especially on the hedonic qualities, which had been overlooked by the intense attention on productive performance of human-machine systems.

It was not only the sensitivity to the use context that was at odds with the ideals of efficient streamlining of designing. Also the construction and availability of materials for reflection were being replaced by more rapid methods to craft ideas. An example from the office of the Baltimore

& Ohio Railroad (in the year 1899) from Ferguson (1993) shows a room equipped with a wealth of materials available for designers to think with. A designer in this space had for his immediate reference a set of papers, sheaves and rolls of blueprints, and printed materials. Full-size drawings were stored in drawers in the same space for quick retrieval. Data books and sketchbooks were available on the desks, and results of work were on display in framed photographs on the walls. And, it was possible for the designers to go out to the yard to see the real things that had been designed in earlier projects. With all these resources available a designer could easily learn from the choices that had been made earlier (Ibid.).

During the 1950s several creative methods were developed and experimented. One of the methods from this period is brainstorming. The technique was based on a setting where a group of people were gathered for generating ideas together. The leader of the group exposed the purpose of creating new ideas and a secretary wrote down all of the ideas, even the bad and harebrained ones. The intent was to produce a large amount of ideas quickly. The rationale behind this method was the expectation that if sufficient ideas would be brainstormed, some of these would have to be good. Some experiments, such as the Panoramic Design Technique (PDT) in 1961, attempted to amplify the role of creative thinking in the process. The PDT technique centred on graphic facilitation by using a space with blackboard walls for creating sketches. Participants of designing could discuss plans, meanwhile a designer sketched visualisations on the blackboard that were photographed for later review. This method replaced contemplation, referencing, and consideration of initially doubtful ideas by continuous discussion about first impressions. The PDT system was quickly forgotten (Ferguson, 1993), but its kin creativity techniques continued unabated in many quarters.

The design-minded historian Ferguson (ibid. p. 57) argued, "More important to a designer than a set of techniques (empty of content) to induce creativity are a knowledge of current practice and products and a growing stock of firsthand knowledge and insights gained through critical field observation of engineering projects and industrial plants". However, during the 1950s the curricula of engineering design were changed to exclude activities that would sensitise engineering designers to the authentic world of engineering.

A new wave of designers adopted the way of engineering design in their work, resulting in a greater demarcation between artisan designing, or crafts, and drawing-driven designing than ever before (Hiesinger

& Marcus, 1993). The increased haste pushed designers and managers to develop new methods to enhance speed as well as to cut down costs. This tension introduced several new fractures into the communications of designers. Designers were no longer in direct contact with the users of their design. Designers became distanced from production, and managers took over the concerns about economics. Designing became distributed and disintegrated across various disciplinary roles.

It was not only the relation of designers to other professionals that created chasms across discipline borders. The changes in production environment had bearings on how designers' role was manifested in organisations. For example, in Finland the design profession grew into specialised disciplines over the course of the 20th Century. Valtonen (2007) identified six roles of designers that evolved in Finland from the 1950s through to the 2000s: 1) *designer as a creator*, who was responsible for the product aesthetics and styling; 2) *designer as part of a team* with mechanics and marketing, being partly responsible over the whole product development process; 3) *designer as a promoter* of user understanding, having the responsibility of the product definition; 4) *designer as coordinator*, who is increasingly involved in management and responsible for a whole product portfolio; 5) *designer as experience designer*, who functions on a strategic level in building a company's brand; and 6) *designer as 'innovation driver'* fostering the competitiveness of organisations by engaging in vision building.

The emergence of the new roles for designers reflects a transformation of design practice towards fast-paced Concurrent Engineering (CE). It is a practice where people work in parallel across distinct departments on a single product (Valtonen, 2007, p. 145). People in the different units with different responsibilities may lack a shared background and common practical understanding, and may have different conceptions of what is being designed. According to Bolman and Deal (1997), the fact that people already work in an organisation introduces an overwhelming complexity. And, when they work in a hurry, interactions between individuals, groups, and organisations become complicated further. However, the social complexities are but one aspect of the whole. New products, such as mobile devices and applications, have also grown very complex. And when these complex products are developed, maintained, and used by people in their respective organisations, which function in networks of organisations, the complexity of relations in these settings is next to beyond imaginable. How could anyone foresee the relevant details in a product's construction, use, and financial feasibility?

Frame it simple! A commonly used approach is to use conceptual tools to gain control over the complexity.

2.3. Emergence of tools for conceptual designing

Conceptual tools, such as 'theatres of machines,' 'design patterns' and 'contextual models,' are guides that may help designers to address the complexity they are facing. With such conceptual tools designers may be guided towards recurrent problems in some domains and thus they may more efficiently identify patterns that help structure discoveries. Conceptual tools, such as 'Personas,' (see e.g. Cooper, 1999) and 'Scenarios,' (see e.g. Carroll, 2000a), assist designers to attend to issues related to experiences and interactions that could be addressed in the design process. Models about 'design concepts' help designers structure their articulation about what to create, and 'process models' enable designers to plan and communicate how the overall approach will be laid over time. The list of models that are included below is by no means exhaustive, and will be used to illustrate some of the available conceptual tools that have been devised to assist conceptual designing.

2.3.1. *Theatres of machines*

Tools for conceptual designing are not a new invention. For instance, Thomas Edison presented various alternatives he had in mind for the mechanism to move paper in the 'automatic printing telegraph' that he was inventing. The great variety of alternative solutions to mundane problem, for example, that of intermittent advancement of paper in the telegraph device, reflected the fact that these mechanisms were publicly available for examination and use by any interested reader of the technical books and periodicals of the time. The collecting of these mechanisms had begun already during the Renaissance period, collating them into illustrated books called "theatres of machines" (Ferguson, 1993). "This tradition was simultaneously disruptive and progressive because it suggested new and novel ideas to anyone who could 'read' the instructions. The seeds of the explosive expansion of technology in the West lie in books such as these" (Ibid., p. 115). We may find similar 'theatres of machines' currently in the Internet, where developers share patterns of code, templates, files, frameworks and tips to bring into life particular kinds of effects in the digital realm; (see e.g. SmashingMagazine, 2011).

2.3.2. *Design patterns*

Theatres of Machines answer to a similar kind of question as a more recent idea of design patterns. Having their original inspiration in the work of Christopher Alexander (1979), who developed the idea in the context of architecture (addressing the 'quality without a name'), Gamma, Helm, Johnson and Vlissides (1993) introduced design patterns into the design of computing systems. Design patterns address recurrent problems with the best-known solutions. And rather than being constrained by the level of particular platform or implementation technique, design patterns were targeted at developing more generic resources that could be applied at a more fundamental level to give structure to designs than the items enlisted in the 'Theatres of Machines.' For example, Arvola (2004) developed design patterns for the sociable use of computing systems, and presented patterns to control information visibility in social situations. Gamma et al. (1993) stated that design patterns might be considered as 'micro-architectures' that contribute to the larger whole that is being designed. And, when given names, design patterns could be utilised to give new vocabulary and thus promote designers' discourse onto a higher conceptual level.

2.3.3. *Contextual models*

The 'Theatres of Machines' and design patterns both approach the challenges from the point of view of the properties of the design result. They imply an understanding of a particular context with relevant aspects that can be mapped on the design patterns. These, however, may not help designers discover relevant features of use contexts and the inherent problems that the environments of use produce. To address this dilemma, several schemes, or abstracted frameworks, have been proposed. Perhaps the most famous of such models is the set called Contextual Design Interpretation Models, which was developed by Hugh Beyer and Karen Holtzblatt (1998). Five interpretation schemes, named Sequence, Artefact, Flow, Environment, and Culture model, were proposed to assist designers to effectively and efficiently conduct user-studies and articulate the discoveries in a design-relevant manner. The challenge of the models is their bias towards particular kinds of designs. For example, the contextual design models were good for making relevant findings for the development of groupware and middle range information systems, but not so good for personal everyday products.

To address this gap, several other schemes to represent use context have been proposed. The additional models, or schemes, do not put as much

emphasis on the functioning environment, but promote the characteristics of the people in the settings and describe potential interactions in more varied ways. Personas (Cooper, 1999) and scenarios (Carroll, 2000a) are archetypal examples of these two perspectives.

The difficulty in the application of the contextual models is their relationship to design. The models may be employed without any explicit reference to a design, i.e. a user study can be conducted without knowledge of a product, service, or system that could be built on the understanding that these models enable it to achieve.

2.3.4. *Process models*

Process models are tools that help designers split complex tasks into simpler parts, and plan and orchestrate sequences of activities over time. There are numerous variations of such models, such as those proposed by Ulrich and Eppinger (2003) and Pahl et al. (2007). These models describe the progress in a linear step-by-step manner through analysis and synthesis from qualitative towards increasingly quantitative concretisations. The linear presentation format provides a convenient means to plan and follow timely progress of development.

2.4. The rational takeover

Where the use of conceptual tools made the process of simplification appear more efficient, efficiency of designing was also promoted by rationalisation of the practice. This is vividly present especially in the developments that took place in the US, where a broad wave of rationalisation had great impact on designing over the mid-1900s. According to Ferguson (1993) the ties between engineering and science begun to form during the latter half of the nineteenth century when the laws of thermodynamics had been successfully employed to make steam engines more efficient. Vannevar Bush, the director of the Office of Scientific Research and Development (OSRD) in the US during the World War II, gave further impetus for engineering to approach science when he elevated the engineers at his office to scientists. This decision grew from a practical finding that the military officers, with whom Bush's engineers needed to work with, did not have respect for engineers but did respect scientists.

The great impact set forth by military research changed the nature of engineering education in the US. The 'art of engineering' became replaced by the 'science of engineering.' The professions of medicine, business

management, and education science had overtaken art (Brooks, 1967). According to Schön (1983, p. 34) the professions of engineering and medicine propelled the increasing appreciation of the ideal of Technical Rationality by displaying dramatic success in applying specified and scientifically developed means to specified ends. These professions became iconic to instrumental practice and prototypes of science-based practice, where arts and crafts were devalued.

This Positivist ideal of practice penetrated university education and research. Even the social sciences adopted forms from the models of medicine and engineering, borrowing methods and language such as "measurement, controlled experiment, applied science, laboratories, and clinics" (Schön, 1983, p. 39). Ferguson (1993, p. 159) wrote

> *"engineering faculties had become strong in research but were generally unfamiliar with engineering practice, particularly design. Nor did the teachers have the necessary industrial experience to introduce students to the many subtle, unstructured problems of designing, building, operating, and maintaining structures and machines."*

Engineering design was evolving into a 'confident practice' promoting the positivist ideal that problems can be thoroughly and completely understood a priori to devising solutions to them. The way the new engineering designers used drawing in their work reflected the rational uptake. The drawings were neatly made and produced on large sheets of paper, and they (ibid., p. 3) "exude an air of great authority and definitive completeness" for those who build the system and for those who use these drawings to learn exactly what they are expected to produce. Such authoritativeness, however, drives monologue rather dialogue.

Schön's criticism towards what he called 'Technical Rationality' (Schön, 1983) was addressed against exactly such a rational way to conduct expert practice with confidence, and reflects celebration of "instrumental problem solving made rigorous by the application of scientific theory and technique" (ibid., p. 21). By the mid-1960s Technical Rationality had provided little help for designers and managers to respond to overwhelming complexity, uncertainty, instability, uniqueness and value-conflict, which are characteristics of *actual* practice (Schön, 1983). These are issues that cannot be explained by translating professional practice into a problem-solving activity.

Challenging the confidence

Regardless of the awareness of the problems concerning the so-called 'engineering design' approach that began to emerge in the 1960s, only recently Buxton (2007) has argued that industries are still blinded by an unwarranted confidence in what they create (ibid. p. 77):

> *"Our industry is organized around two all-too-common myths:*
> *– That we know what we want at the start of a project, and.*
> *– That we know enough to start building it."*

Nevertheless, important developments have occurred, regardless of not completely penetrating the industry. One such development was Lucy Suchman's (1987) landmark work 'Plans and Situated Action' that articulated the importance of the close understanding of the organisation of activities that take place in particular settings of technology-mediated human practices. During the 1980s and '90s an increasing number of studies were conducted with the particular intention of closely scrutinizing the social organisation of action at workplaces before designing for the particular practices in there. This introduced new requirements for development organisations, and guides for how designers could pay better attention to the context of use started to emerge. One such example is that of Blomberg, Giagomi, Mosher and Swenton-Wall (1993), who outlined principles that could be followed in the studies of workplaces for design:

- Close appreciation of detail in a particular setting
- Explorative attitude, i.e. conducting study without a theory in mind to be refined or tested
- Aspiration to understand the studied community members' point of view
- Holistic understanding of a locality

It was, however, soon revealed that ethnographic workplace studies would require much additional work and competence (Anderson, 1994). Studying workplaces, analysing the findings, and translating these into useful contributions for design require the dedicated investment of time for days or weeks. As a response Hughes, King, Rodden and Andersen (1994) outlined several ways in which ethnographic workplace studies could be made to better fit the available resources: 1) *concurrent ethnography* where ethnographic studies are conducted along with systems development, 2) *quick and dirty ethnography* that relies on short studies to provide generic sense of the use context to designers, 3) *evaluative ethnography* to understand how a design fits to a workplace, and 4) *re-examination of*

previous studies to inform initial design. Button and Dourish (1996) went so far as to propose a whole new methodology for merging technology development and ethnomethodologically informed field studies.

A disturbing fact about ethnographic studies is that, rather than making designing easier, they made it more complicated, because even more new issues had to be taken into account. This is not to say that such studies would be of little value, but that the tension between the deployment schedules and number of things to be taken into account was increasing. Moreover, as ethnographic studies kept bringing into light unexpected issues that could render current plans problematic, the potential for developers to be able to feel confident about what they create was waning.

2.5.1. *Sketching as a way to address uncertainty*

Schön (1983) argued that developers should appraise the uncertainty of situations in the same way that what he called 'reflective practitioners' do. The 'artisan designing,' as exposed by Ferguson (1993) is a clear example of 'reflective practice' in the field of design. This is visible in the way the so-called 'artisan designers' use drawings in their work. The artisan designer may sketch the idea on paper, or draw directly on the material that he or she uses, to create an object. They may as well begin to build a model of the thing to be created, as some boat builders do. The material that an artisan works with has an active role in adjusting their vision about the thing to be created. And, finally, when the finished product is handed over into use, the users may directly give feedback to the artisan. When made in this way, the products are formed in dialogue with the local culture, with the materials at hand, and with the ideas that the makers had about their designs. (Ibid.)

This kind of practice could be called 'iterative' in that the approach is largely based on returning to the things that have already gained an initial expression. Iteration is promoted as the key to successful design processes, see e.g. (Kelley, 2001), and it is reflected in process models, such as the ISO standard (ISO 9241-210). A key insight about iterative design is that it recognises that the design requirements cannot be completely understood upfront, but need to be revisited, often multiple times.

Through sketching, designers may quickly articulate ideas, reflect on these, and then elaborate. Sketching can be thought as another way to talk about iteration. According to Buxton (2007) sketching is especially helpful in that it leaves apposite room for uncertainty, and he encourages designers to leave room for ambiguity into their sketches (ibid. p. 115):

"If you want to get the most out of a sketch, you need to leave big enough holes".

While sketching has for long been recognised to be instrumental in the dialogue in design reasoning (see e.g. Goldschmidt, 1991), it may be the key skill that contemporary design organisations need to learn to re-master, when sketching is understood in the broad sense that Buxton talks about it.

2.6. The quest for simplicity

Jenson (2002) identified simplicity to be strategically important for development organisations to address the increasing complexity of social and technological environment. He (ibid., p. 161) argued that simplicity is a "much stronger concept than a good user interface" since it may enable companies to create breakthrough products. He based his argument on years of working on the development of Macintosh and Newton operating systems, and his work as an initial member of the Apple's System Software Human Interface group in the late 1980s. A key aspect in the argument is the realisation that in order to be successful simplicity needs to transcend typical disciplines in companies, including management, marketing, project management, developers, designers, testers, and documentation writes. This is supported by Buxton (2007), who emphasises the importance of 'executive understanding' to focus on the right thing and making its design right. He argues that this requires more than design and engineering, and that "may well involve every arm of the company" (ibid. p 78).

The involvement of 'every arm of the company' is a not a trivial challenge, especially to the respect that apposite work requires a shared understanding of what should be done. This is a communication and learning challenge. And it all rests on simplification. For one thing, a development organisation needs to simplify the design idea on the basis of an appreciation of the whole setting that transcends discipline borders. Sometimes the dilemma is resolved by the process being centred around a strong personality, such as Thomas Edison, as observed by Brown (2008, p. 1):

"Edison wasn't a narrowly specialized scientist but a broad generalist with a shrewd business sense. In his [..] laboratory he surrounded himself with gifted tinkerers, improvisers, and experimenters. Indeed, he broke the mold of the "lone genius inventor" by creating a team-based approach to innovation."

A process that centres around such a person gains authority as well as expression through the person, who can simplify the message and thus also ensure a delivery of the message across the full arrangement of people involved. Norman (2011, p. 253) writes: "Even the most complex things are simple to those who have mastered the structure, understood its operations, and have a cohesive internal understanding – good conceptual model." However, not all organisations have such a design-minded leader at the centre to understand the potential, to convince sales people, and to bridge the communication gaps between the various parties involved. Nor may the "central genius" myth always be very accurate a description of the creative processes and dynamics that are attributed to the genius (Gruber, 1981). In such a case the organisation needs to learn as a whole to develop relevant simplifications and develop practices that enable the message to penetrate effectively across departments. One central instrument in this is the design concept.

2.7. Design concept as a simplification

What is a design concept? The term 'concept' has varying meanings across different design-related disciplines, such as fashion, graphic design, interaction design, (see e.g. Arvola & Artman, 2007), and the term is also often used loosely by designers and may refer to the rather simple explorations they have sketched on paper. Sometimes the notion of concept refers to a product and sometimes it may express parts of it, such as a user-interface concept, form concept, etc. (Keinonen, 2006). Jacques, Preece and Carey (1995) used design concept to refer to the overall principle for designing a product, and they argued that 'engagement' could be a design concept to guide the design of a multimedia application. Such a design concept may provide practical aid for designers to create designs that are based on the understanding of the design concept, 'engagement' in the case presented by Jacques et al. (ibid.). This kind of understanding of the term concept comes close to how concepts are understood in the sociological tradition called symbolic interactionism. Blumer (1998a/1969) argued that concepts are tools that enable scientists to gain a new orientation, permits a new organisation for effort, and guides the release of action.

The work by Jacques et al. (1995) was based in a laboratory, and as such may not illustrate how practitioners in the field might conceive the idea of design concept. Keinonen (2006), in contrast, who worked in industry and later in academia, approached the definition from the point of view

of practice in the field, the integrated product design. He (ibid.) defined product concept as the description of a product (or service) that is anticipatory, well-founded, focused, and understandable.

These are characteristics that a product concept *ought to* have in order to function as a tool to guide decision-making and designing within the realm of integrated product design. Hence, rather than being a research investigation of what the field of concept design is, Keinonen's (ibid.) review of product concept designing functions as a design manifesto. It is inclined to guide designers towards a particular kind of way to understand design concepts, to help them learn the right way. Yet the review is thin in reporting how design concepts are formed and how they *actually work* in designing.

Cross (2011) studied how designers use design concepts in interaction. He utilised video records of staged designing to study the phenomenon. He does not define what a design concept is, but rather uses it in the same way as he discovered designers on the video to use the term to express structurally different paths to generate alternative designs. The notion of 'concept design' was mentioned in the design brief and is likely to have influenced in the choice of terminology by the designers. Nevertheless, it was not explained what a 'design concept' is, but designers had to invent its use or, more likely, to employ it as they normally use it as part of their work.

In a short (two-hour) design experiment three designers were given the task to create a special fastening/carrying device that would enable attaching a backpack to a mountain bike. Designers made a scheme of a process, which included six phases, of which three had the notion 'concept' in them. The phases were (Cross, 2011, p. 97): 1) Quantify the problem, 2) generate concepts, 3) refine concepts, 4) select a concept, 5) design, and 6) present. Hence designers appeared to adopt the use of the notion of 'concept' to guide their action over the two-hour period.

After the initial generation of concepts, the designers had listed such concepts as "Do nothing – wear it," "Front wheels (bikebasket)," "Gas tank (Harley)," and "Saddlebag (Folds in middle)." These were apparently invented through an exploration of the structure of the bike, by imagining what could be created where on the bike. At some point of their discussion, one of the designers introduced the notion of 'tray'. It resulted from the identification of the problem that the shoulder straps of a backpack could possibly become stuck by dangling into a wheel. Within two minutes of the introduction of the notion 'tray,' the team had accepted, modi-

fied, developed and justified it to function as what Cross (ibid. p. 107) calls the *key concept* for the final product design of the team.

The 'key concept' had several important impacts on the designing that took place. First, once the team had accepted that the 'tray' will be the key concept that they will work towards, the thing-to-be-designed was given *a name through which it could be referred to*, and employed in conversation. Second, the team had discussed problems and requirements and they recognised the tray idea *could solve and accommodate the identified problems and requirements*. It hence expressed, although somewhat implicitly, high-level goals for the design, i.e. that the design enables to attach a backpack to the bike in a way that is safe and prevents the pack to get muddy. Third, based on their understandings of trays in general, the team was *guided towards a design with generic qualities of trays*, such as a solid bottom base and shallow sides that prevent stuff to slip out from the top, which enable the quick putting in and removal of stuff, which people are familiar with from their everyday world.

However, it was not just a 'tray' that the designers presented as the design concept in the end. The resulting design concept was a more elaborated basic construct, which expressed some key aspects of the design in addition to it being constructed on the basis of the idea of a tray. Clearly, the designers had worked on the basis of the idea of a tray that is visible in their final sketch of the design (see Figure 2). So, the team had appreciated the form of a tray to the extent that *every addition that they made to*

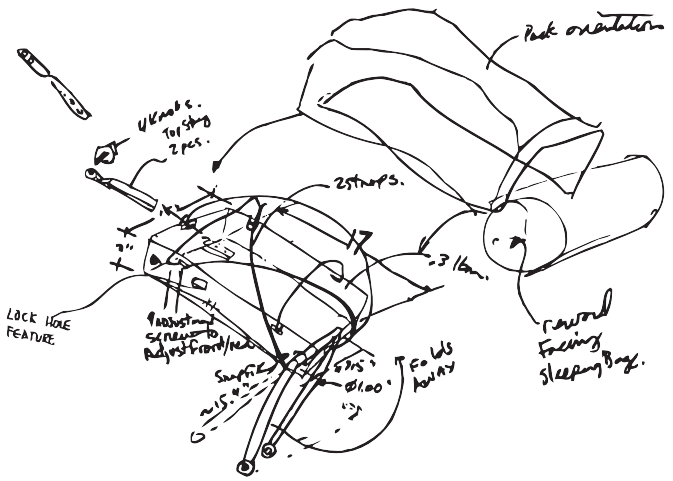

Figure 2. *A design sketch of a tray design concept for mounting a backpack to a mountain bike. (Cross, 2011, p. 109)*

their design followed the form of a tray. The form of the tray functioned as a principle that each change and addition they made to the design had to follow, i.e. they would not break the form of a tray, but rather, were built on it.

In addition to generating and adopting design concepts, the designers also used other concepts in their talk. Cross (2011, p. 104) identified the use of 'rooster tail' being a concept that was employed to talk about a particular problem with bikes. It related to the phenomenon of mud being sprayed from the rear wheel, which makes roughly the shape of a rooster's tail. So, apparently concepts were used in the symbolic interactionism sense 'sensitizing concepts,' which Blumer (1998a/1969) identified as being used in scientific discovery.

When teaching design concepts to students of industrial designing, Keinonen (2009) illustrated parts of a product concept through the Product Concept Presentation Pyramid (see Figure 3). At the top of the Product Concept Presentation Pyramid is the 'name' for the concept. The name functions as a way to talk about the thing-to-be-designed. The 'metaphor' (such as the tray) communicates the concept's identity by resorting to a notion that people already know. It may help distinguish the concept from other concepts and attract desired associations.

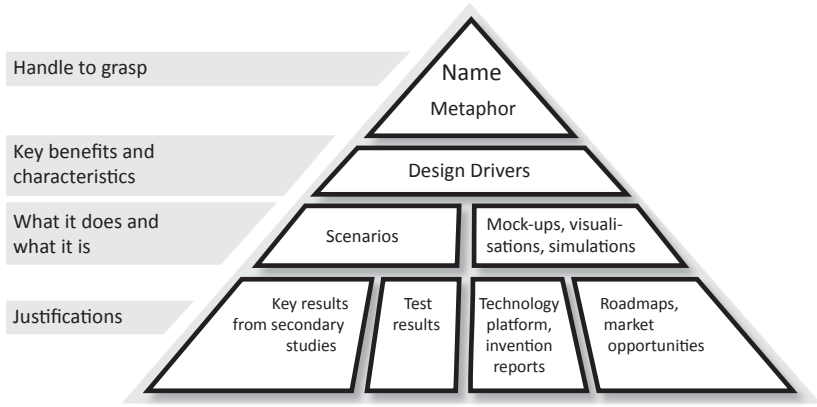

Figure 3. *Concept Presentation Pyramid (from Keinonen, 2009)*

The second layer comprises design drivers, which express the key benefits of the product. According to Wikberg and Keinonen (2000, p. 193) a design driver is a "central goal that guides designing", which is presented in a "crystallised and condensed way." (Original in Finnish) A design driver presents issues as goals rather that as requirements. Keinonen and Wikberg (ibid.) argue for the positive format of design drivers to encourage

the exploration of novel opportunities, where risk-taking and failures are not shunned. Design drivers assist in conceiving central goals of design without delving too deep into the requirements analysis. Design drivers, however, must be grounded in discoveries from user studies, literature, competing products, etc. (ibid.)

Wikberg and Keinonen (2000, p. 195) argue for the coherence of the presentation by stating that, "There must be only few design drivers. If there are too many, the concept breaks down and its character becomes ambiguous." Lindholm and Keinonen (2003) defined design drivers in a formal manner:

> *"A design driver may be defined as a design objective that (1) has a very high priority in concept creation; (2) characterises the concept in a way that underlines its distinctive properties; (3) is comprehensive by nature, affecting several aspects of the design; and (4) can be presented with one simple, clear sentence of phrase."*

In this formulation of the definition of design drivers, the role of simplicity becomes explicitly stated. The Concept Presentation Pyramid also guides design students to explicitly express design concepts in a manner that is justified on the basis what is known. These are presented in the two layers that form the base of the pyramid.

While the pyramid presented by Keinonen (2009) is a substantially more elaborated expression of what a product concept features than the idea of design concept that was underpinned by the above study by Cross, these two views on concept have important similarities. First, in both the ways to express what a design concept, or product concept is, a *verbal expression of the name of the thing-to-be-designed,* is fundamental. In Keinonen's pyramid the name stands at the top of the pyramid, and he refers to it as the 'handle to grasp' the concept. Cross, on the other hand, shows how the designers expressed concepts in interaction especially by giving them a name, sometimes a metaphoric one, like the 'gas tank'. The name of the concept was a central means for the designers to be able to talk about a design concept.

Secondly, both Keinonen and Cross address the *value that a design concept is considered to have*. Keinonen (2009) talks about it in the form of 'key benefits,' whereas Cross (2011) addresses it by showing how designers explicitly address a particular goal and solve problems with a design concept.

Thirdly, both Keinonen and Cross address, although somewhat implicitly, the inherent *principledness of design concepts*. Cross (2011) reveales the principledness by illustrating both how the tray idea emerged in interac-

tion, and how it was manifested in the design sketch. The tray gave a principle to the form of the design, and this was followed in all the changes and additions that were made to the overall design. The inherent principledness of design concepts is perhaps best implied by the above-presented quote from Lindholm and Keinonen (2003) about design drivers. If design drivers will function as guides for designers so that the resulting design will express the distinctive characteristics underlined by a design driver, then it is a must that designers follow such guide as a principle, which they can employ for making decisions on particular changes and additions that they propose when designing a product.

A fourth commonality between Keinonen's and Cross's work is *the role of related knowledge to justify the concept*. Keinonen lists explicitly that a product concept must be justified by resorting to user study results, competitive analysis, technology roadmaps, etc. The role of related knowledge is also visible in the example that Cross analysed. He (Cross, 2011, p. 101) writes, "The team relied heavily on any personal experience and knowledge that members had (or claimed to have) that was relevant to the problem." This supports the assumption that despite the experiment that Cross studied was only of two hours duration, designers worked on the basis of preliminary work and knowledge.

Despite that a design concept may be expressed in varying degrees of detail accompanied by different sets of materials, such as scenarios, mock-ups and simulations as stands in Keinonen's pyramid, design concept can be understood as shared simplification grounded in relevant preliminary work having the following essential functions:

1. It identifies and gives name to a novel thing-to-be-designed.
2. It sets high-level goals for designing.
3. It outlines generic principles to drive progress and inform judgment.

2.

A short history of conceptual designing

3. Explanations of conceptual designing

This chapter reviews some of the more theoretically-oriented works that have explained designing and design thinking. Once the challenges of the design problem centred explanations are outlined, the chapter illustrates in detail Donald Schön's idea of reflective practice together with some of the key notions he has introduced and promoted.

3.1. Design problem as the explanation

The dominant theoretical point of departure of designing pivots around the notion of 'design problem.' Over the last half of a Century, academic dialogue around design problems has exposed important aspects of conceptual designing. Herbert Simon's "The Sciences of the Artificial" was a rigorous effort in this pursuit (Simon, 1996). He defined design to be the activity of "devising action to transform existing situations into preferred ones." (Simon, 1996, p. 55) He identified that the older professional schools had presented design knowledge in a form that was "intellectually soft, intuitive, informal and cookbooky." The newer schools, which were more absorbed into the culture of 'modern university,' promoted natural science (Simon, 1996, p. 56), and as a response to recognising this, Simon developed an explanation of designing in terms of formal science.

According to Schön (1983) the key problem with Simon's approach to the 'science of design' was the issue that his science can be applied only to well-formed problems already extracted from situations of practice. Schön (1983) claimed that Simon built his science of design into a form that presumes that design process starts with well-formed situations, which could be subjected to instrumental problem-solving. The early so-called design methodists followed a rationalistic approach to explain and inform designing, and for example, Archer (1965) and Jones (1963), saw the development of designing as a matter of developing increasingly sophisticated design methods and applying these on design problems. Later the same design methodists acknowledged that their idea of design methods was

underpinned by an overly simplistic idea of design. For example, Jones (1992, pp. 331–332) expressed his frustration over the discrepancy between the approach promoted by the design methodists and the difficulties of real design practice[1]:

> *"What's striking is that each method begins with a first stage that is extremely difficult to do*
>
> *...*
>
> *TO USE DESIGN METHODS ONE NEEDS TO BE ABLE TO IDENTIFY THE RIGHT VARIABLES*
>
> *THE IMPORTANT ONES*
>
> *AND TO ACCEPT INSTABILITY IN THE DESIGN PROBLEM ITSELF*
>
> *"*

Jones (1992) emphasised the importance of the beginning of designing. This phase involved the 'identification' of the 'right variables' and the 'stabilisation' of the design problem itself. Alexander (1984/1971) and Broadbent (1984/1979), who are also considered to be the original design methodists, joined the criticism of design methods during the 1970s. As a result, the issue of problem setting started to attract increasing attention. Rittel and Webber (1973, p. 161) re-articulated the dilemma by arguing that "the formulation of a wicked problem is the problem!" Understanding this would require an altogether different kind of approach to the study of designing, and of conceptual designing. This view challenged design theorists to pay attention to the ways in which unique situations were transformed into actionable formulations of design problems.

Simon (1984/1973) disputed Rittel and Webber's view by proposing that there exists an inherent structure in 'ill-structured' problems. He utilised the notion 'ill-structured' to refer to what Rittel and Webber had called 'wicked'. Simon (ibid.) argued that the ill-structured problems only needed to be interpreted or "formalized" properly in order to turn them to well-structured for problem solvers. Designers, thus, would need to develop means to structure their interpretation in order to be able to design in a controlled manner. Simon's work was, however, deeply theoretical and gave little practical guidance to designers.

An interesting analogue was proposed by Hillier et al. (1984/1972). They highlighted how scientists approached novel challenges in quite

[1] The original capitalisation by Jones is retained in the quote. He used the broken format to criticise the way design methods forced designing into a ready-made format. The parts written in capital are from his original lecture notes and the parts written in small letters from tape recordings of his talks.

similar ways to designers, and that this approach was characterised by a pre-structuring of problems. Hillier et al. (ibid.) argued that the pre-structuring had two main sources: 1) the materials and tools the practitioners had available (the 'instrumental sets', as Hillier et al. called them), and 2) the practitioners' understandings of different types of solutions, or the "cognitive schemes by which we interpret the world and prestructure our observations" Hillier et al. (1984/1972, p. 247).

Darke (1984/1979) was not satisfied by the loose connection that Hillier et al.'s work had with real contexts of designing. She (ibid., p. 177) had observed that "some rather unfruitful attempts were made to observe designers at work but it seems to the present author that the research material necessary to understand the design process is not a set of sketches but a knowledge of the mental process the designer goes through." However, when conducting the research to uncover the mental process, Darke (ibid.) faced difficulties. Her approach was to ask designers to recall their own processes, and she acknowledged that this method had its drawbacks (ibid., p. 178):

> *"This method, of course, has problems of its own. Some of the architects interviewed in the present research found it difficult to describe a non-verbal process in words. Other problems include faulty recall, and post-rationalization by architects describing the process after the event."*

She (ibid., p. 178) decided to treat the architects explanations "as if they were accurate summaries, bearing in mind that oversimplification and so on may have occurred." She connected her discoveries to the argument set out by Hillier et al. (1984/1972), who saw the early phase of designing essentially as variety reduction, which happens through the introduction of constraints as well as designers' own cognitive structures. Hillier et al. (ibid.) pointed out that a designer works at the beginning to structure the "problem in terms in which he can solve it," and that the "conjectures of approximate solutions" come early on in the process due to practical necessity. This is because "a vast variety of design decisions cannot be taken–particularly those which involve other contributors–before the solution in principle is known" (ibid. p.257). Darke (1984/1979) took Hillier et al.'s idea of the conjecture-analysis as a starting point for developing an elaborated version of the conjecture-based 'method'.

Based on her own discoveries and on the work of Hillier et al., Darke (1984/1979) introduced a the notion of 'primary generator'. Darke (ibid., p. 180) had observed that "the use of few simple objectives to reach an initial concept was characteristic of these architects' approaches in design".

A primary generator was displayed in designing as self-imposed objectives that designers fixed upon. Darke (ibid., p. 181) characterised the primary generator as a "concept or objective that generates a solution," and that a primary generator is "a self-imposed constraint that arises from a value judgment". Darke argued that primary generator should be conceptually separated from the idea of conjecture as presented earlier by Hillier et al.. Darke (1984/1979, p. 181) claimed that primary generator refers to the ideas that generate the first image, or the 'conjecture' as Hillier et al. had expressed the notion, and thereafter proposed that the explanation of the early phases of designing could be elaborated into a form of generator-conjecture-analysis.

Design problem appeared to be a useful notion for the explanation of designing in so far as problem setting was not considered. But once problem-setting became recognised as a fundamental ingredient of all design activity, scholars were faced with a terminological challenge. The whole dilemma is perhaps best articulated by Rittel and Webber (1973), who asserted that the setting of the design problem is the problem, and thus, the notion of the design problem becomes obsolete for the pursuit of explaining the essence of designing. What to call the activity if design problem is just an outcome of the activity to be explained?

Schön (1983) discussed the issue in terms of naming and framing. He wrote (ibid. p. 40): "Problem setting is a process in which, interactively, we *name* the things to which we will attend and *frame* the context in which we will attend to them." Adopting these notions in the explanation of designing over 'design problem' has been slow. Instead of adhering to the ideas set forth by Schön (ibid.), scholars, such as Dorst and Cross (2001), have continued to pursue an explanation of the early phases of designing in terms of design problems. Dorst and Cross (ibid.) conceptualised the early phases of designing as goal analysis, solution focusing, co-evolution of problem-solution, and problem framing. They (ibid.) refer to Schön's definition (Schön, 1983) of framing with respect to this 'moment of insight,' when the problem-solution pair becomes discovered.

Cross (2007) employed design problem in his theory, although with an extensive focus on the 'construction' of the problem. He (ibid.) concluded that describing the activity as 'problem framing' may best capture the key features of design activity, when it is understood as the process of structuring and formulating the problem. In a recent book Cross (2011) still outlines the 'design strategy' followed by expert designers in terms of problems and solutions. Still today the design scholars debate about the

wicked problems of designing; see e.g. the lively thread on the topic in the e-mailing list PHD-Design (Friedman, 2012). The challenge, however, remains: What to call the activity if design problem is just an outcome of the activity to be explained?

3.2. Conceptualising designing with frames

Schön's treatment of professional practice has attracted a significant amount of interest in the domain of design research, including a number of studies, (e.g. Carroll, 2000b; Fallman, 2003; J. Hey et al., 2007, 2008; Sengers, Boehner, David, & Kaye, 2005; Stempfle & Badke-Schaub, 2002; Stumpf & McDonnell, 2002; Valkenburg & Dorst, 1998; Valkenburg, 2000), related to further developing understandings about how designers use frames in designing. Within the field of design research frames are used as analytical instruments in the context of studying collaborative design events; (see e.g. Schön, 1983). The studies and theorisations of design research that employ the notion of framing, or re-framing, are influenced by how Schön (1983) originally introduced the term. Different types of frames have been proposed, such as 'individual frames' and 'team frames,' to assist in analyses of group work, (e.g. Stumpf & McDonnell, 2002). Properties of frames in design teamwork have also been explicated in detail (Hey et al., 2007). According to Hey, Joyce and Beckman (2007) frames have the following constituents (ibid. p. 81):

"1. A desired end state or goal
2. Relative importance and relevance of features (prioritization of designers' attentions)
3. Boundaries to the design situation (problem scope, solution scope, resource constraints)
4. Criteria for evaluation (of new information, features, and possible solution concepts)."

Hey et al. (2007) explored how newly established design teams negotiate a shared understanding of their design task during the early ambiguous phases of designing. The detailed definition of a frame enabled them to look for concrete signs of frames in how designers expressed goals, priorities, scope, and evaluation criteria, in their talk. This enabled Hey et al. (ibid.) to make the negotiation process visible in its underlying structure, and analyse large numbers of design teams within a single study. In a study of 22 newly-formed multi-disciplinary teams Hey et al. (ibid.) identified a framing cycle that consisted of pseudo-frame setting, making

individual's frames explicit, making frame conflicts salient, and building a common frame.

In a collaborative design session many frames are likely to be found to co-exist in parallel. This is the case especially during the early phases of designing, where the participants each may hold their individual understandings of what the project is about and what should be done. During the process, a multidisciplinary design team may develop a shared frame. Later, Hey et al. (2008) distinguished several strategies for how designers negotiate a shared frame. During the construction of the shared frame previous frames are forgotten and they fade into the background while greater and broader frames become salient (ibid.).

The analysis by Hey at al. (ibid.) resembles the work by Valkenburg and Dorst (1998) and Valkenburg (1998) in that frames are especially a conceptual tool for design researchers to build taxonomies about designing. In this line of research, Valkenburg (2000) outlined a taxonomy of design activities in reflective practice. She used the notions 'naming,' 'framing,' 'moving,' and 'reflecting', which she outlined on the basis of Schön's work on reflective practice. These categories enabled using protocol analysis and to slice design teamwork into small phases, where particular type of frame was identified.

As stated further above, the most influential treatment of frames, framing, and re-framing, is by Donald Schön (1983) who set out to define an epistemology of practice, which is implicit in the artistic, intuitive processes that some practitioners bring to situations of uncertainty, instability, uniqueness, and value conflict. He developed a highly influential synthesis of pragmatist thought, stemming especially from the works of John Dewey, into an explanation of how professional practitioners address challenging and unique situations of uncertainty.

Central to the idea of reflective practice by Schön (1983) is the development of a sensitivity to how professional practitioners *form part of* the situations in which they function. Seen in this way practitioners are *shaping* the situation through their involvement in it. This way of understanding the role of a practitioner was contrasted by Schön (ibid.) against a technical rationalist stance that treats reality as an objectively knowable entity that exists independent of a practitioner's values and ways to relate to it.

According to Schön (1983) there are some relatively constant structures that the practitioner brings to a situation. In addition to the above-mentioned 'stance,' the practitioner has a 'repertoire of familiar examples,' an 'overarching theory,' and an 'appreciative system' having bearings on the

way a reflective practitioner establishes structure for a situation. This knowledge is personal and has evolved over the trajectory of a practitioner's career through repeated encounters of similar situations, patterns, and ideas.

3.2.1. *Knowing-in-action*

Skilled practitioners display ability, or knowledge, through the way the practitioners perform their actions, and this knowledge is often implicit even to the practitioners themselves. Schön (1983) wrote:

> *"When we go about the spontaneous, intuitive performance of the actions of everyday life, we show ourselves to be knowledgeable in a special way. Often we cannot say what it is that we know. When we try to describe it we find ourselves at loss, or we produce descriptions that are obviously inappropriate. Our knowing is ordinarily tacit, implicit in our patterns of action and in our feel for the stuff with which we are dealing. It seems right to say that our knowing is in our action."*

Building on Polanyi's (1966) idea of tacit knowing, Schön (1983) claimed that instead of *applying* knowledge in a situation, it is often so that the knowing is *in* the action. Such knowing is displayed in practitioner's spontaneous recognitions, actions and judgments when he or she carries these out without having to think about them prior or during the performance. A reflective practitioner makes and tests new models for situations by *seeing as* and *doing as* they did in their familiar examples.

Schön (1983) asserted that for becoming competent in addressing and managing intuitive and feeling-based responses a person needs to use words to describe a kind of knowing, and a change of knowing, which may not be originally presented in words at all. How did Schön see the possibility of developing a description of such intuitive artistry that is displayed in the embodied feeling for one's performing?

3.2.2. *Reflection-in-action*

Central to Schön's argument was the idea that practitioners may become aware of the underlying patterns that guide their action through what he called *reflection*, on the same lines as Dewey (1991/1910). Schön (1983, p. 54) talked about a particular kind of reflection, that of "thinking about doing while doing it," and chose to call this reflection-in-action.

Reflection-in-action is typically stimulated by the experience of a surprise. An activity, which was originally unfolding without much thinking, may turn into an exploration of the underlying assumptions that were guiding action. Schön (ibid.) argued that people do not tend to think about

their actions unless these produce results they did not anticipate. Surprises may be pleasant, promising, or undesirable, and altogether provoke reflection on the "outcomes of action, the action itself, and the intuitive knowing implicit in the action" (Schön, 1983, p. 56).

When a practitioner turns his or her attention to the structures that implicitly give structure and guide their action, they may build up awareness of the limits of the evaluative *frames* that they employ in their work. Schön defined frames as underlying "structures of belief, perception, and appreciation" (Schön & Rein, 1994, p. 23). As a result of this awareness the practitioner may also become increasingly ready to critically judge and adjust the frames they are using to guide their action.

According to Schön (1983), a situation that requires reflecting-in-action is one where the practitioner is confronted with demands that seem incompatible or inconsistent with what practitioner already knows. They may respond to such a situation by reflecting on the appreciations that he, she, or others have brought to the situation. In such a situation the practitioner may attribute the origin of the dilemma to the way he, she, or the other stakeholders have constructed the situation. Schön (1983, p. 68) states: "When someone reflects-in-action, he becomes a researcher in the practice context. He is not dependent on the categories of established theory and technique, but constructs a new theory of the unique case."

In reflective practice means and ends are developed interdependently, knowing is inseparable from doing, and the practice itself is a kind of research (Schön, 1983). According to Schön (1983, p. 165), reflective practitioners construct the reality of the situation by framing the problem in the situation, by determining which features they will attend, the order that they will attempt to impose on the situation, and the directions in which they will want to change it. In reflective practice the reality for the practitioners is constructed in interaction between the practitioners and the situations. Designers connect to the particularities of a situation through perceiving these and articulating their thoughts about these back into the situation. Schön (1983) expressed this as the "reflective conversation with the materials of a situation."

3.2.3. *Reframing*

Schön analysed tutoring sessions, where a master is guiding a student; (see Schön, 1983; 1984; and 1987). In such a setting the master is a more trained person with a deeper appreciation of the issues relevant to the particular domain of expertise. The situations that Schön has reported were

such where a student had become stuck and had turned to the master for guidance. The following example illustrates this kind of situation (from Schön, 1983).

An architect student, Petra, is reviewing her work with her supervisor, Quist. Petra explains how she has become stuck after taking the form of the construction site as her starting point. She has tried to fit the structure of the building to a prominent contour of the site. Figure 4 shows her original design. What is not shown in this picture is that she has also experimented with the size of the classrooms by grouping two rooms into more significant L-shaped blocks. She has discovered the forms to be valuable, since they would encourage the interaction between certain age groups, and the forms also have established external spaces, 'home bases', where the children of these age groups could meet. She, however, has not yet found a form for the building that would fit the slope.

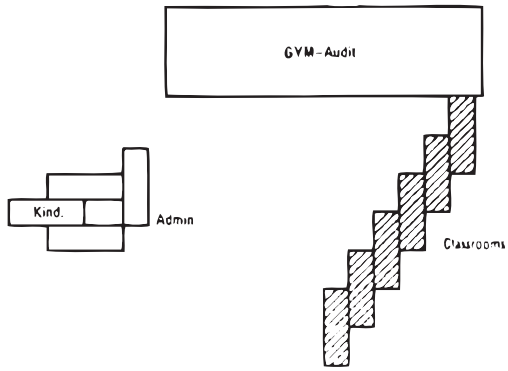

Figure 4. *Petra's original layout (from Schön 1983).*

Quist sees that the contour of the slope is not 'significant enough' in order to suggest a shape for this kind of building. Then he begins a frame-experiment. He first outlines a preferred orientation for the building with respect to where north is and then sketches the L-shaped classrooms on the site.

Excerpt 1

```
Quist Now this would allow you one private orientation from here
      and it would generate geometry in this direction. It would be
      a parallel… (see Figure 5)
Petra Yes, I'd thought of twenty feet…
Quist You should begin with a discipline, even if it is arbitrary,
      because the site is so screwy-you can always break it open
      later. (Schön, 1983, p 85)
```

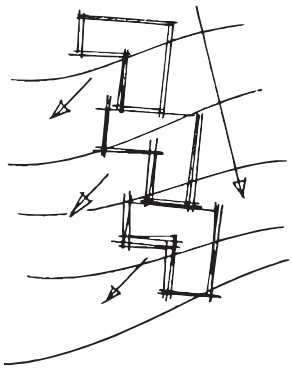

Figure 5. *Quist's sketch that he starts his frame experiment with (from Schön 1983).*

Here Quist uses the notion of 'discipline'. While Schön (1983) does not point this out, the idea of discipline implies a *principled approach*, which will be shown to be central to conceptual designing through investigation of the empirical data in the present study. Quist emphasises that the chosen discipline that appeared here is arbitrary, can be later broken up later if it does not seem to work with the site, i.e. if it creates undesirable consequences for the following moves. Schön (ibid.) called the adoption of a new starting point to the designing – that of not following the contour formation of the site, but following an imposed geometry instead – as *reframing*.

Quist then enters a frame experiment after reframing the task by naming the things he considers. In the present analyses, I have chosen to use the term things-to-deal-with to refer to these. Some of the things that he considers in the planning are already shown in the picture that he and Petra have in front of them on the table.

Excerpt 2

Quist Now in this direction, that being the gully and that the hill, that could then be the bridge, which might generate an upper level which could drop down two ways.

Then he starts to explore the new structure with the new array of L-shaped classrooms, (see Figure 5).

Excerpt 3

Quist We get a total differential potential here from one end of classroom to far end of the other. There is 15 feet max, right?-so we could have as much as 5-foot intervals, which for a kid is maximum height, right? (See Figure 6) The section through here could be one of nooks in here and the differentiation between this unit and this would be at two levels. (Schön, 1983, pp. 85-88)

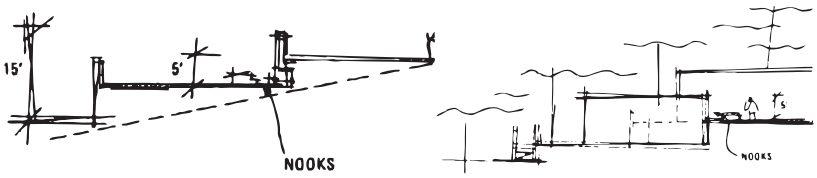

Figure 6. *Quist's sketch about 'differentiation potential' and the 'nooks' that the structure generates (from Schön, 1983).*

Quist observes new issues that arise from the experiment. He notices how the levels of the classrooms relate to the maximum height of a child, a measure that he appears to be familiar with. And he begins to use this observation as a resource for suggesting new useful properties for the design.

Excerpt 4

```
Quist Now you could give preference to that as a precinct which
      opens out into here and into here and then, of course, we'd
      have a wall-on the inside there could be a wall or steps to
      relate in downward. Well, that either happens here or here,
      and you'll have to investigate which way it should or can go.
      If it happens this way, the gallery is northwards-but I think
      the gallery might be a kind of garden-a sort of back area to
      these.
      The kindergarten might go over here-which might indicate that
      the administration over here-just sort of like what you have
      here-then this works slightly with the contours- (Schön,
      1983, p. 89)
```

Quist observes that the 'nooks' could be treated as 'precincts,' which are protected little areas outside the building. He suggests that the three classroom units could be related together by stairs.

These are signs of investigation of the implications of the reframing. The implications are found both outside of the building as well as inside. During this exploration new suggestions about valuable properties of the structure emerge. Quist suggests that earlier ideas about spaces could be treated differently. For example, that the gallery could be transformed into a garden. He also positions new functional entities, such as the kindergarten and administration in the plan.

In the final comment by Quist in Excerpt 4, "works slightly with the contours" he returns back to the earlier dilemma that dealt with how the building and the shape of the site relate to each other. All the moves, i.e. the intentional changes to the plan, that Quist has made here, relate to the overall structure that he suggested above. He followed the 'discipline' implied by the original structure that he suggested on the site in Figure 5. The

procedure that is shown in the example is that after Quist has reframed the planning situation, he begins to make moves by sketching and by explaining these verbally. After each move he evaluates the consequences of the move in the light of his domain-specific knowledge (Schön, 1983).

Through the making of new moves and appreciating the consequences that each move yields, Quist continued to generate a structure that was coherent with respect to the starting point. By working this way he was able to attain a 'disciplined,' or coherent, structure on the site.

3.2.4. *Design moves*

Schön (1983, p. 94) expressed the above action, where Quist created new shapes on the basis of the form that he initially suggested, as the "spinning out a web of moves, consequences, implications, appreciations, and further moves". Schön (ibid.) considered each move as "a local experiment which contributes to the global experiment of framing a design task. During the experimentation some moves are resisted (the shapes cannot be made to fit the contours), while others generate new phenomena." A move, according to Schön (1983), comprises of both the thought 'what if I did *this*' and the action of doing it.

Some of the new phenomena that the making of the design moves generated were unanticipated. Quist observed and verbalised how he saw these phenomena with regard to the overall framing that he had suggested. Through the discovery of many positive consequences that the making of the moves yielded, such as the nooks, the pleasant soft back area, and the views, Quist decided to affirm his framing. In other words he decided to commit to the proposal to base the designing of the buildings for the site on the initial array of L-shaped forms.

3.2.5. *Frame as a tool for experimentation*

Schön (1984) explained designing as a particular form of *experimentation*. Through experimentation a practitioner will be able to learn about particularities of a unique new situation, and appreciate its regularities on the basis of earlier knowledge. Designers enter experimentation according to how they initially perceive it. A practitioner, hence, enters the situation by imposing on it a structure according to which he or she may proceed (ibid.).

The incentive to engage in experimentation is triggered by the practitioner's appreciation of the situation. This appreciation may take forms, such as the practitioner realising that he or she cannot solve the problem as they have set it, or that they dislike what they get when trying to solve

it in the particular way, or that they find the resulting situation incoherent, or recognise that the result is not congruent with their fundamental values and theories, or when they get stuck in the enquiry (Schön, 1983). In such a situation the practitioner may suggest to appreciate the unique characteristics of the whole situation in a different way, i.e. impose a new frame upon it.

Frames give coherence to the situation and enable the practitioner to perceive it as something they find familiar, which in turn, enables the practitioner to treat the situation *as* one of their repertoire of familiar situations. The experimenter employs elements of his or her repertoire of familiar examples to formulate new hypotheses. These are tested by experimental actions that function to shape the unique situation. The situation is transformed from the initial experience of puzzlement and uncertainty into a discovery of what are the things of the situation in the light of the newly imposed frame.

A frame-experiment progresses in a sequence where each new move carries forward the implications of the previous ones. In the conversation with the situation, the practitioner frames the situation in a particular way, acts on the basis of this frame, and then appraises the unanticipated meanings that the dialogue elicits. With the new ingredients that emerge in the conversation the practitioner may discover new issues, dilemmas and opportunities in the situation. Throughout this process the practitioner remains open to the situation's back-talk, and is willing to re-frame it when he or she finds this helpful (Schön, 1983).

An important aspect of framing experiments is that each move can be 'undone'. Even the whole plan can be replaced with a new one; for example, simply by taking a fresh sheet of paper. This enables the practitioner to try out a series of moves and to learn from the consequences that become available for the reflection. The practitioner may then take into account these – probably unanticipated – results in subsequent moves (Schön, 1983, p. 158). Frame experiments may be chained together in a learning sequence.

> *"When a move fails to do what is intended and produces consequences considered on the whole to be undesirable, the inquirer surfaces the theory implicit in the move, criticizes it, restructures it, and tests the new theory by inventing a move consistent with it. The learning sequence, initiated by the negation of a move, terminates when new theory leads to a new move which is affirmed." (Schön, 1983, p. 155)*

A move-testing experiment is an activity to produce an intended

change. Schön (1983) says that when a move-testing experiment succeeds, the move is affirmed, and if it fails, the move is negated. "Do you get what you intended?" "Do you like what you get?" "Do you like what you get from the action taken its consequences as a whole?"

Schön (1983, p. 158) maintains that the practitioner, who experiments in a 'virtual world,' must have acquired specific skills in order for experimentation within the virtual world to be of benefit to real practice. First, the practitioner must be able to use the medium, such as graphic notations and professional language, for the purpose. And, second, the practitioner must be able to relate the context of the virtual world to the real world of practice. The results of the experiments within the virtual world must be transferrable to the real world practice. According to Schön (1983) architects learn to experiment in the virtual world by moving back and forth between drawing and building. Through this they rehearse their skills to understand the limits and benefits of the media that are employed in the context of experimentation in the virtual world. Schön (1983, p. 162) summarises, "Virtual worlds are contexts for experiment within which practitioners can suspend or control some of the everyday impediments to rigorous reflection-in-action."

3.3. Interim summary

In the present chapter I reviewed such theoretical explanations of designing that have adopted two main explanatory notions, namely design problems and frames. Despite that the notion of 'design problem' is actually employed by design practitioners, it was argued to have little explanatory power on the character of the activities of constructing a structure for how designers see their situation. This brought us to the notion of framing, which was central in Schön's (1983) detour of the notion of 'problem': "Problem setting is a process in which, interactively, we *name* the things to which we will attend and *frame* the context in which we will attend to them."

In the previous chapter, which focussed on describing the development conceptual designing in practice, the following functions were outlined for a design concept: 1) It identifies and gives name to a novel thing-to-be-designed; 2) it sets high-level goals for designing; and 3) outlines generic principles to drive progress and inform judgment. These points arose from the study of how design practitioners have displayed the use of concepts in their activities. The following chapter attempts to bring the insights from the above into discourse with deeper theoretical considerations.

4. Conceptual designing as project-specific learning

This chapter aims to make a theoretical contribution to the field of design research, especially on the area that has conceptualised designing in terms of design problem framing. The chapter explains what is meant by conceptual designing and develops a theoretically grounded explanation of it in terms of project-specific conceptual learning. The explanation centres on a fresh interpretation of *articulation* as the very means through which designers express their conceptual learning. It is argued that qualitative changes in re-articulation can be employed as an indicator of project-specific learning.

4.1. Conceptual Design

Conceptual designing is concept-mediated planning activity that is typically collaborative and involves the use of semiotic resources such as talk, text, figures, pictures, visualisations, diagrams, sketching and gesturing. Central to conceptual designing is the intent to articulate high-level simplifications, design concepts, which guide strategic decision-making over a thing-to-be-designed and inform detailed designing. The notion of conceptual design can be used almost synonymously with design thinking, however, the reason for coining the new term is three-fold: 1) to underline the significance of symbolic concepts for designing, 2) to promote the value of design concepts for the effort, and 3) to take a re-framed approach to highlight formerly less attended aspects of design thinking. Conceptual design should be distinguished from predominantly perceptual design, as well as from such design that is dominated by established rigid principles of how things should be created, i.e. 'more of the same' kind of approaches.

Typical examples of projects that can be easily associated with the notion of conceptual design are those that convey their results in mainly verbal form; for example, strategy planning projects where a dedicated committee is preoccupied with the task to outline what an organisation conceives

of as its mission and vision. These are typically communicated verbally. Concept design projects are also characterised by a high level of abstraction, they are fairly complex, and involve social interaction and communication across various stakeholders. The role of conceptual designing is elevated in projects, where a newly formed team of people from different backgrounds is pursuing to make sense of what they should be creating.

4.1.1. *What is a concept*

Conceptual designing centres on the production of a design concept. In this study a design concept is considered to be a well-justified idea about what to create. A presentation of a design concept outlines a name for the thing-to-be-designed, describes the core purpose of it, and delineates a few key principles that guide the making of design moves. These aspects of design concepts were explicated in Chapter 2.

The notion of 'concept' as used in our everyday business is rather different to the quite specific meaning that is given to a 'design concept' here. In some instances I will refer to the notion of concept as 'symbolic concept' to distinguish it from the design concept. *Design concepts* are entities having a particular role as simplifications that guide designing, whereas *symbolic concepts* are ubiquitous phenomena in everyday life. Donald Schön (1963, p. 4) characterised the range that can be thought of as the symbolic concepts in our everyday life:

> *"I want to use the word 'concept' broadly enough to include a child's first notion of his mother, our notion of the cold war, my daughter's concept of a thing-game, Ralph Ellison's idea of the Negro as an invisible man, the Newtonian theory of light, and the idea of a new mechanical fastener".*

Schön aligned with Dewey, Wittgenstein and C. I. Lewis by underlining the instrumentality of symbolic concepts as "tools for coping with the world, for solving problems" (ibid. p. 5). Similarly, Blumer (1998b/1930), who focussed on the functioning of symbolic concepts rather than on their structure, argued that in science symbolic concepts, such as mass, motion, and electricity, serve to "introduce order or intelligibility" to puzzling and problematic experiences.

> *"They [concepts] are not items of direct perceptual experience; they have originated as conceptions from direct perceptual experiences which have been puzzling and problematic" (Blumer, 1998b, p. 156/1930).*

Symbolic concepts are a means to *conceive* some *content* having an identifying mark or symbol that is typically *verbal,* and it functions as an

expression of a "given process of conception" (ibid. p. 159). For Blumer (1998b/1930, p. 157) they are "a *way* of conceiving and of having a content which is conceived." The verbal character of many symbolic concepts has significant influence on how they function.

> *"By reason of its verbal or symbolic character, the concept may become an item of social discourse and so permit the conception that it embodies to become common property." (Blumer, 1998b/1930, pp. 159–160)*

Since a symbolic concept may enable people to gain the same point of view and help them to orient to a situation in the same way, it is an important means for the facilitation of collaborative action. When a symbolic concept is shared within a project team, the team members can have a shared point of view with which to perceive and structure the situation, and hence, they may release action in a coherent and manner intelligible to the others in the situation. It will be, however, apparent further below that it is not at all straightforward to state what it means that a symbolic concept is shared.

Blumer (1998b/1930) made a distinction between common-sense concepts and scientific concepts. He (ibid. p. 160) stated, "the chief difference is that the abstraction embodied in the common-sense concept is just accepted and is not made the subject of special analysis and study". The symbolic concepts employed in design projects fall in-between common-sense concepts and scientific concepts in how they are treated. On the one hand design concepts do not have the obligation to contribute to the coherent cumulative heritage of scientific knowledge, whereby, symbolic concepts in design may be metaphorical and loosely grounded in data and they may be used in the common-sense manner, unquestioned and just accepted. On the other hand, the symbolic concepts that designers use may also go through a rigorous process of elaboration, investigation, and restructuring, unlike what people do with common-sense concepts.

On the basis of this observation, I will make the distinction, between *open concepts* and *closed concepts* according to how the concepts are treated in interaction. I will here omit the term 'symbolic' to avoid terminological clutter. *Open concepts* are those that are subjected to a special analysis and study, their meaning may be questioned and changed, whereas *closed concepts* are those that are just accepted without questioning. It will be visible in the empirical part that the status of a concept may change in interaction. It may be opened for study, if it is found puzzling and problematic, or if its elaboration is anticipated to increase the potential for development.

4.2. Frames

A notion, which is closely associated to concepts in terms of their function, as will be argued below, is that of *frame*. In the previous chapter it was shown that 'frames' have been employed extensively to explain design practice (e.g. Hey et al., 2007; Paton & Dorst, 2011; Schön, 1984; Stumpf & McDonnell, 2002). The academic use of the notion of frame comes from outside the field of design research. The notion of frame as a theoretical or methodical tool is employed with varying meanings in different fields, such as sociology (Goffman, 1974), psychology (Gardner, 1983), cybernetics (Bateson, 1972a), media studies (Ryynänen, 2009), socio-technological studies (Bijker, 1989; Gash & Orlikowski, 1991; Orlikowski & Gash, 1994), communication studies (Entman, 1993), cognitive science (Lakoff, 2010; Schank & Abelson, 1975), artificial intelligence (1975), and linguistics (Fillmore, 1976; Tannen, 1979, 1986, 1993). The use of frames in these fields reflects the different histories and analytical purposes to which these have been employed; however, certain underlying similarities exist.

4.2.1. *A short history of frames*

Minsky (1975) defined frames in the context of Artificial Intelligence (AI) as *data structures* that can be utilised to interpret stereotyped situations. Frames, according to Minsky, contain information about how to use the frame, what can be expected to happen next, and what should be done if the expectation is not met. Frames contain 'top parts' that are fixed so that when a stereotypical situation is encountered, these parts are held as true for the situation. The 'lower parts' may contain 'slots' to be filled by specific instances of data. Collections of related frames form broader 'frame-systems,' where effects of interpreted actions are reflected as transformations in the frames of the frame-system. (Ibid.)

While these ideas were formed initially to inform the development of better AI systems, they were also adopted into the field of cognitive science, (e.g. Lakoff, 2010; Schank & Abelson, 1975), to explain human cognitive functioning. Schank and Abelson (1975) explain frames as knowledge structures that a person brings into a situation to understand a task. Lakoff (2010) assumes a physiological basis for frames and claims that each frame is physically realised in neural circuits in the brain. Lakoff (ibid.), and Schank and Abelson (1975), associate frames closely to the notion of 'schema' as employed by Rumelhart (see e.g. Rumelhart & Ortony, 1976; Rumelhart et al., 1986).

The concept of schema was originally introduced by the psychologist Frederick Bartlett (1932). According to Bartlett, schemata allow for a quick pattern matching against a summary of prior experience, such that rapid judgements can be made. Bartlett (ibid.) defined schema as an 'organised setting,' which is a more dynamic notion as compared to thinking of schema as a structure. This definition implies a *process* of organisation as well as *resources* that comprise the setting. Bartlett (1932, p. 201) held a discordant opinion on the term schema:

> *"I strongly dislike the term 'schema'. It is at once too definite and too sketchy ... it suggests some persistent but fragmentary, 'form of arrangement' and it does not indicate what is very essential to the whole notion, that the organised mass results of past changes of position and posture are actively doing something all the time; are so to speak carried along with us, complete, though developing, from moment to moment. It would probably be best to speak of 'active developing patterns': but the word 'pattern' ... has its own difficulties; and it like 'schema' suggests a greater articulation of detail than is normally found. I think probably the term 'organised setting' approximates most closely and clearly to the notion required."*

The cognitive scientists Rumelhart and Ortony (1976) adopted the notion of schema and, nevertheless, defined schemata as data structures for representing abstract generic concepts stored in memory. One way they explained schema was as a script of a play. A schema becomes active in a particular situation in a manner a play becomes active when it is enacted in a situation. Rumelhart and Ortony (1976) enumerate several characteristics for schemata: 1) they include variables, 2) they can be embedded within other schemata, 3) they represent generic concepts on varying levels, and 4) represent knowledge rather than definitions, i.e. they are unlike dictionary entries. Rumelhart and Ortony (ibid.) explained frames through their structural characteristics, rather than based on their 'process' and 'arrangement' character that Bartlett promoted. Furthermore, they (ibid) studied frames in an individualistic manner, i.e. assuming *an individual* who has the frames to interpret the world.

In the field of linguistics Fillmore (1976) echoed many of the ideas of the cognitive scientists, and explained frames as knowledge structures that function as means to categorise experience and conceptual understanding. He departed from the way cognitive scientists understood frames, and employed frames in order to explain *language use* rather than human information processing. His focus on social aspects of communication,

rather than individual cognition, further distanced his topic from the individualistic treatment of the cognitive scientists. According to Fillmore (ibid.) frames enable structured ways of interpreting experiences especially by fostering sense-making of talk in its context. He assumed that over their lives language-users acquire a repertoire of frames that enable them to formulate messages to others, to understand the others' messages, to interpret their environment, and moreover, to create an internal model of the world around a situation. Once skilled with frames, Fillmore argued, language-users may also create new frames and transmit them. Frames are fundamental for people to be able to communicate so that shared understandings may emerge (ibid.).

Before becoming adopted into the analysis of design interaction, the notion of frame was employed in sociology. The sociologist Ervin Goffman (1974) employed the notion of frame to explain how people make sense of situations. According to Goffman, frames enable people to answer the question: "What is it that's going here?" He wrote (ibid. p. 8),

> *"Whether asked explicitly, as in times of confusion and doubt, or tacitly, during occasions of usual certitude, the question is put and the answer to it is presumed by the way the individuals then proceed to get on with the affairs at hand."*

Goffman (ibid.) saw frames as shared phenomena embodied in the ways people create the "apparent consensus" about what is going on now and here. Such frames are implied by the smooth flow of orchestrated interactions and unquestioned engagement in social interaction. Fundamental similarities with the way Fillmore (1976) explained frames are easy to find, although, Goffman was predominantly focusing on the explanation of social situations in the wild, rather than the theoretical linguistic bases for the achievement of shared understandings.

For Goffman (1974) the notion of *context* was closely associated with the idea of *frame*. For him (ibid.) *context was a frame* that surrounds a focal event providing resources for its appropriate interpretation. This interpretation of frame is rather different to the way cognitive scientists defined it. A frame, for Goffman, was then not a structure within an existing repertoire that would become *activated* once a particular situation or word was encountered, but instead, it was a means to refer to the organisation of social situations in connection with how these became experienced by their participants. This highly contextual way to think of frames in social settings subjects frames to much greater dynamism than is assumed by the rather static idea of frames in the cognitive sciences, AI, or linguistics as outlined further above.

Explaining frames in terms of 'context,' however, does not resolve the inherent problems of frames as instruments to explain social interaction, but moves the part that needs to be explained to another set of concepts. The notion of context is no less problematic than is the notion of frame. Goodwin and Duranti (1992) discuss in detail dilemmas related to the idea of context, and admit that it may be impossible to give a single, precise, technical definition. They, nevertheless, outline an abstract description of context (ibid., p. 4),

> *"A relationship between two orders of phenomena that mutually inform each other to comprise a larger whole is absolutely central to the notion of context (indeed the term comes from the latin contextus, which means "a joining together")."*

Gregory Bateson, see e.g. (1972b), to whom Goffman owes greatly in his treatment of frames, explained the idea of context within a systematic framework, which he developed in an attempt to come to terms with the human mind from the point of view of cybernetics. Bateson developed his notion of context by taking as the point of departure the perspective of the participant(s) whose interaction was studied, whether the participants were humans or animals, such as monkeys or porpoises (see e.g. Bateson, 1972a/1955, 1972c). A famous quote from Bateson (1972d, p. 459) illustrates the dilemma of drawing the line between the thing in focus and its context through an example of a blind man walking.

> *"But what about "me"? Suppose I am a blind man, and I use a stick. I go tap, tap, tap. Where do I start? Is my mental system bounded at the handle of the stick? Is it bounded by my skin? Does it start halfway up the stick? Does it start at the tip of the stick? But these are nonsense questions. The stick is a pathway along which transforms of difference are being transmitted."*

Bateson (ibid.) urged to draw the limiting line around the system to be explained in such a way that none of the important pathways becomes cut leaving things inexplicable. According to Bateson (ibid), if it is the walking of the blind man that one have set out to explain, then the relevant context may be different as compared to investigating the situation a moment later when the man sits down to eat bread. Hutchins (1995) employed this insight when bringing cognitive psychology outside the skin to consider the ways in which environment plays role in cognition. The extension of the scope of analysis beyond the skin, however, does not resolve the problem how to conceptually draw a difference between the ideas of 'context' and 'frame'.

In order to understand Bateson's development of these notions appropriately, the setting for his argument needs to be explained. He studied communicative phenomena from the point of view of cybernetics, which is a mathematically oriented approach to the study of communication and control systems, whether machine or animal. Originally Norbert Wiener (Wiener, 1961, p. 11) coined the term 'cybernetics' with his colleagues on the basis of the Greek term "steersman" as a response to the emergent concerns that scholars in the field of control and communication theory were facing in 1947. The idea of steering reflects the interest of the cybernetic theorists to explain how self-organising systems regulate themselves by adjusting and correcting their behaviour.

Bateson (1972b) connected his findings from patients with the severe mental condition of schizophrenia as well as from his observations of animal behaviour to abstract mathematical notions, such as Logical Types from Whitehead and Russell's (1963) "Principia Mathematica". With these he formed a synthesis to explain communicational phenomena, such as learning. A key concept that he employed in the explanation was that of 'difference'. With it Bateson was able to theoretically argue how the study matter of the science that studies physical phenomena, such as causation and natural forces, must be different from a science that studies communication (1972d). Difference is a matter of perception and thought, not a phenomenon of the material reality.

> *"When I strike the head of a nail with a hammer, an impulse is transmitted to its point. But it is a semantic error, a misleading metaphor, to say that what travels in an axon is an "impulse." It could correctly be called "news of a difference." (ibid. p. 454)*

According to Bateson (ibid.), difference is synonymous to the word 'idea' (as well as 'message') in its most elementary sense. Difference is a communicative phenomenon rather than a phenomenon of the Newtonian physical world, so Bateson (1972d) argued. Once an impulse enters the sensory organs, the neural mechanisms in them receive it as a difference, recreate or transform it, and pass it on. And once the difference travels through the pathways in the body, it becomes contextualised, re-created, transformed, re-contextualised, re-created, transformed, re-contextualised, many times in the complex of the mind.

Bateson used both the notions of context as well as frame intensively in his theorising, and he developed both notions in a systematic manner over decades. He (Bateson, 1972b) admits that it was only after he started to see the significance that *context* plays for the functioning of the mind,

that he was able to devise deeper theoretical explanations on how the functioning of the mind could be explained. The role of the notion of context was so profound for Bateson's theorising, that he (Bateson, 1972e, p. xvii) concluded:

> *"the phenomenon of context and the closely related phenomenon of "meaning" defined a division between the "hard" sciences and the sort of science which I was trying to build."*

Bateson outlined the idea of context within a broader cybernetic framework that he was constructing. He used the term context to describe the process of interaction where messages are exchanged and interpreted (Bateson, 1972f). By its existence, a message establishes a context for itself, proposing a certain class of responses appropriate and meaningful in this context.

'Frames,' in contrast, was a means for Bateson to talk about the premises that establish a context for messages (Bateson, 1972a/1955). This functioning is well described in his exposition of play. He recognised that somehow even animals are able to signal to each other that 'this is play'. A 'nip' is not a real 'bite,' but an invitation to join the play. The way the context is perceived and how messages become interpreted are changed during a play.

> *"A psychological frame [..] is (or delimits) a class or set of messages (or meaningful actions). The play of two individuals on a certain occasion would then be defined as the set of all messages exchanged by them within a limited period of time and modified by the paradoxical premise system." (Bateson, 1972a/1955, p. 186)*

With regard to the 'paradoxical premise system', he referred to the phenomenon in play by which the participants exchange messages that are like the real, for example expressing anger, but that the participants have a way to signal and interpret these messages as not real. For Bateson, frames are meta-communicative phenomena within a broader system of communication where it is also possible to treat *contexts as messages*. Bateson (1972a/1955, 1972g/1942) talked about this in terms of context marking. Even animals have a way to mark the context in which the messages should be interpreted in a different way than is normal. Bateson concretised the functioning of frames by outlining several characteristics for them (Bateson, 1972a/1955, pp. 187–188):

1. Frames are exclusive, i.e. by including certain messages (or actions) within a frame certain messages are excluded.
2. Frames are inclusive, i.e. by excluding certain messages (or ac-

tions) certain others are included. He exemplified these two points through the example of the functioning of a picture frame that tells the spectator to attend that which is within the frame, and not to attend to that what remains outside it. Both the inclusion and exclusion of messages is a positive process, i.e. the messages outside are positively inhibited and the messages inside are positively enhanced.

3. Frames relate to, and are part of, "premises". A frame instructs to use different kind of thinking on the things enclosed within it as compared to the things outside it. The picture within a picture frame is expected to be interpreted differently than the wallpaper visible on the background. In terms of mathematical 'set theory', messages are considered as belonging to the same class by virtue of them sharing common premises or mutual relevance.
4. Frames are metacommunicative. Any message that explicitly or implicitly defines a frame, by the fact of doing so, gives instructions or aids for the recipient of the message to interpret the messages enclosed within the frame.
5. Every metacommunicative message defines a frame, i.e. defines the set of messages about which it communicates. As an example of a metacommunicative message, Bateson gives the handshake of boxers before the fight.
6. Frames are psychological; not logical or physical (ibid.).

4.2.2. *On symbolic concepts and frames*

Let us consider the relationship between symbolic concepts and frames. In the section on symbolic concepts, it was argued that concepts have three main characteristics: they have a *symbol*, they imply some *content*, and suggest a *way to conceive* of the content. A symbolic concept may enable people to gain the same point of view and help them to orient to a situation in the same way. Frames have very much concept-like functioning. If we consider, for example, Fillmore's (1976) explanation of frames, the notion of frame could be used almost interchangeably with the notion of symbolic concept. He (ibid.) explained frames as knowledge structures that function as means to categorise experience and conceptual understanding. Frames are fundamental for people to be able to communicate so that shared understandings may emerge as they enable structured ways of interpreting experiences especially by fostering sense-making of talk in its context. Frames also enable the formulation of messages to others,

the interpretation of their environment, and moreover, the creation of an internal model of the world around a situation (ibid.). This is very close to the way Blumer (1998a) presented how concepts function in symbolic interaction, and the way Schön (1963) argued concepts to work.

Frames and symbolic concepts share still further similarity. According Schön and Rein (1994) it is possible to engage in 'frame-reflection,' which is the intentional activity to subject one's frames to critical evaluation and modification. Similarly symbolic concepts can be questioned, reflected upon, and transformed (Blumer, 1998b/1930; Schon, 1963). It would be tempting to conclude on the basis of this that frames are but concepts without a name, which would save a lot of further explanation. However, this would be a biased interpretation, and is reflected in how both Blumer and Schön eventually developed a different way to talk about the topic in terms other than the 'concept'. Both Schön (1963) and Blumer (1998b/1930, 1998c/1940) developed extensive treatments the notion of concept, before Blumer (1998a/1969) started to use the term 'symbolic interactionism,' and before Schön (1983) introduced the notion of 'reflective practice'. These two approaches have interesting resemblances that relate to the discussion of frames and symbolic concepts.

Blumer (1998a/1969, p. 2) outlined the three premises of symbolic interactionism in the following way: "1) human beings act towards things on the basis of the meaning that the things have for them; 2) the meaning of such things is derived from, or arises out of, the social interaction that one had with one's fellows; and 3) these meanings are handled in, and modified through, an interpretative process used by the person in dealing with the things he or she encounters." The notion of *meaning* appears central to symbolic interactionism. With regards to the meaning of 'objects' Blumer (1998a/1969, p. 11) wrote:

> *"The nature of an object – of any and every object – consists of the meaning that it had for the person for whom it is an object. This meaning sets the way in which he sees the object, the way in which he is prepared to act toward it, and the way in which he is ready to talk about it."*

He further concluded that, from the standpoint of people, the environment consists *only* of those objects that they recognise and know. Blumer (ibid.) grounded his explanation of *symbolic* actions on G. H. Mead's examples of 'the conversation of gestures' versus 'the use of significant symbols,' and on their basis distinguished between "symbolic interaction" and "non-symbolic interaction". The difference resided in what Blumer

termed *interpretation*. If a response requires interpretation, it is symbolic. As an example of non-symbolic interaction he mentioned a boxer who intuitively raises his hands to prevent a blow. But, if in that situation the boxer would see the attack as a 'feint' to deceive him then he would be engaged in symbolic interaction. It is important to pay attention to the phenomenon of *seeing as*, i.e. perceiving "through images we already possess" (ibid. p. 36), since it is an essential aspect of the way complex situations are made sense of, or framed.

The 'seeing as' scales from the brief instances, such as interpreting a blow, into complex situations. An essential skill of practitioners is the ability to see problematic situations as something that he or she is familiar with (Schön, 1983). With the repertoire of examples that a practitioner has constructed during their lifetime, they become not only able to interpret the situations in terms that they are familiar with, i.e. see as, but also able to *do as,* in other words, to take similar kind of action than in a situation that they have faced earlier. The familiar situations function as precedent, or metaphors, or exemplars for the new one, and enable the practitioner to appreciate the new and unique situation with regards to what he or she is already familiar with. This allows for the recognition both of the ways in which the situation is similar than the old ones as well as how it is different. (ibid.)

What are frames, then? Based on the above, frames can be understood as the premises that underlie the process of recognition and expression of messages and of the 'things' in a situation. Frames are a situated phenomenon, and do not only function inside the heads of people. Frames, unlike symbolic concepts, are local and situation-bound phenomena, woven into the materiality of a situation. Situations are always unique in their materials and participation, and so are the frames that are active. When considering the differences between symbolic concepts and frames, it is possible to argue that unlike symbolic concepts, which are generic and transferable, frames are unique-to-situation and cannot be replicated. However, frames can be socially distributed in the situation.

Goffman (1974) asserted that due to frames being somehow underneath the surface of what happens, and due to them being a phenomenon of action, it is highly doubtful to conclude decisively the 'exact frame' that is functioning in a particular analysed event of social interaction. He acknowledged multiple difficulties for the analysis of frames in a particular situation (ibid pp. 8-10):

1. The focus of study can be narrow or wide (span), close or distant (level).
2. Perspective – people view the same situation differently and are motivated by different things.
3. Many things happen in parallel and have different temporal range.
4. The meaning of "here" and "now" changes dynamically.
5. The identity of the "something" that happens and the inclusiveness of "before the eyes" are matters of implicit agreement.
6. A retrospective account of a situation provides a different evaluative assessment of the particulars of the situation than what is possible for an individual in the situation to generate.

In addition, Christiansen (1996, p. 178) argues that one of the key difficulties in studying activities empirically is the fact that the activities both create and are created by frames at the same time.

So, it does not make sense to claim that different groups of people at different times would have the chance to use *the same* frame in the way it makes sense to say that they use the same symbolic concept. The use of frames and symbolic concepts can be closely intertwined in designing, as Schön (1983, p. 40) explains: "Problem setting is a process in which, interactively, we *name* the things to which we will attend and *frame* the context in which we will attend to them." Here, Schön states that the things are referred to verbally, i.e. they are used as symbolic concepts. And at the same time as deciding to approach the situation in terms of these symbolic concepts, the context is set for their consideration. Regardless of the uniqueness of situations, and of the frames in these situations, frames can be intentionally set and used to advance designing.

4.2.3. *Frames in designing*

Rather than talking about 'frames,' scholars typically explain the treatment of frames in the context of designing as *framing*. For example Hey (2008, p. 29) writes:

> *"Framing is the process by which people consciously or unconsciously structure a situation by selecting relevant features: what is important and what is less important. Framing provides structure from the viewpoint of an actor both highlighting and hiding different elements. Frames often include assumptions of a desired end state and of what is good or bad."*

In addition to echoing many of the characteristics of frames that have already been identified, this quote highlights one of the key assumptions

that underlie all designing, that there is a "desired end state and of what is good or bad." In designing people are not just 'playing' with each other in a frame, or spending time chatting nonsense, but actively striving forward to achieve some progress, to transform a situation towards a preferred one (to remind of Simon's (1996) famous definition of design). Hence, goal-alignment could be promoted to the role of a defining requirement for all frames in designing. If a study of interaction would reveal frames that were not aligned with goal-attainment, then people would not be considered to be engaged in designing at that moment.

Symbolic interaction between people features numerous situations where the expressing of messages embodies intent or a plan, rendering these situations, in the sense of them being goal-directed, as designing. Blumer (1998a/1969, p. 9) outlines "such things as requests, orders, commands, cues, and declarations are *gestures* that convey to the person who recognizes them an idea of the *intention and plan* of forthcoming action of the individual who presents them." When a robber asks a person to put hands up,

> *"the meaning of the gesture flows out along three lines (Mead's triadic nature of meaning): It signifies what the person to whom it is directed is to do; it signifies what the person who is making the gesture plans to do; and it signifies the joint action that is to arise by the articulation of the acts of both." (Blumer, 1998a/1969, p. 9)*

This, of course, entails that both of the persons in the situation share the premises in order to frame the situation similarly, to interpret the messages in the same way, and thereafter, display conforming lines of action. In the analyses by Hey et al. (2008), as well as by Valkenburg and Dorst (1998), conforming lines of action that are goal-oriented, were discovered.

There is an important aspect that the goal brings to the interpretation of messages that are exchanged in a frame. In the animal 'play' the exchanged messages are interpreted through the paradoxical premise system that the display of anger is not real but something else. When designers are articulating within a frame, their messages become interpreted in relation to how they relate to the goal of the frame: Is it relevant to the attainment of the goal? Do people use such semiotic resources that they might support advancing towards the goal? Are the things that people refer to, or express though their talk, relevant for the goal? As soon as a goal can be recognised, the interpretation of the messaging in this sense becomes possible. In sum, it makes sense to consider frames in a goal-oriented fashion when studying designing.

Levels of Learning

In his later works (Schön, 1983) Schön explained design practice in terms of frames and framing, rather than in terms of concepts, as in (Schon, 1963). Schön's idea about framing resonates with Bateson's (1972c) theorisation of communication and learning, which may be grounded in the fact that Bateson was preoccupied with devising an explanation of communication and learning *in terms of functioning* rather than in terms of structures. In the next sections, I shall review Bateson's framework that explains the idea of levels of learning in order to arrive at a deeper theoretical explanation of conceptual designing in terms of project-specific learning.

Bateson (1972b) aimed at explaining how interaction evolves as a system over time; how an organism-in-its-setting learns. In this pursuit he came to differentiate between several hierarchically related types of learning. By Zero Learning Bateson (1972c) referred to the situation when learning is 'complete'. Zero Learning is essentially about the coherent recognition of stimuli, i.e. when the organism responds in essentially the same way to the perception of a 'difference'. In the context of design, an example could be a design student, who is able to coherently recognise the shape of the Juicy Salif citrus squeezer (Starck, 1990). When perceiving the squeezer, the student demonstrates Zero Learning, given that his or her encounter with the squeezer does not influence the way he or she will recognise it on later occasions. At the level of Zero Learning the recognition process does not change regardless of how many times the same stimulus is present.

The higher orders of learning are defined through a *corrective change in the process* on the lower level of learning. In other words, whenever the process of a subordinate level can be said to become qualitatively different, learning of a higher order can be said to have taken place. Learning I is thus a change in Zero Learning. Let us consider the design student again. When the student learns for the first time that the aeronautically-profiled object he or she sees is qualitatively different from other objects, and if he or she is able to recognise it coherently in later events, he or she displays Learning I. The process of recognition has undergone a qualitative change by the addition of the form of the Juicy Salif to their capabilities of recognition.

Learning I has subsequent effects on Zero Learning by changing the way the student perceives and recognises the phallic head between the slender legs of the object in their future encounters with it. Learning I is

what Bateson (1972g/1942) originally termed as proto-learning which he associated to the learning that takes place, for example, in Pavlovian studies of conditional reflexes, and in psychological studies investigating the rote-learning of meaningless syllables. Due to Learning I, an organism changes its communicative habits with regards to the 'same' stimulus.

Learning II is a corrective change in the process of Learning I. Learning II is what Bateson earlier (1972g/1942) called deutero-learning, or learning to learn. To return to the student example, we may say that when the design student learns that Juicy Salif is a kitchen appliance, he or she learns to classify the object according to a particular type of context. The student's learning about various types of contexts, for example about 'tools' or 'exhibition objects,' may help the student to make sense of the object in deeper ways, impose different structures upon the experience of the object, and adjust expectations accordingly. Bateson maintained that Learning II may take place due to people having developed sets of alternatives that they can choose from to categorise what they experience. Once the student has learned different types of contexts to interpret the meaning of Juicy Salif, he or she may choose to categorise their experience accordingly. This in turn may lead to different kinds of actions with regards to the object, e.g. shall it be used for squeezing lemon or be placed on display.

Learning III is a corrective change in the process of Learning II. Bateson (1972g/1942) held that Learning III is a very rare and complex phenomenon in human life, such as a religious conversion. Moreover, it may lead to profound reorganisation of a person's character, even so radical that, for example, the concept of 'self' ceases to be central to one's experience. Bateson (ibid.) admitted that even for scientists it is difficult to imagine or describe the process of Learning III.

Learning III is more profound than the lower levels of learning, which can render it as a more desirable learning goal than the lower levels of learning. Bateson (1972c, p. 305), however, warns that "even the attempt at the level III can be dangerous, and some fall by the wayside". In the context of human life this is certainly serious, but nevertheless, I shall argue that Learning III can be of great value for the explanation of the project-specific conceptual learning in the context of designing. The aspect of Learning III that Bateson (ibid. p. 303) considers to belong to the level of Learning III is a "*change in the habits acquired by Learning* II". In this kind of learning *the principles change* according to which influences become contextualised and on the basis of which articulation is done. The ability

to choose to act according to different principles is a strategic skill. I later refer to this level of learning as *strategic learning*.

Learning, even on the higher levels (up to level II at least), does not necessarily have to be mediated by verbal signs. From the above we know that Learning I is about familiarisation with stimuli resulting in coherent recognition. Learning I does not have to be verbally mediated, as is evident in it taking place in such studies as the Pavlovian conditional reflex studies. Also Learning II may take place without the mediating role of verbal language. Bateson's example of a porpoise that displays Learning II, and dogs that learn quicker to salivate in repeated studies in similar contexts justify to this, see (Bateson, 1972g/1942). Blumer (1998b/1930, p. 157), nevertheless, argues that when social interaction is not mediated by symbolic concepts, there would be "scarce opportunity" to reach the higher levels.

4.4. Conceptual Learning

Blumer (1998b/1930) outlined concepts as symbolically identifiable means to conceive some content in some way. This conception has three aspects to it that need to be understood: 1) the identifying symbol or name of the concept (i.e. the 'conceptual handle'), 2) the implied content, and 3) the suggested way to conceive. All three of these aspects play a role in what I call conceptual learning, which refers to such learning, that is, whether concept-mediated or concept-forming.

4.4.1. *The handle aspect*

Bateson's (1972c) cybernetic explanation of communication and learning presented learning in terms of corrective behavioural changes. These changes were exhibited by the transformations in the ways a regulatory self-organising system (e.g. human) reacts to stimuli (Bateson, 1972d). A significant omission in Bateson's cybernetic explanation of communication and learning is the role of verbal signs, words and symbols. If we consider the student example, already when the student learns for the first time to recognise the aeronautically-profiled object, the perception is typically associated with a text or talk stating essentially that "this thing is called Juicy Salif". So, the student learns not only one thing, to differentiate the same object through perception, but two things, i.e. that he or she at the same time also learns the verbal sign that it is associated with.

Through the works of Vygotsky, e.g. (1978, 1981a), we know that sign-mediation is a significant phenomenon of human thinking. Vygotsky

(1981b) saw sign as a mediating means, and when functioning in thought processes signs change how meanings are handled, and thereafter, result in qualitative transformations in thinking. Wertsch (2007) identified two ways in which Vygotsky used mediation: explicit and implicit. According to Wertsch (ibid.), explicit mediation involves the intentional introduction of a sign into an ongoing activity. Such a situation is described in the above paragraph about the learning of the Juicy Salif. Implicit mediation is such, where signs have been integrated into thinking in a manner that the signs do not become the object of consciousness and reflection (ibid.).

When seen against the backdrop of Bateson's theorising, it is obvious that the explanation of the levels of learning does not explicate the kind of change that takes place in the process of internalising a sign, i.e. when the experience of an object of perception becomes sign-mediated. As I argue above, the person, who learns that Juicy Salif is the aeronautically-profiled object that he perceives, learns two things, and not just one. And once he or she expresses the object by its name, it is one experience instead of two separate ones.

On the basis of Vygotsky's (1978) work, it is possible to say, that the processes of perception and expression of the 'thing' through a sign become intimately coupled due to learning, as the sign becomes internalised. If this coupled experience would grow into such a kind that it would lead to the same coherent response every time the student would encounter the object, then it would make sense to talk about Learning I. This may well happen in the process of perception and in the process of expression. Verifying this learning is not straightforward, as people do not trigger their talk in an uncontrollable manner in response to some thing perceived. The student will not shout Juicy Salif even though he or she has internalised its name every time they see one, even though they would implicitly and unconsciously process their perception of it in terms of its name.

If Learning I happens in a verbally mediated way, the learner must 'know' the verbal signs, the words, and the language that are used in the situation. For verbal learning to be possible at higher levels, we must assume that a learner has learned the syntax and lexicon of a verbal language as to be able to recognise, process, and express the signs of a language coherently. This kind of coherent processing of language falls in to Bateson's framework of Learning at the level Zero. In sum, verbal mediation may have an important role for conceptual learning, since it provides learners with an effective means for sharing a point of view, since the learners share the underlying habits of processing the symbols consistently.

4.4.2. *The content aspect*

The content, which a symbolic concept is a means to conceive of, can be explained with the assistance of Blumer's notion of 'object.' Blumer (1998a/1969, p. 10) stated that, from the point of view of symbolic interactionism, the "world" that exists for human beings, is composed of "objects" that are produced through symbolic interactionism. He defined (ibid.):

> *"An object is anything that can be indicated, anything that is pointed to or referred to – a cloud, a book, a legislature, a banker, a religious doctrine, a ghost, and so forth."*

Blumer (1998a/1969) categorised objects into three categories: *physical objects*, such as bikes, trees, etc.; *social objects*, e.g. mother, friend, and president; and *abstract objects*, for example, moral principles, justice, and compassion. In the context of design projects, the notion of object could be used interchangeably with the notion 'things-to-deal-with' that is used throughout the present study. Blumer even comes close to using this terminology in his text, as he talks about the "objects with which people have to deal and toward which they develop their actions" (ibid. p. 11). I have chosen to use the term 'content,' rather than 'object,' to emphasise the phenomenon of referring to an object. When some thing becomes referred to, or indicated, the act of referring brings that thing into attention and at the same time highlights some aspects of the object over others. An object perceived in a certain way may not have the same meaning in a situation. Depending, for example, on which words one uses to refer to the ostensibly same thing, it may invite different responses.

The 'content aspect' of a thing and what I call the 'way aspect,' are very intimately related. These are separated here because the referred thing and people's response to it are two different points of focus in the analysis of interaction. I have reserved a constrained role for the 'content' aspect to explicate the discrete things-to-deal-with that designers express in their interaction.

In terms of learning, when one learns new content, one learns new things that can be discretely recognised, referred to, and (re-)articulated. The phenomenon is hence, easy to associate with Learning I. This learning, however, is always bound to the other two aspects of conceptual learning, the 'handle aspect' and the 'way aspect'.

4.4.3. *The way aspect*

Objects can be talked about in different ways. For example, a bike can be expressed as "my mountain bike" or as the "old rusty one." Both are refer-

ences to the same object, but the expressions bring up different qualities, and perhaps also invite different readiness to act upon and to feel about the object. The wordings that are used in a situation also grow out of a different history and relationship that people may have with the expressed objects. Learning to talk about a bike in these different ways, necessitates that the one who is talking knows the terms 'my,' 'mountain bike,' 'old,' and 'rusty'.

> *"The nature of an object – of any and every object – consists of the meaning that is has for the person for whom it is an object. The meaning sets the way in which he sees the object, the way in which he is prepared to act toward it, and the way in which he is ready to talk about it." (Blumer, 1998a/1969, p. 11).*

All conceptually mediated behaviour is social and learned in symbolic interaction with others. Learning is displayed in *the way* people recognise and respond to things, interpret and (re-)articulate them. Above, Blumer (ibid.) associates the meaning of things, or objects, to the *way* in which objects are seen, responded to, and talked about. On the basis of Bateson's (1972c) theory on the levels of learning, the 'way' can be seen as that which changes due learning.

Through Learning I a learner will gain an ability to recognise, respond to, and articulate, particular discrete 'things' in one way, which is consistent across instances where the 'thing' is expressed in action. When learning a concept, one learns a way to interpret the meaning of the thing referred to, i.e. learns to recognise, respond to, and talk about the thing in a shared manner. Let us consider another imaginary example of the learning that is mediated by the concept of 'plastic'. It may happen quite early in a child's life, when they become introduced the word "plastic" in the connection of concrete experiences with things, such as plastic toys, spoons, mugs, and bottles. The experience of plastic is likely to be something different from the experiences associated with terms such as, "metal," "glass," "wood" and "stone". Once the word 'plastic' becomes internalised into the thinking of the child to an extent where one can recognise some thing as 'plastic' in a manner that the experience of recognition does not influence any further such recognitions, then Conceptual Learning I can be said to be complete with regards to that particular *term*, and with the *thing* it refers to. It becomes recognised always the same *way*.

Dynamic response entails higher level of learning to take place. The 'thing' can be interpreted differently and may be *seen as* some other known thing upon choice. According to Schön (1983), in a problematic situation

a practitioner may suggest to appreciate the unique characteristics of the whole situation in a different way, i.e. see it as in terms of one of the examples of the repertoire that the practitioner is already familiar with. This enables the practitioner to structure his or her perception of the situation according to what is already known to him or her, and gain use of their set of related expectations to guide his or her response and action.

Symbolic concepts can be employed intentionally to set a particular frame for a situation, and thus to enable a shared way to structure the experience of what is perceived. Schön (1987) argues that frames can be intentionally set, replaced, and changed, and furthermore, that their handling may be learned. Hence, concepts may have a significant role in learning to frame situations effectively. Intentional framing with concepts necessitates a prior process of familiarisation and learning of the structures that can be set upon the present situation. Schön (1963, p. ix) argued that this process is "nothing less than our way of bringing the familiar to bear on the unfamiliar, in such a way as to yield new concepts while at the same time retaining as much as possible of the past." The learner needs to possess the premises, i.e. the repertoires of the familiar, in order to use these for frame-setting.

Conceptual Learning II could be concretised by continuing with the 'plastic' example. Once a learner becomes faced with a new use for the term 'plastic' in the context of materials that behave differently, the meaning that he or she has assigned to the term. The malleability of materials can be called the 'plasticity,' and malleable materials thus 'plastic' materials. The term 'plastic' becomes used as an adjective in addition to being a noun, and this adds to the set of meanings that are possible for the term from the point of view of the learner.

Once this learning takes place, it is possible for the person to see a lot of different materials, even structures and situations, in terms of this developed concept of 'plastic'. Despite that the *name* 'plastic' has remained the same, the *thing* it refers to as well as the *way* of conceiving the thing, have changed. And, as the result of this, new uses for the name of the concept can occur, i.e. the word can be used to refer to an extended set of things due to this learning.

The use of a particular word, or concept, can thus have an impact upon what becomes considered as 'a thing,' and furthermore, what will be constructed and considered as the justified actions with regards to the thing. This is especially relevant when people are discussing abstract things. Schön and Rein (1994) explained this phenomenon in terms of 'rhetori-

cal frames'. For example, a housing situation can be seen as a "disease" which needs to be cured, or as a "natural community" which must be protected. Such normative concepts can be used for arguing about how to deal with the situation, and since these depict the considered situation in a particular light, certain actions may become favoured over others. In other words, the meaning of the considered thing can change once it becomes seen in the light of a concept. This change may become further visible in the set of things that people recognise as being related to the thing, what they do with these, and how they talk about these.

Concepts may change due to learning. Schön (1963) asserted that when old concepts are employed to explain something new, not only what is experienced becomes structured in a new way, but also the metaphor that is employed in the process of sense-making may change. Blumer (1998b/1930, p. 157) also held that "content may be specified, discussed, studied, and reorganised" thus highlighting the elasticity of concepts.

4.5. Re-articulation as a display of learning

Blumer underlined the effect of conception with regard to flowing back to perception (Blumer, 1998b/1930, pp. 164–165):

> *"Through conception objects may be perceived in new relations, which is tantamount to saying that the perceptual world becomes reorganized".*

And perception flows back to conception.

> *"Conceiving serves the same biological function as perceiving; it permits new orientation, a new organisation for effort, a new release of action." (Blumer, ibid. p. 155)*

Blumer, as well as Schön, talked in terms of how 'perception is given structure' or how 'experience of a situation becomes organised' and this enables the '*acting* upon a situation' or the 'release of *action*'. Rather than emphasising the significance of perception or conception for *action*, I promote their role for *articulation*. Articulation also conveys the constructive and imaginative character of conceptual designing better as contrasted with action, or with the cybernetic explanation, which saw communication and learning as a corrective and regulatory process.

Articulation refers to the symbolically mediated production of messages into a material form. The production of the material expressions of the messages embodies an assumption upon their meaningfulness for the participants of the situation.

4.5.1. *Meaningful vs. conceptual*

On the basis of Bateson's cybernetic framework of learning, as well as on the basis of what was stated above regarding the relation of verbal signs and symbolic concepts, it is possible to distinguish between two levels of thought processes: the 'meaningful' level, which refers to the processes of perception and expression, and the 'conceptual' level, which is about interpretation and articulation.

The *meaningful level* addresses the rather constant and coherent processes that take place, for example, in the fluent comprehension and speaking of certain language, such as English. This is a level at which machine applications are also becoming competent, i.e. software that is capable of transcribing speech to text. This layer is characterised by the dominance of zero learning, i.e. that the correct recognition of a sign does not affect the perception of the same sign later. This level is an important enabler of shared orientation, point of view, and collective action, i.e. the function of verbal concepts that Blumer (1998b/1930, p. 160) emphasised. Consistent exchange of messages is possible when both the expression of a set of signs and their perception become a shared property of interaction.

The *conceptual level* is about interpretation and articulation, which are more dynamic phenomena compared to those addressed by the meaningful layer. Interpretation, in the way the term is interpreted here, entails the existence of various types of concepts that enable subjecting that which is perceived or imagined under flexible re-contextualisation. On this level it becomes possible to talk about the 'content' that a concept relates to, i.e. about "that which is conceived," (see Blumer, 1998b/1930, pp. 158–159). Conception is possible only after Learning II has taken place, i.e. after one is able to relate perceptions to different types of contexts and to concepts. Concepts are a means to interpret what is perceived in terms of what one is already familiar with, on the basis of the expectations that the concepts one knows give rise to (Schon, 1963).

The cyclic flow of interpretation and articulation becomes perceptible in expressions that one produces. These expressions are perceptible 'differences' (to echo Bateson) in some physical material that will embody the messages one is conveying. Hence, it will be assumed that all conceptual learning is displayed in articulation. By tracing the qualitative changes in articulation it is possible to recognise when learning has taken place. Schön (1963, p. 8) argued,

> *"We cannot even name things without giving clues to the concepts which make 'things' of the situations confronting us."*

Blumer's account of interpretation illustrates the intimate relationship between articulation and interpretation of the 'things' of the situation. According to Blumer, the process of interpretation has two steps:

> *1) "The actor indicates to himself the things toward which he is acting; he has to point out to himself the things that have meaning,"*
>
> *2) "The actor selects, checks, suspends, regroups, and transforms the meanings in the light of the situation in which he is placed and the direction of his action."*
>
> *"Accordingly, interpretation should not be regarded as a mere automatic application of established meanings but as a formative process in which meanings are used and revised as instruments for the guidance and formation of action."*

Blumer (1998a/1969, p. 5) And, in the context of the attempt to explain conceptual designing, I observe that the last word in the quote could be replaced with 'articulation'.

This assertion, that learning is visible in the qualitative changes in expressions produced over repeated re-articulations, provides an important aid in the pursuit of tracing conceptual learning. Conceptual designing centres on the articulation of a design concept, i.e. the well-justified description of the design-to-be-designed. It is assumed that a project team's learning will be displayed in the team's articulation of the thing-to-be-designed. Learning, on any level, becomes observable to the outsider through a team's articulation and *re-articulation* of the 'thing' they are designing. During a project a team is likely to be re-articulating the thing-to-be-designed numerous times, which enables the investigation of project-specific conceptual learning. Articulating can be seen as an activity of producing expressions, each of which is context-shaped and context-renewing, to repeat the thesis originating from Garfinkel, as expressed by Heritage (1984, p. 242). Re-articulation may be the key means through which ideas are brought across design events in design processes.

4.6. Crux events and strategic learning

Some projects may result in insights that later are said to have happened in a sudden manner. A good example of this is Darwin's discovery of the theory of natural selection. Due to his detailed record-keeping of his thinking about the theory, it is possible to trace how the event of discovery actually took place, and especially, how the event was primed by a lengthy process of investigation and reflection. Gruber (1981, p. 41) writes:

> *"His [Darwin's] thinking could be described as a process of purposeful growth organized into a number of distinct enterprizes. These enterprizes moved forward more or less in parallel. Within each, he had many insights. To be sure, he was looking for a way of synthesizing these efforts, and he did indeed on 28th September 1838 have one great insight in which he first saw clearly the theory of evolution through natural selection."*

In this Gruber (1981) discloses how Darwin re-articulated his idea about the theory during the fifteen months of deliberate effort that led to the moment of insight and argues that "the historic moment was in a sense a *re*-cognition of what he already knew or almost knew" (ibid. p. 42). In addition to the event being a *re-articulation* of what was already known, there are several other aspects in which the event is significant for the present theorising: 1) that the experience of this event was *primed* by substantial preliminary work on several areas of inquiry, 2) that there was an experience about a particular moment in time when things seemed to fall into place (in fact, on 28th September 1838), which I shall call *the crux event*, and 3) that the realisation of the central role of this event came only in hindsight rather than during the moment it occurred. Similar effects are found in the empirical part of the present study.

I use the term *priming* to refer to the construction of the things-to-deal-with. Darwin pursued several parallel enterprises in which he considered many 'things' that his theory of natural selection would build upon and relate to. These were entities, which do not exist in a ready-made form at the outset of the conceptual design effort. It is necessary that they become known in order to construe the theory, and thus they have to be constructed. On the basis of his review, he concluded that the more one looks at the cases "the more one sees that a seemingly sudden inspiration exhibits a complex history of purposeful growth and a dense inner structure" (ibid. p. 57). Blumer (1998a/1969, p. 20) underlined the significance of the phenomenon (I have chosen to call priming) for social interaction in the following way:

> *"The participants involved in the formation of the new joint action always bring to that formation the world of objects, the set of meanings, and the schemes of interpretation that they already possess. Thus, the new form of joint action always emerges out of and is connected with a context of previous joint action."*

Schön (1983) argued that during the course of his or her lifetime, a practitioner builds a repertoire of examples, images, themes, category

schemes, expectations, techniques, cases, precedents, understandings, and actions. When a practitioner attempts to make sense of a new situation, he or she will see it through what he or she already knows. Especially, they see it through their repertoire of what they are familiar with. What are these but *premises* to make sense of situations, to make apposite interpretations of messages? These are the resources that enable a practitioner to interpret the things in a situation, and they are fundamental for a practitioner to be able to perceive a situation in a certain way. Hence, it may be argued that the understanding cannot be attained without the presence of proper *semiotic resources*[2], which may need to be constructed for the purpose. I consider what Schön (ibid.) referred to as the repertoires of the familiar to function as semiotic resources, because they participate in interpretation and articulation.

The construction of these resources may take a substantial amount of time and effort, but regardless of this, the significance of the initial construction of these resources fades to the background in explanations of the creation of innovative insights. Gruber considered the creative processes of individuals, such as Kekulé, Freud, and Poincaré. He (Gruber, 1981) argued that what these scientists had reported as sudden insights, were actually post hoc rationalisations of what happened at the moment of insight. Based on their reports it is impossible to know what *really* happened during the live event. Moreover, regardless of whether there was a video recording available of the event for analysis, it may have given little insight into the event, because it is likely that the development of the insight happened mainly within their heads if they were alone. It is likely that a broad number of semiotic resources were appropriately processed and brought into the reported moment of insight, whether consciously or not.

The experience of a momentary insight, nevertheless, is an interesting phenomenon. The recognition of moments of insight being 'historic,' for example in the Darwin example, coming only in hindsight can be argued to be a more generic characteristic of innovation projects. How could one know about the relevance of a particular event without knowing the context that it becomes judged through afterwards? As innovation projects aspire to create novel ideas that have not existed before, it may require time before the possible other ideas and interpretations around have been realised to be less relevant. I have argued before (Ylirisku, Halttunen, Nuojua, & Juustila, 2009) that it is impossible for designers to know if an idea is relevant or not if they have not constructed an appropriate context for

[2] I have adopted the term 'semiotic resource' from Goodwin (2000).

its judgment. I have called this the 'dilemma of relevance'. I have considered an idea relevant simply on the basis of whether it 'survives' until the end of the project, i.e. if it becomes presented as a key result of the process. The dilemma of relevance has bearings on project-specific learning, which is unlike the formal learning in schools, where the right answers are known beforehand.

A remarkable aspect of the reported 'aha' events which Gruber (1981) recounts, is that these events led to a change of strategy for developing their theories. The events have enabled scholars to gain a new level of judgement on their work. What they report as the insight has had a radical influence on how they have pursued their theoretical agendas later. It is possible that *principles* that govern the articulation of the theory have changed, influencing what will be considered as the relevant things in the theory, how these become recognised and related to together, interpreted, and (re-)articulated. If the impact of the 'aha' events was this profound, it is suggestive that the reported instances of insight were moments when project-specific *strategic* learning took place.

The reported enterprises where, for example, Darwin was involved, lasted over years and involved collecting and analysing a great quantity of materials. Projects, however, can be much smaller units. While it is theoretically possible to consider extremely short projects, such as a single turn in interaction as a project, meaningful durations for projects to be analysed for project-specific learning in the context of conceptual designing span from days to months, and perhaps years. These projects are typically expressed on paper with a name, agenda, timing, and resources. The following section places a focus on conceptual learning within a project's boundaries.

4.7. Project-specific strategic learning

Project-specific learning takes place within the duration of a studied project. The notion of 'project' here is defined with regard to a goal; a project is considered as timely-bounded intentional resourceful work to attain a goal. Theoretically, projects can vary dramatically in their duration from sub-second tasks to multi-year efforts. At the most detailed level, analyses could be as detailed as is presented e.g. in Goodwin's (1981) investigation of sub-turn transitions in the production of talk, and displayed in how people modify their messaging reflexively for the different participants in a situation. The administratively defined projects, i.e. such that feature a

written project plan, studied in the present work endure over much longer durations. Projects exist within projects due to the often hierarchical character of goals, and project-specific learning may be chosen to be analysed on dramatically different levels of duration.

In the current focus are particular types of projects, namely conceptual design projects, which set an additional anchoring point to consider.In a conceptual design project the goal is related to the conception, modification, and expression of an entity, which I shall refer to as a *thing-to-be-designed*. In terms of projects, it is possible that two or more related conceptual design projects, regardless of their being administratively separated, to focus on the same design concept. The concept may become iteratively refined over more than one project, for example, due to the subsequent technological discoveries.

A project is essentially the means to draw timely boundaries around the investigation. Bateson studied and explained learning in the context of life-long processes, not within the potentially much shorter durations of projects, which may be one reason why Learning III was recognised as a very rare phenomenon. I would argue that project-specific strategic learning might not be as rare based on two observations: Attempting strategic learning does not have to be as dramatic as Learning III can be in the context of human life; and the learning is relative to a project team's (re-) articulation of the thing-to-be-designed rather than to a person's character and selfhood. Framing strategies in design projects are *local* phenomena with regard to the life-context of a person, not *global* in the sense of radically reconfiguring one's personality and outlook.

It appears to be beneficial for designing to aspire to a global framing strategy with regards to a project, as this enables the production of coherently organised designs that work as a whole. An example by Schön (1984) shows an architecture student 'Harold' being stuck in his planning of a new dormitory for the MIT campus, and his teacher 'Franz' is assisting him to proceed with the planning. After Harold's explanation of how he is stuck, Franz asks him to explain the 'problem' that he is facing. Harold responds (Schön, 1984, p. 133):

"*Harold: Well, I'm not sure it is at this moment a difficulty in that I don't have a conceptual handle that guarantees that this system is going to be resolvable.*

Franz: I still don't understand.

Harold: Well, right now it's a spaghetti bowl...

Franz: ...pinball machine.

Harold: Yes, yes. And I'm not sure how far away from that I want to get, but I would like to make sure it's comprehensible."

Schön (ibid.) reports that he reviewed the instance with Franz on video tape, and Franz explained his interpretation of the impasse. According to Franz, the problem stemmed from Harold's systematic effort to avoid hierarchical organisation in his design. Franz sketches out an example to show how hierarchical order was embodied in renaissance structures in order to display a clear and comprehensible architectural order. He argued that Harold's non-hierarchical plan might not work out.

Harold had worked according to the "principle that 'relations of parts to whole are defined through local relations'" (ibid. p 134). The experimentation with the non-hierarchical planning caused Harold to realise that the result resembles a 'spaghetti bowl,' but due to his deep appreciation of 'political socialism' and 'sixtyish, anti-establishment views' he would strongly like to avoid a centralised hierarchical system, which appeared to be rooted in his appreciative system in more than one way. As soon as Franz understood the dilemma, he encouraged Harold to start to resolve the problem with the organisation of the structure by means of sketching new drawings from particular views. In this way Harold might be able to address such dilemmas, which would only be surfaced once the ideas became realised as drawings (ibid.).

Despite being global to a project, strategic learning in design projects does not have to be as dramatic as Learning III may be in the context of human life. Harold would not have to transform his world views and fundamental values, or undergo a radical reformation of his character and selfhood to make a principled plan for the dormitory. The investigation of a possible revolution of design principles can be constrained within the context of the one project.

Changes in framing strategy may be limited to local strategies that are employed to work on parts of the whole, or global strategies, which consider the whole thing-to-be-designed, and thus, the whole duration of the project. Project-specific strategic learning is not constrained within one single planning session, but transcends across the subsequent events of developing the same thing-to-be-designed. The thing in the above case is the dormitory, which becomes expressed during the meeting with Harold and Franz several times from different points of view. If Harold ultimately changed the principles that he followed in his final design, the change should be visible in the concrete details that he chose to include and present in his final plans. These plans are (re-)articulations of the thing-to-be-

designed, and whenever these expressions convey a sense of revolutions in design principles, i.e. changes of a framing strategy, it is possible to justify the interpretation that project-specific strategic learning has taken place.

All the levels of project-specific strategic learning are bound together in ways illustrated by Bateson, and as echoed above. Project-specific strategic learning, therefore, is reflected through all the levels of learning within a project. Hence, it is the most profound and thoroughgoing form of change that may happen during a project in the ways a project team interprets and articulates a thing-to-be-designed. And, since the change is propagated through all the levels of thinking, it becomes visible through the talk, gesturing, writing, etc. through which a project team expresses its object, i.e. the thing-to-be-designed. This makes possible the analysis of project-specific strategic learning by the means of scrutinising the changes that occur in project teams' strategic framing of their articulation.

4.8. Definitions

Symbolic concept is a means to address some content or thing, and it suggests a particular consistent way to conceive of the content it implies. Symbolic concepts are identified by a symbol or a verbal name.

Design concept is a well-justified high-level simplification that mediates detailed design and strategic decision-making over the character and features of a thing-to-be-designed.

Open and closed concepts. Open concepts are such concepts that become subjected to special analysis and study, and whose meaning may be questioned and changed. Closed concepts are those that are just accepted in interaction without questioning.

Frames are the premises for meaningful interpretation and articulation. They form the basis for the recognition and expression of messages and context. In designing, frames always embody intent.

Articulation is the expression of such messages with the available semiotic resources that are potentially understandable by the participants of a situation.

Re-articulation is the repeated production of such expressions that refer to the same 'thing'.

Priming is the construction of the semiotic resources that are necessary for the setting of particular frames. Priming can be seen as the learning of the premises to learn.

Crux event refers to a session during which a sustained strategic framing, or global framing strategy, becomes first articulated.

Framing strategy is such setting of frames that appears to follow an explicit principle or rule.

Local framing strategy is a framing strategy that is employed over the duration of a constrained event.

Global framing strategy is a framing strategy that is used across several events, and which may be anticipated to be used continually.

Concept-mediation is the influence that concepts have for interpretation, judgment and articulation of ideas when being included in the design process.

Conceptual learning refers to the sustained changes that take place in the way a concept is used, as well as to the sustained changes in one's repertoire of concepts.

Project-specific learning is a way to talk about learning that is constrained within the duration and materials of a project.

Project-specific strategic learning happens when a global framing strategy becomes modified or replaced.

5. Research method

This chapter describes the research method, the Framing Analysis of Design Articulation (FADA). It is a novel method inspired by ethnomethodology, Interaction Analysis, and Conversation Analysis, and is grounded in the above-presented theory of conceptual designing. The focus of the analysis is on the naturally occurring organisation of conceptual designing. It is argued that through FADA it is possible to uncover project-specific conceptual learning in conceptual designing.

5.1. Framing Analysis of Design Articulation

FADA is based on the scrutiny of *what can be perceived in interaction,* and it builds the analyses on an initial making of transcripts of and observations on video records. It is assumed that video records are able to represent lived practice in a manner that allows for the reading of signs embodied in its visual view while retaining their original visual character well enough for the analysis. Video is also considered to be able to reproduce the sounds aired in a situation in a way that preserves many of the original characteristics of the sounds. This feature allows for the making of detailed observations about talk in interaction. Video also enables researchers to view an event repeatedly in order to ensure that interpretations will be based on valid observations.

In FADA, interpretations about content, frames, and framing strategies are grounded in observations made of expressions that are perceptible for the participants of the studied situation, i.e. what the participants say, write, draw, gesture, point, orient to, etc. I have adopted Goodwin's (2000) term semiotic resource to refer to a broad range of assets that people may employ to convey or conceive a message in a situation. We may not directly perceive every semiotic resource, such as those within people's heads, but we may observe a special category of semiotic resources, which Goodwin (ibid.) calls *semiotic fields*. Sign phenomena become perceptible through their display in semiotic fields; see Figure 7.

Figure 7. *An example of two semiotic fields (the connected hands and the wall projection) that are utilised in connection with talk during a real design project.*

FADA focusses on details of interaction, but it is not limited to making interpretations only on the basis of what is directly observable on video records. In the generation of interpretations on the top of what is observed, the analysis uses information about the semiotic resources that are not directly perceptible in the interaction. This requires the study of events that have led to the situation in order to render the discussed content comprehensible. For example, when a person in a studied situation says, "this is the centre" while pointing at a circle on a paper, what does the person mean? The 'centre' may refer to a particular geographic place or an abstract idea if further context is not given. To disambiguate meanings, FADA combines the close scrutiny of video materials with ethnographic field data covering events around the one that is being analysed in detail.

The theory in the previous chapter argued that semiotic resources do not emerge out of vacuum for the participants of the situation, and that they may result from an intentional construction process. It is, however, also possible that semiotic resources 'sneak into' the process, as Sundholm et al. (2004) have recognised. The groundwork for the preparation of semiotic resources as well as the work conducted to enhance participants' awareness of these, i.e. *priming*, can be explicitly traced in events that lead into the focal event. Designers may, for example, stage the space in a way

that *a priori* prepared semiotic resources are brought into the view for the participants. The investigation of priming requires the analyst to become familiar with background data from the project activities prior to the focal event in order to suggest connections between what is being constructed and the (possibly invisible) semiotic resources that the participants of the situation employ in their articulation.

5.1.1. *Concepts, frames, and framing strategies*

FADA attempts to unveil the construction, transformation, and use of concepts, frames and framing strategies in conceptual designing. The discovery of these requires two things: first, a clear idea of what these issues are; and second, a procedure for recognising them. Once these issues are recognised, it becomes possible to draw conclusions about project-specific conceptual learning.

Concepts are semiotic structures that have the following features:

1. Concept has a name or sign through which it is publicly used in interaction.
2. Concept implies some content that may be interpreted on the basis of available semiotic resources, situated display of signs, and shared habits of interpretation.

Since concepts may transform, two kinds of concepts can be identified: open and closed. *Open concepts* are those that are being constructed, or whose meaning is being questioned, and *closed concepts* are those that are used without questioning their meaning, i.e. they are simply accepted.

Frames are premises for the interpretation and articulation of messages having the following characteristics:

1. Frames are implied by the material alignment of (collaborative) action and by the use of concepts.
2. A frame in design interaction can be understood in terms of a goal that it serves.

Framing strategy refers to the principled generation of frames over some duration, and their identification requires the analysis of frame-generation over multiple frames.

5.1.2. *The FADA process*

A presumption for conducting FADA is that there is good data to be analysed. The requirements for data are:

1. The focal event(s) must be covered on video in a way that allows for the close scrutiny of the use of semiotic resources. The semiot-

ic fields that the participants of the studied situations employ need to be covered by the video data.
2. The initial project description needs to be known, including the agenda and aims of the project.
3. The events that lead into the focal event(s) need to be covered in such detail that enables the tracing of the evolution of project-specific semiotic resources.
4. The results of the project need to be known.

If these requirements are met, it is possible to begin the FADA process. It begins with the identification of those events that will be analysed in detail. Since projects may last over years, it is important to reduce the analysis to a small fragment of the all possible events in the project. One useful indicator for an event to be relevant for closer scrutiny is the occurrence of significant changes in how a project team expresses the thing-to-be-designed. This may take place, for example, in a meeting where a project team is gathered to articulate a definition for what the outcome of the project will be. Changes in (re-)articulation of the thing-to-be-designed can be indicative of project-specific learning, which render the events where such changes occur of potential interest to be analysed with FADA.

Once the focal event is identified, the next step is to analyse the video recordings. The analysis proceeds through four rounds, which are summarised in Table 1. Each round builds its interpretations on top of the previous round(s)

Table 1. *The four levels of analysis in FADA.*

Analysis	Focus
1. Round	Expressions
2. Round	Concepts
3. Round	Frames
4. Round	Framing strategies

The first round is transcription. During this phase a translation of the talk and of the use of semiotic fields in interaction is produced. The translation is presented as text and other symbols that convey what the participants expressed through their use of physical materials in their articulation. The transcripts may be accompanied by screenshots of the video. The first round transforms the initial physical and analogue appearance of a situation into the form of conventional language and explicit written/drawn figures.

The second round builds on top of the first, and it identifies the concepts (both open and closed) that the participants of the studied situation express. Open concepts are those that are being formed or transformed, i.e. their meaning is constructed or questioned. Closed concepts are simply accepted and used as if everybody in the studied situation would know what they mean.

The third round builds on top of the second, and aims to identify frames. The participants of a studied situation can be said to 'be in a frame' when a particular goal can be interpreted on the basis of the previous two rounds of interpretation. What are the participants willing to achieve by doing or articulating what they do in the studied moment?

The fourth and final round builds on top of all the previous ones, and it seeks to uncover framing strategies, i.e. principled organisation in how frames are generated.

It may be that the later rounds reveal phenomena that have remained implicit in the previous rounds. During the analysis several repeated analyses across the analytical levels four rounds may be needed so that the resulting description can appropriately and clearly report all that matters and nothing much more.

5.1.3. *Project-specific strategic learning*

In the previous chapter I argued that learning is displayed in re-articulation. The notion of re-articulation assumes that the 'same thing' is expressed anew in a later situation. In addition to the thing-to-be-designed, designers talk about users, what they do, their needs, technologies, trends, business opportunities, etc. These are examples of things-to-deal-with in conceptual designing. Designers' conceptions about these are likely to evolve during a design project.

Through the investigation of the articulation of a project team it is possible to identify when a design team is talking of, or otherwise referring to, the things of interest. And, when the re-articulations of these display significant changes over time, it is possible to make justified interpretations about how the conceptions have evolved. With FADA it is possible to track qualitative changes in how concepts, frames and framing strategies are displayed by articulation in interaction. The analysis can uncover learning on all the higher levels: conceptual, intentional, and strategic.

The empirical part below exemplifies how the procedure functions and the kind of results it yields. It also illustrates the many contingencies and challenges that the conduct of this kind of research sets for the researcher.

The exposition also highlights some insights during my personal journey as a new researcher that have led into my development of the FADA method and the theory behind it.

5.2. Research design

The present research was conducted 'in the wild' where conceptual designing happens. The study has been brought into existence primarily due to my work experience as a conceptual designer, and thus it belongs to the rather new tradition of research through design (see Koskinen et al., 2011, and Zimmerman, Forlizzi, & Evenson, 2007). Only in two of the total of thirteen projects that I studied or in which I participated (see Table 2) have I been acting as a mere researcher, i.e. simply collecting data without contributing to the designing. Through my now over-ten-year experience in the field of conceptual designing the difficulties in coming to a conclusion about the 'product concept,' the 'design concept,' or the 'innovative idea' have become familiar to me. For the convenience of being able to address that dilemma, I started to first talk about it in terms of *getting to the point*, (see Ylirisku, 2004), later *focusing*, (see e.g. Ylirisku & Buur, 2007), and *framing* (see e.g. Ylirisku, Vaajakallio, & Buur, 2007 and Ylirisku et al., 2009).

In the early projects, until somewhere between 2005 and 2006, I focussed mostly in advancing my personal conceptual design competence. This was done by exploring, developing, and publishing about new design methods and facilitation techniques (see Jääskö, Mattelmäki, & Ylirisku, 2003 and Battarbee et al., 2005). Around the time, when I officially begun the doctoral study in December 2006, the dilemma that I referred to as 'framing,' called for a deeper, more analytical, and more theoretically inclined approach. This motivated data collection *as a researcher*.

5.2.1. *Being a non-designing researcher*

At that point I began to study design projects by observing what other designers did. I started by observing students in a concept design course called User Inspired Design in 2006 (a course that I know closely, earlier as a student and later as a teacher), and later, in 2007, I went to observe students and teachers in an urban planning project. These projects were easy for me to gain access to and they were also relevant to the topic. The downside of these projects was their status as student projects, and thus,

Table 2. *Available data for analysis in this study*

	Project	Year	Focus	Client(s)	Role	Note on framing
1	Knowledge Management	2002	Phone service concept	Bank	Designer	Intuitive process, it simply had to work
2	Freeride skiing	2003	Complementing the experience in Freeride skiing	Manufacturer of sports technologies	Designer	Intuitive co-design. Worked in response to situations.
3	Kiteboarding	2004	Opportunities for Mobile Lurking	Consortium of three companies	Designer	Focusing workshops, focusing templates, mostly intuitive
4	Clinical collaboration	2004	Communication of anaesthesiologists	Clinical equipment manufacturer	Designer	Scenario-based framing, explored how scenarios work as a tool for focusing
5	Konkari	2004–2006	Wellbeing at work	EU	Designer	Situating designing, personas, experiments with different techniques
6	User Inspired Design	2006	Concepts for the blind	–	Researcher	Looking at how the students utilise field materials when they crystallise their concept
7	Strategic Partnering	2006	Developing new work practices	Public health organisation	Designer	Organising a project-in-a-day workshop, importance of priming started to stand out
8	ELVIS	2007	Prototyping a provocative library information system	–	Designer	Experimented by building something technical in order to learn how it influences concept framing
9	Studio'n'site	2007–2008	Urban planning	Town	Researcher	Investigating a repeated study project, where framing and priming is done systematically and efficiently
10	MenoMaps	2008–2010	Multichannel map services	Consortium of 10 organisations	Designer	Real challenge where I acted as a designer willing to frame the process as well as possible, a surprise was how long framing may take to settle
11	Spice	2009–2011	Urban Spaces and Services	Consortium of 6 organisations	Designer	Organising project-in-a-day workshop, and other workshops. I started to feel like a pro in setting these events up (which is boring).
12	MenoMaps II	2010–	Multichannel map services	Consortium of 12 organisations	Designer	Exploring a new area to extend an existing concept, organising business modelling workshops
13	Microsoft	2010–	Re-designing the web for homes	Microsoft	Designer	Multi-layered framing, where the project featured a large goal and the design concepts/ prototypes addressed small parts of that.

not about the real business of designing. The problems of the relevance of student projects research is recognised in the research community, see e.g. Paton and Dorst (2011), and employing data only from such projects would make it challenging to argue for the overall value of the discoveries. So, I also needed to gather data about how professional practitioners do conceptual designing.

5.2.2. *Being a designing researcher*

In my personal conceptual design projects I was lucky to get the opportunity to organise a session, where professional practitioners would be engaged in conceptual designing (the Multichannel Maps project). And being aware that this event could be of great importance for my discoveries, I documented it with two video cameras. The session proved to be what I later became to call the *crux*[3] event. This term as an analytical tool will be explained in the section 4.4. The key part of the session, where the design concept was articulated, was enclosed within a time window of 1 hour and 10 minutes. This is a short-enough time to be analysed in the required detail to investigate the organisation of the conceptual design work. In this event a complex design concept was articulated as a coherent whole for the first time. This concept functioned as an expression of what was being created, and it gave direction for the subsequent activities to develop a functioning interactive prototype and to communicate in public what the project was about.

The issue with the two student projects remained still to be resolved. The User Inspired Design project was organised in a manner that it had some important characteristics of 'real' projects, as it included requirements for contextual justifications, it was conceptually challenging, multidisciplinary, and the students had to communicate their design concepts in the form of persuasive marketing, i.e. trying to attract imaginary investors (the teachers and other students in the course were acting as such) to buy their ideas. Hence I considered it relevant for the study. I nevertheless chose not to include the User Inspired Design project materials for the reason that the data records did not indicate a clear crux, which I had sensed to be a valuable phenomenon to be attained and, therefore, also understood.

[3] The use of the term here was inspired by my earlier interest in rock climbing. Climbing routes are graded according to their difficulty largely on the basis of usually one very challenging spot on the route, the crux. Once a climber is capable of overcoming the crux, s/he is able to climb the whole route. Conceptually crux, as it is used in this study, plays a similar role. In a suggested analogy, once a design team is able to handle the crux, they will master the project conceptually.

Frame it simple!

The Urban Planning project, which was also a student project, included a very clear crux event that was documented on video. In post-reflection, having witnessed this very event may be the very reason I became aware of the phenomenon that I later began to call the crux event. In that session two teachers (Master and Assistant) were engaged in conceptual designing. Master led the sketching of the overall scheme of how the students would be grouped to work on different topics. In the collaborative situation, Master had to render her thinking visible and understandable to her co-designer. This was a jackpot for me, as the observational researcher. I could gain analytical access to an example of professional conceptual designing, where the basic structure for a multi-month planning process was given form in a matter of 10 minutes. A crux event was writ open in front of the video camera, and it enabled me to become aware of it being something quite special for the first time.

5.3. Empirical data

The study began with data gathering covering full projects. In the gathering of the data I employed both *passive observation* and *active participation*, which are both also employed in ethnographic data construction (see Wolcott, 1999). Passive observation was a method to engage with the field where the data were collected while minimally interfering and influencing the unfolding activity being studied. Active participation, in contrast, was the mode of data gathering where I was a legitimate participant in the studied activity. Data was collected by first-hand engagement in the field, video recording, by the means of situated interviews, and by archiving the communications and planning materials that were produced by the studied people.

It was important to cover full projects, since only at the end was it was possible to state with certainty what ideas survived till the end, and thereafter, it was only then possible to trace back to the events where these ideas had been first articulated. I had started to become conceptually aware of crux events during 2008, which is visible in my early drafts of this manuscript. A most likely sensitizer for this was the above-mentioned investigation of the construction of the overall design scheme in the Urban Planning project (autumn 2007). The project was exceptionally clear with regard to its structure, and featured an intense contextual immersion, ideation, and consolidation during its first 24 hours. I looked into my other data as well, and began by trying to recollect sessions where the design

team had developed an initial articulation of what would ultimately grow to be the final design concept. Table 3 shows the results of this exploration.

Based on the review of my projects over the last ten years, it appeared evident that a clear crux moment was absent in many conceptual design projects. However, the projects that appeared to feature a crux, I found conceptually to be the most engaging. These projects had provided me with the feeling that people were creating a new idea that really made a difference. There seemed to be a moment of insight, where a new structuring suddenly started to make a lot of sense. Very much like, as described by Gruber (1981), that which occurred to Darwin as he discovered the theory of natural selection. Such projects were: Knowledge Management, Freeride skiing, Konkari, Urban Planning, and Multichannel Map Service.

5.3.1. *The two chosen projects*

The data ultimately chosen to function as the empirical material for the present study were taken from two separate projects. The first project, which I refer to as 'Urban Planning,' was a student project in the autumn of 2007. It was organised by the University of Oulu, in Finland. I observed the project without influencing the design process. The second project, which I call 'Multichannel Map Service,' was an academic conceptual design project with industrial partners (2008–2010), and it was organised in collaboration with my home department. I was personally responsible for leading the concept design[4] in the project.

The data from the first project comprise written course agenda, written instructions given to students, observation notes, photos of students' sketches, and the final design proposals, as well as observational video material of site visits, planning and feedback sessions, and of final presentations (in total approx. 13 hours of raw footage). The data from the second project included my personal research diary, project plan, meeting minutes, photographs from meetings and planning sessions, presentation files for the (industry chaired) steering group of the project, the steering group minutes, and most importantly, video material from collaborative planning sessions (in total approx. 10 hours).

The Urban Planning project was completely unknown to me beforehand, and I did not have prior acquaintance with the people organising

[4] Note the terming concept design, and not conceptual design. Concept design is a term that design practitioners use for the activity that results in a design concept, whereas, *conceptual designing* has the specific meaning explained in Chapter 4.

Table 3. *Crux events in conceptual design projects.*

	Project	Year	Design concept	Notes on the crux event	Data on the crux
1	Knowledge Management	2002	Scenario set of a realistic truly tricky situation	Clear crux where a principled concept emerged. The preparations for the crux were, though, not well documented.	Video
2	Freeride skiing	2003	Portayal set of freeride skiers' values	Despite a principled concept, no such crux was found that would be enclosed within a single observed session. The iteration of the concept began in a workshop, continued over e-mail, and was refined based on user feedback.	Video, N/A (e-mails in a destroyed hard drive)
3	Kiteboarding	2004	No principled concept, just list of themes	A session was organised, where the crux could be expected, but the result was a ppt presentation with themes rather than a principled concept.	No crux
4	Clinical collaboration	2004	No principled concept, but an inspirational story	–	No crux
5	Konkari	2004–2006	ICT concept set for different worker identities	We had a clear crux, where our ICT ideas were put together according to user portrayals, but this session was not properly documented.	N/A
6	User Inspired Design	2006	A navigation concept for the blind	The emergence of the concept remained implicit as the students did not conclude their concept in the observed session.	N/A
7	Strategic Partnering	2006	No clear single concept, but several ideas about novel partnering process	–	No crux
8	ELVIS	2007	Provocative library information system	I was working alone, I did not articulate the process in enough detail for crux analysis, and there was no clearly enclosed crux event.	N/A
9	Studio'n'site (Urban Planning)	2007–2008	Three-fold scheme for generating town plans	A clear and brief crux.	Video
10	MenoMaps (Multichannel Service)	2008–2010	Multichannel map service concept	Despite it was clear that a principled concept was articulated in the observed crux session, it remained a mystery for long time, what actually happened.	Video
11	Spice	2009–2011	No principled concept but many disparate ideas during my time in the project	–	No crux
12	MenoMaps II	2010–	The core concept, which was discovered in the previous MenoMaps project remained the same.	–	No crux
13	Microsoft	2010–	Several concepts	The process was more like a movement towards an increasingly clear idea about why particular concepts were chosen to be prototyped, and stating this in the concept descriptions.	No clear crux.

it. It provided me with data that would not have the bias of my personal input as a designer, and hence, would contribute to making the whole study on the nature of conceptual designing more objective. The project also addressed a quite different planning context as compared to the other project, which was about Multichannel Service design. If there had been significant similarities in the underlying patterns of communication and learning across these projects, it would suggest the potential discovery of something truly interesting. With this, I refer to such underlying organisation that would be so germane to conceptual designing that interpretations about it through the hereby-proposed methodology would not be dramatically altered by further evidence.

The studied projects have characteristics that are suggestive of making the findings relevant beyond these two projects; hopefully even beyond mere academic practice. First, both projects had clients, which is a significant aspect of the projects for then it may be anticipated that designers were working with a real need to understand and address what was relevant for those clients as well as to communicate their ideas to the clients. This setup is likely to have influenced both what issues were concerned, as well as how design concepts were formulated.

In the Urban Planning project, the clients were the steering group that was formed from citizens of the target town. In the Multichannel Maps project the clients were the companies in the project steering group. The project was 10% financed by the organisations that were represented by these professionals who guided the process, and who reviewed the plans and results. The project team needed to ensure delivering valuable results to these people in order to maintain partnership with these organisations in the future.

Second, both projects required the design team to become acquainted with a setting that they did not know beforehand. In the Urban Planning project it was the target town, its history, locations, currently pressing issues, and related trends. The Multichannel Service project team had to investigate technical platforms that were previously unknown to them, such as the Web 2.0 technologies, the iOS operating system, and the MultiTouch display system. The team also had to investigate novel ways for processing laser scanned geospatial data for the purposes of visual presentation and route optimisation.

Third, both projects had a newly founded team working closely together. The team members had to employ their personal communicative skills, resort to their repertoires of professional knowledge as well as uti-

lise whatever materials they had at present in an effort to produce coherent results that hopefully would be valued by others.

Fourth, these projects featured true time-pressure. This may sound counter-intuitive after hearing the fact that it took 18 months in the Multichannel Service for the team to articulate the design concept. The project was a two-year-long exploration of the potential of multichannel publishing in the area of outdoor activities, and it included a large amount of technological work. The work was guided by a vision of a working system, which was originally expressed in the form of a story. The team, however, decided to deliver a concise and conceptual description of the design concept for the project's steering group, and the authoring of this presentation was decided in a co-design workshop. The time-pressure was caused by the fact that there were 10 professionals available over the limited duration of the workshop. Most of them were also working in parallel projects and thus were not too easy to get around the same table. This also added to the project's challenge, as not all participants were actively concerned with this particular project all of the time, and some forgetting that the project was likely to take place. The design concept had to be ready by the end of the day. The concept articulation took place within the last two hours of the workshop, and this two-hour time window forms the core of the analysis of the Multichannel Service project.

The teachers also worked under high time-pressure in the Urban Planning project. Within the first 24 hours of the project they needed to present the initial planning scheme to the steering group. It required the whole project team to develop an initial sense of what the town is, of its history, of the places worth saving and those in need of change. They also needed to construct various ideas and elaborated visions about what kinds of developments would be possible. Less than three hours before the steering group visit, the teachers deliberated to outline an overall scheme for the planning. Their private session lasted for 57 minutes, and in the first 10 minutes the overall plan was formed. These 10 minutes form the video corpus from the project that was analysed in required detail.

The following list outlines the criteria I utilised for choosing the projects:

- A clearly recognisable crux event.
- Video data available from the crux event.
- Diverse data prior and after the crux event.
- Professional practice, not just students.
- Different project settings in their domain, focus, and process.
- Collaborative design so that thinking is externalised.

While it would be possibly as interesting to investigate the reasons and processes of such projects that did not feature a clear crux event, I chose to focus on those projects where such an event occurred. Projects with a clear crux event may be such where learning on a deeper level has occurred. However, drawing conclusions about this is beyond the scope of the present study. By the close inspection of successful projects with crux events, I intended to be able to discover such characteristics that would be worth paying explicit attention to when facilitating conceptual designing in practice.

5.3.2. *Data analysis*

The video analysis began by choosing relevant parts of the video footage. The initial focus was put on two events (in total approximately three hours in length), which were fully transcribed in a rough manner, i.e. just the talk was written as text. This enabled the identification of the most relevant moments to be analysed in detail. Once the key parts were chosen, the chosen 12 transcripts were processed in the original language of the situations (Finnish) and then translated into English. The notation of the transcripts follows roughly the transcript notation as introduced by Atkinson and Heritage (1984). Speech is transcribed in an accuracy that was found sufficient and necessary for the current analysis. During the initial selection of the parts for closer analysis, roughly twice as much of video material was transcribed in detail into separate excerpts as compared to what is ultimately reported in the analyses that are presented in the following chapters.

Where needed, additional explanations were added to illustrate the role of the material environment in the interaction. Material interactions are presented in the transcripts in a smaller font than spoken expressions, and references to figures are provided whenever these were considered necessary. What could not be expressed in words accurately enough in the transcripts was visualised in the accompanying figures. An example is presented in Excerpt 5.

Excerpt 5

02 As we think a bit.. On Ruotanen's [pa]rt
[draws Figure 8 B]

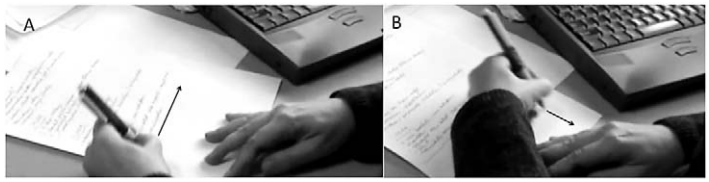

Figure 8. *Master draws two lines on the paper.*

The analysis required many rounds of reading and interpreting the video data. The analysis followed the FADA process described above. A significant characteristic of the analysis, which may not be appropriately emphasised in the description of the four phases of the analysis, is its iterative nature. The four rounds of analysis from expressions to the identification of framing strategies needed to be made so that the levels 'interacted' well, i.e. that discoveries on a greater level were appropriately highlighted in the presentation of the data on a lower level. This was necessary in order to report only that which appeared to matter for conceptual designing through the levels. I had to return many times back to the analysis on a lower level to take out unnecessary details as well as highlighting some of the expressions that the participants of the studied situations had made, e.g. adding in the emphasised arrow-headed lines in the Figure 8 to illustrate the expressions that Master did by drawing the two lines.

The discoveries in the reported analysis also needed to interact with the reporting of the preliminary events that had led to the focal event. After the things-to-deal-with were identified in the analysis, it became possible to trace back the situations where those things were first introduced to the project team. Then these events could be opened up in appropriate detail in order to picture how the concepts were grounded in the earlier events.

In the identification of frames it appeared easiest to interpret a goal that the interaction appeared to align with on the basis of the transcript and the extraction of the concepts that were used. Sometimes the participants of the studied situations verbalised the goal explicitly, which made it easier for the analyst to read the activity as being aligned to such a goal. And as the goal had been publicly expressed in the interaction, the participants of the studied situations also had the possibility to respond to it and align their actions and articulation accordingly. However, quite often no explicit goals were stated. Then the analysis proceeded by explicating the material and conceptual interaction in detail. Occasionally the participants of the studied situations were sketching visually and accompanying this by talk and gesturing. Such occasions provided the most vivid resource for the present analyses, making the progress of the studied thinking process easy to follow.

The interpretation of framing strategies on the basis of the lower levels required the consideration of a longer duration and searching for potential patterns of framing. In some situations the patterning of frames originated in the hierarchical character of the design task. In such a case an overall-goal with several sub-level goals could be recognised. Occasionally multiple sub-levels could be discerned. In order to stay within a manage-

able amount of time in the analysis, the time resolution was set from the duration of seconds upwards when considering frames and framing strategies.

6. Urban Planning Project

An investigation of an example project in the context of developing a future vision for a town is next presented. The project is exceptionally clear in terms of how conceptual designing was advanced within it, and it functions as a benchmark for an efficient conceptual design process due to its repeated and well-structured character. The construction of relevant semiotic resources, the externalisation of conceptual entities, as well as their use in the articulation of the design concept is clearly visible. The analytical focus of the chapter is on the construction of semiotic resources for, and their use in, the articulation of a design concept. The structure of the chapter is chronological, and consists of two main parts: priming and crux.

6.1. Priming

The Urban Planning project was a 13-week project conducted in the Laboratory of Planning and Urban Design at the University of Oulu in autumn 2007. It was a project with fifth-year students of architecture, applied geography, and regional planning. The project aimed to create a vision plan for a town in central Finland. The analysis covers the first two days in the project the key activities in constructing novel semiotic resources for the crux.

The Urban Planning project started with a two-day visit to the target location. At the Town Hall, a local historian illustrated the past of the place, and local authorities provided a status update of the town. The presentations were followed by a guided walking tour, gåtur, during which the participants made observations to discover potential for development. The initial findings from each gåtur team were collected on a transparency and presented to the local citizens after the tour. This process involved an initial filtering of material for ideation. The ideation was organised later on the same day. On the basis of their observations and on what they had learnt from the presentations the students were encouraged to sketch anything, in any scale, and anywhere in the town.

These first ideas were collaboratively reviewed after 2.5 hours of sketching, and everybody could see and hear what the others had planned. The leading teacher, which here is identified as *Master*, carried a memo where she made notes about the initial ideas. Once the review was done, Master gave the next brief. The students would go back to make further observations. They were asked to think about a growth scenario for the town: Would the town grow, shrink, or stay the same size? They were also asked to think about concrete survival strategies: Which districts would have the major role in these, and how? The students were explicitly asked to "think these issues while you are there".

Once the students returned back to the design studio they were asked to develop concrete ideas on the basis of their view about the growth scenario and the strategies for survival in this scenario. Master presented the requirements for the planning on a flip chart, where she had written explicit criteria that the students needed to address in their plans. The criteria included 1) deadline (in two hours), 2) growth expectations in terms of growing, shrinking, or staying the same size, 3) survival strategy, 4) areal emphases, 5) actions, and 6) phasing. The last point was optional in case someone was quick enough to address it as well.

While reviewing the ideas Master made notes on a sheet with a five-column grid. She had labelled the columns 1) name, 2) growth scenario, 3) areas, 4) survival strategy, and 5) actions. The *name* referred to a particular student. The other columns matched with the criteria she had given to the students earlier.

Figure 9. *Master teacher had earlier collected the students' ideas on paper within a scheme that comprised 5 columns: 1) name, 2) growth scenario, 3) areas, 4) strategy, 5) actions*

After the review, the teachers deliberated for a private structuring session, which turned out to be a crux event in the project. Hence the necessary semiotic resources for the crux event were created during the activities explained above. The event was scheduled before a steering committee meeting, where the teachers should be able to present an initial outline of what would be done in the project over the following months.

6.1.1. *Semiotic resources*

What happened during priming in terms of constructing semiotic resources for the crux event?

During the priming observations were transformed from objective facts into resources for prospective change. When the students were making their observations, they were not recording the reality and landscape in an objective fashion, i.e. neutrally collecting facts, but they were actively looking for opportunities for change. Initially the observations were mostly factual, i.e. during the City Hall presentations and gåtur the students were presented information in terms of facts. But as soon as they started to group, filter and value what I have chosen to call *things-to-deal-with*, the observed facts were externalised in the form of their potential for design. Things-to-deal-with are observations, issues, discoveries, elements, people, spaces, structures, products, systems, technologies, etc. that are found to be relevant to the project at hand. When the students state these in words, they give verbal and socially shared form to what the project is addressing.

Teachers employed a particular strategy to generate such semiotic resources that they anticipated to be efficiently systematised into a grand scheme that would guide the whole project that would be forked into several sub-projects. This is visible in how the making of the second round of observations was instructed as an emphasis on the growth scenario, the survival strategies, and the role of different areas in this. They further elaborated this structure by giving explicit criteria for the ideation, i.e. the six points on the flip chart. The teachers also reviewed the students' ideas with this scheme. In sum, a particular structuring was enforced upon the planning so that the teachers could easily identify which ideas would go together and that they would be able to form working groups of students with similar growth scenarios.

Semiotic resources were articulated into *embodied expressions*, i.e. signs that are made perceptible on a material, during the priming activities. Master made markings on her paper, making sure that she covered each

of the ideas by the students. During the review she asked the students elaborating questions in order to map each student's idea into the scheme that she had on her notes. Each idea would thus have an externalised presentation on this paper. And since each idea was characterised according to the aspects that she had chosen to record, the ideas gained an identity of the kind that the teacher anticipated to be beneficial for the efficient structuring of the grand scheme. Master took the note sheet to the private structuring session immediately after the review and utilised it in a way that confirms the interpretation here.

The mind of the teachers was primed too. Here mind refers to an implicit process centralising in the teachers' heads, but not being limited within the head only, encompassing the necessary semiotic resources to render interactions in a situation understandable and accountable. Through their active involvement in the process the teachers became knowledgeable of the things-to-deal-with. They planned the project, participated in the Town Hall presentations, gåtur, filtering of observations, instructing the making of further observations, scouting the places, instructing ideation, and reviewing the ideas. Many such resources that need to be expected to reside in the mind of the teachers are found in the following analysis of the crux event.

In sum, the priming had these characteristics:

- Observations were articulated as resources for prospective change.
- Things-to-deal-with were externalised, filtered, and reified.
- Higher order logical structuring was enforced into the planning.
- Semiotic resources were externalised in a form available for the crux event.
- The things-to-deal-with were re-articulated just prior to the crux event.

6.2. The crux event

Master and Assistant moved into a discrete space to frame the later activities in the project. The location was an office room with nobody other than Master and Assistant, and me observing with a video camera.

6.2.1. *Expressing the overall goal*

The session began by Master expressing the overall goal of the session and dedicating a semiotic field for the conceptual construction. Master placed an A4 paper in front of herself and then the following unfolded (see Excerpt 6).

Frame it simple! Excerpt 6

```
01 M: I think we will try to make th[ree alternatives. And I don't
                                   [draws two horizontal lines
                                   [across the paper dividing it into
                                   [three sections, see Figure 10.
02    yet know if I will succeed in this. But let's try.
```

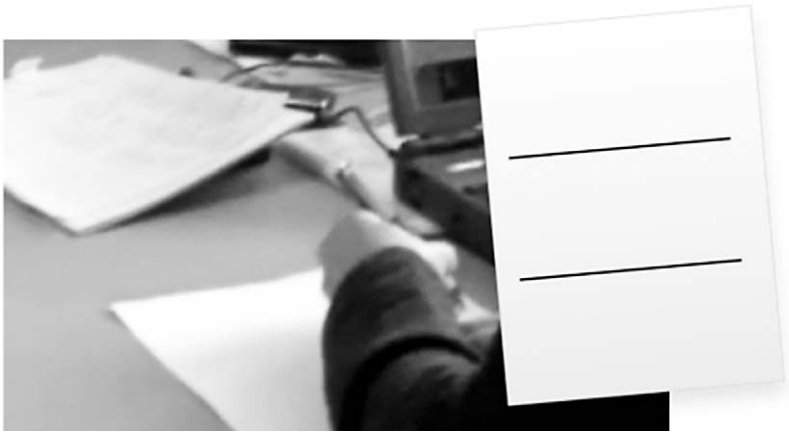

Figure 10. *A reconstruction of the A4 paper (on the right) after Master has drawn two horizontal lines on it, dividing the paper into three areas.*

The idea of 'alternatives' is presented here (on row 01) for the first time with the single expression as a word in talk. At this point in time the idea of 'alternative' does not have a particular meaning beyond its anticipated lexical meaning yet, as it does not refer to any particular content, but is ambiguous. 'Alternative' is an *open concept*, and it becomes expressed here for the first time. Furthermore, the concept of 'alternative' cannot be expected to be understood in a shared manner on a basis of the single expression, i.e. the word 'alternative,' whereby, it will be expected to be disambiguated during the session. During Excerpt 6 Master does not explain what the concept of 'alternative' means here.

By drawing the two horizontal lines, which divide the paper into three areas, Master gives the idea of 'three alternatives' a persistent external expression. Also, as the result of the talk and the drawing, it becomes increasingly apparent that three concepts that will be introduced, namely alternatives '1,' '2,' and '3'. All these are open concepts at the moment.

The word 'this' (on row 02) functions as a likely reference to what Master has introduced as the goal, i.e. "*we will try* to make three alternatives" (on row 01). Together the acts of drawing and expressing a goal suggest that Master is attempting to *invoke a frame* for the next actions.

6.2.2. *Realising the need to reframe*

Excerpt 7 shows how Master starts working on the first alternative. She soon recognises a difficulty in the chosen approach with regard to the ideas collected from the students, and she stops articulating the alternatives abruptly. This leads to the withdrawal of the current approach and to the explication of a new approach.

Excerpt 7

```
01 M: Well I think one of the [premises is clearly it that if
                              [draws, see Figure 11 top bubble
02    here is this water area and [here is this town centre
                                  [draws, see Figure 11 middle bubble
03 A: Mmm.
04 M: [and here is this highway four.
      [draws, see Figure 11 bottom bubble
05 A: Mmm.
06 M: So some of them want [well the new here.
                           [elaborates elliptical shape in Figure 11,
                           [rightmost bubble
07 A: Mmm.
08 M: And and-and [at the same time they believe well..
                  [moves pen at the figure for the town centre
09    [Woul.. Could it.
      [Strengthens the figure for the town centre
10    Or wait a moment. Should I do this so that we first go
11    through the visions area by area and then try.
12    ((Pushes the paper away))
13    Yes [it could be
          [reaches for a pile of papers and begins browsing
14    easier that way. ((browses the paper pile))
```

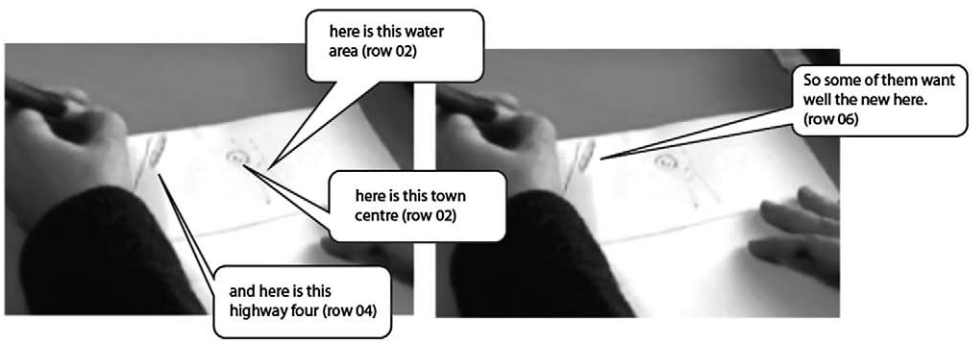

Figure 11. *Master sketching and naming areas.*

Master uses a combination of talk, drawing, draw gesturing (e.g. elaborating and strengthening lines) and pointing with the pen to express messages. She uses drawing in synchrony with talk to introduce novel references to concepts, "here is this water area," (row 2) "here is this town centre" (row 02), and "here is this highway four" (row 3). She completes the explanation of each figure prior to moving ahead to the next one.

Master uses her knowledge of symbols used commonly in town planning when she draws the figures on the paper. For example, town centre is marked with 'C,' the water area with arrows pointing from the shore, and road is presented as a thick line. Also, the layout of the figures on the paper resemble the spatial organisation of the related places. She uses several resources to make the figures unambiguous. By the synchrony of talk and gesture, by her verbalisation of what each of the figures stand for, and by following conventional symbolic forms she invites particular kinds of interpretation upon the figures on the paper. The concepts 'water area,' 'town centre,' and 'highway four' are not explained any further but become just accepted and used to further the plans. The 'water area,' 'town centre,' and 'highway four' are treated as *closed concepts* after this initial explanation of their drawn symbolic forms.

As soon as the concepts are externalised on the paper, she takes advantage of the material persistence of the symbols, and makes a deictic reference, i.e. points at the figure symbolising Highway Four and says, "So some of them want, well, the new *here*" (row 06). At the moment of uttering the phrasing Master makes references to three different 'things'. Firstly, there is a reference to the students, i.e. "some of them". Secondly, there is a reference to the kind of ideas these students created, i.e. "the new". And thirdly, there is a reference to a junction at the Highway Four, i.e. "here". These 'things,' i.e. the students who wanted to create the new, the idea about the something new, and the Highway Four junction, are the *things-to-deal-with* at this moment. These are expressed by Master as parts of the dilemma that is being addressed.

Then Master moves the pen to the figure symbolising the town centre and says "And and-and *at the same time* they believe" (row 08). The word "they" refers back to the same students that suggested "the new" at the junction of Highway Four. Master, however, stops in the middle of her phrase with a "well.." and moves on to formulate a question, "Would it.. could it.." and then concludes by calling for a pause by stating, "Or, wait a moment" (row 10). She withdraws from the current approach and suggests going through the "visions area by area".

Here she uses new term, 'vision,' for the first time, but does not explicate what it means but rushes ahead with the planning. It is here treated as a closed concept despite that its meaning may not be shared. A vision may refer to an individual student's single idea, groups of similar ideas, or it may even have a somewhat similar meaning as the still open concept of an 'alternative' she introduced earlier. If the meaning of the concept of 'vision' is not shared by the whole team, it is likely that misunderstandings or conflicts will result and the concept will need to be disambiguated later. The meaning of new concepts cannot be expected to be shared on the basis of a single expression. Otherwise a shared understanding is implied, it will be constructed along with the next actions, or confusion may not have a reason or chance to surface. The status of the concept of 'vision' may be thus only be concluded by studying further evidence, which is found in the next excerpt.

Frames. On the basis of the previous excerpt (Excerpt 6), it was interpreted that Master made an attempt to invoke a frame that had the associated goal to construct 'three alternatives'. The concept of an 'alternative' has not been explained thus far, and still remains open. Supporting evidence of the evocation of the frame with a goal to disambiguate the concept of 'alternative' can be found in the Excerpt 7.

After Master had sketched the figures on the paper, outlining a rough map of the whole territory under consideration, she began substantiating the map with the ideas from the students. She started with the top-most of the three areas that she had outlined on the paper with the two horizontal lines, and drew only inside the topmost of the three areas. Based on this, it is possible to interpret that these areas could function as separate spaces for articulating each one of the alternatives, one-by-one, from top to bottom.

The concept of 'alternative,' however, still remains open, since Master does not conclude the construction of any of the alternatives but, instead, urges to "wait a moment" (row 10). This diverts attention from the construction of content on to the organisation of the on-going activity. She continues, "Should [..] we first go through the visions area by area and then try." This functions as a call to quit the following of the current one-by-one strategy, and instead to construct the alternatives with the area-by-area strategy.

The proposal to change the approach is dramatic, because it implies restarting the planning anew and structuring the process in a different

manner. In other words, the principles that govern the progress are suggested to be changed and the construction re-initiated. A change of framing strategy could be taking place. However, drawing conclusions requires the analysis of what happened next.

6.2.3. *After reframing*

Excerpt 8 illustrates a situation a short while after the interactions in Excerpt 7. Master has found a paper from the pile on the desk with two thirds of the surface of the paper already filled with text. She complains about not having brought more fresh paper along, but nonetheless, decides to use a free corner of it for sketching the figures needed in the plan.

Excerpt 8

```
01 M: ((draws, Figure 12 A))
02    As we think a bit.. On Ruotanen's [              pa] rt
                                        [draws Figure 12 B]
```

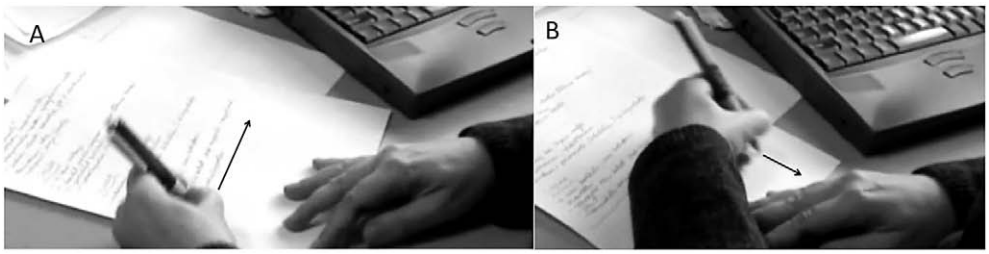

Figure 12. *Master draws two lines on the paper.*

```
03    quite many wanted to [preserve it
                           [faces Assistant
04    as su [ch.
            [turns back at the paper
05 A:       [Yes. [Little improvements. No big ones.
06 M:             [writes 'RUOTANEN'
07    Yes. But someone said that there could be travelling.
08    So for Ruotanen we have the vision that it is 'A'
09    ((Writes the character 'A' and draws a circle around it))
10    for residential.
11 A: Mmm.
```

12 M: 'A' plus 'R' 'M'⌈
13 ((Writes under the previous entry the character 'A' and draws a circle around it, and adds the letters '+RM' on the right side of it))

Figure 13.
The result of the sketching is highlighted on the right.

14 ⌊Looks at Assistant
15 These are really the
16 A: Mmm.
17 M: basic visions.
18 A: Mmm.

Master began by drawing a horizontal line across the paper (Figure 12 A), and then a vertical line (Figure 12 B). She was still drawing the lines as she began to talk: "On Ruotanen's part quite many wanted to preserve it as such." Ruotanen is a name of one of the areas in the town. It is used with a single expression, simply accepted and used as such, and is accompanied by an explanation of what the students wanted to do with it. Hence, Ruotanen is an expression of a closed concept. The assistant also treats it as such in his response: "Yes. Little improvements. No big ones" (row 05).

The expression "quite many" functions as a reference to the students who wanted to preserve Ruotanen as such. The placement of the phrasing within the current planning action makes this meaning of the reference the most likely one. For example, at another moment of the project the expression could refer, for instance, to the steering committee members. But now the planning action is taking place right after interacting with the students and collecting their ideas, which makes it the most likely candidate for the meaning of the reference. The phrasing "quite many wanted to preserve it as such" also bears a reference to the preservation idea. In sum, the teachers are treating the Ruotanen area, the students who wanted to preserve Ruotanen as such, and the preservation idea as the things-to-deal-with at this moment.

As soon as Master begins to write Ruotanen on the paper (row 06), she continues, "But someone said there could be travelling." This phrase also features three references: first, to Ruotanen, which is the area under

consideration, second, to the travelling idea, and third, to the student who presented this idea. This is another set of three things-to-deal-with.

What are these two sets of three things-to-deal with? And, how do the participants of the studied situation conceptualise these?

The clarification is provided when Master states, "so for Ruotanen we have the vision that it is 'A'" (row 08) and continues "'A' plus 'R' 'M'" (row 12), and "These are really the basic visions" (rows 15 and 17). Here Master disambiguates the meaning of the 'vision' concept, which she expressed initially during Excerpt 7. It is now apparent that she was treating the two 'visions' as *open concepts* until now. Master expresses the first of these 'visions' on the paper in the form of an encircled 'A' (in Finnish 'Asumisalue,' i.e. residential zone). The second 'vision' is related to travelling and it becomes marked on paper with an encircled 'A' with the letters 'RM' accompanying it (in Finnish RM refers to 'retkeily ja matkailu,' i.e. hiking and travelling). As soon as she has finished sketching the figures on the paper, she concludes, "These are really the basic visions."

Frames. In Excerpt 8 material interaction centres on the acts of using the A4 paper. The line drawn in Figure 12 A was used as a guide, dividing the paper in two areas, and markings were only made on the blank area below the line. The line, which that Master drew in Figure 12 B, appeared to have a similar function. Markings were made only on the right side of it. The guides functioned as visual signifiers of boundaries constraining the articulation on specific areas on the paper, and thus were utilised to organise the articulation. A specific semiotic field was dedicated to the production of persistent expressions. Master wrote the word RUOTANEN on the right side of the guide, which functioned as the label for all externalised conceptual entities that were articulated in the enclosed space, and the later articulation of the symbolic figures on the paper followed the thematic guidance of this label. Every symbol that became drawn on that area was about Ruotanen.

Master and Assistant expressed several concepts and things-to-deal-with related to the goal to collect the students' ideas for the Ruotanen area, and these became condensed into the two 'visions'. It so seems that the teachers were working towards expressing the *visions* for each area, and they were referring to only such conceptual entities (above) related to the visions in the Ruotanen area. Hence the material interaction and use of conceptual entities supports the interpretation that the teachers were articulating in a frame that was aligned to producing the visions for the

Ruotanen area. This interpretation of the goal is supported both by what happened earlier as well as how the results of the interaction were treated.

Earlier in Excerpt 6 Master attempted to invoke the frame that was related to generating 'three alternatives'. In Excerpt 7 Master proposed to re-frame the approach to express the alternatives from the one-by-one strategy into the area-by-area one. In Excerpt 8 the teachers were collecting the visions area-by-area, starting with the Ruotanen area.

Framing strategies. Excerpt 8 shows evidence for a change of a framing strategy as compared to the articulation in Excerpt 7. The teachers were initially expressing the ideas on a top-to-bottom scheme, most likely following an alternative-by-alternative strategy. It could have been actually expected on the basis of the initial work that the teachers did in order to sell the idea of different growth scenarios for the town, i.e. growing/shrinking/zero-growth. The top-most area was being initially filled with the ideas that proposed something 'new,' and the expected next one could be the shrinking scenario. Apparently this did not work, and now that Master had proposed a new order for progress, they structured the process so that they would first articulate the 'visions' for each of the areas, and only then would combine these into broader 'alternatives' (if the current interpretation of the concept of 'alternative' is correct, as it is still an open concept there is no certainty as to what is meant by it). The action in Excerpt 8 clearly follows this re-framed strategy.

6.2.4. *Solving the new puzzle*

Excerpt 9 describes a situation some five minutes after the previous situation. The teachers have externalised all the 'visions' on the paper, and the result is shown in Figure 14. Then Master asks a question.

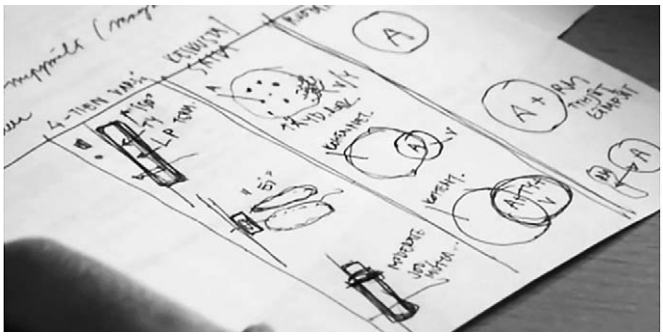

Figure 14. *The resulting sketch after all the 'visions' are externalised on the paper.*

Frame it simple! Excerpt 9

01 M: Well, how are these connected, these things, together?
02 (1.9)
03 These NO guys
04 (2.0)
05 Are they the ones who believe that [the centre? (0.5)
puts fingers on figures
(see Figure 15)

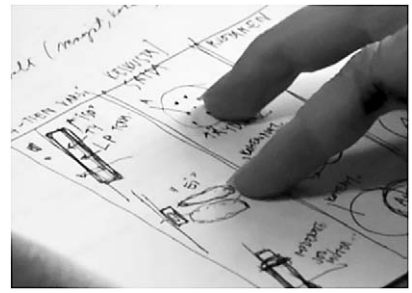

Figure 15. *Master puts her fingers on two of the drawn figures.*

06 M: In a way, [now well, the lo[gic with these?
waves her both hands in the air
07 A: [Well well [here it was so,
taps on a figure with
index finger. Figure 16.

Figure 16. *Assistant pointing at a figure standing for the "No" vision.*

08 that with [this they will, well, invite people [to stop.
moves index finger along the line that stands for Highway
Four (Figure 17)
Assistant stops his
finger movement at the
intersection of the two
lines standing for the
junction of the roads

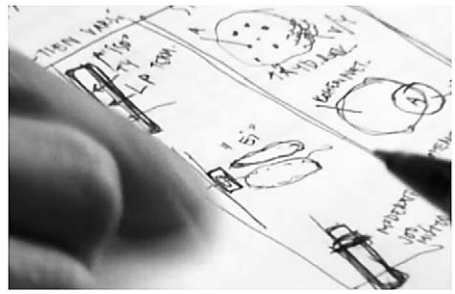

Figure 17. *Assistant moving his finger along a vertical line.*

09 Then there were some [.. things along the road.
moves index finger along the horizontal line
that is accompanied by two elliptical shapes
(Figure 18)

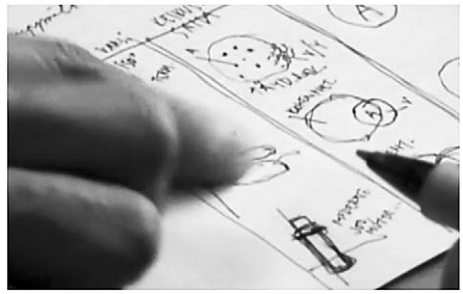

Figure 18.
Assistant moving his finger along a horizontal line.

10 And (.) it will increase [the centre's activity.
Points to the figure in the middle of the
at figures standing for the 'visions' for
the centre (Figure 19).

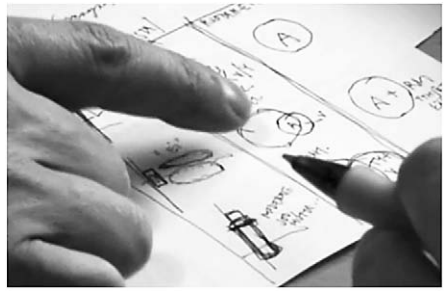

Figure 19.
Assistant pointing at the image standing for the centre.

11 So [here was..
taps back at the figure for the "no" vision with index finger
(Figure 20)

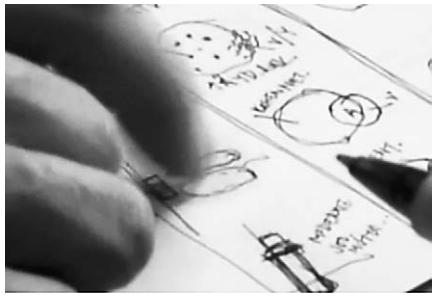

Figure 20.
Assistant taps at the figure standing for the "no" vision again.

12 Of course all of [these believe in getting money flows
points with three fingers to the three figures in
the area labelled as "Highway Four side" (Figure 21)

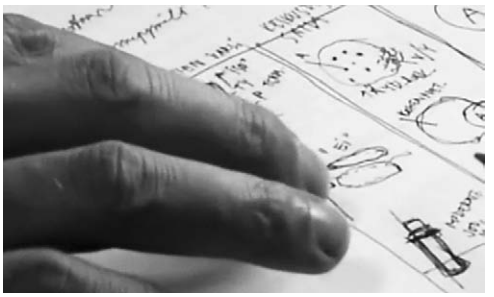

Figure 21.
Assistant points at three figures in the area labelled as Highway Four side with three fingers.

13 A: that way
14 M: Mmm.
15 A: to the town and that already, well
16 M: Mmm.
17 A: creates
18 M: Mmm.
19 A: opportunities and [developments.
20 M: [Mmm. Mmm
21 A: But, well, [maybe the well in a way at the centre (.)
taps on the top-most figure in the area labelled
"Centre/Sawmill"(Figure 22)

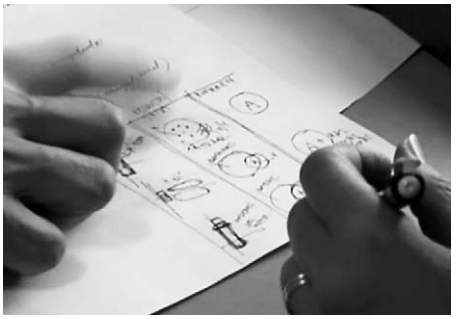

Figure 22.
Assistant taps on the top-most figure in the area labelled "Centre"

22 A: [the heaviest supplementary construction
23 M: [the localness
Moves her hand towards the paper (Figure 23)

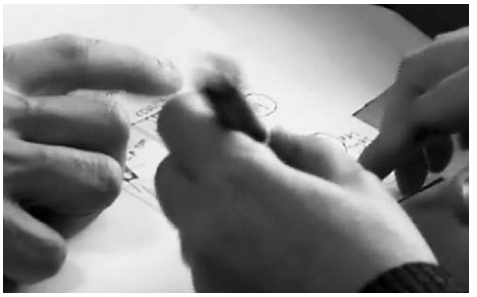

Figure 23.
Master moves her hands towards the paper.

24 A: is connected [directly to
Taps on the image standing for the "NO" vision
(Figure 24)

Figure 24.
Assistant tapping on the figure for the "NO" vision.

25 (1.0)

26 M: Well I was thinking if [it would be connected that well
taps on the figure at the bottom of the
area labelled "Centre/Sawmill"
(Figure 25)

Figure 25.
Master pointing the bottom-most figure on the area labelled "Centre/ Sawmill"

27 (..) yeah.
28 (1.2)
29 A: And then that (0.8) <localn> yeah.
30 (2.5)
31 ↓the local people behold, the local people >beh<, that the
32 gas station will arrive and [the old pub will be developed
waves his fingers over the area
labelled "Highway Four side"
(Figure 26)

Figure 26.
Assistant waving his fingers over the area labelled "Highway Four side"

33 M: Mmm mmm

34 A: So it, perhaps, connects to a kind of [zero growth vision
makes a pointing gesture (Figure 27)

Figure 27. *Assistant makes a quick pointing gesture away from the area labelled "Highway Four side"*

35 well, where little..

36 M: Mmm mmm. [So I would put these in a way together.
draws a line connecting the figure standing for the "NO" vision and the top-most figure in the area labelled "Centre/Sawmill" (Figure 28)

Figure 28. *Master drawing a connecting line between two of the figures that stand for the 'visions' for the town.*

37 The lo[calness
38 A: [Mmm mmm

39 M: [and moderateness. A bit more cautious
Draws arrow heads at both ends of the line and emphasises them ————

40 A: Yes.

41 M: making. Utilising what there is. T[hese belong together.
(Figure 29)

Figure 29. *The figure after Master has drawn a line that connects the "NO" vision from the area labelled "Highway Four side" and the "supplemental construction" vision from the area labelled as "Centre/Sawmill".*

The teachers were working with a paper on which Master had drawn the figures symbolising the 'visions' as a 3x3 grid. Each expression of a vision was produced on the basis of the re-articulation of the students' ideas. The 3x3 grid was divided into three columns, and each of these was labelled with a name of a particular area of the town. From left to right the areas were labelled: "Highway Four side," "Centre/Sawmill," and "Ruotanen".

Master began by asking (row 01), "Well, how are these connected, these things, together?" In her question, she refers to 'these things' as well as to how they are 'connected together'. The 'things' is a likely reference to the 'visions,' as the teachers have just finished externalising those on the paper. The expression 'connected together' hints towards the open concept of 'alternative,' which was stated at the very beginning of the session by Master as the goal "I think we will try to make three alternatives" in Excerpt 6 (row 01). However, it cannot be yet definitely known, since the concept of 'alternative' has not been explained further. The articulation is, nevertheless, appearing to be increasingly suggestive of the interpretation that alternatives will be sets of three visions that are aligned with each other in their inherent growth scenario.

The question is followed by a nearly two-second pause before Master says, "These NO guys". One of the 'visions' externalised on the paper was marked with a visible "NO" (in Finnish "EI") label on it. Based on the later pointing gesture to this figure and the talk that uses the term "NO", it is apparent that Master was referring to the concept expressed by the figure labelled with the "NO" sign. The statement "These NO guys" also refers to the students who authored original ideas that were later merged under the label of the "NO" vision. And like the visions in the previous excerpt, this too is a conceptual combination of three 'things'; the 'NO idea', the place of 'Highway Four Side,' and the 'students proposing the idea'.

At this phase the treatment of the 'vision' concepts changes from open to closed. As soon as the visions have been laid out and expressed on the paper, they are treated as closed concepts. They are accepted for the furthering of the greater plan, i.e. that of searching for how the visions are related together.

After a further two-second pause Master continues by asking "Are they the ones who believe that the centre?" While talking, she placed her index finger on the figure for the "NO" vision at the column labelled as "Highway Four side" and her middle finger on the top-most figure in the column labelled "Centre/Sawmill". This is suggestive that she is proposing to make a connection between two visions, the "NO" vision at Highway Four

side and the top-most vision (let us name this the "supplementary construction" vision, since it contains the text "Täyd. Rak.", which is a Finnish abbreviation of the word "Täydennysrakentaminen") at the Centre/Sawmill. She, however, does not draw the connection on the paper but rather continues by withdrawing her hand from the paper. Then she paused for half-a-second, raised both her hands into a waving gesture while uttering a question "In a way, now well, the logic with these?" (row 06).

Assistant joins the talk and while pointing to the figure for the "NO" vision he said, (rows 07-08) "Well well, here it was so that with this they will, well, invite people to stop." In addition to pointing at the "NO" vision figure, he made a gesture with his index finger that imitated traffic moving back and forth on Highway Four and stopping at the junction. Such gesturing is recognised as *mimetic* or *representational*, see (Murphy, 2005). Assistant talked in more detail about the "NO" vision, and while doing so, he re-articulated some of the parts that comprise the "NO" vision. He explicates parts of the vision instead of supporting or disagreeing with the connection between two visions that Master proposed above.

Assistant continues moving his finger along the horizontal line, which represents an existing road connecting Highway Four and the centre and says (rows 09-10), "Then there were some.. things along the road." Until this point Assistant explicates details of the "NO" vision, and only then proposes a connection between the "NO" vision and the visions expressed in the centre column by saying, "and it will increase the centre's activity". While saying this he points at the centre-most figure in the column labelled as "Centre/Sawmill". The vision that was represented by the centre-most figure was one where the centre would be improved, a new residential area developed at the Sawmill area, and a new recreational area constructed. This kind of improvement would be logical considering the articulated reason that the Highway Four side plans would increase the activity of the centre.

Assistant then moves his index finger back to the column with the label "Highway Four side," taps the figure for the "NO" vision and begins, "So here was.." He stops briefly and states (rows 12-19), "Of course all of these believe in getting money flows that way to the town and that already, well creates opportunities and developments". This statement removes the logical connection that he had developed with the "NO" vision and the "Supplementary construction" vision, since the argument that the plan for the Highway Four side would increase the activity of the centre would hold true for each of the visions. It would not, hence, render any of the visions

at the centre to be better for the making of a logical connection between the visions.

Assistant then comments on the "Supplementary construction" vision at the centre, which is displayed in his tapping of the top-most figure in the column labelled "Centre/Sawmill" and his statement (rows 21-24), "But, well, maybe the well in a way at the centre the heaviest supplementary construction is connected directly to". He taps on the figure for the "NO" vision. Based on Assistant's talk and gesturing it is possible to interpret that he was about to propose the same connection that Master was proposing earlier (row 05). He, however, never completes his turn into a full sentence.

A pause for one second ensues before Master takes a turn, "Well I was thinking if it would be connected that well (..) yeah." She taps on the bottom-most figure in the column labelled "Centre/Sawmill". This figure represented a vision for the "Centre/Sawmill" area, where the centre would be slightly improved and where the sawmill area would go through a radical development into a combined residential and industrial zone. This is followed by a series of pauses interrupted by Assistant's words "And then that (0.8) localn yeah". He does not develop this into a full sentence, and the utterance "localn" (in Finnish "paikallis:") is only a partly completed word. The word was a moment earlier said in full "localness" (in Finnish "paikallisuus") by Master (row 23). Not shown in the transcripts was the moment when the teachers were externalising the visions on the paper. Master characterised the "NO" vision by these words, "Then there were those who believed in the *localness* and culture". Hence, it supports the interpretation that by the word "localness" Master started exploring a connection from a quality assigned to the "NO" vision to the vision that was expressed by the bottommost figure in the "Centre/Sawmill" column.

A 2.5-second pause takes place before Assistant continues, "the local people behold, the local people beh, that the gas station will arrive and the old pub will be developed. So it, perhaps, connects to a kind of *zero growth vision*". Assistant's term "zero growth vision" refers to one of the growth scenarios that the teachers had attempted to sell into the planning, i.e. they had the "+/–/0" growth scenario scheme. It was argued in connection to Excerpt 7 that Master attempted at first to create the 'alternatives' on the basis of this "+/–/0" growth scenario scheme. So, regardless of using the word 'vision' in this connection the reference is not to any particular vision that is expressed on the paper, but to a broader zero-growth 'alternative,' which is an open concept. This interpretation is supported by

what happens after Assistant has expressed the term 'zero-growth vision'.

Assistant does not develop a full sentence before Master makes the conclusion (row 36) "So I would put these in a way together". She connects the figures on the paper that represent the "NO" vision and the "Supplementary" vision with a line. She gives further characteristics to the connection (rows 37-41), "The localness and moderateness. A bit more cautious making. Utilising what there is". These are all characteristics of the zero-growth scenario. This supports the interpretation that by articulating the term "zero-growth vision" Assistant happened to express the principle according to which the two visions would be associated together to move closer to disambiguate one of the 'alternatives'.

The association between the "NO" vision and the "Supplementary" vision is emphasised by the arrow-headed line that Master draws between the figures that represent these visions. It is still further strengthened by Master's statement, "These belong together" (row 40).

Frames. Materially, the interaction centres around the figures on the paper that the teachers have in front of them. The role of the A4 paper, and the field that is surrounded by the lines Master drew earlier, has changed from being a target for articulation into a source. Earlier Master was using the paper to externalise the visions, but now she and Assistant are using the figures on the paper as a resource that they can refer to by the means of deixis, i.e. by pointing gestures as well as by using pronouns, such as 'this' and 'that'. Master and Assistant are only using the corner of the A4 paper in the making of references to conceptual entities, i.e. their action displays an overall alignment towards handling such content that is related to by the references implied in the figures on the paper.

The question at the beginning of Excerpt 8 by Master (row 01), "Well, how are these connected, these things, together?" functions as an invitation to investigate the connections of the visions. It was argued above that here Master makes reference to the 'visions' that have just been externalised on the paper as well as to the broader 'alternatives' that will be comprised of the visions. Throughout Excerpt 8 the teachers are working with, for example, talking about and referring to such conceptual content, i.e. whether the visions or their details, which is related to the construction of the alternatives. The interpreted conceptual work aligns with the use of material resources.

The passage of interactions in Excerpt 8 concludes with Master drawing a line between two of the figures and saying, "These belong together"

(row 41). With these words she reports an accomplishment. The goal to discover a connection between two visions was accomplished. The initial question (row 01), "Well, how are these connected, these things, together?" functioned as a frame-invitation, and it rendered some of the material and conceptual resources that were accessible to the teachers relevant for the proposed activity. The question indicated the goal to explore how the 'things' are 'connected'. The opening ("how are the things related") and closing ("there belong together") of the frame, as well as based the use of material and conceptual resources display evidence that the participants of the situation were producing a frame and acting according to it.

Framing strategy. In the example, the teachers made one 'design move,' the connecting of the two visions. A design move is an act of making a change to the thing being designed. The 'thing' here is the conceptual framework (the set of the three 'alternatives') that the teachers are constructing. The teachers made several move-testing experiments, to use Schön's (Schön, 1983) terminology, in the studied excerpt. Regardless of committing to only one move, the teachers made several move-testing experiments, which they did not commit to. These experiments are potential moves, which imply a process of goal-genesis, action, and consequent judgment that is displayed in cancelling or committing to the prospective moves.

After Master has asked the initial question that marks the frame change from producing the visions into exploring how they are related, she makes the first experiment. She starts from the "NO" vision and considers its relation to the visions at the centre, especially she experiments to connect it with the "Supplementary" vision, which is visible in Figure 15, where she puts her index fingers on the respective figures. She, however, does not draw a connection, but rather, asks or states the dilemma, "In a way, now well, the logic with these?" (row 06). What is she referring to with this 'logic'?

Earlier, in Excerpt 6 and Excerpt 7, it was argued, she was working along the (+/–/0) scheme that the she had promoted for the students. It is likely that the above question is a reference to something of this kind, which would enable the making of decisions over the visions about which category they belong to. In other words, what is the kind of a 'vision,' i.e. is it such that assumes growth, reduction, or zero-growth. Now that the earlier scheme had been abandoned, the teachers need to discover new principles according to which to group the visions into 'alternatives' and according to which to claim the character for each of them.

Until the point Assistant mentions the 'zero-growth vision' (row 33), the teachers are proceeding with the 'visions' indecisively. Details of the visions are rearticulated and qualities that were associated to the visions restated. However, once the 'zero-growth' is stated, the first connection becomes fixed almost instantly. The 'logic' that enables the teachers to make a principled decision upon the connection has been found. It is, however, not possible to say yet if this principle is sustainable, and that it holds for one of the visions in the 'Ruotanen' area as well. And, moreover, it is not possible to say yet if this principle will be sustained, for it is possible that there will be too many visions that assume zero-growth and this principle would not have the power to discriminate amongst the alternatives.

6.2.5. *Finalising the new scheme*

The final excerpt from the Urban Planning project shows a situation after the central simplification of the project has been fixed. Master has had a moment to think alone with the drawing while Assistant was fetching additional papers and pens. Master added textual remarks to the side of the externalised planning scheme on the A4 paper. These labels underline the differences between the 'alternatives'. The following excerpt shows Master and Assistant preparing for the introduction of the design brief for the review of the project's steering group. An overview image of the situation with the papers is shown in Figure 30.

Figure 30. *Master has finished writing labels for the 'alternatives' on the left side of the externalised 'visions'.*

Excerpt 10

01 M: I was thinking if these would be typified, then one would
02 be really about [the industry, tradition and localness,
makes 3 circles around the labels on the paper with her middle finger and then follows the line through all the parts in this zero-vision alternative (Figure 31)

Figure 31.
The path of Master's pointing gesture. (The currently visible posture of the hand is from a moment later due to the invisibility of the drawing while pointing).

03 M: this zero vision.
04 A: Mmm. Sounds good.
05 M: Then the, well, the one, the one of the kind,well,
06 inter-m-mediate. Could it be somehow about
07 [wellbeing services.
makes a circle gesture around the bottom-most label with her middle finger and makes quick movement back and forth between the label and the 'vision' at the bottom of the Column labelled 'Highway Four side' (Figure 32).

Figure 32.
Master making a gesture towards the bottom-most of the 'visions' at the column labelled 'Highway Four side'.

08 Of course it would also fit [(0.6)
Moves her hand in the air back and forth in the air with the middle finger pointing towards the figures for the other two 'visions' in the 'Highway Four side' column. (Figure 33)

Figure 33.

09 [that too.
Taps the middle one of the 'visions' (i.e. the 'zero vision') in the 'Highway Four side' column with her middle finger. (Figure 34)

Figure 34.

10 But if it would be somehow typified.
11 A: Mmm.
(1.4)
12 M: Caretaking.
(1.1)
13 Would [the shore then fit that.. after all?
Taps a figure with little finger (see Figure 35)

Figure 35.
Master taps and holds with her little finger on the 'vision,' which includes ideas for the 'shore' that she refers to in her talk.

(6.9)
14 Why not.
15 (0.9)
16 They, well, are.. [It is entrepreneurship altogether. It
[holds her finger on the figure (as in Figure 35)——
17 does [not have to be industrial entrepreneurship at the shore
[crosses out the 'T' for industry (see Figure 36)

Figure 36.
Master crosses out the letter 'T' (for 'Teollisuus', Engl. 'Industrial').

18 but, well..

(2.0)
19 A: Here] it was [was=it, well, mainly residential and
[puts middle finger on the centre-most 'vision' (Figure 37)

Figure 37.
Assistant puts his middle finger on the centre-most 'vision' within the column labelled 'Centre/ Sawmill'.

20 [here it was, well, too.
[moves his finger on 'vision' with the 'shore' ideas. (Figure 38)

Figure 38.
Assistant pointing at the 'vision' (from which Master just has crossed over the letter 'T') and pointing out that it was mainly residential.

21 M: Yes.
22 A: Yes.
(0.8)
23 M: As I was thinking, that for [this model it would
moves pen along the line that connects
'visions' into the one 'alternative'
(see Figure 39)

Figure 39.
Master moving pen above one of the 'alternatives'.

24 somehow fit if it is assumed that [here are big actors and
moves pen in a circle around
one of the 'visions'
(see Figure 40)

Figure 40.
Master making circular movement with the pen around one of the 'visions'.

25 workplaces so [then it is needed..
lifts the pen towards the centre
26 [They are not..
makes bouncing movement between two 'visions' (see Figure 41)

Figure 41.
Master makes bouncing movement between two 'visions'.

27 A: Mmm.

28 M: Well, it is in different location. [This could be a kind of
Waves the pen between the
two bottom-left 'visions'
(Figure 42)

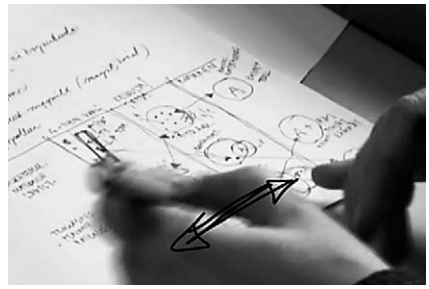

Figure 42.
Master moving pen between two of the 'visions' at the bottom-left.

29 living and work together.
30 A: Yes.
31 M: Maybe. If we would somehow try to..
32 ((writes "CARETAKING" below "WELLBEING / SERVICES"))

Master has written three sets of labels beside the externalised 'visions' on the paper in front of her. The labels are:

"JÄLKITEOLL. / MATKAILU / LOGIST."
(Engl. "POST-INDUST. / TRAVELING / LOGIST.),
"TEOLLISUUS / PERINNE / PAIKALLISUUS"
(Engl. "INDUSTRY / TRADITION / LOCALNESS"), and
"HYVINVOINTI / PALVELUT"
(Engl. "WELLBEING / SERVICES").

She begins (rows 1-3), "I was thinking if these would be typified, then *one* would be really about the industry, tradition and localness" and makes a continuous gesture that first circles around the labels "INDUSTRY / TRADITION / LOCALNESS" and then travels across the three visions that belong to this alternative. Now, she is talking about 'one' thing, and this comprises a set of 'visions' that she points to as well as the qualities expressed in the textual labelling. She also repeats the term 'zero vision' which was expressed in the previous excerpt. The teachers appears to use the terms 'alternative' and 'vision' interchangeably, when talking about the 'zero-growth vision,' which may be a commonly used notion to refer to the future where a town is not growing, nor shrinking. Here the 'one thing' that Master expresses will be referred to as the concept of 'zero-growth alternative'.

Master continues (rows 05-07) "Then the, well, the one, the one of the kind, well, inter-m-mediate. Could it be somehow about wellbeing ser-

vices." At the same time as she says "wellbeing services" she makes a circular gesture around the label "WELLBEING/SERVICES" and a quick pointing movement towards the bottommost 'vision' in the column that is labelled 'Highway Four side'. Master starts her talk, (row 01) "*one* would be really about" in a way that suggests a list to be reported. The term 'one' was argued to refer to the 'zero growth' alternative. Later Master says, (rows 05-06) "Then the, well, the *one*, the one of the kind, well, inter-mediate". This phrase follows the list structure as initiated in above by the repetition of the term 'one'. Hence, it is argued that she has moved further in the list and now refers to the second 'alternative' for which she uses the identifier 'intermediate' when talking about it.

She displays signs of hesitance when uttering the word "inter-m-mediate". This hesitation is underlined by the formulation of the next utterance as a question rather than as a reporting statement, "Could it be somehow about wellbeing services" (rows 06-07). She uses the terms 'WELLBEING' and 'SERVICES' both in the text as well as in her talk, and makes a reference to the written terms with a circular pointing gesture while she is talking about this 'intermediate' alternative. Then she reveals the potential reason for the hesitance, by adding (rows 08-09), "Of course it would also fit that too" and points to the figure in the middle of the 'Highway Four side' column symbolising the "NO" vision.

If Master would have simply reported the 'alternatives' as a list, it could have suggested that the concepts of the three alternatives were closed. However, the hesitance in the reporting, accompanied by Master's statement, "but if it would be somehow typified" (row 10), suggests that the meaning of the alternatives has not yet been closed. The statement is followed by a 1.4 second pause and a statement (row 12), "Caretaking", and a further pause for 1.1 seconds after which she said (row 12), "Would the shore then fit that.. after all?" Master is clearly questioning the meaning of what was being expressed as the 'intermediate' alternative, and the alternative appears still to be open in its meaning.

The openness is further supported by the pregnant pause of almost 7 seconds, which is broken by Master, "Why not" (row 14). "It is entrepreneurship altogether. It does not have to be industrial entrepreneurship at the shore" (rows 16-17). While saying this, she crosses the letter 'T' from the 'vision' that refers to the idea to develop industrial entrepreneurship at the shore. Here the labelling of the 'alternative' and assigning with abstract qualities, such as "caretaking", leads to making changes to one of the 'visions' that formed part of it. This is an interesting phenomenon,

since the meaning of the concept of the 'intermediate alternative' is initially built on the basis of the observation of the underlying similarities across the listed 'visions' in connection to the making of the other two 'alternatives'. Now one of the 'visions' that gave rise to the original interpretation becomes changed. The construction of meaning appears hence to move in both directions, bottom-up and top-down.

Master pauses for two seconds, and Assistant takes a turn by expressing details about the two 'visions' that are externalised at the bottom of the "Centre/Sawmill" column. These two 'visions' are both characterised as being "mainly residential" (rows 19-20), and no difference between the two 'visions' is expressed with regards to how they relate to residential development.

Master continues (row 23), "As I was thinking, that for this model". She was moving her pen in a gesture back and forth along the line that connects the top-most 'vision' in the "Highway Four side" area and the centre-most 'vision' for the "Centre/Sawmill" area. She progresses in her talk (rows 23-26), "for this model it would somehow fit if it is assumed that here are big actors and workplaces so then it is needed". With the pen she is pointing at the 'visions' that are linked to the 'third alternative,' i.e. not to the intermediate one. She is expressing details about the relation between the 'vision' linked to the 'third alternative' for the "Highway Four side" and "Centre/Sawmill". The word 'model' in her talk (row 23), "for this model" is interpreted as a reference to this 'third alternative' too.

Master starts a phrase (row 25), "so then it is needed.." but self-repaired it into "They are not.." and moves her pen in a bouncing manner between the two 'visions' connected in the 'third alternative' (Figure 41). She restarts her talk (row 28), "Well, it is in different location. This could be a kind of living and work together". She moves her pen in a pointing movement along the 'visions' connected to the 'intermediate alternative'. So, rather than continuing her talk about the 'third alternative' she moves back to refer to the 'intermediate alternative'. It appears that here she concludes the second item in her listing of the 'alternatives,' which she started earlier (row 01) and continued (row 05).

Now the 'intermediate alternative' becomes characterised with an additional quality of "caretaking". Master writes the word "CARETAKING" (in Finnish "HOIVA") under the words "WELLBEING" and "SERVICES" on the paper. At this point the 'intermediate alternative' becomes closed with regards to its meaning, and with regards to the visions that belong to it.

Frames. Excerpt 10 begins at a moment when Master had had some time to think alone while Assistant was in another room finding better pens and larger paper on which to re-draw the plan on a bigger scale for presentation. Master starts to report the improvements to the plans she had been doing while Assistant was away by referring to the activity of 'typification'. She enters the frame associated with the goal to report the typified alternatives.

This interpretation is supported by her use of concepts and materials. When Master explains the 'zero-growth alternative,' she uses a combination of talk and a moving pointing gesture tracing around the labels "INDUSTRY / TRADITION / LOCALNESS" and along the line that connects the externalisations of the 'visions' that are assigned to the 'zero-growth alternative' (row 02). During this, she expresses references to 'visions' and to 'zero-growth vision' alternative, and to the qualities 'industry,' 'tradition,' and 'localness'. All this articulation supports the interpretation of the frame.

In the reporting Master follows a list-structure. The first entity of the list is introduced by her in her statement (rows 01-02), "then *one* would be," and the second entity of the list is introduced in her words (row 05), "Then the, well, the *one*". The explanation of each of the entities in this list forms a sub-goal for the overall goal of explaining the typification of the alternatives. The existence of the goals in the action is visible both through the initial introduction of the reporting by Master, "I was thinking if these would be typified" and the subsequent references to the starting points of the explanation of separate entities in the list of 'alternatives' by the use of the word 'one'. The accomplishment of the first goal is also recognised by Assistant, "Mmm. Sounds good" (row 04).

The reporting of the second entry in the list is introduced by the reference to the second alternative, "Then the, well, the one, the one of the kind, well, inter-m-mediate" (rows 05-06). Here Master produces the phrase in a hesitant fashion by repeating the word one and pronouncing the term 'intermediate' in a prolonged way, as if she was uncertain as to whether it was a proper way to talk about what she was talking about. The uncertainty is further underlined by her transition from reporting to uttering a question (rows 06-07), "could it be somehow about wellbeing services". From this moment on the activity appears to switch from reporting to investigation, as the articulation appears to deviate from the goal-alignment that it had a moment ago. The transition is simply enacted by the participants rather than explicitly pronounced. The switch of mode

from reporting to investigating is visible in Master's talk "it would also fit that too" (rows 08-09) and referring with a pointing gesture back to the earlier 'zero-growth alternative,' which had already been reported.

Master continues (row 10), "But if it would be somehow typified". Here she is stating the goal that she apparently was following while Assistant was fetching pens and paper. Why the re-statement? A likely interpretation of it is that it is an expression through which Master articulates her uncertainty about the current 'typification' and the expression works to re-set the goal to 'typify' the alternatives. The next actions support the interpretation that indeed the goal of action was switched from reporting to investigating, and the 'intermediate alternative' was opened for investigation and construction. Master introduces a term she had not written on the paper yet (row 12), "caretaking" and asks, "Would the shore then fit that.. after all?" (row 13) This is followed by almost a 7-second pause.

Seven seconds is a very long pause in articulation, and here it is likely a sign of problems. On the basis of what has happened earlier, it is possible to find an explanation for why the teachers found themselves somewhat stuck at this moment. Master has been promoting the scheme for the students to focus on three different growth scenarios for the town: growth (+), reduction (–), and zero-growth (0). The 'intermediate alternative' discussed here does not fall into any of these categories directly. The remaining alternative that she has not yet reported implies greater growth than the 'intermediate alterative'. The intermediate alternative appears to fall between the growth (+) and zero growth (0) scenarios. So, the situation is such that the teachers do not have a ready-made category into which to place the 'alternative' that is being discussed, but as they have chosen to work in a manner sensitive to the material they have at hand, so they are currently back in the construction of the new category that is initially referred to by the term 'intermediate' (row 06).

What Master says supports this kind of interpretation. Once she has introduced the term 'caretaking' she considers how the characterisation fits to the 'intermediate alternative' (row 13), "Would the shore then fit that.. after all?" and how it relates to the other two alternatives (rows 08-09), "Of course it would also fit that too" and (rows 23-25) "for this model it would somehow fit". As a conclusion she edits the 'vision' by removing the "industry" from the shore to better fit the 'intermediate alternative' as a 'caretaking' alternative and concludes that it is (rows 28-29) "kind of living and work together". The interactions described in Excerpt 10 is concluded by Master writing the word "Caretaking" under the terms "WELL-

BEING" and "SERVICES" that were used as the other characterisations of this 'intermediate alternative'.

The frame-transition from reporting to investigating is visible also in the use of materials. The change is displayed in the way that the externalisations on the paper are used. Initially the externalisations are treated as sources for articulation, i.e. Master was only pointing and reporting about what they were about. But once the investigation started, the externalisations on the paper transform from sources into potential targets for articulation, and thus subject for modification. This argument is justified by Master crossing over the "T" in one of the 'visions' (row 17). It seems here that interpretations on open or closed concepts may be supported by their materially different treatment.

Framing strategy. As noted above, the excerpt featured two phases: reporting and investigation. Until row 06 frames are constructed along a structure to report a list: Master reports the first alternative and then starts on the second one. The framing strategy is, however, abandoned as soon as the uncertainty about the type of the 'intermediate alternative' becomes apparent. The actions are made in the form of an investigation, where the proposed 'type' or 'kind' is considered with regards to the other alternatives and where the *fit* of the details of the alternative to be characterised according to the 'caretaking' quality is considered. As the result of the activity, one detail is edited in the 'intermediate alternative,' i.e. the 'vision' where industry would be developed at the shore at the Centre/Sawmill area.

The externalised concepts, i.e. 'alternatives,' have a built-in suggestion for a framing strategy for the realisation of these in the detailed design in a later phase of the project. It is inherent in the idea that Master expresses as 'typification'. The term 'typified' is interesting, since it refers to seeing the 'alternatives' as representatives of some 'type'. Master characterises the 'zero-growth alternative' in terms of industry, tradition, and localness. After the 'zero-growth alternative' becomes identifiable through these qualities, it becomes *seen as* an alternative of that 'type' or 'kind'. This requires making the interpretation of the 'zero-growth alternative' in a way that brings upon it an interpretive or conceptual lens that enables the *seeing as*. Schön (1983) called this kind of function of a concept, the *generative metaphor*. It is a conceptual instrument that is utilised to enable a fresh interpretation of a conceptual entity. The generative metaphor brings to the process a concrete proposal about *a way* in which a concept should be interpreted, but it does not describe *what* the concept refers to.

Together with the expression of the 'zero-growth alternative', the generative metaphors suggest a strategic framing. The terms 'localness,' 'tradition,' and 'industry' refer to generic qualities, or characteristics, with likely implications for the kinds of design moves that are ultimately made in the detailed planning. The metaphors drive the making of the alternatives to be different from each other. So, the ideas of localness, tradition, and industry hence may be seen to function as *design drivers* for planning. They give planners concrete guidelines to inspire their design as well help them judge if their ideas *fit* the character scheme that the labels set up. So, it may be argued that the activity of typification and, thereafter, assigning the 'alternatives' particular generative metaphors, makes the 'alternatives' concepts stronger for designers. It may actually be that the typification is what makes them ultimately to be design concepts. This may be the reason why the teachers begin to conduct the activity of typification in the first place.

6.2.6. *About the designed concepts*

What were the design concepts in the Urban Planning project, and what qualities did they have? The 'alternatives' were the design concepts in this case. These were the different concrete deliverables or products that the design teams would be working to produce. Each 'alternative' was assigned a dedicated design team to work on, and each of the alternatives outlined a different approach to creating a plan for the town.

How do these design concepts provide a framing for designers? The concepts specified the thing-to-be-designed, i.e. the areas and targets within these areas to focus on. The concepts specified goals in terms of a comprehensive listing of what issues need to be addressed in the resulting plan. When adopted as a working goal, these issues functioned as the motivation for action, i.e. it specified the 'why' of designing. And finally, the concepts outlined concretely what the planners needed to follow in their planning. These principles were expressed in the form of the qualities that teachers negotiated as the 'types' of 'kinds' of the alternatives.

6.3. Conceptual designing in the Urban Planning project

The Urban Planning project showed a systematic procedure for building semiotic resources by exploring the site, the history, and maps of the town. It also involved the production of the semiotic resources in the form of ideation. There is also an important lesson about framing. The teachers

were pushing a structure to guide the ideation and evaluation of the semiotic resources in an attempt to make the production of the overall scheme more efficient. They, nevertheless, did not consider their structure, i.e. the (+ / – / o) scheme, as something to be held onto regardless of what happens, but they were open to respond to the endogenous characteristics of their design materials. The scheme, nevertheless, appeared to provide the teachers with clear starting points and concepts that helped them to get started with the structuring of the overall planning scheme.

After the session of structuring the planning task the teachers presented the alternatives to the local evaluation/steering group. The teachers divided the students into working teams, and each group was assigned one of the 'alternatives' to work on. The students spent the next month working in their individual teams resulting in plans that were exhibited publicly at the local community centre. These plans followed the guidelines that the teachers had outlined above. Hence, the one-hour session that the teachers spent in structuring the design challenge arguably formed a crux event in the project.

The design concepts that the teachers had outlined guided the subsequent planning. These design concepts featured principles, which the students used to drive the generation and elaboration of their ideas. The whole organisation, including all the student groups, functioned according to the principles that the teachers articulated here. And these principles that the designing followed did not exist *a priori*, but Master and Assistant formulated them for this particular project as a response the particular early plans that they had worked with and on.

In terms of framing, the overall process during the first weekend of the Urban Planning project could be crystallised to consist of two aspects: first, constructing the things-to-deal-with, and second, generating a separate thing-to-be-designed for each student group. Within the weekend the teachers worked to generate a view into the details of the project in a way that was preliminarily processed into higher level of abstraction. They ensured that they had the details fresh in their memory when starting to simplify the project. The immediacy of the project-specific context, i.e. a fresh awareness of the things-to-deal-with, may be a necessary condition to successfully deal with the complexity of large collaborative design projects. And this context does not readily exist nor is it available for consultation, but needs to be constructed through intentional action. From the point of view of project-specific learning, the teachers were able to push the learning of the whole project organisation to the strategic level in the

matter of the 24 hours from the outset of the project. This is not a meagre achievement in a contextual process, which may be the reason why my attention was repeatedly drawn back to this project. The articulated plan was a means to convey the project-specific learning and propagate it to the student teams so that they could instigate action in order to attain the goals implied by the plans.

7. Priming a Multichannel Service Concept

This chapter begins the investigation of an innovation project, referred to as the 'Multichannel Maps' project. It was an essentially a unique project addressing a challenge that was globally new. There were no known examples, prototypes, or models that would illustrate the expected results for the project team. The thing-to-be-designed was a multichannel map service, and no definitions of a multichannel map service were available to the team, outside from how they themselves had defined it during the application for funding for the project. The project team was set the task to produce a definition of a novel kind of design concept.

The treatment of the Multichannel Maps project is divided into two chapters. This first chapter uncovers the activities for constructing the conceptual resources employed in the identified crux event, which is then analysed in the next chapter.

7.1. Project overview

The Multichannel Maps project (with the official acronym "MenoMaps") was a joint research project with two academic partners; the University of Art and Design Helsinki (the former name of Aalto University), and the Finnish Geodetic Institute (FGI). The project featured ten partners in total, and in addition to the research units three commercial organisations, two governmental institutions, two cities, and a foundation for outdoor actives participated in the project consortium and participated in the financing of the project. The main financial source was the Finnish National Agency for Technology and Innovation, TEKES. I worked on the project as a designer and design facilitator, and my responsibility was conceptual design and its facilitation.

The two-year project began in the spring of 2008 and lasted until spring 2010. The planned tasks are illustrated in Figure 43, and are listed as they appeared in the original project plan with respect to the timing and names of the tasks. Figure 44 depicts what actually happened during the project.

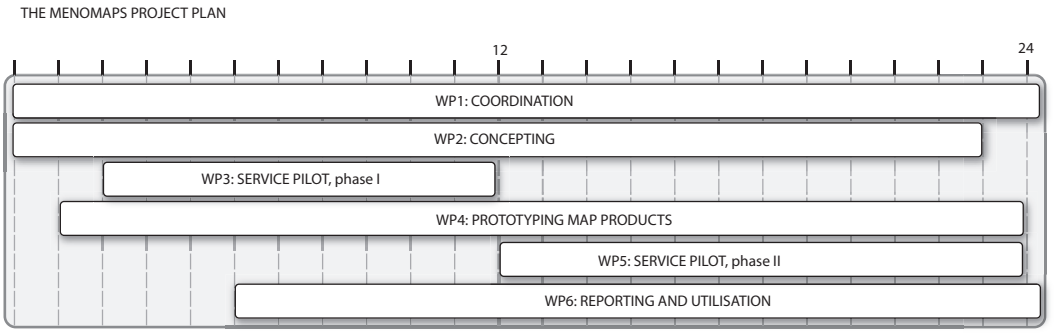

Figure 43.
The Multichannel Maps (MenoMaps) project tasks according to the project plan.

A key difference between the plan and the way the project unfolded was the role of workshops. Workshops were collaborative events to work on the project involving the whole project team. The workshops were located at key moments of the project, where previous tasks were ending and new ones were starting. Thus, they functioned as important communication events, whereby the information from the previous activities had to be transferred to the next ones. Hence, the workshops function as analytical milestones that enable analysis of what the things-to-deal-with are at each occasion.

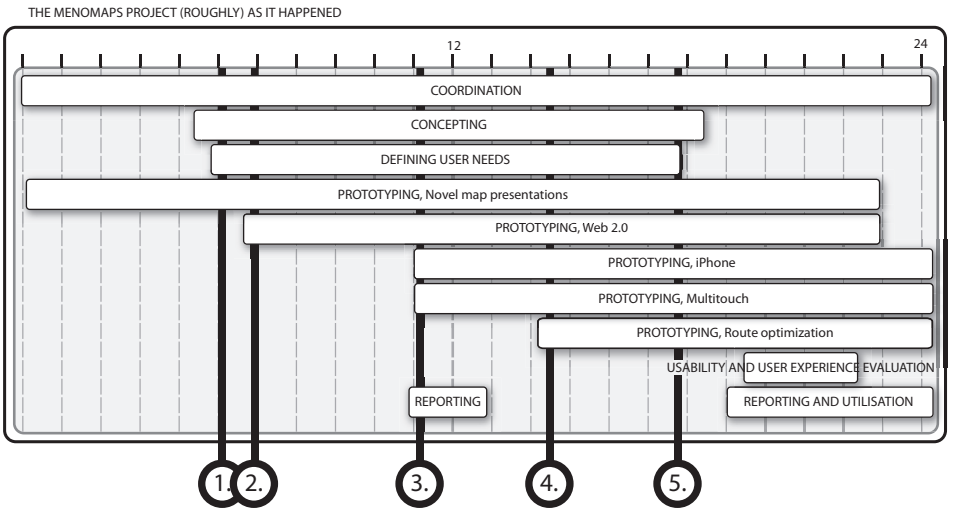

Figure 44. *A rough overview of the actual activities in the MenoMaps project. The numbered indicators illustrate times of workshops.*

The first workshop was organised on 4th September 2008 to co-explore what concrete steps to take next. The workshop resulted in descriptions of potential users and improvised stories on video about potential uses of a future multichannel map service. The results from the first workshop were reviewed in the second workshop, which was held (29th September 2008). It aimed at choosing which use situations the project should focus upon. Also, concrete technologies and target user groups were discussed. Through these two workshops the project team developed a vision in the form of a story, the 'Family-hiking Scenario', and this vision guided the activities in the project for the next four months.

At the mid-project reporting time the project team gathered into a third workshop (6th March 2009). This workshop aimed to fix a definite goal for what should be prototyped in the project, i.e. to define, which features and functions the prototype would have, and which user needs it would be made to meet. The workshop was planned to utilise the Family Hiking Scenario to ground the development on a concrete conception of the value of the service for the users. For this the scenario was elaborated by circulating the story via e-mail prior to the workshop. The story was jointly edited in the workshop, and then the features and functions to be implemented in the current project were decided upon.

Three months later, just before the team went for a holiday for the summer, the project team gathered at an intermediate coordination meeting (17th June 2009) to ensure that all tasks that were in the project plan could be realised. The meeting also functioned as a means to coordinate work across different projects that were running in parallel at the FGI. Some of the technical components, which were developed in the current project, could be utilised in the parallel projects. It was thus important to ensure that the schedules would not cause conflicts across the projects in which some of the project members were involved. An additional coordination meeting was arranged on 18th August in order to ensure that everything was prepared well for the next steering group meeting.

The final workshop was organised on 9th October 2009 to fulfil a missing part of the concepting task exploring the social sharing of materials in user communities of the multichannel map service. The workshop aimed at articulating a verbal description of what the multichannel map service was fundamentally about. In the following, the workshops are reviewed to illustrate the framing process in the Multichannel Maps project. The focus is on the fifth workshop, where the first comprehensive core of the design concept for the MenoMaps service was articulated. The key activities in the

concept design process and the resulting concept were published during the follow-up project, MenoMaps II (Halkosaari, Sarjakoski, Ylirisku, & Sarjakoski, 2013).

7.2. Workshop 1

The first workshop was organised on the basis of the original project plan in order to identify potential users for a multichannel map service. The project statement did not constrain the focus much, as the overall goal of the project was to explore opportunities to design new kinds of 'multi-publishing' services for outdoor leisure activities. The focus outlined in the project plan was too wide, and the role of the first workshop was to provide the project team with a more concrete focus on where to begin. The workshop agenda included

1. revisiting the project's goal,
2. reviewing potentially relevant existing and emerging technologies,
3. imagining potential users, and
4. sketching and acting out scenarios on the basis of the imagined users.

The goal of the project was presented as it was expressed in the project plan: "Utilising multichannel-publishing in supporting outdoor leisure activities." The team discussed what it means to 'utilise multi-channel publishing,' and what outdoor leisure activities are. The review of the technologies included new tools for user-generated content, GPS navigators and related real-time online services, new application programming interfaces between geo-information services, multi-touch screens, mobile social networks, etc. During the third part of the workshop, the imagination of the potential users of the designed service was assisted by a template (shown in Figure 45). It included fields for issues, such as 'attitude towards technology,' 'daily rhythm,' and 'special interests'. One of the fields, which proved to be of surprising value for the project was a field titled "An interesting situation for MenoMaps".

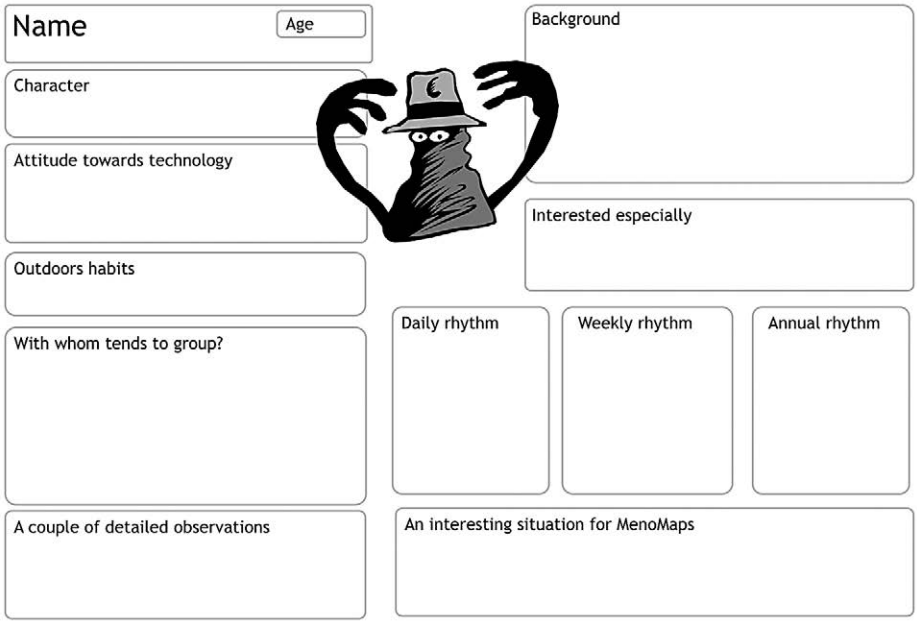

Figure 45.
Template that was utilised for describing potential users of the designed service.

Each participant outlined two users: one realistic and one 'extreme' character that would not have to be realistic at all. The workshop resulted in 12 user descriptions of which one was exceptional. It was produced by one of the participants, who described himself in the template. Below are some of the issues that he wrote on the paper:

[Background] Family father, barely free-time since the everyday routines and work take almost all time. The kids are big enough to walk short routes alone.

[Daily rhythm] 'Tight'. Food times give a rhythm for a day. AM two-hour time. PM several-hour time.

[Interesting situation for MenoMaps?] Weekend trip to Nuuksio. Where there?

What to see? Where to eat? How long route?

During the fourth part of the workshop the participants sketched stories about the users in any chosen situation in need of the multichannel map service for some purpose. They were asked to incorporate some of the presented technologies, or others they found useful in their story. They were also provided with tangible materials to tinker with. These in-

cluded pieces of cardboard, glue, tape, and some materials, i.e. a Make Tools Kit, (see Ylirisku & Vaajakallio, 2007), from a previous study. The Make Tools kit was a collection of random shapes with a furry surface, upon which buttons, dials, and displays that has a piece of Velcro tape glued on their backs could be easily attached. The participants were asked to prepare props to support their stories so that they could act the stories out in front of a video camera. Some created puppets and parts of a small stage, some of them used the materials in the form of 'magic things,' (see Iacucci, Kuutti, & Ranta, 2000), that represented a future system. In total six semi-improvised video scenarios were created, which were invariably based on the "interesting situation for MenoMaps" that the participants had included into their user descriptions. Screenshots from each of the six scenarios are shown in Figure 46.

Figure 46. *Screenshots of semi-improvised acting with props that describe the use of a potential multi-channel map service.*

Each participant had chosen the 'realistic' user for the interaction scenarios. So, all of the six realistic users, out of the total twelve users that were generated, were explored in the video scenarios. The participant (John) who created the realistic person about himself acted out as himself in the scenario. His name was later actively used in the project to refer to the scenario, and the scenario will here be called the 'John scenario' (presented in Excerpt 11 including talk roughly transcribed).

Excerpt 11. The John scenario

John The situation is such that I am going to Noux (a local National Park in Southern Finland) and the car has just been parked. Family is has gotten out of the car. At this point, we are living such times that I did not spend time on checking the Internet for what I want to do before leaving home. I simply arrive at Nuuksio. There I want to decide what to do. I have time for three hours.
I walk to an info centre. It is here (walks at the wall with yellow sticker notes). And here is a giant screen as it were an info board. [..]
I start to ponder with this user interface where to go in Noux. I can tell to it that I have three hours to spend of which I will eat for a half-an-hour.

I So, how do you tell it to the screen?

John Well, here is a panel. By tapping I tell to it that the length of the route is so and so much.

I (To another Participant, B) Could you simulate the panel? (B hands a piece of paper over to A)

John It is here. This kind of thing is here on the side. It is there in the touch screen, in the same surface. I choose three hours. And, well, we eat for a half-an-hour. We eat once. And then we want something interesting and fun to be seen there en route.
Then it pops out a whole... all the options that there may be. So, what kinds of routes I would be able to pass in that time. Then with my hand here I can.. Now, I don't have a clue how I would zoom or scroll. But everything is completely dynamic. I can check here that…

I Please, simulate it as well as you can.

John An interesting looking route is here. I want a close-up picture of the fireplace here. The system zooms into it, in one way or another, and shows the view on a larger scale.

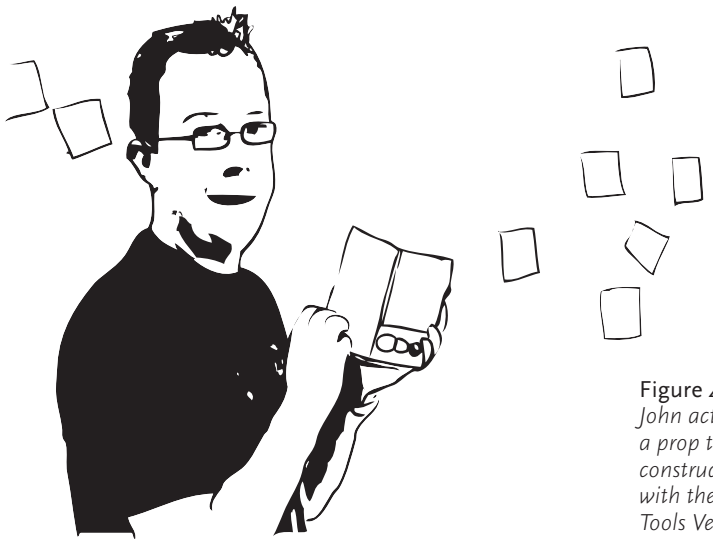

Figure 47.
John acting with a prop that he constructed with the Make Tools Velcro kit.

John And then an essential trick. When I decide, okay it looks good, a route has certain amount of things to see, and it is varying and interesting enough, this steps in (shows a mock-up in his hand, see Figure 47).
This actually knows that I am standing here in front of this screen. And the route that I planned here… Once I have made up my mind about the route the device knows it already. And the device comes along into the forest. I use it to navigate. It shows me where to go. It helps me orient, and it brings me back to my car when the route is done.

There are a number of issues in the scenario that stem directly from the user template. First, that it was based completely on the 'interesting situation' that was articulated in the corner of the user template including the kind of trip and the place. Second, the importance of the eating times was listed in the paper for setting the rhythm for walking. All the answers to the questions that were listed in the template about 'where to go,' 'what to see there,' 'where to eat,' and 'how long route to choose,' were included in the story. And third, the scenario also employed the multitouch wall technology, which was presented during the technology review.

In addition to incorporating the already-presented materials, the scenario expressed a set of novel features. These are visible in the expressions: "This actually knows that I stand here in front of this screen." (=Feature 1, i.e. user/device recognition at the proximity of the info display) "And [it knows] the route that I planned here." (=Feature 2, i.e. the wireless transmission of the route-plans to user's terminal). The device "comes along into the forest" (=Feature 3, i.e. the system has a mobile terminal). And, the device is used to "navigate" and it "shows where I go. I can orient with it, and it brings me back to my car when the route is done" (=Features 4, i.e. navigational assistance with directional support, route displays, and return path calculation). These features became the 'things-to-deal-with' in later situations of the project, for example, the idea to enable the planning of routes in front of a large multitouch screen and then transmitting the plan into the user's terminal became central to the planning of the multichannel system.

7.2.1. *A note on the generation of the 'things-to-deal-with'*

The workshop structure was designed in a way that supported bringing a relevant set of things to consider for the planning. Since the starting point was very open, the initial set of things that were brought into and presented to the workshop participants were constrained very little. The scenario-making was based on 1) the goal of the project, 2) the technology

review, and 3) the user-descriptions by the participants. All these were used in the construction of the scenarios, which is clearly visible in the John scenario. So, the 'things-to-deal-with' in that workshop were used in the making of new 'things-to-deal-with' in a consequential manner.

The John scenario became the key reference point to inspire and guide designing of the system, and it was revisited and collaboratively edited later. The other scenarios faded away from the attention of the project team. A question, which draws attention with regards to only one of the scenarios drawing the central attention later, is why exactly was this scenario so successful?

A key difference between these scenarios was the fact that the John scenario was the only one where the participant was using himself as the protagonist of the story. He was able to evoke his relevant experiences about being engaged in such outdoor activities, which were in the focus of the project. He was representative of a potential real user of the system, since the system would be targeted to national park visitors, and families with children are a major user of national parks in Finland (Konu & Kajala, 2012). And, he was also member of the development team of the map service, and could employ his hobbyist knowing (Kotro 2005) in the drafting of the scenario. So, he had a large number of project-relevant knowledge, and he was able to resort to this knowledge and bring it all together in the form of the story about his own practice of going into nature.

While this is only a single example of collaborative envisioning with a user that is proficient in the project's target domain, it aligns well with my (Ylirisku & Vaajakallio, 2007) and others', (see e.g. Binder, 1999; Iacucci et al., 2000), earlier findings on the value the facilitation of prop-mediated situated exploration of user-relevant semiotic resources together with the users. With a different group of participants the result would have likely to be quite different.

7.3. Workshop 2

The second workshop was organised three weeks after the first, on 29th September 2008. The first workshop had generated descriptions of twelve possible users of the system and six video scenarios of the potential future interactions with the system. The main purpose of the second workshop was to concretise plans with regards to the next steps in the project. The structure for the Workshop 2 was the following:

1. Reviewing the generated user descriptions form previous workshop
2. Considering who are missing from this set of users
3. Reviewing the video scenarios from Workshop 1
4. Articulating findings from these (on sticker notes)
5. Grouping the notes and labelling the groups
6. Discussing where to focus
7. Creating a concrete plan for the next steps

All the user descriptions that had been created in Workshop 1 were rewritten and printed on paper. The user characters were reviewed, and the group discussed who would be the potentially most relevant users that were missing in the list. I had prepared additional 'extreme characters,' such as "Werner Greyback, war veteran" and "Hiddne Wheerami, immigrant, pipe vision" to spark discussion about the possible areas that had not been covered. It was concluded that since the intention of the project is to create a new-to-the-world service, the development would be started with a mainstream focus. So, some of the listed exemplary users were immediately filtered out.

The video scenarios from the first workshop were reviewed, and the participants were asked to list the features of the multichannel map service that they could identify in the scenarios. For example, the copying of the materials from the large display on her small mobile device was written in the form "planned route from the info board into the terminal – UPCODE" (see Figure 48). The participants were also encouraged to write any other issues they discovered as important to consider at this point of the project on sticker notes. The idea was to collect the things-to-deal-with on the notes.

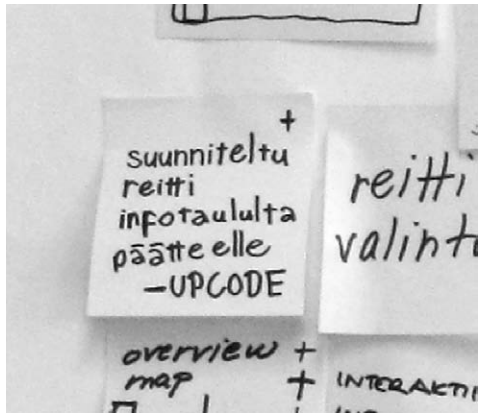

Figure 48.
The copying of the ready-made plan from the large display on personal mobile device was written in the form of "planned route from info board into the terminal – UPCODE".

Figure 49. *The workshop participants working with notes about the things-to-deal-with.*

All the notes were then posted on the back wall of the office space accompanied by the small printed sheets depicting the 'users' (see Figure 49). Three of the new user characters were included in the affinity diagram to be considered as potential users of the system. These were "Merrill Mishap, A retired midwife, all thumbs," "Andy Airhead, a student whose bag is always lost," and "Arja Purho, community fiscal, committee of outdoor sports."

7.3.1. *Grouping the notes and labelling the groups*

The notes were affixed to a wall for the construction of thematic clustering of the notes. This is a standard method in user-centred design; see e.g. Hackos & Redish (1998). The rule that was given to the participants was to move individual notes closer to the other notes that they found to be related. The resulting thematic structuring will render the conceptual connections that the participants conceive as a material externalisation, and the resulting structure reflects a multi-sided process of organisation. Making the connection on a conceptual level between two material entities, which are the physical sticker notes, implies that there exists at least four processes involved: first, the participants must be able to interpret the messages expressed by the symbols on the stickers; second, they need to hold two such messages in their mind simultaneously; third, they have to be able to discover conceptual relations between these messages; and fourth, they need to express their judgment about the relatedness by ar-

ticulating the conceptual distance through the act of arranging the notes.

When groups of notes emerged they were labelled in a way that would explain the conceptual idea of why the notes are together. The labels, which were identified in the workshop by drawing a line around the note, were posted on top of each group. In total 11 thematic groups were labelled.

The team decided to arrange the notes along a rough timeline that would span over the wall from left to right. This was due to the fact that some of the notes referring to features were considered to be too advanced to be implemented in this project. Despite that these notes were also considered relevant for multichannel map services, they were not considered relevant for the current work, and the team decided to move them further away to the right in order to make the most imminent issues to stand out. As a result the wall was divided into three sectors: The MenoMaps proto, MenoMaps 2.0, and MenoMaps 3000 (see Figure 50). MenoMaps proto refers to the multichannel map service prototype that was planned to be realised during the project.

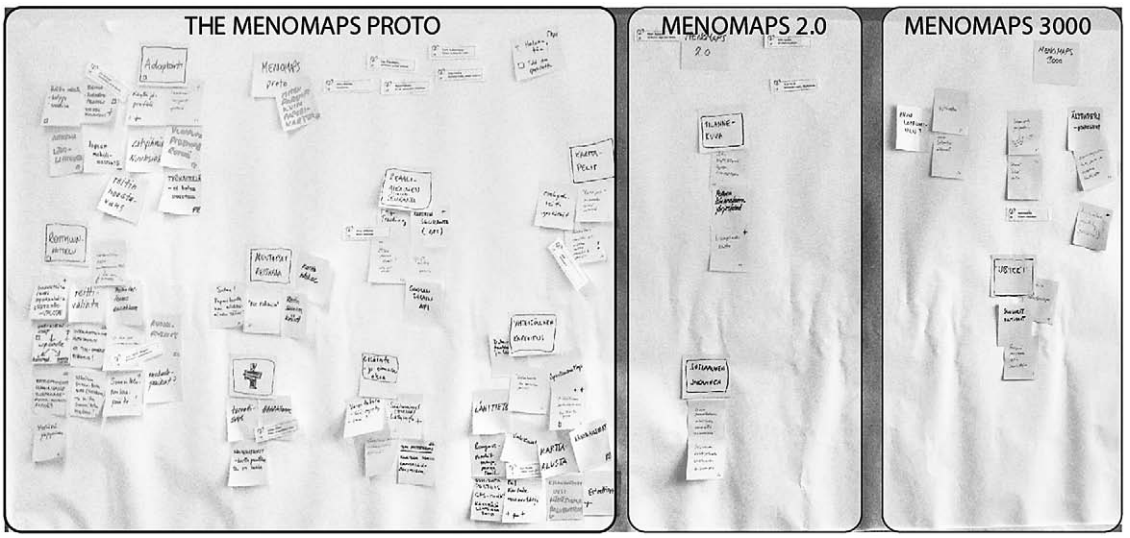

Figure 50. *The wall with the labelled groups of issues was divided into three sectors according to an idea of potential versions of the system.*

The MenoMaps proto sector comprised of eight groups of notes in total: Adaptation (shown in Figure 51), Route Planning, Changes en Route, Safety, Real-time Location Tracking, Additional Information, Social Mapping, and Map Games. The participants were asked to mark the notes that had been already specified in the project plan by drawing a square figure

on each such note. In this way it was possible to see the issues that were new to the project at this moment. The participants were also asked to mark those notes (in total 5 notes for each participant) that they would like to include in the prototype with a '+'-sign. The most plusses (3) were put on three notes: [Overview map->UpCode-link->Mobile phone], [Tracking], and [POI[5] – landmarks on the map].

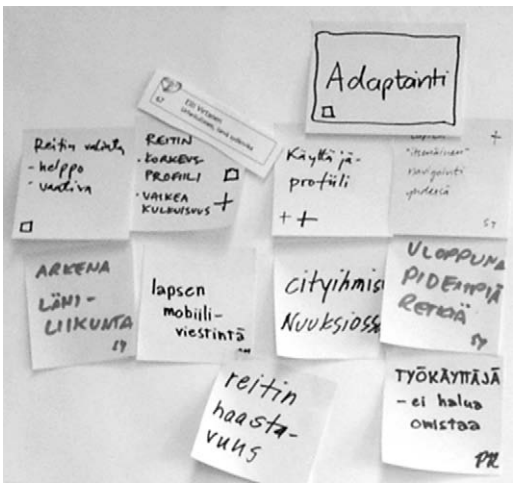

Figure 51. *A labelled cluster of notes entitled 'adaptation.' The features, which had been expressed in the project plan, were marked with a small square in order to identify emergent features.*

7.3.2. *Cultivating the 'things-to-deal-with'*

For the development of the things-to-deal-with, Workshop 2 functioned by bringing the materials from the first workshop as well as delivering new materials that were inspired by it. The project team explicated the 'things-to-deal-with' on the sticker notes and grouped these according to their conceptual relatedness, and mapped these with regards to the timely relevance to the current project. Hence, the function Workshop 2 was especially that of becoming explicitly aware of what are the things-to-deal-with. Concrete things that were promoted in the workshop were the 'UpCode' technology, a 'Web 2.0 interface,' and 'adaptation'. Actions were taken on these during the intermittent period before the Workshop 3.

[5] POI is the slang of the professionals of geoinformation systems and refers to 'Point of Interest.'

7.4. Intermittent work

An analysis of working files at this time and my personal diary notes reveal that there was a meeting on 9th October 2008, and a review of e-mail exchange during this period reveals that there was a meeting with the UpCode company representative. The e-mails also show that we had a user interface design meeting in the morning, which included a review of the 'current development version.' The time was one and half weeks after the second workshop, and it suggests that after the second workshop one of the project group members had begun the work on the Web 2.0 platform exploring the utility of the OpenLayers platform. I had prepared a graphical sketch of the user interface for the Web Platform. It seems that at this phase of the project there was not yet work done on mobile platforms or the UpCode-based platform and it was displayed in the files (diary notes, working files, or e-mails) retrieved from this period.

In my project diary I identified four different user interfaces that I had found important to consider at this phase: Web 2.0 UI, Mobile Web 2.0 UI, iPhone App UI, and UpCode UI. For my personal memo before the meeting, on the same day of the meeting, I had noted, "The map must be made full screen if possible." This idea, one year later, was identified as one of the design drivers of the whole platform (see the next chapter).

The period during the autumn of 2008 was marked with overlapping responsibilities with most of the project participants. And the Web 2.0 platform development for the MenoMaps multichannel map service prototype took the central stage of development during October 2008.

A designer was recruited into the project in November and a software engineer also started during that period. In an e-mail that I received on the 5th December 2008, the project manager at the FGI stated that the software engineer has begun to study the mobile platform. The e-mail contained an explanation about the work that had been conducted with the map data. Different forms of presenting the map and classifying the contents for the user had been processed for the Web 2.0 platform and for printed maps. These were about to be transported also to a form that suited mobile devices. The project manager from the FGI mentioned that 'adaptation' will be an important theme over the next year, and she asked me to prepare en 'entrance page' for the service, where the desired adaptations could be chosen. Work with path mapping and route-optimisation was also in progress.

In that e-mail the FGI project manager notified that a MultiTouch wall

system had been purchased and was being delivered soon. She stated "It will be a question of if we should already start to think of the implementation of the John scenario. The Multitouch equipment is on its way to here." This move was exciting, as it was written in the project plan, and appeared to be a quite radical step in the whole progress. The project was now becoming increasingly to be driven by the vision contrived in the first workshop, and a whole new channel that had not been thought of during project planning was being constructed for the multichannel map service system. The multitouch system would allow for the project team to attain the goal that was articulated in the 'John' scenario.

7.5. Workshop 3

The third workshop was organised on 6th March 2009, i.e. almost a half year after the second workshop. The workshop was organised around the 'John scenario,' which was given a new name, 'The Family Hiking Scenario' in order to make it less esoteric. The overall intention of the workshop was to concretise the user requirements for a prototype of the multi-channel map service. Prior to the workshop the scenario was written into textual format, and this was circulated amongst the project group members. All project team members could thus add details to the story.

New features could be added into the system, but the requirement was to embed them into the story in order to make any new features justified on the basis of human needs expressed in the story. The story was jointly edited in the workshop, and then the features and functions to be implemented in the current project were decided upon. The Family Hiking scenario became articulated in terms of the concrete technologies that had been explored in the project thus far, i.e. Web 2.0, iPhone, MultiTouch, UpCode, and printing. The collaborative editing of the 'Family Hiking' scenario in Workshop 3 is shown in Figure 52.

The workshop produced a new version of the scenario, and this was labelled the "Family Hiking Vision for the Year 2012." The year 2012 was two years beyond the scope of the project, and was chosen to function as a concrete goal to be achieved. Within the project's duration the team agreed to aim for the realisation of a prototype that would be able to support one use case, which was based on the scenario. The use case would include the use of a MultiTouch wall map, where a user could choose a specified route by touching the screen. This would produce an UpCode data matrix on the screen, which could be used as a link to copy the shown map on a

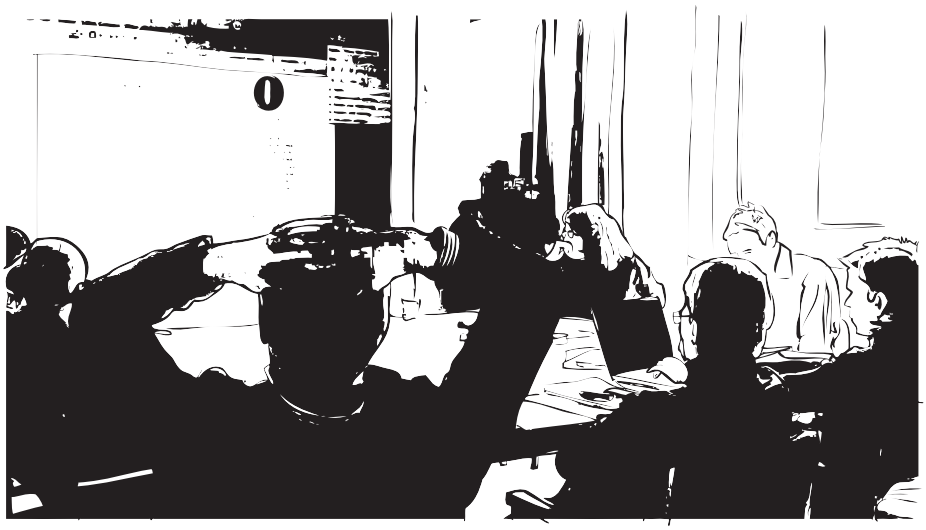

Figure 52.
Collaborative editing of the Family Hiking scenario. I was working as the scribe.

mobile device. Hence, the scenario not only expressed a concrete vision to work towards, but also functioned as an instrument for strategic decision-making upon the project's resources.

From the point of view of the production of things-to-deal-with, the scenario functioned as a high-level 'thing' that brought together the many parts that the system would comprise. It included technologies, described different uses, concretised features, and illustrated potential users and use situations. The scenario was based on the team's preliminary work on the parts of the story, and it featured 'things' from the first workshop, such as the idea to use a large multitouch screen to plan and then wirelessly transfer the plans to the user's mobile terminal. The form of the articulated vision at this time was refreshed and expressed on the basis of the up to date knowledge of the participants. This was visible in the story especially in the way that the concrete use of particular technologies, such as the Web 2.0, was explained.

7.6. Coordination meeting 1

The fourth workshop or perhaps more appropriately a 'coordination meeting' was organised on 17th June 2009 before the project team left for summer holidays. The meeting aimed at coordinating the various tasks that were included in the project plan in order to deliver what was agreed for the project with the financiers. The agenda, which was sent to the participants by the project manager, included these issues:

1. Situation review, project manager
2. Situation of the data materials, winter maps, mobile maps
3. UpCode, Multitouch and Family Hiking Scenario, discussion of the implementation
4. MenoMaps prototype situation review, discussing the UI and terminology
5. Discussing the thesis work on user-centred concepting in the MenoMaps project by an MA student
6. The role of TaiK (i.e. Aalto ARTS) for the autumn, potential user study, collaborations across projects
7. Sound environment maps
8. Situation of symbols
9. iPhone, latest news
10. Summary, what should be ready by the next steering group meeting

During this meeting it was decided that another meeting would be organised to plan a follow-up project to continue the work. The coordination meeting 1 focussed mainly on reviewing the current situation, checking the project plan, and ensuring that each task would be conducted as planned. The creations that had been made thus far were reviewed and elaborations were made. The agenda of the meeting shows that the process was conducted on many parallel and related threads simultaneously. The agenda functions as a concrete high-level outline of the things-to-deal-with at that point in time.

7.7. Coordination meeting 2

After the summer holidays the project team gathered again in coordination meeting 2, on 18th August. This took place two months after the previous meeting. The issues that were listed in the agenda were:

1. Opening, by the FGI project manager
2. The final phases with the data materials
3. The implementation of the UpCode, Multitouch, and the Family Hiking Scenario
4. The latest issues in the web prototype
5. iPhone, latest news and symbol implementation
6. Concepting and user study, discussing the identification of the communicational opportunities
7. Preparations for the week's steering group

The Family Hiking scenario was repeatedly used through these meetings as a reference to guide designing of the features, such as the integration of the UpCode technology. As with the previous meeting, the agenda functioned as concrete high-level labelling of the things-to-deal-with. A central impetus for arranging the meeting at this time was the project's steering group meeting, where the project team needed to tell about what has been done and what would be the plans for the rest of the project. The next workshop was organised after the steering group meeting.

7.8. Workshop 4

The final workshop in the project, Workshop 4, was organised on 9th October 2009 which was month 18/24 of the project. It may be surprising that there was no clear definition of what a multichannel map service is, nor of the design concept, despite that the project had been running for one-and-a-half years. Yet, the project had been running successfully according to plans over this time. The workshop was a full-day event with the following agenda:

10:00 Start: I introduce the agenda and goals of the day

Situation review (brief recap of all areas)

10:15 Project Manager – MenoMaps-project goals and context
10:20 Participant A – State of the map presentation and questions
10:25 Participant B – Web and questions regarding the interactive map
10:30 Participant C (the Software Engineer) – iPhone state
10:35 Participant D – The state of route optimisation and questions
10:40 Participant E – The state of the interactive wall map and questions
10:45 Participant F – Description of design potential
10:50 Me/facilitator – The unexplored territory of MenoMaps application

Task: User organisations

10:55 Producing sketch-like descriptions of potential organisations that could use the MenoMaps service
11:15 Lunch

Task: Situation sketches

12:00 Producing quick sketch-like descriptions of potential situations that lead into the use of the MenoMaps service
12:30 Collecting the sketched situations into a list
12:45 Prioritising the situations for the MenoMaps service

Task: Interaction sketches

13:00 Sketching brief outlines of scenarios on the user interface level

14:00 Coffee and a small airing of brains

Task: Focusing and filling

14:15 Reviewing the initial scenarios and producing three "ready" scenarios

Task: Concept description

15:00 Outlining the overall characteristics of the concept

16:00 Ending the session

The workshop participants were: Department manager, who functioned as the responsible manager of whole project; Project manager, who functioned as the coordinator of the project practicalities; Participants A-F, who were experts in technology, geo-informatics, and design; and me as the facilitator.

7.9. Reviewing the things-to-deal-with

Workshop 4 began with a review of all the sub-areas of the project. The project had progressed already for a year-and-a-half and during this time the project team had worked on a variety of areas related to the overall service. A functional Web 2.0 service prototype had been created, the Multitouch wall system had been purchased and tested, a functional prototype had been built for the iPhone, route optimisation algorithms had been developed on a particular set of data, design opportunities had been defined and presented, novel cartographic formats developed, various use scenarios formed, and an area of 250 km² had been scanned with the LIDAR (LIght Detection And Ranging) system and processed into geospatial database in order to realise the prototypes. All these areas were covered in five-minute presentations, which the participants had been asked to prepare for the workshop.

After the participants' presentations (setup is shown in Figure 53) the team focussed on exploring how data sharing of multi-publishing map data could occur in the system. The planning was conducted by reviewing a wide variety of organisations that could possibly relate to the service. Then scenarios illustrating concrete situations were sketched in pairs. The generation and the review of the interaction sketches took longer than estimated and one phase, "focusing and filling," was omitted from Workshop 4.

Figure 53. *The MenoMaps project team listening to a project participant's presentation about the map visualisations.*

Before the final phase of the workshop, the group had a coffee break. After everybody had returned from the break I summarised the presentations that were given in the morning, because several hours had passed since the morning presentations. With this recap of the main components of project I attempted to help the participants of the situation gain a fresh memory of the things-to-deal-with. During my multiple years of facilitation of this conceptual design workshop, and from my earlier preliminary analysis the Urban Planning project (see the previous chapter) I had learnt that having the things-to-deal-with fresh in the memory can be very helpful for the making of relevant plans. In the next chapter illustrate how the team worked on these 'things' when crystallising what the design object in the project essentially was. That event turned out to be the crux of that project.

8. Multichannel Service Concept crux

This chapter uncovers what was identified as the crux event in the Multichannel Maps project. The event took place on 9th October 2009, which is during month 18 of the two-year project. The last part of a full day workshop is analysed. In the MenoMaps project, a simplification of the design concept had been articulated during the first 18 months of the project. But in this project, instead, a scenario called "Family hiking" founded on the so-called John scenario helped to orchestrate designing of the various parts in order to accomplish a coherent whole, a cross-platform functional prototype of the multi-publishing service. The family-hiking scenario was initially sketched during the very first workshop in the project as a result of a video-assisted brainstorming session. The scenario featured all the main components of the system to be designed, and it was presented in a way that emphasised the context and motivations of a family that wants to go hiking in a national park. Later, this scenario became a central anchor of discussions of what the design team should create, and it was constantly referred to during the project, and it became elaborated in later collaborative sessions.

The scenario focussed only on one family and covered the system as one story. Regardless of its power to merge a number of technical components into a system that could support hikers' everyday needs on their national park trips, the system could potentially facilitate a variety of different uses as well. The project aimed to produce a more generic description of what the multichannel map service is, its generic purpose, and how it should be designed in principle.

The crux event of the Multichannel Maps project took place in an afternoon part of a full-day workshop. The team had reviewed the project status and explored the potential for extending the service to cover also social sharing of data.

8.1. Entering the crux event

The analysed interaction in Excerpt 12 begins at a moment when the design team has returned from a break and I had finished recapitulating the presentations that the participants of the workshop had given in the morning. The presentations covered the goals of the project and the parts of the multichannel map service system. The setup of the workshop is shown in Figure 54.

Figure 54. *The workshop setup. I am beginning to explain the task to articulate the design concept of the MenoMaps multichannel maps service.*

Excerpt 12.

```
01 I:          We have quite a complex⌈
                                      ⌊shows slide (1) with a text
                                       “concept description” (Figure 55)
```

Figure 55. *I showing slide with text “Concept description”.*

02 arsenal of different things and background work to,

03 well, crystallise [I show slide (2) with texts “Name”, “MenoMaps” (with smaller font), “Core purpose (mission)” and “Design drivers (vision)”

Figure 56. *I am showing slide (2) with the texts “Name,” “MenoMaps” (with smaller font), “Core Purpose (mission),” and “Design drivers (vision)”*

04 what [I highlight text “MenoMaps” (Figure 57)

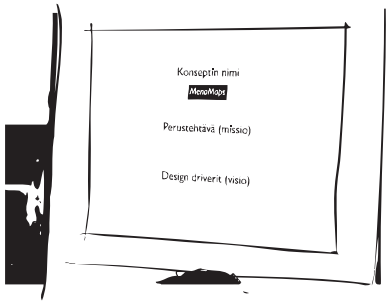

Figure 57

05 what this our menomaps [I type text on the line with “Menomaps” map service

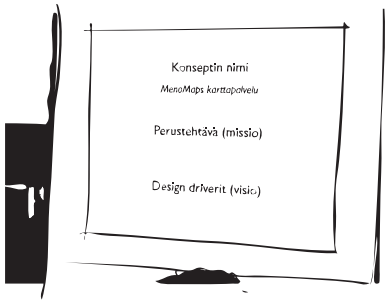

Figure 58

06 What this is, now this,
07 our [
I highlight the row containing the just-written text and the text “MenoMaps”

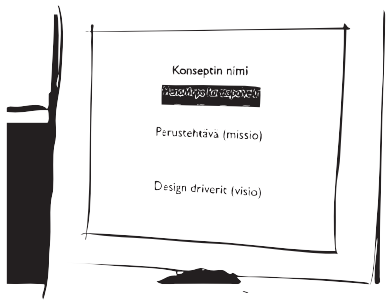

Figure 59

08 service called. Could it then be menomaps map service
09 if there are no objections?
10 Could we [
I highlight the empty row below “Core Purpose” heading (Figure 60)

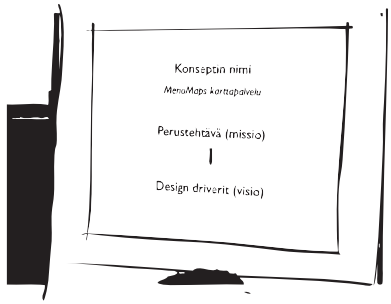

Figure 60

11 for this map service >We have during this week been
12 already exercising the strategy of the department and
13 perhaps tried to polish the whole institute’s
14 strategy< briefly sharply concisely the reason why
15 this exists?
16 ((I make a hand gesture from left to right with pinched fingers)) (Figure 61)

Figure 61

```
17                Could we put that into a phrase somehow?
18                (5s)
19 Dept.Manager   It is there in the research plan. Heh. I presume.
20                Heh. That was blatant.
21                (12s)
22 I              Let's leave this. It's Friday. Quite challenging=
23 Project Mngr   =well...
```

I began by saying "We have quite a complex arsenal of different things and background work." The expression "complex arsenal of different things and background work" did not refer to anything in particular, but was a likely reference to a set of semiotic resources that were just re-stated before starting the interactions shown in Excerpt 12. Hence the 'complex arsenal' can be interpreted as an overall reference to all the things-to-deal-with.

I articulated both by talking and by controlling the projection of the computer screen. At the same time as he referred to the 'complex arsenal' through talk he showed a slide with the text "Concept description" (row 01). This was a likely reference to the goal of the session, which is supported by the fact that this was presented in the session agenda sent earlier to the participants.

I showed a second slide with the texts "Name," "Core Purpose (Mission)" and "Design Drivers (Vision)" (row 03). The slide also contained the text "MenoMaps" written in a smaller font on a row underneath the "Name". Once I began to edit the smaller text under the title "Name," i.e. when he highlighted the text "MenoMaps" and typed in more text (rows 04-05), a transition took place. Action changed from *exposing* the relevant semiotic fields into *externalising* meanings into a dedicated target of articulation. The editing was bounded within a particular target, i.e. within the row with the label "Name" on the shared display.

Through these acts, i.e. exposing the slide with the titles and editing the text below the "Name" title, I made an implicit statement that the titles on the slide are expressions of a structured set of goals. Each title was suggestive of what to write below it. The vertical ordering of the titles hinted to a particular progression, from top to bottom, as is the habit of reading and proceeding with texts in Finland. This interpretation is justified by further evidence in the form of me reporting a possible goal accomplishment after he had edited the row, "Could it then be MenoMaps map service, if there are no objections?" (rows 08-09).

The term "The MenoMaps map service" refers to the name of the thing-to-be-designed. The project team is currently resolving how the service

concept should be understood, and it is hence still ambiguous to its meaning. Thus it will be interpreted as an open concept.

Nobody commented, and I moved to editing the next heading "Core purpose" (row 10). This move supports the interpretation that the first goal, implied by the titles on the slide, was attained. The next actions by me, i.e. highlighting the space below the "Core Purpose" (on row 10) and talk "Could we for this map service [..] briefly sharply concisely the reason why this exists?" (rows 10-15), also support this interpretation. These were acts to introduce a new goal and a dedicated semiotic target for articulation, which was bounded by the titles on the slide.

During the introduction of this new goal I made an insertion in my talk (rows 11-14), with increased speed, and recounted for an earlier event from which the participants may have shared experiences: "We have during this week been already exercising the strategy of the department and perhaps tried to polish the whole institute's strategy." This was a reference[6] to an earlier activity, where the group had been involved in crystallising verbally the "department's" and "institute's strategy". I used the adverbs 'briefly,' 'sharply,' and 'concisely' (row 14) to describe the characteristics of the desired description of the 'Core Purpose'.

I re-started the "Could we" phrase by saying "Could we put *that* into a phrase somehow?" (row 17). In the phrase the word 'that' functions as a reference to the 'Core Purpose'. This interpretation is supported by the pointing to the screen, the highlighting the words on the screen. However, the notion of 'Core Purpose' still lacks content, and will be thus considered as an open concept.

The phrase "Could we put that into a phrase somehow?" did not function like a question that would have called for a simple 'yes' or 'no' answer. Rather, it functioned to mark a clear position for others to participate in the construction. After a 5-second pause Department Manager responds to the invitation, "It is there in the research plan. Heh. I presume. Heh. That was blatant" (rows 19-20). His statement is followed by further 12-second pause, during which nothing was written on the slide below the title "Core Purpose". Finally I suggested leaving the topic "Let's leave this. It's Friday. Quite challenging" (row 22).

At this moment it seemed as if the team was not able to articulate anything that would have contributed to the construction of the 'Core Purpose' of the designed service. The highlighted row on the slide also remained

[6] Earlier that week the team had a meeting to verbalise the strategy of the cartography department. I assisted in the meeting.

empty. Project Manager then began "well.." and started to articulate what could be the core purpose.

Frames. The material interaction displays evidence of an overall frame as well as frames that are hierarchically subjugated to the overall frame. The overall frame was referred to in my actions, when I started talking about the 'complex arsenal' and displaying the slide with the text "Concept Description" (row 01). When I urged the team to "crystallise" (row 03), I simultaneously showed the slide with texts with text "Name", "MenoMaps" (with smaller font), "Core purpose (mission)" and "Design drivers (vision)". These acts were all aligned with the goal that was presented in the formal invitation for the workshop as "the Concept Description." The second slide showed a more detailed format for the description to construct, and implied subjugate goals, i.e. to describe 1) the "Name," 2) "Core Purpose," and "Design Drivers".

Once I had introduced the goal and the format for the articulation, I switched from exposing to constructing meaning, when I highlighted the row and started writing below the first title, expressing an example "Name" on the slide. Through these acts I pointed to a specific semiotic field that would function as the target for the articulation, i.e. the surface on which the expressions would persist. I wrote "MenoMaps Map Service" on the row and stated "Could it then be menomaps map service if there are no objections?" Nobody responded, and I moved to work on the line below the title "Core Purpose". These acts support the interpretation that the structure of the slide that was displayed was utilised to divide the overall task to develop the concept description into smaller tasks.

My actions displayed a move into the next sub-task, when I highlighted the line under the "Core Purpose" title, and invited the others to join in the construction by stating the question "Could we put that into a phrase somehow?" Despite that the team did not produce the expression of the core purpose, the material interaction displayed concrete support for there being an overall frame and frames that are hierarchically subjugate to it.

The name "MenoMaps Map Service," which was expressed both in talk and writing, functioned as the first expression of an open concept, the name of the thing-to-be-designed. I stated (rows 08-09) "Could it then be menomaps map service if there are no objections?" Based on the fact that I was writing on the line below the title "Name" on the template that was used to articulate the "Concept Description" of the MenoMaps map service, it is interpreted that the term "MenoMaps Map Service" referred

to the thing to be designed, and the term 'it' referred apparently to the "Name" of the thing. These references are supportive of the assumption that the activity took place in a frame aligned towards a articulating the name of the concept. And goal associated to this frame is subjugate to the overall goal to develop the "Concept Description". Above, it was also argued that when I moved to work on the next title, it was a signal about the first sub-goal, which was implied by the structure of the articulation template, was achieved.

Once I moved forward to work on the "Core Purpose," I referred to particular shared experience of articulating a strategy, and I used adverbs "briefly," "sharply," and "concisely" to underline the desired characteristics for the description of the "Core Purpose". The slide that I prepared also contained additional terms that were adopted from strategy work. On the same row with "Core Purpose" was the term "Mission," and on the row with the text "Design Drivers" was the term "Vision". These are labels that are used in the articulation of strategies, and these had been used earlier during the week in a meeting with the same team.

However, regardless of all these acts by me before inviting the participants to articulate the "Core Purpose," the result was a silence. The invitation was responded by Dept. Manager, but his reference to the definition in the project plan did not result in any persistent changes to the target for articulation, i.e. no text was written under the title "Core Purpose". This was followed by 12 second pause, and it appeared as if the attempt for articulating the "Core Purpose" in the situation was going to be unsuccessful.

The pauses (in total 17 seconds, rows 18 and 21) were very long, and call for an explanation. A likely explanation is that the participants could not find anything that fits the frame. This incapability could have been anticipated on the basis of what is being required from the team members. In order for participants to articulate relevant expressions into the dedicated space, they must 1) have access to relevant semiotic resources whether in their memory or in the materials at hand and 2) be able to formulate expressions which are grounded in these resources.

If the reason for the difficulties resided in 1) the inability to access relevant semiotic resources required by the formulation, or in 2) an incompatible level of abstraction of these resources for the formulation of the answer, then further questions arise: What are the semiotic resources that the articulation of the Core Purpose requires? And, should it be anticipated that such resources are available in the situation?

The team had worked towards the realisation of a prototype for the multichannel service for over 1.5 years. During this time they had explored a wide variety of possible uses for the system, including the John scenario. It would be reasonable to assume that the purpose of the system would be already known to them, and that the semiotic resources required for the articulation of the core purpose should be available to the team.

The Core Purpose, i.e. the very purpose of the system to be built, was not discussed in the meeting until this moment. The purpose of the system was not included in the recapitulation of the things-to-deal-with, and therefore it is likely that the expression of the purpose was not readily available in the participants' memory. The traces of the experiences of how it was stated are likely to have faded into the background of the participants' minds, and are thus not readily and easily available for retrieving. One indication of this is that Department Manager referred to the definition in the project plan instead of re-articulating it. It is possible that he did not remember it in such a format that would have enabled him to express it in the moment.

The relevant semiotic resources may also be available to the participants on a different level of abstraction than what is needed for the brief, sharp and concise verbal expression on the slide. The participants had earlier in the day drafted scenarios, i.e. stories of people interacting with the service. The formulation of a generic articulation of the core purpose of the system in a way that would also include these new examples would have required the work to abstract generic notions on the basis of the details in the stories. This had not been done, and thus it can be argued that these resources were not available to the participants at an appropriate level of abstraction for the articulation of the Core Purpose. The exploration of the alternative scenarios that explored novel possible purposes for the system on the same day may thus have interfered with the sense that the participants had earlier about the purpose of the system. It was no longer obvious what the service concept should include, and its boundaries had become ambiguous. The participants could not be certain if the core purpose of the system, which was articulated earlier in the project plan, should be changed on the basis of the newest ideas. The purpose had become an *open concept* to the team.

It is also possible that the participants considered their view of the system's purpose to be too partial. This resonates with the fact that it is the ones responsible for the whole project who take the turn at this point. The overall management took the active role in the form of Dept. Manager

speaking first and Project Manager after him. The designers of components of system remained silent.

Regardless of the reason, i.e. 1) memory decay, 2) inappropriate level of abstraction, 3) conceptual ambiguity, or 4) partiality, the silence suggests that the action was occurring within a frame associated with the articulation of the Core Purpose of the system.

Identified framing strategies. There are four points where a particular framing strategy was employed: First, at the beginning of the session the things-to-deal-with were recapitulated. This promoted the immediacy of these matters for the planning, which is reflected in the participants' mute agreement on what the reference to the 'complex arsenal' meant (on rows 01-02). Second, lead-articulation was utilised to show the participants what is being attempted and what will be used as the target for articulation. These acts of editing demonstrated to the participants the kind of changes that were appropriate in this situation. This enabled adjusting expectations as to what is being done, since the collaborative editing of the presentation slides is not what is normally done to slideshows in meetings. Third, a template was utilised to give structure to the progression as well as to outline particular targets for articulation. And fourth, specific evaluation criteria ('brief,' 'sharp',' and 'concise') were given to participants on the kind of product was desired.

8.2. Thematic reframing of the thing-to-be-designed

The following excerpt displays the team continuing to articulate the core purpose of the service. After the interactions analysed above Project Manager begun to articulate how the map service is intended for hikers. Soon, however, attention turned back to the 'Name' of the concept, and especially to the meaning of the term 'service' in the proposed name "MenoMaps Map Service". SW Engineer argued that there would be a technical dilemma that stems from the impossibility to think of the multichannel service in terms of it being a single core service. This resulted in the exposition of two incommensurable views held by Software Engineer and me. Excerpt 13 starts when I expose my view about what is map service. The text "Map Service" is highlighted on the wall projection.

Excerpt 13

01 I Map service means now here that we have one
02 service. As we are now talking about the design of
03 a multichannel service.
04 SW Engineer Mmm.
05 I I would see in some way we have one core (.)
((I make a ball shape with two hands, Figure 62))

Figure 62. *I am showing a ball shape with hands.*

06 [service that is defined by some components.
[I wiggle the ball gesture

07 SW Engineer Mmm.
08 I Those that are rolling in the core there.
09 SW Engineer Mmm.
10 Factilitator There are some geoinformational specifications and
11 processes.
12 SW Engineer Now we have here this exactly. So we have the core
13 then as a set (.)
14 I ((I release my hands from the ball shape, rise up,
and begin to walk towards the flip chart))
15 SW Engineer It is in practice not a physical application or
16 process. Or, it is a set of terminologies.
17 I ((I fetch pen and stand still))
18 SW Engineer A set of user interface components, which are

19 coherent. A set of [interfa[ces that are used,
20 Dept.Manager [((Raises his hand))
21 I [((I point at the
22 Dept.Manager with finger and face him))

23 SW Engineer which are coherent. Because this is now so.
24 Because this goes in web application and mobile
25 phone application so we cannot in any way use the
26 same core.
27 Dept.Manager So but well. Could we here now think.

28 [Or let's go. Let's back up a little.
[He waves his right hand and makes a rapid move from right to left.

```
29                This well the use of terminologies. This
30                is totally terrible as it is so difficult.
31 SW Engineer    Mmm.
32 Dept. Manager  But that this is. This is well. Because we..
33                ((gestures towards Participant E and me))
34                Kinda depending on the point of view the exactly
35                same word may mean quite different things. But I
36                think ((points at the slide)) what we may here
37                adopt as a way, well, to think about this. That
38                that in a way this map service is some kind of
39                a service where the end user.. It could be
40                in principle thought that, if this would work on
41                payment, then you would buy in the same way as you
42                buy the phone carrier plan and then you also check
43                ((makes a gesture in the air as if to draw a check
44                mark)) which options you will turn on with it. Shall
45                you turn the iPhone option on. Shall you take the web
46                option. And shall you take the multitouch option. And
47                shall you also take the map printing option.
48 I              ((I move to the flip chart and begin to write))
49 Dept. Manager  So in a way it is the service now what the
50                end user in a way experiences in this connection.
51 SW Engineer    Ye'
```

I began by saying (rows 01-02), "Map service means now here that we have one service." The first term, which comprises two words 'Map Service', is an expression of an open concept, since it refers to the particular map service being developed in the project. In the phrasing I emphasised that this 'map service' is 'one service'. The latter use of the term 'service' is made as part of the argument about their being just 'one' thing in focus. And this thing is of 'service' kind. Hence the latter term 'service' expresses the quality of the thing, and it invites participants to use their common knowledge of services to interpret the point.

By saying "As we are now talking about the design of a multichannel service," I expressed more details about the concept of service that is being developed. Now the thing that is discussed is a 'multichannel map service'. This talk is particularly interesting, since the thing that is being discussed is the thing-to-be-designed. It is expressed through the notions 'multichannel,' 'map,' and 'service.' Later (in Excerpt 16), it will become evident that the participants did not have shared knowledge about these notions, which were employed in the expressions of the concept here. This problem surfaces in the team's incapability to articulate the concept. They get stuck, and cannot resolve the situation without first reframing the way they understand the notion of multichannelness.

I said, "I would see in some way we have one core" (row 05), and contin-

ued, "we have one core service defined by some components. Those that are rolling in the core there" (rows 05-06). Here I changed the words used to refer to the thing-to-be-designed from 'multichannel service' into the 'multicomponent core'. I continued detailing the concept of 'components' by saying (rows 11-12), "There are some geoinformational specifications and processes". The expression "some [..] specifications and processes" is ambiguous and does not refer to anything in particular, nor does it help to describe the 'thing' in a shared way. On the contrary, it outlines the 'thing' under discussion as even more complex by adding the attributes 'geoinformational specifications and processes' to it.

After I had said (row 05) "one core," I made a ball-shaped gesture with my hands. This gesture can be interpreted as an illustration of two parts uniting into one, and thus supports the verbal point about there being 'one core'. When I stated (row 06) "service," I wiggled the ball shape. This expression can be seen to align with the spoken message by illustrating the core as a dynamic entity with processes inside.

As soon as I had used the more technical terms "geoinformational specifications and processes," SW Engineer began to talk (rows 12-13), "Now we have here this exactly. So we have the core then as a set". In Finnish, the original term that is here translated as "set" is "joukko". It could be translated into "group" as well. As soon as SW Engineer began to talk about the 'core as a set,' I released the ball gesture and started walking. It appeared as if the words by the SW Engineer would have physically shot down the gesture that symbolised the singular core that had just been articulated by me. SW Engineer continued to elaborate the core as "a set of terminologies," "a set of user interface components," and "a set of interfaces." Here he was developing the meaning of the same 'thing,' which now became expressed as a 'core which exists as a compound of sets'.

Now there were two competing definitions of the core, the 'one core service' defined by me, and the 'core which exists as a compound of sets' by SW Engineer. SW Engineer's proposal to see the core as a 'set' and further as a 'compound-of-sets' expressed the core in terms of a collection of multiple components. I was arguing for a view to see the core as a one unity.

The way the conflicting views were allowed to coexist in the situation is interesting. By dropping the gesture and by rising up instead of objecting to SW Engineer, I gave space for SW Engineer to articulate his view. This gave space also for the others in the situation to hear both views and join the construction of concepts, and thus, utilise the whole team as a resource. Dept. Manager raised his finger to indicate that he would like

to get a turn to speak (row 20), and I responded to this (rows 21-22) by changing my posture, facing and pointing at Dept. Manager.

Dept. Manager waited until sw Engineer had finished his explanation about how the idea of a single core was an impossible idea, "we cannot in any way use the same core" (rows 25-26). Dept. Manager began (rows 27-28), "So but well. Could we here now think. Or let's go. Let's back up a little." He made a quick gesture with his hand from right to left. This expression supported the idea of going back, since in the Finnish (and Western) culture the normal direction to proceed is from left to right.

Dept. Manager said, "This well the use of terminologies. This is totally terrible as it is so difficult. [..] the same word may mean quite different things" (rows 29-35). This turned the attention to the difficulties of approaching the dilemma of defining the core. Instead of making a statement for or against either of the presented views, he pulled the discussion towards a meta-level. He made the discussion itself the target of attention. With this rhetorical move he was able to avoid entering the disagreement and opened the discussion for approaching it from another perspective.

Dept. Manager then proposed, "what we may here adopt as a way, well, to think about this [..] in a way this map service is some kind of a service where the end user" (rows 36-39). Here he began to introduce the service from the point of view of the 'end user,' and elaborated how the user would use the service as analogous to how 'phone carrier plans' are used, "you would buy in the same way as you buy the phone carrier plan" (rows 41-42). Now, instead of talking about the 'core,' which had been just disputed, he was talking about the whole service.

Then Dept. Manager introduced interactive functionality to the system, "you also check which options you will turn on with it. Shall you turn the iPhone option on. Shall you take the web option. And shall you take the multitouch option. And shall you also take the map printing option" (rows 42-47). Dept. Manager expressed the whole service in a manner that accommodated the various parts that had been developed over the course of the project, i.e. the iPhone, the web 2.0, the MultiTouch wall, and the printed maps. Here he expressed these things-to-deal-with in a new guise, as 'options' that the end user could select.

Dept. Manager concluded his turn by stating, "So in a way it is the service now what the end user in a way experiences in this connection" (rows 49-50). The system became introduced as a whole perceived from the point of view of what the end user experiences. The multichannel map service gained here a new definition in terms of how users experience it.

Frames. Interaction took place in the form of talk and gesturing in Excerpt 13. I was talking first, and I used the ball-shaped gesture to support the point that the core of the map service should be thought of as one thing. sw Engineer responded by claiming that the idea of a single core is impossible. Both of us were expressing the core in two ways, which were fundamentally incommensurable. One would argue for multi-component core and the other about the core as a single service. Both sw Engineer and I were apparently working towards answering the sw Engineer's question that started the debate, "what do we mean by service here?" But this led into a situation, where one claims that there is a single core and the other claims that there cannot be one. The situation was moving towards a 'yes-no' impasse.

Luckily, Dept. Manager was sensitive to the form of the impasse. He turned attention to the problem of the various meanings of the same words, "Kinda depending on the point of view the exactly same word may mean quite different things" (rows 34-35). What is identifiable in Dept. Manager's comment is that sw Engineer and I were working in different frames, which were only partly overlapping.

I was experienced in concept design, and in the role of leading a session to crystallise the design concept of the multichannel service being designed. This professional domain produces design concepts that convey the essence of a product, service, or system in a simple manner. They are free from technical jargon, and are communicable across disciplines, (see Keinonen, 2006). Essentially a design concept needs to communicate what is the thing-to-be-designed. It is a single idea that needs to be understood and communicated as one whole. I was obviously working according to these principles in my articulation of the core, which, can be understood as the essence of something. So, based on what I knew about the service, and based on my professional expertise in concept design, I argued for what appeared as the sensible thing to do from the point of concept design, i.e. to see the service as a singular whole.

Sw Engineer, in turn, was arguing on the basis of what he knew about, developing software applications for mobile devices and for the web. On the basis of this knowledge he developed a view according to which the core should be understood in terms of "set of terminologies," "set of interface components," and "set of interfaces". Furthermore, he concluded that since the system is used in such diverse platforms as the web and mobile phone, it could not use the same technical core. This was a rational conclusion from the technological premises that he outlined.

On the basis of these two kinds of professional knowing, there existed two disparate agendas pursued by me and by sw Engineer. And these agendas were implicit in the way they talked about the core. If stated in terms of goals, sw Engineer was working towards ensuring that a technically appropriate definition of service is attained. I, in contrast, was working towards a description of the design concept that could be understood as a singular whole. The visibility of the different agendas was occluded by the use of the same words with different meanings in our articulation.

The comment "same word may mean quite different things" by Dept. Manager enabled the discussion to move on to a meta-level, which made the situation better visible to the participants. In addition to making the situation visible, Dept. Manager also suggested another way to talk about the service, in terms of how the users experience it. This enabled moving beyond the impasse and to continue towards a description of the service in terms of one united whole. Dept. Manager was able to re-frame how the design team talked about the thing-to-be-designed. And, since the re-framing was more about how to talk about the thing, i.e. which concepts are used for talking about the thing-to-be-designed, rather than about re-thinking the process to approach it, it makes sense to talk about *thematic re-framing*.

8.3. Proposing a three-part scheme to think about the whole

The following excerpt describes interactions two minutes after what was shown in Excerpt 13. It was again possible for the team to talk about the service as a whole, after Dept. Manager had proposed to talk about it in terms of how the user experiences the service. I took the next step in an attempt to define the whole more accurately, and asked the participants to think how the 'channels,' i.e. iPhone, web 2.0 etc. would relate to each other. I took a fresh flip chart sheet and the following discussion took place. The completed figure is shown after the excerpt in Figure 78.

Frame it simple! Excerpt 14

01 I I would see that we have [three (.) three things.
[I draw three intersecting circles on flip chart (Figure 63)

Figure 63.
I draw three intersecting circles (lines emphasised for visibility).

02 Or well these are well. Each of these use the same

03 data somehow. These now intersect [here. So
[I point at the Intersection (Figure 64)

Figure 64.
I point at the intersection of the circles.

04 [here is the, well, the [iPhone or..
[I move the pen above the top-left circle
[I write iPhone above the circle (Figure 65)

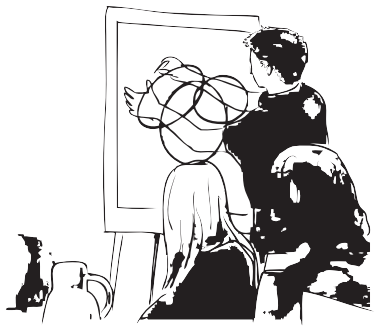

Figure 65.
I move the pen above the left-most circle and begin to write.

05 ((I lift both hands in the air, Figure 66))

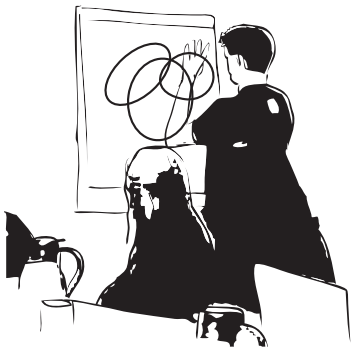

Figure 66.

06 Dept. Manager Mobile phone.

07 I iPhone, web, printout is kinda one whole.
((I write on the flip chart while I talk, Figure 67))

Figure 67.

08 I Then we have the imprint.. which is a kinda one-time
((I write imprint over the top-right circle, Figure 68))

Figure 68.

09 on-demand that is business-to-business kind of a
10 thing. And then we have, well
11 [this touch wall which is this kind of, well
[I write under the bottom-most circle (Figure 69)

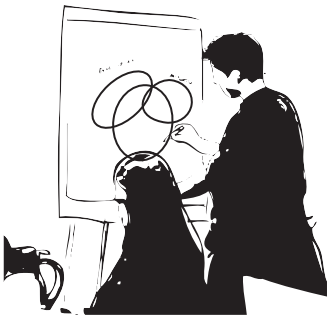

Figure 69.

12 public service.
13 ((I make a large circular gesture in front of the
drawing and leave index finger pointing, Figure 70))

Figure 70.

14 I So this kind of a whole.]
[I remove the pointing gesture
15 Then we have MenoMaps service [which in a way what
[I begin to draw a
dashed square around the
intersection (Figure 71)

Figure 71.

16 we are talking about well is this there at the

17 [centre
[I draw an arrow pointing at the intersection (Figure 72)

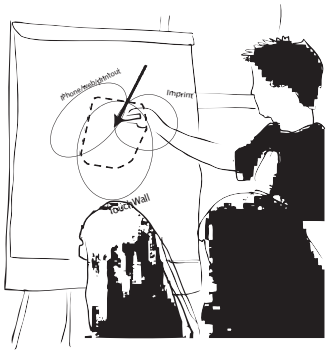

Figure 72.

18 where these intersect.

19 SW Engineer Well [
[SW Engineer raises his right hand
[Dept. Manager raises his right hand
[Participant D between them raises both hands behind his head

Figure 73. *SW Engineer and Dept. Manager raising a hand simultaneously.*

20 SW Engineer That [I
21 Dept. Manager [Wh'

22 SW Engineer was searching >That I was searching exac<
23 Dept. Manager Well=

24 SW Engineer =that what is here now [ ] these well
25 DeptManager [Aaa]

26 SW Engineer these sy' map symbols for example. The same=
27 I =common visual appearance

28 SW Engineer Exactly. Part[ ]icular
29 Proj. Manager [Same data sets]

30 SW Engineer user interface components. To a certain point at
31 least there are the same data sets. Exactly the
32 same cannot be. Exactly the same symbols cannot
33 be.
34 Proj. Manager In some way generalised
35 SW Engineer In general the same but, what does it mean with us

36 now [ ] here well now, well, map service? So..
37 Dept. Manager [But]

38 But my point of view was different (.) than
39 Salu's. I was thinking that the map
40 service is the sum of all these. Not the core.
41 (3.2)
42 Participant D All the way to the outer edges.

43 I So you would have, well, this kind of..
I draw a dashed line around the whole set of circles on the flip chart. (Figure 74)

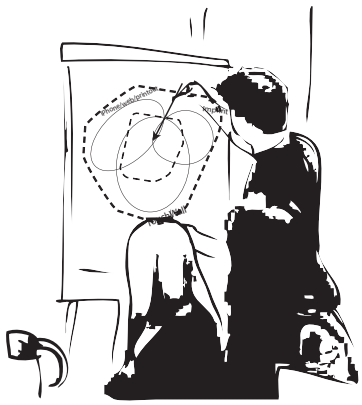

Figure 74.

44 Dept. Manager Exactly. That I tried to explain.

45 I So it is, well,[this?
I draw an arrow pointing at the outer edge (Figure 75)

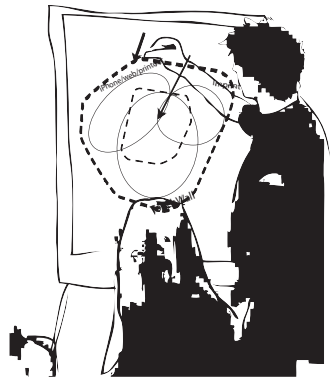

Figure 75.

46 or it is, well, [this?
[I emphasise the dashed square around
[the centre (Figure 76)

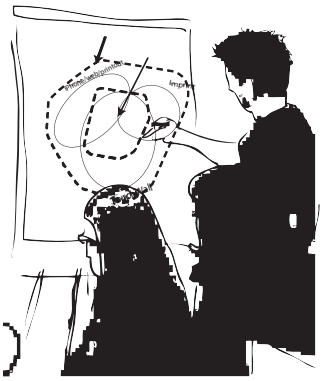

Figure 76.

47 Dept. Manager Well, I think that if, if we start um with the point
48 of view of our project plan. I think that, well,
49 in a way it is, well, without doubt this outer edge.
Points at the flip chart with his finger and makes a circular gesture with his finger (Figure 77)

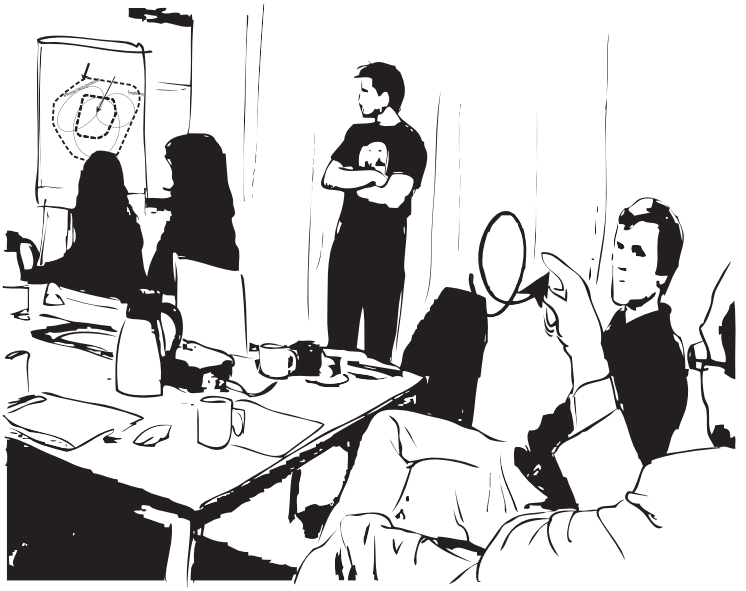

Figure 77.

50 Dept. Manager There is, well the..
51 Proj. Manager ((Swinging left and right on her seat)) All of
52 which together form a meta user interface to the
53 surrounding nature.

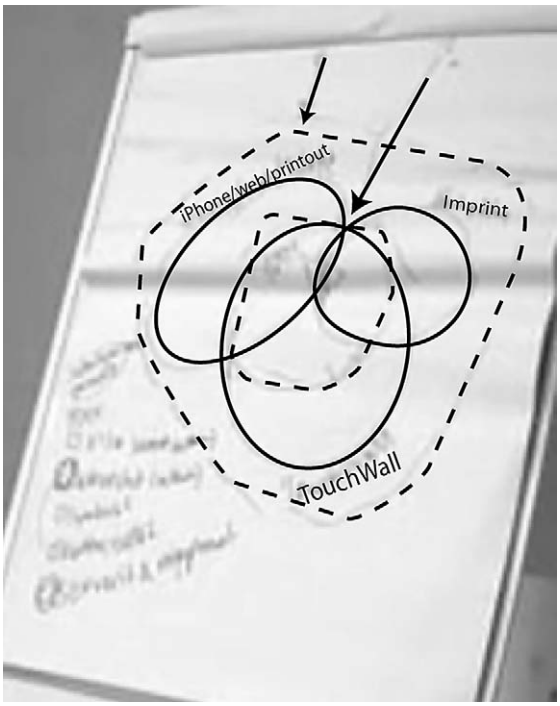

Figure 78.
A close-up view to the figures drawn on the flip chart.

I began by saying that "we have [..] three things" (on row 01) and by drawing three intersecting circles. These were persistent expressions of three 'things' that do not yet have any particular content assigned. They were just circles referring to some 'things' at this point. They were expressions of three open concepts, which would call for clarification. Then I pointed at the first circle and said, "here is the, well, the iPhone". The expression 'iPhone' could be interpreted on the basis of the common meaning of iPhone, but in this context, it could be interpreted also in a more specific manner, as feature of the system that is specific to this project. The latter interpretation is more likely, because in the set of the three figures, iPhone was assigned to one of the circles, rather than it being expressed as a discrete figurative image.

I ended the talk "iPhone or.." (row 04), paused, and lifted both hands up while still looking at the figure. Dept. Manager intervened here and said "Mobile Phone" (row 06), which is an expression of a broader category of things within which iPhone belongs. I, however, repeated "iPhone" and continued "web, printout is kinda one whole." So, I rejected the proposal by Dept. Manager, who proposed a more generic term for the mobile channel, and instead argued for the iPhone, web and printout to form

"one whole". I wrote the words "iPhone / web / printout" above the first circle on the flip chart, and thus made these expressions persistent. With this move a new 'thing' became introduced. It consisted of the channels 'iPhone,' 'web,' and 'printout.' The first circle became the persistent expression of this 'thing'.

The meaning of the first circle became more specific with these expressions. But was it now a closed concept? It is unlikely, since the concept did not yet have a singular name, but a collection of three names. In order to know if the concept became closed, evidence would be required of its treatment as such, i.e. it should be accepted as such and be used in constructive action.

What happened instead was that I moved forward to the next circle. "Then we have the imprint.." (row 08) and wrote the word 'imprint' on the flip chart above the third-drawn circle (on top-right). I continued, "kinda one-time on-demand.. business-to-business kind of a thing" (rows 09-10). These were additional characteristics associated to the concept of the next 'thing' that was expressed through the circle. These characteristics were specific to this concept of a 'thing' and differentiated it from the previously developed concept of a 'thing'.

By articulating the new 'whole' as the "imprint" the concept could have become closed. It would be a single concept, with a name and a persistent expression. However, in a similar manner as with the previous concept, in order to know if the concept became closed, evidence would be required of its treatment as such, i.e. it should be accepted as such and be used in constructive action.

I continued "this touch wall" (row 11) and wrote the text "touchwall" below the second-drawn circle (the bottommost). Here by means of talk and text I assigned meaning to the 'thing'. I stated, "this touch wall which is this kind of, well, public service" (rows 11-12). These were additional characteristics associated to the thing that was expressed with the circle. These characteristics were specific to this 'thing' and differentiated it from the previously developed two 'things'. By articulating the new 'thing' as the "touchwall" the concept can be argued to have become closed in the same manner as with the other two concepts above. All three 'things' that I had expressed, had now gained such a persistent expression, where different meanings were assigned to each of the circles.

The role of the circles in the visualisation became clear once I stated, "Then we have MenoMaps service which in a way what we are talking about well is this there at the centre, where these intersect." Now I utilised

the scheme that I had just articulated and the three concepts gained a new role in the expression of the thing-to-be-designed. Based on the rush of responses from the team, it is possible to interpret that the meaning of the 'things' became now well enough defined in order to facilitate constructive action on them.

As soon as I had expressed that MenoMaps service could be understood as the intersection of the components, which were expressed as the encircled 'things,' sw Engineer and Dept. Manager reacted both by raising their hand as if asking for a turn to speak. sw Engineer started "well" (row 19) and for a moment Dept. Manager and sw Engineer were talking on top of each other. Then sw Engineer stated, "map symbols for example. The same" (row 26), and I continued directly and added "common visual appearance" (rows 27). sw Engineer responded, "exactly," and continued adding the "particular user interface components". Project Manager inserted in-between (row 29) the "same data sets". Sw Engineer responded, "To a certain point at least there are the same data sets. Exactly the same cannot be" (rows 30-33). The participants of the situation started negotiating, which are the characteristics of the 'service,' if it is assumed to be defined as the intersection of the three 'wholes'.

Department Manager then intervened and said (rows 37-39), "But my point of view was different than Salu's. I was thinking that the map service is the sum of all these. Not the core." This stops the construction that the team had just begun with regards to the service being defined as the intersection of the 'things'. With the notion of 'core' Dept. Manager obviously referred to the intersection of the circles, and the imagined shared core between the three 'things'. By this move Dept. Manager started to contest my proposal to define MenoMaps service as the intersection of the three 'things'.

After a 3.2-second pause, I responded to this contestation by drawing a dashed line around the whole figure on the flip chart and said, "So you would have, well, this kind of.." (row 43), and Dept. Manager agreed by stating, "Exactly. That I tried to explain" (row 44). I then drew one arrow that pointed to the intersection of the circles, and another that pointed at the newly drawn dashed line around the whole figure. When I had finished the arrow pointing to the surrounding dashed line, I asked "So it is, well, this?" (row 45), and progressed to emphasise the dashed line around the intersection in the centre and asked, "Or it is, well, this?" (row 46). Now I had expressed two possible ways to define the 'MenoMaps service,' i.e. the thing-to-be-designed, along the figure on the flip chart. These com-

peting definitions expressed MenoMaps as intersection of the circles, and MenoMaps as the sum of all parts.

Dept. Manager then said, "Well, I think that if, if we start um with the point of view of our project plan. I think that, well, in a way it is, well, without doubt this outer edge" (rows 47-49), and he made a circular gesture with his index finger while pointing at the flip chart. The 'it' in the sentence, "it is, well, without doubt this outer edge," functions as a reference to definition of the MenoMaps service, and by the expression 'outer edge,' he expressed his stance to argue for defining it as a sum of all the parts. Project Manager said, "All of which together form a meta user interface to the surrounding nature". This was a direct quote from the project plan.

Frames. Excerpt 14 is part of a longer situation where the team is discussing how to talk about the MenoMaps service. The interaction started after the team had considered the proposal by Dept. Manager to think about the service in terms of how users experience it. I expressed that I would "see that we have three [..] things," and drew three intersecting circles. Through my position at the flip chart, orientation towards the chart, through my acts of drawing, and through my indexical talk, e.g. by referring to "each of these" (row 02) and "intersect here" (row 03), I had assigned a dedicated target for externalising thinking, i.e. the semiotic surface for expressing persistent figures. I was also talking about what I was drawing, thus introducing particular hints for the participants on how the figures could be interpreted.

By introducing the 'three things' and by beginning to articulate these, I set a new frame, and moved into it, i.e. started to do communicational work according to it. The material interaction was oriented to developing a persistent visual expression of the service on the flip chart. The use of conceptual entities, such as 'iPhone,' 'web,' and 'printout,' was aligned to clarifying the meaning of figure on the flip chart.

During the interactions the 'things' were constructed with the assistance of such things-to-deal-with that the participants of the situation were familiar with. This was done by first introducing the three 'things' and then assigning particular things-to-deal-with (iphone, web, printout, imprint and multitouch) to them. Through this, the 'things' gained a more specific meaning and were differentiated from each other. The 'things' were expressed in the form circles on the flip chart, and they were employed to define MenoMaps service, "MenoMaps service [..] is this there at the centre" (rows 15-17). I defined MenoMaps as the intersection of the circles.

This sparked discussion about what the shared part of the circles would contain. An interesting detail in the way that the participants talked about the things at the centre was the use of adverbs in their talk. For each of the things they introduced in the centre, they accompanied the introduced thing with an adverb, such as 'same,' 'common,' and 'particular, in their talk "*common* visual appearance" (row 27), "*particular* user interface components," (rows 28-30), and "*same* data sets" (row 29). Now, as the participants were expressing what the three parts of the whole service share at the intersection, the adverbs function to specify the reason why the things that they propose into the centre would be shared across the parts of the service.

This talk, however, led into a discussion resembling the technical talk that had led into the 'yes-no' impasse earlier (in Excerpt 13). Dept. Manager intervened and introduced a competing way to define the MenoMaps service. He argued that the MenoMaps service should be seen as a *sum* of all the components (or the 'union' of the components), and Project Manager recalled a passage from the project plan that supported this argument. In the situation there were two ways for the team to see the MenoMaps service: MenoMaps as an intersection and MenoMaps as a union.

Intersection is a term that suggests exploring what the things are that intersect, whereas union proposes an exploration of the qualities of the whole that emerges out of merging the parts. This may have significant implications to provide a detour around the looming impasse that was already faced above in Excerpt 13 where I and sw Engineer discussed what the core is.

In sum, the goal of the interaction in Excerpt 14 appeared to be that of constructing a shared way to talk about the MenoMaps service. Two contesting proposals were constructed.

Framing strategies. I made a strategic change in the process by proposing to approach the definition of the multichannel service or the 'core' in terms of three 'things'. This move generated an overall three-fold scheme, which guided the making of the next moves towards the definition. I followed this scheme and expressed the core then as the intersection of the parts. This kind of re-framing also took place in the Urban Planning project, where the process to generate the 'alternatives' was re-figured once the initial approach was recognised ineffective for the purpose. This kind of re-framing is identified in the present study as *strategic re-framing* as it results in a new principled way of generating goals.

There was also another framing strategy visible in the situation. In Excerpt 14, as well as in Excerpt 13, two competing definitions were allowed to co-exist. In both situations the two definitions were allowed to be expressed in full, i.e. they were not shot down by me nor the others in the situation before they were expressed in a complete-enough form to allow their consideration as rightful candidates for action. Only then did the team made judgments about which one is the best way to think about the thing-to-be-designed.

8.4. Re-articulating the three-part scheme

After Excerpt 14, the discussion moved back to consider what is shared across the different parts of the system, i.e. iPhone, web, printout, touchwall, and imprint. I continued listing connecting elements on the flip chart beside the encircled expression of the core on the flip chart. The elements that were listed were: 'visually same,' 'same data sets,' 'same symbols,' 'map contents.' Once these had been listed, Department Manager said that 'visually same' is "actually nothing." The team stopped to listen.

Dept. Manager began to argue that visual similarity is not part of the core, but instead a principle according to which the whole is constructed. After I asked him to explicate what he would think to be the core, he stated "data sets," and "servers and interfaces." He said that these "clearly belong to the core," but that the "visual appearance of the contents" as well as the "user interface" were matters of making decisions about implementing things in a certain way. In the discussion, the team realised that it was also a matter of making a decision to use the same data sets across different applications. This discussion led into the situation, which is analysed below.

Excerpt 15

```
01 Dept. Manager  What do we mean by the word core?
02 SW Engineer    Because this has, this has come into my mind.
03                Because everything else I have released
04                completely. So that I don't think web application
05                at all. Those that I don't think needs to be the
06                core here. In a way. If it is not necessary that
07                the styling of symbols is the same, then
08                there can be in principle comple::tely different.
09                Thoroughly different.
10 Dept. Manager  Yes yes but
11 SW Engineer    Well, if we don't need to make the user interface
12                then we are completely free to create.. At this
13                moment I have been waiting for when do we get
14                the decision about the styling of the user
```

interface, that we take it. And if it does not belong to the core, then we are free to decide in the web application to use something else. It will not be associated as the same through it.

I We:ll. [One possible way to try to see the issue
I open a blank flip chart sheet

So, well, [we have here a user.
I draw a stick figure and labels it “user”,
(Figure 79)

Figure 79.

Then we have here, well. [We have here a computing
I draw another stick figure and
labels it as “Software engineer”
(Figure 80)

engineer

Figure 80.

who can make software like hell. Then we have a

24 cartographer [or kinda geodesist.
I draw third stick figure on the flip chart (Figure 81)

Figure 81.

25 Dept. Manager Or.. Decide which one.
((team laughing))
26 Participant A Choose now correctly. ((team laughing)) So which
27 one?
28 I Cart.. A person who understands geospatial
29 information, who.. You tell me.. Well, my point is
30 that in a way the core may be defined differently
31 [in the eyes of these actors.
I move my hand in front of the figures, see Figure 82

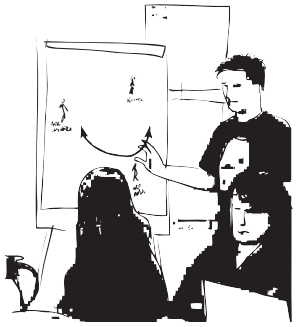

Figure 82.

32 I And well for [the user what he or she experiences as
I tap on the figure with the text 'user', see Figure 83

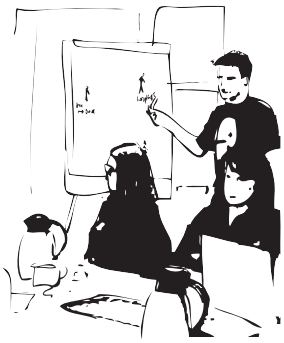

Figure 83.

the service or the service concept comes from what he/she perceives visually. Kinda brand identity and what is connected to it. These kinds of principles of visual similarity. And principles for interaction and simplicity. And principles of ecologicalness or socialness, or principle of openness. Whatever principle there is that affects the user's interaction. [Then we have the principles that
I point at the figure with the text "Software engineer", Figure 84

Figure 84.

affect the software engineer. So that what are the data base platforms that are used. Which formats are being played with. Which interfaces are being played with. That he/she has completely his own this, well, [window to the [issue.
I draw a slanted square beside the "software engineer" character, see Figure 85
I draw another slanted square beside the "user", Figure 85 (right)

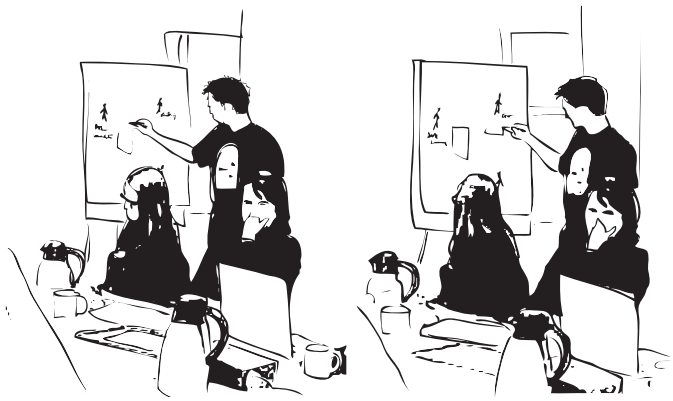

Figure 85.

```
46 I            And then we have this (.) ⌈ geoperson.
                                          | I draw third slanted square
                                          ⌊ beside the "geoperson", Figure 86.
```

Figure 86.

```
47 Dept.Manager Well
48 I            Who then looks at the principles of modelling the
49              geospatial information. (cont.)
```

The discussion in Excerpt 15 was triggered by Dept. Manager's question (row 01), "What do we mean by the word core?" The meaning of the term 'core' was explicitly questioned, and thus it was treated as an open concept here. sw Engineer responded (rows 02-04), "Because this has, this has come into my mind. Because everything else I have released completely." There are two potential ways to understand the reference that sw Engineer makes with the word 'this'; as a reference to 'the following that I will say' or as a reference to 'the idea of core'. The latter of these is the reference, which interpretation is justified on the basis of the other talk that sw Engineer produces during his talk until row 19. sw Engineer built an argument that the idea of 'core' is a matter of making decisions, which can be interpreted in his talk (rows 15-16), "if it does not belong to the core, then we are free to decide". He expressed 'styling of symbols' and 'styling of user interface' amongst the things that could be freely decided, if they would not belong to the 'core'.

I took over and stated (row 19), "One possible way to try to see the issue," and began to draw on a fresh flip sheet on which I drew a stick figure of a man and said, "So that we have here a user." 'User' is a generic term that does not refer to anything particular in the project. Similarly I drew the 'software engineer' and 'geo-person,' which are ambiguous characters. I used these in building an argument that (rows 30-31), "the core may be defined differently in the eyes of these actors." Then I described the relation of these 'actors' to the service by outlining 'principles' that characterise each actor's relationship with the system.

About the user I said (rows 33-35): "the service or the service concept comes from what he/she perceives visually. Kinda brand identity and what is connected to it." I expressed the 'principles' characterising user's relation to the system (rows 35-40): "These kinds of principles of visual similarity. And principles for interaction and simplicity. And principles of ecologicalness or socialness, or principle of openness. Whatever principle there is that affects the user's interaction."

I characterised the other two 'actors' in the picture in a similar vein, and I underlined the 'principles' governing the relationships of these actors with the system. "Then we have the principles that affect the software engineer. So that what are the data base platforms that are used. Which formats are being played with. Which interfaces are being played with" (rows 40-44). "And then we have this geoperson. Who then looks at the principles of modelling the geospatial information."

During the explanation of how the 'actors' relate to the system, I introduced a new element in my explanation. It was the idea of 'window'. I concluded the explanation about the 'software engineer' that "he/she has completely his own this, well, window to the issue". I also drew a slanted square beside the 'software engineer' figure on the sheet.

What is the conceptual work that the 'window' metaphor and its expression on the sheet do in the situation? By drawing the 'windows' between each of the 'actors' and the centre I made an argument that the actors are looking into the system from different angles, and they may perceive and experience it in quite differing ways. "The core may be defined differently in the eyes of these actors" (rows 30-31), as I put it.

Frames. The interactions began as Dept. Manager asked (row 01), "What do we mean by the word core?" A question may be used to set a frame, and thus it may mark a frame-change. Here the response by SW Engineer supports the interpretation that the team was entering a frame that is associated with a goal to 'clarify the meaning of the word core'. However, before concluding that this goal was actually effective in the situation, a consideration of the action that followed is necessary.

sw Engineer explained how he had experienced problems because the core had not been clearly specified in the project. He articulated how he did not "think web application at all," and how the "styling of symbols" and "styling of the user interface" could be created completely freely, if they did not belong to the core. Rather than being an answer to Dept. Manager's question, the talk by sw Engineer contributed to emphasising the

importance of the definition of what the core means, and thus motivating the work to develop an answer to the question.

I introduced another way to talk about the core. I sketched a picture with three actors – a user, a software engineer, and a geo-person – who would perceive the system differently. These expressions could be thought of as building blocks of a new way to talk about the idea of the core, and thus it is possible to argue that I redefined the context for talking about the core. I reframed the discussion from a debate about technical components into the realm of how different people experience the system. This was essentially the same move that Dept. Manager made earlier in Excerpt 13, when he urged the team to discuss the service in terms of how the 'end-users' experience it rather than discussing technical details. Now I expanded this view by bringing the two other 'actors' into the picture in addition to the 'user'.

It can be argued that a frame-transition is taking place over the actions described in Excerpt 14. The goal to define the 'core' is introduced, and it is motivated by what sw Engineer stated. However, nobody is defining the core but rather a new approach towards that definition is proposed. During this, new concepts such as 'software engineer,' 'geo-person' and 'window,' were introduced.

8.5. Re-framing into meta-level

Excerpt 16 continues right after Excerpt 15. During it Dept. Manager questions the purpose of the whole discussion, and this leads the enquiry into one of the most central notions in the whole project, the idea of 'multichannel'. The definition of a multichannel service presumes that the idea of multichannel is understood. In the following the team moves into defining the notion of multichannel, which is a generic concept that may also characterise services other than the presently planned one.

Excerpt 16

```
01 Dept.Manager (cont.) Could you tell that.. Could you still tell,
02              well (.) What you are saying is, well, quite ok
03              but well (.) Why are we now having this
04              conversation?
05 I            We are having this conversation so that we can
06              articulate our MenoMaps multichannel service.
07              ((spreads his arms wide open))
08              As simple as that.
09              What is MenoMaps multichannel service.
10 Dept.Manager Mmm.
```

11 I And [this articulation here is helping us, so that
[I place my hand on the flip chart (Figure 87)

Figure 87.

12 we can say aloud what we are here doing here
13 as simply and understandably as possible.
14 Dept. Manager Well th's this. Let us stop here really for ten
15 minutes or for a half an hour.
.. (discussion about availability of time omitted) ..
16 Dept. Manager Because this is in a way quite good question that
17 that what is generally in the world meant when
18 people talk about some multichannel service or
19 multichannelness. Terribly fuzzy concept. I
20 dunno
21 Proj. Manager [when you put into Goo, well, put it into Google
22 Dept. Manager [if anybody has defined it.
23 Proj. Manager it throws our project from there first.
24 Go and try.
25 Dept. Manager And then there are some synonyms for it. So that
26 is it just a multi, multi, channel but
27 I This is pointing to us making a ground braking
28 research.
29 Proj. Manager Yes.
30 Dept. Manager Well, in a way we may have a multichannel service
31 and we can for example decide that for each
32 channel we give completely different visual
33 appearance. It is, in spite of all this well, a
34 multichannel service.
35 I Yeah it has a common principle.
36 Dept. Manager And for that reason I raised this visual
37 appearance, well, on a different level. But that
38 no.. It is difficult to think that it is a
39 multichannel service if it lacks shared contents.
40 So that multichannelservice. That, of that central

```
41                principle.. I think it includes the idea that
42                we have common contents. And those are wanted to
43                be (.) shared.
44 Proj. Manager   But then if all the channels have been branded
45                according to the same visual principle, it is a
46                recognisable whole to the user.
47 Dept. Manager   So th' in principle there is the MenoMaps logo in
48                every place. So that it is the
49 Participant A    But could it be imagined that the binding factor
50                would be visual appearance? On the background
51                there would be different data sets. It would have
52                to be thought if that would still be a
53                multichannel. So that in a way.. no. It is
54                difficult to invent an example about this.
55 Dept. Manager   Try at least. So that if you can find out, well,
56                an example for this, then good. I, I, the - when the
57                project plan was being made, well, I did some
58                browsing that what is meant by multichannelness.
59                And I think that if you choose for example Hesari
60                (a newspaper), so Hesari is also thinking this
61                multichannelness, that, because, paper is dying
62                and web has come and mobiles are coming. How do
63                you live in this?
```

The interaction starts by Dept. Manager's question about the purpose of the discussion: "Why are we now having this conversation?" I replied, "we are having this conversation so that we can articulate our MenoMaps multichannel service" (rows 05-06). MenoMaps is the thing-to-be-designed, and it is an open concept, since its meaning is currently being negotiated. I also referred to the expressions on the flip chart by pointing and placing my hand on it: "This articulation here is helping us, so that we can say aloud what we are here doing here as simply and understandably as possible."

Dept. Manager responded to this by urging "Let us stop here really for ten minutes or for a half an hour". He then introduced the notion of 'multichannelness' (rows 16-19), "Because this is in a way quite good question that that what is generally in the world meant when people talk about some multichannel service or multichannelness. Terribly fuzzy concept". The notion 'multichannelness' is here treated explicitly as an open concept.

Project Manager gave an example that if the multichannel service is typed (in Finnish) into Google the MenoMaps project appears first. The anecdote about Google, supports Dept. Manager's expressed doubt about the issue if anybody has defined the concept of multichannelness. Dept. Manager added that, "And then there are some synonyms for it" (row 25). These turns contributed to the argument that multichannelness is indeed

a "terribly fuzzy" concept, and that there is little hope of discovering a ready-made definition for it.

Then Dept. Manager began to argue that visual appearance cannot be the defining factor for a multichannel service, "we can for example decide that for each channel we give completely different visual appearance" (30-33). The 'visual appearance' became here a *topical aspect* of the system. It is not a 'thing' to refer to, but it is a quality, or characteristic of the system. A moment later Dept. Manager topicalised the issue of 'shared contents' in the same way (38-39), "It is difficult to think that it is a multichannel service if it lacks shared contents." I related this to my own earlier topicalisation of principles (in Excerpt 15) by stating (row 35) "it has a common principle" and Dept. Manager continued on this (rows 40-42), "of that central principle.. I think it includes the idea that we have common contents".

The word 'principle' is stated many times over Excerpt 15 and Excerpt 16. This is, however, the first time it is mentioned in the form 'central principle'. The concept of the 'central principle' was expressed and opened.

Project Manager then stated that visual appearance could actually be the defining factor for multichannelness, and a Participant A joined in the discussion (rows 49-50), "But could it be imagined that the binding factor would be visual appearance?" Here Participant A introduced the notion of 'binding factor'. This is interpreted as a re-articulation of what I expressed earlier in the form of 'principle'. For example, I had earlier stated (Excerpt 15, rows 35-36), "These kinds of principles of visual similarity," when talking about how users perceive the system. Participant A is here apparently referring to a principle of visual similarity but with the words 'binding factor'.

Participant A continued to elaborate the situation, where visual similarity would be used as the binding factor (rows 50-52), "On the background there would be different data sets. It would have to be thought if that would still be a multichannel". The notion of 'data sets' is expressed here again (It was earlier discussed e.g. in Excerpt 13).

Dept. Manager encouraged Participant A to explore such a possibility. He continued by reporting an anecdote about his personal experience (rows 56-58), "when the project plan was being made, well, I did some browsing that what is meant by multichannelness". He mentioned a local newspaper Hesari, which is assumed to be shared knowledge within the team. He argued that the topic of multichannelness is also timely from the point of view of publishing organisations.

Frames. When Dept. Manager asked, "Why are we now having this conversation?" he did not address the content of the discourse, but rather, addressed the discourse itself. It was a reflexive statement. Attention was turned on the goal of the interactions and on the justifications for investing effort in this activity. The impact of this question for the interactions was dramatic.

I stopped re-articulating the semiotic resources developed in the previous excerpt. Rather than referring to them I made a reference to the flip chart, but not in reference to what the content is. I referred to it as an "articulation" and argued that it was helping to attain the purpose of the session. I re-stated the goal of the session as the explication of a simple and understandable description of MenoMaps multichannel service (rows 05-13), "We are having this conversation so that we can articulate our MenoMaps multichannel service. As simple as that. What is MenoMaps multichannel service [..] as simply and understandably as possible". This provoked Dept. Manager to call the whole planning to a stop on the issue of multichannelness.

By turning the attention to the justifications of the activity itself, Dept. Manager was able to instigate a move into a meta-frame. This move is reflected in my actions. I made articulations and used semiotic resources aligned with a goal to "explain the goal of the session" and to "give justifications for the current activity." Action continued on the meta-level when Dept. Manager stated (rows 14-15), "Let us stop here really for ten minutes or for a half an hour." He again addressed the situation itself, i.e. the organisation of the activity, rather than contributed to the development of content about the thing-to-be-designed.

This triggered a discussion about how much the team has time to spend on the issue, and the team worked on this meta-level frame discussing about the organisation of the activity until Dept. Manager returned to the content of the concept design (row 16), "Because this is in a way quite good question that that what is generally in the world meant when people talk about some multichannel service or multichannelness. Terribly fuzzy concept." Here Dept. Manager works to set another frame, which led way from the meta-level discussion. This new frame was aligned to the goal of articulating the meaning of multichannelness.

Dept. Manager exposed background information about the difficulties he had faced with the notion of multichannelness, and he reveals doubt if there exists any common definition of multichannelness (rows 19-22), "I dunno if anybody has defined it". Project Manager's statement about the

Google search providing only the present project (MenoMaps) as the first entry supported the argument that nobody has defined the notion, in case this project team does not have a good definition for it. And, based on the discussion it is apparent that the team does not really have a definition for what is a 'multichannel'. This may be surprising because the project team has worked already more than 1.5 years in developing a multichannel service.

Then Dept. Manager began to develop the topic of multichannelness (rows 38-40), "It is difficult to think that it is a multichannel service if it lacks shared contents". This confirms that the frame-setting was successful. Talk-work was being conducted within the frame that Dept. Manager attempted to set to attain the goal to 'articulate the meaning of multichannelness'. The other participants of the situation also joined the construction in this frame. Project Manager argued that the visual appearance that Dept. Manager had topicalised in his talk might have a central role in multichannelness. One of the Participants supported this and suggested that it could also be thought that the visual appearance might be the "binding factor". The discussion then moved into an exploration of concrete examples of this. Dept. Manager presents an example about a newspaper.

In sum, a new frame was proposed by Dept. Manager. It became further motivated and then adopted by the team, who conducted work according to it, i.e. using related concepts and working towards attaining its associated goal. The activity was mainly talk-work where the role of material interaction for conceptual construction is peripheral. Thus it was not analysed in detail.

Framing Strategy. Excerpt 16 displays a two-fold re-framing. First, once Dept. Manager has expressed the need to discuss what a multichannel is, the discussion moved thematically into another level. Second, the team began to talk about multichannelness in such a way that would not only define the present service, but all multichannel services and products in general. In this discussion the thing-to-be-designed is actually the concept of multichannelness rather than the MenoMaps multichannel service. The thing-to-be-designed is switched into a one-step more generic thing. I shall call this change a conceptual re-framing, since the concept that is being designed is essentially changed. The switch of the thing-to-be-designed, from MenoMaps service to multichannelness, also results in changes with regards to conceptual entities resorted to in the discussion. Now, rather than talking about the parts of the MenoMaps service, the

team is discussing about alternative services that could be thought of as multichannel services.

Thirdly, once the thing-to-be-designed and the conceptual entities that are resorted to are changed, the goal structure of the activity becomes modified as well. Now the team is actively searching for and expressing alternative multichannel services and trying to discover defining factors for a multichannel service rather than specifying MenoMaps design concept directly. Hence, the re-framing was also strategic, as it influenced how goals were generated.

8.6. Discovering multichannelness

The following excerpt displays a situation that happened 30 seconds after the previous one. Now the team begins to consider an existing service and start to analyse if it was a multichannel service. Through this example the team is able to spell out in detail how the different aspects of that system would be perceived in the eyes of the 'persons,' i.e. Software Engineer, User, and Geo-Person that are still visible on the flip chart. In the following excerpt the team uses terms "technical implementation, content implementation and identifiability implementation" for the very first time. These topics will be later refined into a definition of a channel as an information instrument that has a recognisable "functional, technical and substantial identity".

Excerpt 17

01 Dept. Manager Just as [Participant D brought up this good
[Points at the Participant D, see Figure 88

Figure 88.

02 example. Actually Google's map realm is, well,
03 in many ways multichannelled.
04 I Mmm.
05 Dept. Manager So that we wel' There is Google Earth existing.
06 There is maps.google.com to it. And this.. On the
07 other hand on my iPhone I have Google's maps. And
08 and you can with a Nokia or mobile take, what is
09 it, the gmaps, or something like this. It is
10 really a multichannel service. It has the same..
11 I [So what everything.. Which? If you would define
[I point at the flip chart, see Figure 89.

Figure 89.

12 this Google. If we take this kind of example..
13 [Could into these?
[I move hand over the character figures on the flip, see Figure 90.

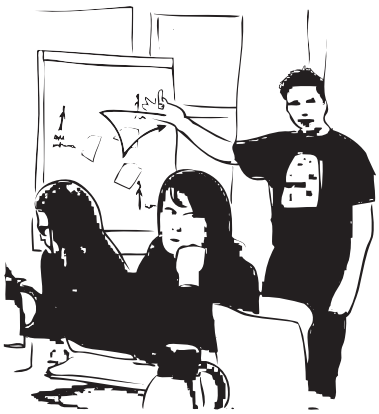

Figure 90.

14 So, this kind of [technical implementation,
I make a gesture over the Software Engineer character at the flip chart, see Figure 91.

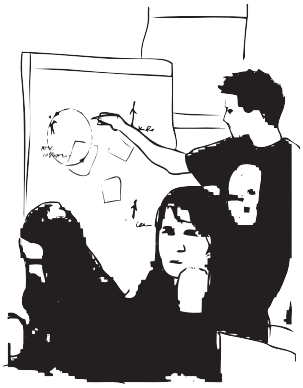

Figure 91.

15 [substantial implementation
I make a gesture over the Geo-Person character at the flip chart, see Figure 92.

Figure 92.

16 and [this identifiability implementation?
I make a gesture over the User character at the flip chart, see Figure 93.

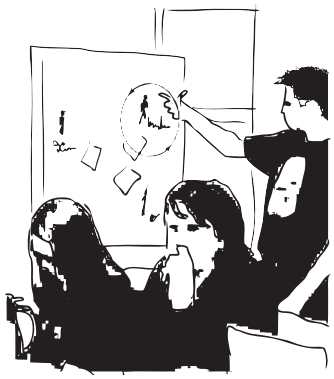

Figure 93.

17 Dept.Manager Well, there actually is, well. There comes. I
18 don't know it so deeply, or.. But that there are
19 the same, the same. Let us focus on Google maps.
20 So definitely you get, well, the same maps, the
21 same maps. The same maps and these maps have, um,
22 partly the same appearance. So that on my iPhone
23 these Google maps look quite alike the the
24 maps.google. As we move to Google Earth, then this
25 does not hold anymore.
26 I Yeah.
27 Dept.Manager And which
28 I [This, technical principles?
[I point at the slanted rectangle beside the Software Engineer figure on the flip chart (Figure 94).
29 Proj.Manager [In our slang it means presentation technique.

Figure 94.

30 Dept.Manager Those are partly the same interfaces back there. So,
31 yes they use the same, well, are used. The same
32 map projections are utilised through and through.
((I write on the flip))

-- (omitting part of the discussion) -

33 I So, well, [these kinds of things, what new came
[I point at the User figure on the flip chart, Figure 95

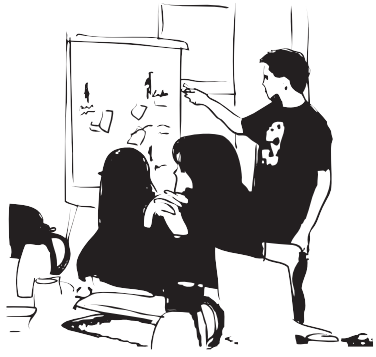

Figure 95.

from the explanation by Dept. Manager in connection to Google example. That there is the same visual appearance. It can be recognised. Google has a particular kind of simplification. Particular kinds of tones in those maps that they use. Particular kind of softening on the edges. And so on. So that they immediately look like Google maps.
Downloading.. This is in a way..

SW Engineer: You can write there.. ((inaudible))

I: [I will write here that downloads fast. So Google
[I move to write on the flip chart, see Figure 96

Figure 96.

has the principle, as it is a nerd-based company. Technically it functions well as hell. It functions on every platform. For example the

[functioning is this kind of technical. So this.
[I write on the flip chart near the Software Engineer character, see Figure 97.

Figure 97.

Frame it simple! -- *(omitting part of the discussion)* -

49 I [Substantially, they've the same maps.. In general,
[I point at the Geo-person character, see Figure 98.

Figure 98.

50 at least. And the same map projections.

The interaction begins with Dept. Manager saying, "Just as Participant D brought up this good example" (row 01). The words "this good example" express a particular 'thing' which is not yet specifically stated. It is ambiguous in that 'this' can refer to anything in particular, as he was not pointing at any persistent expressions about any ideas presented so far, e.g. on the flip chart, but was pointing at Participant D. It functions as an open concept, and such forms an expectation for clarification, and this expectation is fulfilled by the next words of Dept. Manager "Actually Google's maps realm is, well, in many ways multichannelled." Now it became pronounced that "this good example" was an expression of 'Google's maps'.

Then Dept. Manager articulates the names of a number of concepts "Google Earth," "maps.google.com," "iPhone's Google maps," and "gmaps". These are treated as closed concepts, as they are just accepted for use and presentation, rather than questioned and changed in their meaning. The statement after enumerating these concepts by Dept. Manager "it is really a multichannel service" (rows 09-10) suggests that he was exemplifying "Google's maps" as a multichannel service.

I asked Dept. Manager to state the Google example in terms of the scheme, which is visible on the flip chart, "If you would define this Google [..] So, this kind of technical implementation, substantial implementation, and this identifiability implementation?" (rows 11-13). While stating this I also pointed at the figures expressing the 'Software Engineer,' 'Geo-Person,' and 'User' on the sheet.

This situation is interesting from the point of view of concepts. The Google example is a closed concept as are the concepts of the 'persons' expressed on the flip chart. These are not being questioned or changed, but they are accepted for the construction of further meanings. What is open at the moment is the way the Google example relates to the expressed points of view of the 'persons' on the flip chart.

Dept. Manager argued (rows 20-21), "So definitely you get, well, the same maps, the same maps". The idea of 'same maps' is introduced here. It is not a closed concept, since it does not refer to any concrete 'thing,' but rather to a principle of sameness that connects some maps. It is an aspect of the system that becomes topicalised. Topical aspects were also considered earlier, in Excerpt 16. Dept. Manager continues "partly the same appearance" (row 22). This is also a topicalised aspect of the system as well as the "partly the same interfaces back there" (row 30) and the "same map projections" that "are utilised through and through" (rows 31-32). These are all topicalised aspects of the system rather than concepts. I made notes on the flip chart.

I then rearticulated the "things what now came from the explanation by Dept. Manager in connection to Google example" (rows 35-36). The first thing that I mentioned was "the same visual appearance" (rows 36-37). This was an expression of a topicalised aspect of the system. The next things that I listed were not exactly according to what Dept. Manager explained, but rather, transformed re-articulation with some added content: "Google has a particular kind of simplification. Particular kinds of tones in those maps that they use. Particular kind of softening on the edges" (rows 38-40). These are details that elaborate the idea of same visual appearance.

I progressed then to the technical aspects of the system (row 44), "downloads fast" and (row 47), "functions on every platform" are new elaborations that I introduced. These are topicalised aspects, or features, of the system. While pointing at the figure of the 'Geo-Person' I said (row 49), "Substantially, they've the same maps". Here I re-stated the issue of 'same maps' that was topicalised by Dept. Manager. I also re-stated "the same map projections" that Dept. Manager had introduced (rows 31-32).

Frames. The interaction in Excerpt 17 happened after a discussion, which ensued after Dept. Manager had urged the team to stop to think about what is meant by the term multichannelness. The team was still working towards the clarification, and had moved to explore concrete examples after one of the participants had reported that he had difficulties in finding a concrete example for a service combined by visual similarity, and not by technical similarity.

Dept. Manager drew attention to the Google example (rows 01-02), "this good example. Actually Google's map realm is, well, in many ways multichannelled". This is aligned with the goal to search for concrete examples. He introduced the concepts of Google Earth, maps.google.com, iPhone maps, and gmaps, which were parts of a broader 'thing,' i.e. the example of Google's maps. It is important to pay attention here to the aspect that by introducing the Google maps as a 'good example,' Dept. Manager introduces it *as* an example of a *multichannel service*.

I then explicitly asked Dept. Manager to consider the Google map example as an example of a multichannel service in the manner that a multichannel service had been earlier in the situation expressed on the flip chart, "this kind of technical implementation, substantial implementation and this identifiability implementation?" (rows 14-16). This question is also aligned with the goal to explore concrete examples. The question proposed a particular conceptual structure for the exploration and thus contributed to making the goal more clearly structured. The chosen words 'technical implementation,' 'substantial implementation,' and 'identifiability implementation' were also one way in which I made the investigation more formal, as compared to the original expressions of these aspects as the 'computing engineer,' 'geoperson,' and 'user' on the flip chart.

After Dept. Manager expressed how he saw Google maps as an example of multichannel service, I summarised and re-articulated what I had heard Dept. Manager saying, "So, well, these kinds of things, what new came from the explanation by Dept. Manager". In my re-articulation I used words, such as "visual appearance," "simplification," and "tones," which were not part of Dept. Manager's original talk. I elaborated the earlier talk and added details that supported the three perspectives that I had asked Dept. Manager to clarify. Instead of talking about 'same maps,' I talked about visual appearance, technical implementation, and the contents that are used in the different map presentations.

The conceptual work to '*see as*' played an important role for the conceptual development that was happening through Excerpt 17. The Google

maps example was investigated as an example of a multichannel service. The framework that was drawn on the flip chart highlighted particular aspects of the entities considered as channels, especially those related to the 'software engineer,' 'geo-person,' and 'user,' and by doing so, these aspects were also highlighted in the Google maps example.

Framing strategies. Two kinds of framing strategies can be identified in Excerpt 17: 1) the use of a template, and 2) the use of re-articulation. The use of the template, which is drawn on the flip chart, enables the transformation of the activity from free exploration of random aspects of the Google maps example to a structured investigation of three specified perspectives. During the re-articulation, all the three identified aspects of multichannel services were expressed from the point of view of the investigated example.

8.7. Finalising the concept

The team worked to still elaborate the Google Maps example further. Issues such as diversified contents for different channels were identified. The basic data sets were considered to be the same across the maps. However, some differences were identified across Google's map channels. For example, it is possible to get a map of Mars on one channel, but not in another. OpenStreetMaps was also considered as an example of a multichannel service. The relationship of the data sets and visual appearance in the OpenStreetMaps example was considered, together with the fact that there is no solid organisation behind these maps. The 'shared data sets' was considered as the binding factor in the case of OpenStreetMaps. The fact that there are many people providing different intermittent services to the OpenStreetMaps was considered as a challenge in considering it as a multichannel service.

I then returned to the computer, which was still displaying the slide with the 'Name,' 'Core Purpose,' and 'Design Drivers'. I asked if the team should completely omit using the term 'service' from the name of the "MenoMaps Multichannel Service" concept. After several suggestions, such as "MenoMaps publishing," the team decided to omit all the rest from the name of the concept, and leave only the term "MenoMaps".

The team moved to finalise the text under 'Core Purpose' heading. Project Manager suggested "to provide maps for hikers through different channels". The team discussed other expressions, such as "to provide

interactive maps for hikers," and if the channels would be "service channels," "publication channels," "distribution channels," "interaction channels," "devices," or "media". sw Engineer stated that the term 'channel' should be defined more specifically. After discussing these, Dept. Manager pointed at the text on the screen "to provide interactive maps for hikers through different channels" and asked, "what is the problem with that?" The team decided to leave it as such, but add a definition of a channel.

I then explained to the participants the idea of a design driver, and its role as a guide for making decisions about concrete design moves. I exemplified the current web implementation, where the visual character of the map is maximised, and suggested that it might help to outline one of the design drivers. Project manager cited a text from the project plan, where the notion of user experience was promoted. After a discussion about these details the team expressed the first design driver as "Maximising the map experience (ease of use, usefulness, challenge, entertainment)".

Dept. Manager then brought up the issue that the project was conducted in a user-centred manner, and that the whole project was oriented towards supporting users in their situations. This led to a discussion where the notions of user need, activity, and use case were addressed. The second design driver was then expressed in the form of "user's (need and activity) situation centredness" (in Finnish "Käyttäjän (tarve ja toiminta) tilanne"-lähtöisyys).

I then urged the team to still search for a third design driver by stating, "Could we still find another a third one, which describes the way to work that we have followed?" By stating so, I explicitly referred to what has been done already, rather than something to be done. I also referred to the other two design drivers to be such, which describe the team's way to do the designing in the MenoMaps project. Dept. Manager stated that from the start the project featured a cross-media, or hyper-media, approach, where technologies, such as the 'UpCode' are used. This enables the linkage from one channel to another.

This propagated into a debate, which was started by sw Engineer who asked "But is that our driver?" He referred to technical details in the API of the multitouch screen. Project Manager stated that this path had not been done properly yet, and she referred to the other channels, such as the imprint. Dept. Manager supported this by arguing that when the imprint maps have the UpCode, it enables adding details to the map without having to print everything. He said, "You don't have to print everything". One of the Participants also referred to a video scenario, which was pro-

duced in the project, where two participants are using the system. Project Manager stated that it actually linked three of the channels. Thus, after the discussion, the third design driver became expressed as, "Networking the channels" (in Finnish Kanavia verkottava toteutustapa). The original slide on which the MenoMaps was articulated is shown in Figure 99.

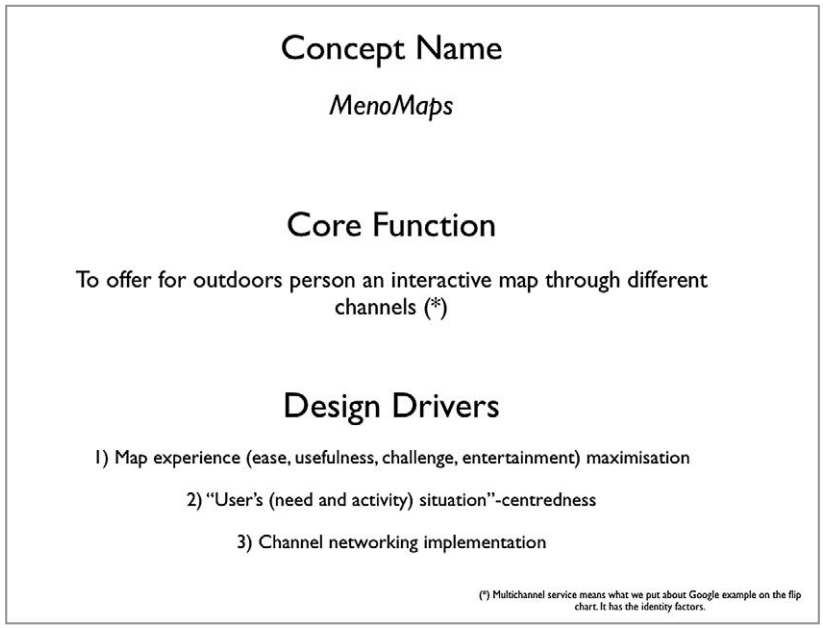

Figure 99. *The slide that was used in the articulation of the MenoMaps concept (a direct translation from Finnish).*

Project Manager proposed to include a fourth design driver as the "identifiability". I, however, argued against this. The argument was that the current thing-to-be-designed was a design concept, and as such, it would have a built-in requirement to be distinguishable from everything else. A concept, he argued, has specific factors that make it distinct (in Finnish "erottumistekijät").

During the articulation of the design drivers, the team had appeared to forget the earlier work that was conducted with the flip chart. The flip chart, however, remained visible in the situation. When the discussion seemed to derail into a debate about if something could be a design driver or not without a good reason, I began to employ the earlier expressions on the flip chart to clarify the trouble. Excerpt 18 shows what happened once I moved to the flip chart.

Frame it simple! Excerpt 18

01 I We attempted [here to describe something kinda um
I raise both hands at the flip chart while walking towards it, see Figure 100.

Figure 100

02 [multichannel service called mess well kinda
I keep hands aligned with the sides of the flip chart, see Figure 101.

Figure 101

03 identity. And in order for some thing to be a
04 multichannel service, then it needed to have kinda

05 these. [An identity that relates to functionality
I place a hand over the 'user' figure on the flip sheet, Figure 102.

Figure 102

06 and identity that a user can recognise. And then

07 there is a [kinda identity that a software engineer
I place my hand over the 'software engineer' character on the flip sheet, see Figure 103.

Figure 103

08 can recognise related to interfaces and kinda
09 well technical level of fidelity. And then well

10 um there [is for geo person.. with him there is the
I point at the geo-person character on the flip sheet, see Figure 104.

Figure 104

kinda identity to recognise the map material, the projections. So it has well this kind of identity. And so if some thing is this kinda multichannel service in its character, it would have kinda [these kinds of traits. So, should we
[I make a gesture above the character figures on the flip sheet, see Figure 105.

Figure 105

then connect this that we are now talking about a multichannel service [here, as it stands in the
[I point at the screen projection with my hand, see Figure 106.

Figure 106

project plan that we are creating a multichannel service, so that we would put it as the fourth this that this will be created according to the principles of multichannel services, or something like that.

Proj. Manager Um

I Or is it connected, could we write it somehow in there? Cuz I think

26 Proj. Manager I: I: [would would simply put there a title
Points at the screen projection, see Figure 107.

Figure 107

27 multichannel service. And then I would put those
28 as entries below it. It defines how we see
29 multichannel service.

I began by saying, "We attempted here" while pointing at the flip chart with two hands. The flip chart contained the figures of the 'User,' the 'Software Engineer,' and the 'Geo-Person'. However, rather than talking about the characters on the flip chart, I used the term 'identity' to refer to the different aspects of the system that could be communicated through these different characters. I read aloud what was written on the flip chart, however, infusing the notion of 'identify' in the re-articulation: "An identity that relates to functionality and identity that a user can recognise" (rows 05-06), "identity that a software engineer can recognise" (rows 07-08) and "for geo-person.. [..] kinda identity" (rows 10-11). These expressions can be interpreted as grounded in the earlier discussion of different 'perceptions' or 'windows' that different people have for the service, and now the terminology was switched to 'identities'.

These identities became a persistent part of the design concept. Later in a presentation to the project's steering group, I expressed the design concept in the form of a phrase: "A channel is an information instrument, which has a recognisable functional, technical and substantial identity." The re-articulation of the aspects that were expressed on the flip chart in terms of identified, thus played a significant role for the final articulation of what a 'channel' is.

Frame it simple!

I also talked about the fourth design driver, which was proposed by Project Manager (row 19) Project Manager however no longer considered it as the fourth design driver but stated (26-29), "I: would [..] simply put there a title multichannel service. And then I would put those as entries below it. It defines how we see multichannel service." I moved to the computer and wrote an explanation about what a 'channel' is.

Frames. The participants were working towards clarifying the issue, which was raised by Project Manger's proposal to include the fourth design driver about the 'identity' of the service. I initially argued against it on the basis of the fact that if MenoMaps is understood as a concept it would have already a distinguishable identity. I, nevertheless, did not continue to challenge Project Manager's proposal on the basis of an apparently unfruitful attempt, but I moved to the flip chart and began to utilise the externalisations of earlier thinking to discuss the topic.

It is likely that because Project Manager had topicalised the notion of 'identity', I explained the things on the flip sheet in terms of identity. And now I explained that instead of having a single identity, we could think the multichannel service in terms of three identities.

The participants of the situation employed the persistent semiotic resources on the flip chart as well as the text on the screen projection to advance their arguments. They used pointing gestures in synchrony with talk to draw focus on issues from the present semiotic fields. As an externalisation of earlier thinking, especially the flip chart proved effective for arguing that the idea of 'identity' is not an issue to be stated as a design driver. Moreover, it influenced within the team the ability to attain a higher level definition of the notion of 'channel'.

8.7.1. *The impact of articulating the concept*

Once the design concept was expressed on the slide and the team had discussed it briefly, Dept. Manager asked, "So what then? What is this leading into, or what it aimed at?" This comment was initially greeted with laughter, but then the discussion became concrete again. sw Engineer responded that this influences how quickly some tasks will be done. I commented that the design drivers would guide how I would be conducting the final phases of the design of the user interface on the iPhone and Web 2.0.

Once the third design driver had been articulated, Project Manager stated to one of the participants, "This is our driver now that we need to

discuss what we shall deliver to one of the Business Partners. Clearly." Project Manager and one of the participants, who had been working on the graphical design of the maps, needed to outline a concrete plan for how the imprint maps would be created. The cross-channel linkage appeared to have a strategic role in making decisions about how to create it.

A central aim of the project was to develop a multichannel service, and the concept functioned as the crystallisation of this concept. It was presented to the steering group of the project, and was approved as the 'designed thing' that the project created. The textual presentation of the concept, which was later presented to the steering group of the project, stood as follows:

Concept name	MenoMaps
Core purpose	Provide an interactive map for outdoors use through different channels (*)
Design Drivers	1) Maximisation of the map experience 2) User's situation centredness 3) Networking the channels

(*) A channel is an information instrument, which has a recognisable functional, technical and substantial identity.

The session to crystallise the concept had still a further, a very concrete impact. It was revealed in an e-mail that the sw Engineer sent the next morning at around 1 am. Below are some excerpts from this e-mail:

> *"I need to admit that I was sceptical before the workshop about its utility, but the results were excellent. Especially the design drivers that we got in the end were good, because they enable steering the application development, and as the first task, I am fixing the priorities in the requirement list according to these.. started already."*

9. Strategic aspects of conceptual designing

This chapter draws together key findings from the two projects and explicates issues that are relevant for the explanation of conceptual designing. It aims at deploying answers to the first two research claims, i.e. the role of material interaction in conceptual designing and the characteristics of a successful conceptual design process. The discoveries are highlighted on the basis of previous research, which is exposed in Chapters 2 and 3. The central intent of this chapter is to highlight such discoveries from the studied projects that are valuable for practitioners in the field of conceptual designing and to which they should be sensitive – hence the title of the thesis.

9.1. Priming

Chapter 2 concluded by arguing that design concepts are expressions of things-to-be-designed that are grounded in preliminary work. The investigation of the two projects revealed the central role that *priming* has for conceptual designing. Priming was defined as the construction of the things-to-deal-with in the project. It thus refers to the construction of and sensitisation to the particular semiotic resources preliminarily considered as relevant to the project at hand. Designers base their situated exploration of the things-to-deal-with largely on the grounds of priming, but also, on the grounds of what is available in a situation.

The present study placed special attention on the investigation of how designers bring about and address the potentially relevant things in their interactions. The study centred on situations where the design concept was crystallised. Priming appeared to be employed strategically by the designers in the projects. The strategy could be outlined as the intentional construction and sensitisation with respect to relevant-to-the-project semiotic sources for the designers. However, it is quite impossible to be certain in advance of whether something is relevant or not for the project at hand.

Sleeswijk-Visser et al. (2005) used the term sensitise to refer to what takes place in the early phases when designers are familiarising them-

selves with a new design domain. Sensitisation has intuitive power as it associates to sensitivity. Designers in the here-studied projects displayed strategic use of sensitisation when the things-to-deal-with were recapitulated just before moving on to the crux event. In the Urban Planning project, Master and Assistant reviewed all the preliminary plans. In the Multichannel Maps, project I reviewed the 'complex arsenal' of issues, just prior to moving on to the crystallisation of the design concept. This activity appeared successful in that in both projects the designers were successfully resorting to these resources while articulating design concepts.

The notion of sensitisation, nevertheless, does not suggest the point of view of constructing new semiotic resources. Construction appeared to be a crucial phenomenon for priming. Priming is not only about becoming more sensitive to existing detail, but it is also about constructing new semiotic resources. Priming appeared as the essential means for designers to bring in the potentially relevant details for the events where they attempt to make sense of what matters for the project at hand.

In both of the analysed projects a substantial amount of preliminary planning and exploration was conducted before the articulation of the central simplification of the project. In the Urban Planning project the project team explored the town landscape as well as being introduced to local stories of the current situation and history. The planners discussed which places in the town would be most important for consideration and they also generated two rounds of ideas for the development of the area. During the second round of ideation the planners were asked to pay attention to the aspects of growth expectations, strategies of survival, and ideas with respect to particular areas. These were the key issues that the teachers needed to know in order to crystallise the design concept that would guide the subsequent planning.

In the same vein, the Multichannel Maps project explored multiple areas of use, addressed various technologies, generated several versions of scenarios, and created functioning prototypes and mock-ups prior to the crystallisation of the design concept. In the concept articulation session the issues of the project were explicitly brought together through invited presentations by individuals responsible for the various areas of exploration. These were map visualisations, Web 2.0 application, MultiTouch wall application, iPhone application, route optimisation, concept design, and social sharing around multichannel maps. An awareness of all these issues was needed for the development of an integrated vision of what the design concept of the multichannel map service would be.

I use the term pre-framing to refer to the activity of creating an initial structure for design action on the basis of some anticipation about what is relevant for the project at hand. For example, the Persona template, which was utilised in the Multichannel Maps project, was a pre-defined structure that guided what the participants in the situation attended to and articulated. In the Urban Planning project the growth-scenario scheme was utilised by the teachers to instruct and evaluate design proposals. They also utilised in their first, unsuccessful, attempt to group the students' 'visions'.

Pre-framing and priming appeared to go hand-in-hand in the projects. With the assistance of the preliminary structures, which were expressed in the present 'artefacts for thinking' as these materials could be phrased in terms of Christiansen (1996), the participants of the situations were guided to attend to such issues that they might not have attended to otherwise. An example of this is the exercise that was conducted in the first workshop in the Multichannel Maps project, where the technology review introduced particular technologies and functioned to prime thinking. The Persona exercise pre-framed attention on particular details of potential users. The pre-framed work introduced the participants to yet new conceptual entities, although, they themselves expressed these on the template. The scenario exercise introduced yet-another pre-framing, i.e. a story structure that requested the participants to use some of the technologies, and one of their personas, acting in a situation that they had expressed on the template.

An important function of pre-framing was to make the task appear simpler for designers. Instead of attempting to address everything, pre-framing that was grounded in the work of scholars and on experiences from earlier projects guided designers to focus on smaller things.

Both of the studied projects displayed investment in a particular kind of guidance for designing, such that was targeted in setting a pre-structured context for collaborative designing. At the most minute level such pre-structuring was present in the moments, where the lead-designers in the analysed situations introduced a graphical scheme, that guided the overall structure of what could be drawn where. Perhaps the clearest example of such graphical ad-hoc pre-framing was the 3x3 scheme that Master drew on the paper in the Urban Planning project (in Excerpt 8). It included a dedicated column for the different 'visions' for the three main areas of

the town, and three lines, which were employed to articulate three different 'visions' for each of these areas. The visual pre-framing on the paper guided with great specificity the acts of drawing the figures.

The central aspect to identifying difference between priming and pre-framing is related to the functioning of the semiotic resource that is being considered. When a semiotic resource, a set of semiotic resources, or articulation, functions to introduce new conceptual entities, or it functions to refresh already known conceptual entities, it primes thinking. I have chosen to use the term priming to refer to the construction of sensitivity and retaining of access to the things-to-deal-with in a project. Pre-framing I have reserved for the purpose of addressing how things are related. Pre-framing is a close relative to the idea of expectation in the way Schön (1983) has used it in the context of arguing for the importance of experiencing surprise, whereas, priming is a close relative to declarative knowledge. A mind primed well succeeds in a knowledge contest, whereas, with apposite expectations one knows where to go find the answers.

9.2.1. *Social pre-framing*

It matters who is present in the collaborative framing sessions. First, different people bring into the session different semiotic resources. The sheer availability of these resources may change the situation radically. Second, the directive control that they may impose on the interaction can also have a remarkable effect on how frames are negotiated, produced, and shared in the session. Especially in the Multichannel map service project this is very clear. For example, the presence of Department Manager has an undisputable influence on the framing through his role as an authority for the others as well as for his ability to invite attention to particular issues and to propose concrete structures to see the challenge. This supports the assumption that social pre-framing, or choosing the set of people who will play a role in the show, has a significant impact on framing.

Social pre-framing had an impact on the language or terminology that was utilised. The discussion was conducted in as high a level of professional language as the setting allowed. The Urban Planning teachers could utilise professional planning terminology. In the Multichannel Maps planning the team could not do this for two reasons; the team was heterogeneous, and the design object was new of its kind, unlike a town plan. This required a cross-disciplinary approach and the use of less abstract – and at the same time more accessible-to-all – language.

While the framing perspective does not necessarily make the process appear less rationalistic than the engineering approach of the mid-20th century, it makes it more socially diverse, and it recognises the inability to be certain before getting to know the things-to-deal-with. One practical thing that was done in both of the studied projects, and which has also been successfully implemented in other projects that were not included in the present study, is the use of workshops. In these workshops special care had been invested to schedule the central framing activities so that the related top-decision-makers could be involved. This implied a requirement to make the process communicable and understandable to these top-decision-makers in order for them to contribute. Once the decision-makers have had their say in the process, it may be more likely for these ideas to make their way through to further development.

9.2.2. *Pre-framed efficiency*

In the Urban Planning project the initial framing of the design concepts were stated within the first 24 hours of the project, whereas, in the Multichannel Maps project the concept was articulated only after more than 1.5 years into the project. Yet, in both projects the action was successful. Both projects progressed according to project plan.

For project planning this may reveal an important lesson: the definition of action should allow for a longer definition of the concept if the project is truly exploratory. If the project is repetitive, it is possible to undertake efficient and sustained framing quickly. In an exploratory project, a significant amount of work may need to be invested in learning about the parts that make up the whole in the end. And effective development of the parts is possible even without a clearly articulated simple concept. However, at some point, as we saw in the Multichannel Maps example, the developers face significant problems, when the overall picture is too ambiguous. From the point of view of the developer, the concept should have been articulated somewhat earlier. However, on the contrary, it is not possible to know whether it would have been possible because the struggle with the openness of the concept definition that motivated the work in that phase may have had an impact on how well the definition of the concept would have been made.

9.3. Crux event

Both of the studied projects featured an enclosed session during which such a design concept was externalised that had a central role in guiding subsequent design action. The design team in both projects invested significant effort in establishing the things-to-deal-with prior to the crux event. In both projects the design concepts were articulated by interweaving the things-to-deal-with into the expression of the thing-to-be-designed. Both of the here-documented crux events also had other common characteristics that are arguably beneficial for the success of the event:

- Both of the crux events were guided by a framing strategy.
- Dedicated ambiguity was employed to focus thinking.
- Re-framing was utilised when faced with insurmountable challenge.
- Visual sketches were actively used.
- Frame-setting through pre-framing was strategic and effective.

9.3.1. *Strategic framing in crux events*

When there appears a principled patterning in the way goals are generated and action is taken towards these, it is possible to say that the action adheres to a framing strategy. Both of the studied crux events display evidence of strategic framing.

In the Urban Planning example, the initial framing strategy was to generate three alternatives, one for each of the student groups, in the manner that was guided by the initial instruction to the students. The instruction was to focus on three different growth scenarios: growing, zero-growth, and decrease. This structure was part of the teachers' global framing strategy, which had evolved over previous projects. The teachers classified the students' ideas initially partially according the scheme, and attempted to follow it in the generation of the alternatives. However, once it became apparent that the ideas did not follow this classification, the teachers, who were sensitive to this aspect of the ideas and hence recognised that this is so, re-framed their approach, i.e. changed their framing strategy. They restructured the process of discovery into two phases, i.e. they adhered to a new systematic way of generating hierarchically related goals and acting according to their achievement. They first generated externalised expressions of all 'visions' that students had generated, and then they related these into broader 'alternatives'. The last phase to typify the alternatives also displayed strategic framing, since the activity of typification displayed

a principled patterning of goals to articulate a distinguished identity for each of the alternatives.

In the Multichannel Maps project the central strategic instrument was the written scheme of the design concept, which was projected on the wall. It was followed throughout the session as a fill-in form that guided what should be discussed. Regardless of the many detours in the discussion, co-participants followed an overall structuring in their goal-generation and goal-achievement according to the template: they started with the 'name,' continued with the 'core purpose,' and concluded with 'design drivers'.

There were also strategies employed other than explicit goal-generation and structuring. Both of the cruxes were conducted in a dialogical manner in two senses. For one, the team was open to what Schön (1983) calls the back-talk of the situation, as the teams were learning new things related to the thing-to-be-designed. On the other hand the teams orchestrated their interactions so that the participants of the situations had a true opportunity to influence the planning. This was due to the active externalisation of the thinking as well as due to the way turns were declared to be open in interaction. For example, pauses, questions, gestures, and postures were employed to signal and give the co-participants the possibility to enter the discussion and contribute to it.

The use of persistent semiotic fields could be claimed to be strategic in both projects. Both teams externalised the things-to-deal-with in a simplified manner on paper, and then they employed these simplifications to express design concepts. Whereas in the Urban Planning project this use of the figures on paper was more likely to be actually planned in advance, in the Multichannel Maps project the figures on the flip chart were used in the articulation of the design concept too. In the Multichannel Maps project the definition of the notion of 'channel,' which was an essential part of the articulation of the design concept of a multichannel service, was expressed on the basis of the visual figures on the flip chart. However, in the situation the visualisation was only adopted into the definition of the design concept once the discussion turned back from the 'design drivers' into the 'core purpose' of the service.

Tolerance for cognitive dissonance, holding two competing and incompatible ideas in mind at the same time, could also be said to be employed strategically in the Multichannel Maps project. In Excerpt 142, as well as in Excerpt 133, two definitions, i.e. the multichannel map service as the intersection of its parts and multichannel service as the united whole, were allowed to co-exist in the design team's discussion at the same time. In both

of the situations the two definitions are allowed to be expressed in full, and were not prematurely dismissed in the discussion. They were allowed to be expressed in a complete-enough form to allow for their consideration as rightful candidates for action. Only then did the team make judgments about which one is the best way to think about the thing-to-be-designed.

The study uncovered several framing-strategies that participants employed in the analysed interactive settings. These findings are, however, very limited due to the study focusing on the development of the methodology for Framing Analysis, rather than searching for the various framing strategies of conceptual designers per se. Nevertheless, the already discovered strategies may be revealed to be used in a sustained way by practitioners in subsequent studies. Hence, to enable the recognition of such happening, the discoveries are included here as well.

Some generic framing-strategies could be identified in the crux events of the projects in addition to the use of priming and pre-framing. These were:

- the use of re-articulation,
- the use of persistent visual articulation,
- the search for difference,
- the enabling of participatory contribution,
- the refreshing of things-to-deal-with (priming),
- the use of a priori scheme to give initial structure for articulation (pre-framing), and
- the use of a three-fold target scheme.

Re-articulation was employed in both projects to draw attention to such conceptual entities externalised earlier and to give these further relevance for the project. In the Urban Planning project the plans that the teachers constructed in the analysed session were copied two times after the plan appeared complete. And in both of the re-articulations of the plans, new details and small adjustments were made. This kind of re-articulation is what iteration is essentially about. The other type of re-articulation was the one employed e.g. in the Multichannel Maps project by me in Excerpt 18 when I introduced the three human-focussed points of view that had been expressed on the flip sheet with different terminology than before, and for making a different argument with these than before.

Use of persistent visual articulation was used throughout the crux events in both of the studied projects. While this was not surprising, as the use of sketching is well-recognised in design research literature, (see e.g. Cross, 2011; Schön, 1983; and Ferguson, 1993), the strategic role of sketching

in the studied projects deserves fresh attention. In addition to being an important mnemonic instrument, the persistence of visual articulation appeared to be a crucial indicator of the progress that designers made in their conceptual designing. The empty visual slots provided designers with the apparent next areas for action. Without exception, the designers moved to work on an adjacent empty area when they had articulated the first round of externalisations. For example, the teachers in the Urban Planning project proceeded through the empty areas on the paper in order, and the planners in the Multichannel Maps project followed strictly the structure of the slide in order.

The persistent visual figures were also used off load the burden from other means of communication, such as expressing the matters through talk. The participants of the studied situations employed deictic referencing, i.e. pointing and demonstrative pronouns, to resort to the meaning that had been assigned to the persistent figures. This made specific communication possible economically, as the participants did not need to rephrase the things they were employing in their arguments.

In both projects the *search for difference* appeared to be used strategically. In the Urban Planning project the teachers worked in order to make three alternatives, which were different from each other. The difference was underlined by Master, who said that she 'typified' the alternatives. This typification was essentially an act of articulating clear qualitative difference across the alternatives in order to make them stand apart from each other, and to give recognisable direction for the subsequent designing. Similarly the Multichannel Map project team discussed the different multichannel services, such as Google, OpenStreetMaps and Helsingin Sanomat, in order to be able to argue for how the MenoMaps service could be made distinct from these.

The crux events of both projects were organised in a manner that *enabled participatory contribution*. In the Urban Planning project Master articulated in such a way that made it possible to follow the thinking closely, and she repeatedly introduced pauses that allowed for the input from the co-participants. In Multichannel Maps open questions for the whole team were actively used in order to invite participation.

Part of the work to enable participation was carried out prior to the actual situations where participation was possible. This was conducted by *refreshing things-to-deal-with (or priming)* prior to moving into the making of the so-called crystallisations. There is no evidence that the participants would not have understood what was being discussed in the studied situ-

ations, without the exceptions of some technical details expressed by both the Software Engineer and the Geo-experts in the MenoMaps project. In both of the studied crux events the participants were able to articulate the things-to-deal-with and advancing designing on the basis of their memory, i.e. without resorting to notes. It is likely that the refreshing of the things-to-deal-with just prior to moving into the crux event. In the Urban Planning project the teachers reviewed their notes once they started to re-articulate the overall plan. Details from the notes were included in the final plans.

Both projects employed *a priori schemes to give initial structure for articulation (or pre-framing)*. Urban Planning teachers had their three-fold scheme about growth, zero-growth, and decrease, which they initially followed, whereas, the Multichannel Maps team had the design concept template that they followed.

Both projects utilised a *three-fold target scheme*. Despite that in the Multichannel Maps project this scheme appeared to emerge quite opportunistically, it formed the basis of the final definition of a multichannel service. In Urban Planning the idea to go for three alternatives was based on the previous experience of Master. This was revealed in a private communication with her later. The number of three was mostly based on the number of students in the course, which is a counter-intuitive discovery with regards to how clear and salient the use of the three-fold growth scheme had been in the course. This gives rise to an assumption that it may be a matter of choosing a scheme with a low number of parts or aspects, and then finding how the thing-to-be-designed can be articulated into that scheme in a way that is sensitive to the things-to-deal-with of that project. While this is not possible to state in the light of only these two projects, the use of a three-fold scheme was strategic in both projects.

It is also possible to say that the choice to conduct the session to crystallise the design concept at such a late phase in the Multichannel Maps project was strategic. Schön (1983) said that the further the process continues, and the more elaborated the view becomes and the more committed the practitioner grows to the chosen frame, the more difficult it will be to break it open later. Schön (1983) maintained that the longer a practitioner is able to maintain a 'double vision', i.e. to be able to attend to the ways in which he or she structures the reality as well as to how the reality talks back them, the chances of the practitioner to arrive at a deeper and broader coherence of artefact and idea increase. This arguably happened in the project.

9.3.2. *The use of dedicated ambiguity*

In both of the studied projects the designers employed open concepts to give direction to planning. They used words and figures to refer to the open-ended 'thing' that they were producing. This issue may be thought of as the constraining boundary for the constructive thought. The lead-designer (i.e. me) in the MenoMaps project, introduced particular notions and figures, the 'alternatives' in the Urban Planning and the 'things' in the Multichannel Maps. These were used to split the overall thing-to-be-designed into smaller units that were employed to describe how this thing could be thought of at a more abstract level than before.

Empirical work to develop initial understanding of what were the things-to-deal-with happened prior to the introduction of any open concepts in the studied sessions. In the Urban Planning project an example of such use of open concepts was the introduction and use of the 'alternatives' and 'visions'. These were utilised in a rather hierarchical fashion to give direction to the discovery. First, the teachers externalised the 'visions' for each part of the town on the basis of their memories of the student's ideas. Then the teachers utilised the 'visions' in order to construct the 'alternatives' in a hierarchical bottom-up fashion.

The Multichannel Maps project also displayed use of dedicated ambiguity. However, it was less structured as a hierarchy, but rather, there was significant work conducted to define meaning for three 'things' in order to come to terms with the idea of a channel. Once I had introduced the three things they became an expression of clusters of existing ideas of channels, i.e. they were initially used in a hierarchical manner, quite like the three 'alternatives' were employed in the Urban Planning project. After a discussion about the dilemmas related to understanding the 'core' of the service, which was also an open concept that was employed to give name to something yet-unknown, the three 'things' were expressed in terms of different perceptual roles: how a software engineer, a user, and a geo-person perceive the service. In the final articulation of a channel, these three different open concepts were expressed in terms of three different identities that a channel may have. These three identities became the grounds for the definition of a 'channel' as an information instrument, which has a recognisable functional, technical and substantial identity. In the last expression the direct connection to the perceptual roles is broken, and expressed in more generic terms.

At the level of interaction, there was a difference between the hierarchical use and the enumerative use of dedicated ambiguity. The hierarchical

use of dedicated ambiguity guided work for constructing items that would satisfy a slot in the hierarchy, whereas the enumerative use of dedicated ambiguity encouraged re-articulation. The three 'things' were re-articulated multiple times before the team adopted them as part of their final design concept.

One way to instigate dedicated ambiguity in the studied projects was that of setting particular guides, or a stage, for action. In both projects dedicated effort was invested in setting the context so that particular semiotic fields were appointed for the externalisation of thinking. In the Multichannel Maps project the stage was expressed in the form of the three-fold template to articulate the service concept that was projected on the wall. It included dedicated spaces onto which the team expressed articulated text that fit the label of each line, i.e. 'Name,' 'Core Purpose,' and 'Design Drivers'. In the Urban Planning project Master drew lines on paper, which functioned as guides and they governed what was expressed where. The lines divided the plan into town-specific areas, and into slots for different 'visions'. With the use of the drawn lines, Master transformed parts of the A4-paper into a stage for externalising particular thoughts.

9.3.3. *Re-framing in the crux event*

In both of the studied projects, the teams abandoned their initial approach and changed their strategy to generate an externalisation of the design concept. In the Urban Planning project the initial strategy was to define the alternatives by assigning the students' initial ideas into three pre-figured 'alternatives:' growth, zero-growth, and decrease. However, as the ideas did not fall into these categories, the teachers adopted a different strategy: to first collect individual 'visions' for each parts of the town, and then connect these into greater alternatives, and by doing so articulate how these alternatives would be different from each other. This kind of re-framing I have chosen to call strategic re-framing, as the process was re-figured with regards to its goal-patterning.

Strategic re-framing was also employed in the Multichannel Maps project. For example, when I introduced the three-fold scheme, i.e. seeing the service as comprising three 'things,' he set a structure for how the next steps would be taken towards the definition of the service.

The crux event of the Multichannel Maps project involved multiple re-framings of different kinds. The first of the re-framings took place, when Department Manager addressed a disagreement between Software Engineer and me about what makes up the 'core' of the Multichannel service.

Department Manager argued that the "same word may mean quite different things". He suggested that rather than talking about the technical components that comprise the core, it is also possible to talk about the service in terms of how users experience it. Here, the way to talk about the thing-to-be-designed was re-framed with regards to which concepts were employed in this. Rather than utilising technological terminology, the use of terminology was switched to notions that are familiar to the potential users of services. I have chosen to call this phenomenon *thematic re-framing*.

In Excerpt 15 two kinds of re-framings took place. First, there was a thematic re-framing back from the technical talk where the discussion had slipped into towards discussion about the service in terms of human experience. This time the articulation, however, was not only in the point of view of the user, but also from two other roles, the Software Engineer and the Geo-person both of whom became expressed on the flip chart. Second, in addition to being thematic, the re-framing was also *strategic*, in that it re-organised the process according to another three-fold scheme.

Strategic and thematic re-framing also took place simultaneously in Excerpt 16. However, in that situation yet another type of re-framing, that I have chosen to call *conceptual re-framing*, took place as the conceptual entity under investigation was changed, or switched. This happened when the MenoMaps team began to define the notion of multichannelness. In this discussion the thing-to-be-designed became actually the concept of multichannelness instead of the MenoMaps multichannel service that was being constructed. The thing-to-be-designed was switched from the MenoMaps service to a one-step more generic notion relevant to projects where multichannelness is an issue.

The re-framing was thematic too, since it resulted in changes with regard to conceptual entities resorted to in the discussion. Rather than talking about the parts of the MenoMaps service, the team began to discuss existing alternative services that could be thought of as multichannel services.

The re-framing in the situation depicted in Excerpt 16 was also strategic. Once the thing-to-be-designed and the conceptual entities that were resorted to were changed, the goal structure of the activity became modified as well. The team began to search actively for and expressed alternative multichannel services and tried to discover defining factors for a multichannel service rather than to specify the MenoMaps design concept directly.

9.3.4. *The role of visual sketching*

Visual sketching had a significant role for the conceptual designing in both projects. Based on the analyses in the present study it is possible to argue for several kinds of ways through which sketching proved valuable for designing. One important aspect of sketching was that it made progress visible. By doing so it enabled the participants of the situation to have a concrete and shared point of reference with regard to the construction of conceptual entities. This allowed for the returning to the previous thoughts by the means of reference, i.e. by pointing and by talking about 'this,' 'that,' and 'here' etc. The persistence and presence of the figures in the environment also fostered consequent thought on the grounds of what had been expressed through the sketches. In the light of the pragmatist idea of reflective thinking, as expressed by Dewey (Dewey, 1991/1910, p. 2) "reflective thought is consecutive, not merely a sequence", it is possible to see sketching as an important means for supporting consecutive thought in collaborative effort.

Occasionally sketches underwent a transition with regards to their interactive role for the planning in the studied projects. In Urban Planning the teachers first employed the sketches in order to express a set of different 'visions' on paper. Once the visions had been externalised on paper, the sketch became treated differently. Now, rather than drawing the building 'visions,' the visions were treated as a collection of existing things. They were referred to, read, and related to each other. It can be argued on the basis of this that the communicative role of the sketches changed as soon as the participants of the situation had achieved a particular state that they had agreed upon during frame-setting. The frame-setting, which is discussed in the next section, was made in the example referred to here by Master's question (in Excerpt 7), "Or wait a moment. Should I do this so that we first go through the visions area by area and then try."

In the Multichannel Maps project the three-fold sketch about the different human-roles with regard to the system were treated in different ways. First, during the sketching of them, I expressed them as different points of view that different people have in relation to the system. Second, in Excerpt 15 I addressed the 'core' and stated "the core may be defined differently in the eyes of these actors." The same characters were later, in Excerpt 17, used to discuss the different 'principles' of building the service. And finally, the same figures were utilised in order to argue that a channel as three different 'identities'. So, the same figures were interpreted three

times differently to develop three different arguments. The persistence of the visual sketches enabled the use of them to ground further arguments on the results of earlier thinking.

When thoughts were externalised and articulated by means of visual sketching, the thoughts were given a specific appearance, a perceptible form. The specificity of the appearance gave grounds for responses, such as Department Manager's statement (Excerpt 14), "I was thinking that the map service is the sum of all these. Not the core". Visual sketching enabled the making of persistent proposals for associations across the externalised conceptual entities by the means of drawing a line between, or around the figures. This aspect of sketching was utilised in both projects to construct broader entities from the "smaller" conceptual entities that had been externalised as sketched figures. Hence, the visual character of sketching affords the perception of wholes in a very concrete manner.

Sketches were also disposed of during the interactions and thus they supported re-articulation. In both projects there were numerous times when a previous version of a sketch was disposed of and a new sketch was built with a fresh sheet of paper. However, in these situations the sketching was not begun from scratch, but reflected what had been learnt during previous sketching. This was visible in how the subsequent sketches became different from the earlier ones, and in the way they embodied conceptual entities that had been expressed in an earlier sketch. Re-articulation was also utilised when the sketches were later re-drawn in a clean manner. This re-articulation was not included in the studied excerpts, but in both projects the sketches expressed what would become the basis for public presentations about the results of the crystallisation of what the project is about in terms of how the project addresses its aims.

Moreover, when a sketch was not a re-articulation in the sense of stating the same thoughts in different terms, it was a re-articulation of the conceptual frame that was employed to approach the thing-to-be-designed, as the two different ways to draw the three-fold scheme in Multichannel Maps exemplify. In that project the first three-fold sketch was based on grouping the different 'channels' of the multichannel service together in order to discover a meaning for the 'core'. Later the three-fold scheme was re-articulated and this time, rather than illustrating the different channels, the figures expressed the different human-roles with regard to the system. It was a re-articulation in the sense that in both sketches the attempt was to explain the 'core,' or the fundamental character of the thing-to-be-designed, in terms of a three-fold scheme.

In conceptual designing as studied here, sketching also appeared in the form of writing. For example, in the Multichannel Maps the text that was written on the slide about the MenoMaps concept functioned as textual sketches. The writing had similar functions as identified above with regard to sketching by drawing.

10. Empirical and pragmatic contribution

The study investigated the role of semiotic resources for the construction of a design concept in situated interaction as well as the strategies that designers employ when actively framing or setting frames for conceptual designing. This chapter draws together the empirical discoveries and relate these to the earlier studies of the considered phenomena. The study findings provide support for existing knowledge about conceptual designing, as well as shed new light on some of the key phenomena in conceptual designing. The most significant empirical discoveries are 1) the exposition of the role of the preliminary activity of constructing tentative semiotic resources, which were collaboratively reflected upon, filtered and elaborated, 2) the uncovering of the value of the pre-structuring of semiotic resources for the events of articulating design concepts, and 3) the description of framing-in-interaction that happens in the so-called crux events where the various preliminary insights and streams of development are brought together. These insights lead to the pragmatic contributions to the field, which are presented after the empirical discoveries.

10.1. Conceptual designing in interaction

What is conceptual designing in practice as displayed by the studied interaction of the practitioners? Two projects were investigated. They were handpicked from a total of 13 projects (illustrated in chapter 5) to function as examples of successful conceptual designing. Design teams in both projects were successful in articulating such semiotic resources, which were later employed to frame design action, and the design teams were able to deliver useful results on the basis of the guidance provided by these resources. For these reasons, many of the discovered phenomena are considered as candidate characteristics for good conceptual designing.

One of the earliest descriptions of what could be considered as conceptual designing was expressed by the Finnish designer and architect Alvar

Aalto in 1948. Schildt (1998, p. 108) quotes Aalto about the 'taking of shape' of the main idea:

> *"I forget the whole maze of problems for a while, as soon as the feel of the assignment and the innumerable demands it involves have sunk into my subconscious. I then move on to a method of working that is very much like abstract art. I simply draw by instinct, not architectural syntheses, but what are sometimes quite childlike compositions, and in this way, on an abstract basis the main idea gradually takes shape, a kind of universal substance that helps me to bring the numerous contradictory components into harmony."*

The quote describes the undertaking as quite arbitrary, even a mystical happening, where components are brought into harmony. Already here, nevertheless, can be found numerous details that are related to the discoveries found in the present study: 1) that there is a 'maze of problems' a priori to the event, 2) the practitioner has developed a 'feel of the assignment' and 'its demands' in the 'subconscious' which the practitioner uses in his intuitive articulation, i.e. 'drawing by instinct,' 3) the approach toward the synthesis takes place through a different mode of articulation 'childlike compositions' on an 'abstract basis' in the development of the problems, 4) that there are 'contradictory components' that need to be brought into 'harmony,' 5) the practitioner assumes that there will be a 'main idea' that obviously stands in a different relation to other ideas, 6) that the practitioner uses drawing on an external medium as an essential means to proceed in his planning, and 7) that there is a conceivable 'event' during which the synthesis takes place.

Aalto's account of his practice (as presented by Schildt above) is mostly congruent with the discoveries in the present study. All of the aspects he mentions have been recognised and studied later by designer researchers. In the following I shall review this literature and highlight where the present study supports the findings, and where the present discoveries illustrate phenomena beyond what was already reported by others.

In the above quote from Aalto, the statement 'maze of problems' suggests that there is not a single problem with which to start the synthesis, but more likely, a setup with multiple problems. Cross (1997, 2008) conceptualised the process in terms of sub-problems and sub-solutions. The structure of these problems may not be a clear hierarchy of related tasks, as e.g. Pahl et al. (2007) describe it, but rather, the whole situation may appear as a juxtaposition of problems incompatible with each other, stemming from different sources, and existing on different levels of abstrac-

tion. In the light of the discoveries of the present study designers invested a significant amount of work to pre-structure the resources that they employed in the articulation of the design concept. The phenomenon that was named *priming* appeared central for designers' ability to articulate the design concept. In the Urban Planning project the project team collected and drafted these materials over several events, such as presentations, site explorations, map observation, and initial rough sketching of preliminary ideas. The Multichannel Maps project featured several full-day workshops, parallel development of technical prototypes, and ideation from different users and uses among other activities to create these resources.

Gruber (1981) has pointed out that even in the case of the most prominent 'eureka stories' of history, which depict the birth of a great idea as an insightful momentary epiphany experienced by a genius, are actually the result of sustained and arduous work with the challenge. Based on the review by Gruber (ibid.) it is possible to see that common to the 'eureka' stories is the phenomenon of re-articulation of ideas related to the central insight multiple times prior to the event of insight.

During many of the events, where priming was recognised to happen, the participants of the studied projects *re-articulated* what they thought were related to the project. For example, in the Urban Planning project once visiting the physical sites, the participants re-articulated their discoveries about the places with the help of their notes and memories of the places. Later they re-articulated the places in the context of their ideas. Each time their expression of the places was different embodying some new influence.

The re-articulations culminated in the presentation of the overall scheme, which the teachers presented to the steering group. The scheme covered all the major places and reflected the ideas of the students. The scheme itself was re-written two times before being presented, each time details of the plan changing and being elaborated, however, each round of re-articulation remaining strictly grounded in the previous presentation, sustaining most messages as such. Re-articulation of the central ideas was thoroughgoing in the Multichannel Maps project as well. For example, the idea to utilise a touch-sensitive wall as one of the channels was initially presented in the first workshop. In basically all the subsequent workshops and planning events the same idea was re-articulated, each time with a slightly different story and setting.

Cross (2001b) observed that designer often act opportunistically, and jump to solutions rather than investigate the situation in detail. This observation is also supported by the discoveries and exposition of the design

process by Lawson (1980), Darke (1984), and Rowe (1987). The current study outlines conceptual designing in such a way that the design concept emerges only in a very late phase. There are three identified reasons for the difference between the earlier discoveries and the present one. Firstly, the present work has focussed on the early phases. It was intentionally constrained to investigate the phases until semiotic resources that could be considered as a design concept became articulated. It is likely to be the choice of focus that renders the studied activity different, i.e. that designers close their framing very late.

Secondly, the changes in the present environment of designing have created an increasing pressure to engage in so-called 'concept design' (see e.g. Keinonen & Takala, 2006). Concept design projects are such that result in a design concept rather than start with one, and the studied Multichannel Maps project was a concept design project. These projects could be thought of in terms having the 'problem as a design goal,' as Harfield (2007) suggests. Thus, the articulation of the design concept was postponed until very late.

Thirdly, the presented design concepts in the Urban Planning project were presented in an early phase of the project. Considering that the concepts were constructed on the basis of contextual immersion and ideation, they can be regarded to have emerged at a very early phase. The courage to trust the process and let the articulation of the design concept be conducted in the very late phase in the Multichannel Maps project is possibly due to the present author's role in the project. Based on the experiences in conducting, researching and teaching of conceptual designing, it appeared to be a sensible way to work. The required resources for the articulation of a sustained concept were simply not available before the event, i.e. the priming was not appropriately done yet.

Related to priming is the phenomena mentioned in the quote above from Aalto's interview (Schildt, 1998) about the 'feel of the assignment' and 'its demands' that the practitioner has developed in the 'subconscious' that enable the relevant 'drawing by instinct.' Schön (1983) resorts on numerous occasions to the 'intuitive artistry' of the reflective practitioner in his framing of the problems. Perhaps due to the studied projects being collaborative, the orchestration of the activity required explicit articulation, and thus rather than remaining subconscious and intuitive, the goals were explicated in the studied crux events prior to starting the drafting of the design concept. In other words, the frame-setting was made public through the use of situated talk.

Frame it simple!

In the Urban Planning project, Master explicated the goal by saying "I think we are going to create three alternatives" and in the Multichannel Maps project I introduced the task by a combination of talk, a priori agenda, and presentation of the structure of the concept on a slide. Verbal mediation appeared to have an important role in the fluent orchestration of conceptual designing in the studied collaborative interaction. Ferguson (1993) differentiated between 'talking sketches' (used in exchanges between people to clarify complex issues and confusions) and 'thinking sketches' (focusing through non-verbal thinking). The sketching in the studied projects was certainly of the 'talking sketch' type, whereas what Aalto explains is of the 'thinking sketch' type.

The third point highlighted in Aalto's quote was the different mode of articulation, 'childlike compositions' on an 'abstract basis,' than the development of the problems. What the professional practitioner may feel, like Aalto, as 'childlike' may have quite a different meaning than actually being essentially similar to the figurations grasped by a child. When considering the figurations in the studied projects, they were abstract and 'childlike,' too: circles, big alphabets, and stick figures. The figures were purposeful and arguably did the work that they were drafted for, i.e. expressed ideas and served as persistent reminders and reference points to these ideas. These qualities of sketches are addressed by, for example, Büscher, Agger Eriksen, Kristensen, & Mogensen (2004), Cross (2001b), Goldschmidt (1991) and by Tholander et al. (2008).

Fourthly, Aalto (Schildt, 1998) mentioned, that when starting to work on the main idea, there are 'contradictory components' that need to be brought into 'harmony.' In the light of the present data it seems that the contradictions are a matter of conception, and this conception relates to an attempt to approach the situation from the perspective of particular idea, or model in mind. For example, if we consider the multiple ideas that the teachers had collected in the Urban Planning project, the ideas appeared contradictory with regard to the teachers' initial intent relating to the alternatives in terms of their pre-conceived categories: growth, reduction, and zero-growth. As soon as they had reframed the approach and worked towards the broader alternatives on the basis of a closer inspection of the relations of the parts that they expressed, the ideas appeared to be not contradictory in the overall scheme. Nevertheless, initially the ideas *appeared* contradictory.

Similarly, in the Multichannel Maps project the ideas appeared contradictory at first. Illustrative of this is the recurrent impasse between the

conception that I promoted and the one that was promoted by Software Engineer. The situation displayed signs of an insoluble impasse, until Department Manager proposed to reframe the approach and talk about the thing-to-be-designed in radically different terms, i.e. in terms of how users experience the service, rather than in terms of technical components or component services. Here also, the parts of the system were in no 'real' conflict with the other parts, but rather it was the conception of the service that highlighted the considered parts in a conflicting light. Once the approach was reframed, the appearance of a conflict in the materials of the situation became dissolved.

The fifth observation in the quote by Aalto (Schildt, 1998) was the assumption that the practitioner assumes there being a 'main idea' that obviously stands in a different relation to other ideas. This assumption of a 'main idea' appears to be thoroughgoing in design literature, although, in the disguise of the 'design solution'. For example, it is common amongst design scholars to talk about designing in terms of problem-solving and problem framing (Schön, 1983), or co-evolution of the problem-solution (Dorst & Cross, 2001). Putting it this way implies that the situation will be conceived of in terms of *one problem*.

In the here-studied Multichannel Maps project the design concept was clearly an expression of the 'main idea,' and the 'things' that were conceptualised in terms of channels, were parts of this main idea. The project team had especially gathered together in order to articulate the 'design concept' for the multichannel map service. The phenomenon of the designers considering that there needs to be a central idea, was thus, present in that project too.

The situation was slightly different in the Urban Planning project, since the teachers were not articulating only one idea, but the 'three alternatives'. Once formulated, the three alternatives came to function as the 'design concepts' in the project, i.e. they were treated by the design teams as a semiotic resource that enabled them to frame their designing in a coordinated fashion. It could be argued, that the 'three alternatives' was an expression of the main idea. The teachers had to generate a set of three alternatives that would be coherently discrete, different from each other, and appropriately expressed in a shared level of abstraction. The situation is similar to what Cross (2011, p. 76) explained in terms that designers explore a 'design problem' from their own perspective and "formulate or *frame the problem* in a way that stimulates and pre-structures the emergence of design concepts".

The sixth issue that the quote from Aalto (Schildt, 1998) raises, was the sketching on paper. The use of sketching on paper as part of designing is substantially studied and documented (see e.g. Goldschmidt, 1991; Rowe, 1987; Schön, 1983). Rowe (1987) considered sketches to be so central to the process of architectural designing that he explained the process of empirical projects through text and the sketches by the designers. Similarly all the imagery in Schön's (1992; 1983, 1984) expositions of architectural designing consists of sketches by the designers. Goldschmidt (1991) argued that sketching is indeed a process through which ideas are developed, rather than merely represented. This argument is supported by Goel (1995), who embraced the ambiguity inherent in design sketches as a valuable feature for how they function. Van der Lugt (2002, 2005) discovered that sketching serves what he called the 're-interpretive cycle' as well as enhanced the access to ideas from previous events.

The discoveries in the current study support the arguments that sketching is a process for generating new rather than being about printing out imagery of what is known. In both of the studied projects the designers employed sketching on paper to externalise what they saw as the 'things-to-deal-with'. The teachers in the Urban Planning project expressed the 'visions' for each of the studied areas, and then, in an active dialogue through talk, gesturing and the sketched imagery, they combined the visions into greater 'alternatives'. In the Multichannel Maps project the sketches were utilised to express and explore new ways to talk about the thing-to-be-designed. It was employed to concretise the different ways to talk about the 'core' and the 'whole,' as well as settle upon a way to consider what are the parts of the system.

The capacity of different materials to capture, sustain, and deliver signs varies, and this impacted the interaction in the studied situations. For example, the participants' choice to use drawings rather than mere talk to express their ideas, even when the ideas were still very much under development, facilitated the sustained and shared perception of the things-to-deal-with. The visual expressions functioned as persistent visual reminders and as shared points of reference over time. They allowed for the participants of the situation to use pointing ("That one") rather than making reference by re-articulation ("I mean the box that comes behind at the bottom-left corner of the map view."). The ability to make deictic references to the concepts by the means of pointing changed the way the teachers communicate. In other words, the participants began to employ a new set of semiotic resources in their communication as soon as the

externalisation of the conceptual entities became available. These aspects of sketches in interaction are documented by Tholander et al., (2008) and by Mondada (2007).

The seventh issue in Aalto's explanation (Schildt, 1998) was the realisation of an 'event' during which the synthesis takes place. Gruber's (1981) investigation across the reported 'aha' events by prominent scholars illustrated a more complex picture of the phenomenon. That, rather than taking place in a single event, the 'aha' experience is constructed through a longer process whereby the central ideas are re-instantiated and re-considered multiple times. On the basis of a close analysis of collaborative designing, Cross (1997) argued that instead of a 'creative leap,' what happens in the moments of insight could be characterised as 'conceptual bridging'. These discoveries from both of the studied projects support this idea. For example, in the Urban Planning project, as soon as Assistant in Excerpt 9 stated (row 34) "So it, perhaps, connects to a kind of zero growth vision" the central dilemma that the teachers were facing in their structuring of the visions into the greater 'alternatives' was resolved. The concept of the 'zero growth vision' established a way to differentiate between three different 'alternatives'. The teachers quite immediately connected three parts to form the zero growth alternative, three other parts to become the increasing growth alternative, and the last three parts became then expressed as the 'intermediate' alternative. The situation was not a leap from what existed into something completely new, but rather, mostly the same old concepts were used to make sense of the situation. The 'intermediate' alternative was a new term that was introduced for the first time in the crux event.

The conceptual bridging also happened in the Multichannel Maps project when the different 'persons' expressed on the flip chart (in Excerpt 15), i.e. the 'user,' 'computer engineer,' and 'geo-person,' became translated as the 'identifiability implementation,' 'technical implementation,' and 'substantial implementation'. The same figures on the flip chart stood for different interpretations on different times. And the interpretations that they facilitated became the central part of the ultimately presented design concept. The final articulation of the design of the 'channels' of the multichannel map service concept was later articulated in the form (Halkosaari et al., 2013, p. 86): "The channels should also be designed so that they share appearances, functionalities, and resources whenever possible." The rooting of this articulation in the concepts originally presented as the figures on the flip chart is obvious. Furthermore, it also shows how

the subsequent concepts were adjoined to the previous ones, thus supporting the idea of conceptual 'bridging'.

10.2. Project-specific strategic learning in conceptual designing

The study investigated strategies that designers employ when actively framing, or setting of frames for conceptual designing, and the role of semiotic resources for the construction of a design concept in situated interaction. Perhaps the principal new discovery of the study is the identification of project-specific strategic learning in conceptual designing. It addresses both the frame-setting activities as well as the use of semiotic resources. The investigation of these phenomena required the development of fresh methodology, including new theoretical propositions, new concepts, and a new analysis method. These methodological contributions are discussed in more detail in the next chapter, and the present section focusses on the explication of the discoveries about project-specific strategic learning.

Project-specific learning, as argued in Chapter 4, is displayed through qualitative changes in (re-)articulation of the things-to-deal-with, or the thing-to-be-designed. The most significant changes took place in the studied crux events, during which the designers in both of the studied projects developed a new way to talk about the thing-to-be-designed. In both projects the design teams articulated the thing-to-be-designed in a manner that explicated the *principles* of its creation. The MenoMaps concept expressed these as the 'design drivers,' and the Urban Planning 'alternatives' expressed these in the form of the 'typification' that each alternative was accompanied with.

The expressions of these principles are semiotic resources that may be employed to set frames for conceptual designing. If project-specific strategic learning takes place in a project, the subsequent articulation of the things-to-deal-with, or the thing-to-be-designed, should exhibit the principles that were outlined in the concept presentations. One way to identify this is to investigate whether such design moves, i.e. additions to such features to the designs, are made that align with, or are in conflict with the principles. With regard to the Multichannel Maps project, there is definite evidence that the project team continued to utilise the concept in their work with the elaboration of the multichannel map service (see Halkosaari et al., 2013). So, it is possible to conclude that project-specific

strategic learning occurred in the project, and that the concept functioned as an externalised expression of a global framing strategy.

In the Urban Planning project the students were grouped and assigned to work according to the expressed design concepts. It formed the requirements for their initial round of planning work until a phase where the students were re-grouped later. The analysis considered only the early part of the Urban Planning project, and the project functioned as an exemplar of an efficient priming, pre-framing, and re-framing of conceptual design work. Nevertheless, the empirical chapters illustrated how the project teams' initial ways to talk about the thing-to-be-designed and about things-to-deal-with changed substantially over the investigated durations.

Re-framing was utilised effectively in the studied projects. In both projects the teams abandoned their initial strategy to approach the articulation of the design concept, and they adopted a different strategy to generate an externalisation of the design concept. Re-framing is understood in the present study as the re-structuring of the principles that design action appears to follow. Three different kinds of re-framing were identified: *strategic*, *conceptual*, and *thematic*.

In the Urban Planning project a strategic re-framing took place at the moment when the teachers had recognised that the initial approach did not work and they adopted an altogether different order for how to proceed to explicate the details of the plan. From listing alternatives one-by-one they moved to collect visions area-by-area. The crux event in the Multichannel Maps project displayed re-framing of all of the three kinds. *Strategic re-framing* happened, for example, when new schemes were introduced to the discussion on a flip chart. These schemes guided the generation of subsequent frames in design interaction. *Thematic re-framing* took place, e.g. when Department Manager suggested that rather than talking about the technical components that comprise the core, it is also possible to talk about the service in terms of how users experience it. Here, the way to talk about the thing-to-be-designed was re-framed with regard to which concepts were employed in this. From using technological terminology the team switched to notions familiar to the potential users of services. *Conceptual re-framing* was identified at a point when the thing-to-be-designed was switched from a multi-channel map service to multichannelness. The thing-to-be-designed was switched for a one-step more generic notion.

The two projects were chosen for investigation because in both of them a phenomenon, which I chose to call *crux event,* took place in a single enclosed event. Based on the available data from 13 projects it was apparent

that a crux event did not occur in all of the projects. It would be a matter of further investigation as to why it is that crux events do not take place in every concept design project. Concept development may also take place in an incremental process that progresses over events, a clearly articulated concept may not result from a project, and a project may work on multiple parallel concepts, each of which may undergo lengthy elaborations. At least, these are amongst the reasons in the set of projects I had available for study.

In the presently studied projects several *framing strategies* were identified to be effectively used in the crux events of the studied projects (elaborated in section 9.3.1.):

- the use of re-articulation,
- the use of persistent visual articulation,
- the search for difference,
- the enabling of participatory contribution,
- the refreshing of things-to-deal-with,
- the use of a priori scheme to give initial structure for articulation, and
- the use of a three-fold target scheme.

In both of the studied projects *priming* and *pre-framing* were strategically employed to assist the designers in the crux event. In the Multichannel Maps project the project team spent the 18 months prior to the crux event working on the contextualisation, detailing the value for the users, as well as on developing parts of the system, and the Urban Planning project team spend the first 24 hours of the project exploring the context and developing initial ideas. Pre-framing, especially the use of pre-defined schemes which had been proven valuable in earlier projects, were utilised to guide attention and articulation of the participants in the studied situations. For example, in the Urban Planning project the three-fold growth-scenario scheme (growth/shrink/zero-growth) was utilised by the teachers to instruct and evaluate design proposals. The Multichannel Maps project utilised a ready-made concept template (name, core purpose, design drivers) to articulate the design concept of the multichannel service. The use of preliminary templates and schemes is actively educated to designers e.g. in the form of product concepts (Keinonen & Takala, 2006), contextual models (Beyer & Holtzblatt, 1998), personas (Cooper, 1999), process models (Ulrich & Eppinger, 2003), etc. The present study illustrated how such schemes are brought into designers' interaction to instigate frames upon the action.

These frame-setting activities involved particular acts to appoint particular materials, concepts, and goals to be worked on. There were many

examples of frame-setting in the situations analysed in the present study, and differences could be found in how the materials, concepts and goals were addressed during frame-setting. Paton and Dorst (2011) based their discoveries of framing and reframing on interviews, but the use of the materials in interaction was not accounted for in their study. The present approach to scrutinise the frame-setting in interaction on the basis of video analysis, renders visible the subtle uses of the materials of the situation, which appear to be essential to the ways in which conceptual designing gets accomplished in interaction.

The design teams also used a technique, which I have called *dedicated ambiguity*. It was used to specify a particular open-ended space that was bounded in some specified way, or the use of an open concept to present the need for elaboration. For example, the Urban Planning teachers collected 'visions' for creating 'alternatives'. Both the 'visions' and 'alternatives' were open concepts that the participants of the studied situation employed in their talk, although not in drawing. In the drawings the ambiguity was instigated by outlining spaces for articulation.

This relates to what was stated about concepts, that the meaning of concepts may change once they become applied in a new domain or purpose (in Chapter 4). This is an interesting phenomenon, since the meaning of the concept of the 'intermediate alternative' was initially built on the basis of the observation of the underlying similarities across the listed 'visions' in connection to the making of the other two 'alternatives'. Now one of the 'visions' that gave rise to the original interpretation becomes changed. The construction of meaning appears, hence, to move into both directions, bottom-up and top-down.

Related to the use of open concepts was the phenomenon where the designers made a transition from treating a concept as open to treating it as a closed concept. The treatment of a concept as open or closed was visible in how the designers addressed the concept in sketching. The interactive role of sketches appeared to change when the sketch was treated as a target of articulation or a source. The transition from semiotic target (i.e. editing a figure) to a semiotic source (i.e. reading a figure, using a figure as a point of reference) typically marked the closing of concepts.

The two projects were quite unlike each other with regard to how the concepts were constructed and explored. An interesting difference across the two studied projects was the use of open concepts in the construction of the design concept. In the Urban project numerous open concepts were generated on the basis of generating a high number of new

closed concepts. Planning could be said to be 'flat,' as the concepts were hierarchically shallow, and 'wide,' because the number of different ideas considered was relatively high in comparison to the Multichannel Maps project, where closed concepts were used less in contrast to a more active use of open concepts. This kind structure of creating new concepts could be stated as 'narrow' and 'deep'. It displayed numerous transitions at a meta-level through reflexive discussion, while considering a smaller number of discrete design ideas.

10.3. Pragmatic contribution

This study was conducted with an attempt to contribute to the field of design practice. The main benefits of the present study for a designer can be seen as four-fold: 1) the study outlines important aspects relating to how designing in the fuzzy front-end can be organised in order to produce simple and relevant design concepts; 2) the study illustrates in a concrete manner what to include (at a minimum) in a design concept presentation; 3) the study provides concrete terms to explain and argue for setting up a project in a particular way; and 4) the study describes in detail how real-life design interaction takes place during concept design, and hence provides examples to assist designers to understand what factually happens in conceptual designing. This is a substantial contribution for practitioners for the reason that conceptual designing is perhaps one of the most mystified and told-about aspects of design, and one that every designer finds essential to master.

Perhaps the greatest lesson for designers is the role of priming for the conceptual design practice. It is simply not possible to express something new, relevant, and deeply insightful without having the semiotic resources to do so. The design process hence needs to be organised in a manner that pays attention to the construction of the premises to frame designing effectively. And, moreover, if designers strive towards achieving a new global framing strategy in a project, it is necessary to take advance of the other areas that are addressed here too.

A clear indication from the findings is that an iterative process is recommendable, however, in dialogue with clearly phased project plans. Project plans appeared to provide a valuable structure for the progress, and they served as guidelines enabling the teams to focus on constructive action rather than on its organisation when the projects were active. This aspect is not emphasised in the empirical material, as the project plans fell into the

background during the action. However, their role was fundamental to the overall strategies adopted to address the agreed agendas of each project.

In my recent work with colleagues (Mattelmäki, Hasu, & Ylirisku, 2009; Mattelmäki, Routarinne, & Ylirisku, 2011; Ylirisku et al., 2013) I have studied ways to reconsider the project plan once the project is already alive. Based on these experiences, it would be recommendable to be sensitive to the particulars of the project, and adjust the plans according to the learning that can be achieved by quick explorations of potential directions. In the light of what was presented in the present study, it should not come as a surprise that the learning that is achieved by collaboratively enacting a project in an embodied manner in inspiring settings, whilst grounding it in project relevant matters, is qualitatively different to the one attained by drafting written project agendas in the office room.

The present study also highlights some concrete techniques, or strategies, that the facilitator of a collaborative design event could utilise. Simply saying aloud what one thinks a situation, for example, in terms of "so, where are we now," appeared to work well especially when the team became silent and stuck. Whilst this occasionally meant reframing the problem or making the conceptual entities more known, sometimes this was useful for just re-stating what had been written on a paper, or flip chart. This provoked responses and enhanced the likelihood of everybody gaining a shared idea about the plans.

The role of visual articulation could not be emphasised enough. It seemed to have a significant effect in focusing the collaborative construction of content by appointing a clear and persistent expression and anchoring for the interpretation and articulation for the team members. With visual sketches the teams were able to quickly make accurate references to ideas, things and environments by the combination of gesturing and talk. The figures on paper also forced ambiguous thoughts to take a specific form, and thereby render aspects of the thoughts, such as what is the 'core' of a multichannel service, external, explicit and addressable.

A built-in character in the designing appeared to be that of searching for 'difference' in the concepts, i.e. distinguishing the developed conceptual constructs from other conceptual constructs. For example, the development of the 'alternatives' in the Urban Planning project had an inherent rule that the alternatives should become different from each other. In the Multichannel Maps project the team included such issues in their expression of the design concept core that rendered it different from all other possible multichannel services they could imagine.

Frame it simple!

A strategy used in both of the studied projects was the refreshing of the things-to-deal-with just prior to the crux events. Based on the empirical evidence this way of working can be expected to have at least two roles: 1) it plays down the likely memory decay that has happened since the previous exposition to the issues, and 2) it contributes to the shared recognition of what should be dealt with and enables the juxtaposing of these issues with the those that the team is to be confronted with in a crux event.

The teams also employed an a priori scheme, or thinking template, to guide exploration and designing. The Urban Planning teachers urged the students to work on the different growth scenarios, and the also used a template for collecting the expressed ideas. This template was later used to talk about the ideas as classes or categories of ideas, hence making the referencing work economic. Now, instead of repeating every student's idea separately, they could be worked upon in larger chunks. The Multichannel Maps project team used templates for inspiring their thinking about potential users of the system, and they also used a template for the articulation of the design concept core. Based on the review of literature and on the empirical work documented in this study, I would recommend conceptual designers to try to articulate the design concept core (or minimal design concept) according to the scheme depicted in Figure 108.

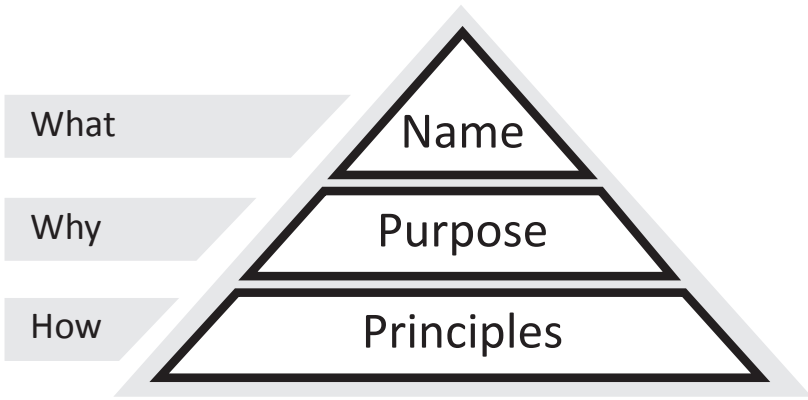

Figure 108. *The design concept core (or minimal design concept) expresses the name for a design concept, its purpose, and the principles (or design drivers) that guide its subsequent realisation.*

In the articulation of the core design concept it is important for designers to bear in mind what is stated about the way of making the expressions. The core design concept and the 'way' of articulating it could be

expressed itself as a design concept. The purpose of it is to function as a semiotic resource that can be used to frame design action, and it should (on the basis what is learnt through the present study) be articulated according to the principles:

- Be simple
- Be positive
- Be different

In the Urban Planning project the teachers expressed each 'alternative' that could be thought of as a separate design concept in concise terms, which rendered them different by highlighting positively their characteristics as: 1) Post-industrial, travelling, logistics, 2) Industry, tradition, localness, and 3) caretaking, wellbeing, services. The Multichannel Maps design concept was expressed to be positively different from other possible multi-channel services by 1) maximising the map experience, by 2) user's situation centredness, and by 3) networking the channels. These characterisations not only articulated a distinguishing character, but also functioned as generative statements driving the subsequent realisation of them in designs, and gave concrete rules for making judgments over features included in design sketches.

The projects were also collaboration-intensive. The participation of multiple people in designing makes available a more versatile set of semiotic resources, as compared to designing alone. This does not only enable a more variegated consideration of what becomes expressed, but also supports other organisational purposes. The aspects of involvement, commitment, power relations, and feelings were little discussed in the study, but are significant aspects for organising the real practice of designing, (see e.g. Sarkkinen, 2006). Moreover, Jenson (2002, p. 161) has argued that making successful products is not only about "overcoming technology and production problems, but also about coordinating a creative, stubborn, motivated, opinionated, and determined group of people to work with, not against, each other". The chosen approach in the projects, collaborative framing, is likely to support such coordination.

The present study included only academic organisations and academic teams working. The reality in companies is likely to be quite different from the academic context. However, what is not likely is that the fundamentals of communication and learning in design projects would be that different. One of the key problems of studying project-specific learning in organisations is the appropriate documentation of the processes. If we consider the groundwork conducted in the present study, with the 13 proj-

ects that were available, only two of them were such that were properly documented at the key parts, and that displayed a clear crux event that was enclosed in a single session.

The choice of data is biased towards exposing a reality that works. The chosen sessions were collaborative events where designs negotiation progresses quite democratically on the basis of expertise on the topic. Each team member could have their say on the whole. One characteristic of most of the projects that were excluded from the present study was the aspect that the design team was not able to conclude if a concept is final or not. Regardless of this bias in the study, it is possible that the conclusions drawn about the fundamentals of the communication and learning that characterise conceptual designing are sustainable.

Through this study I have argued for simplicity. Not for a naïve and superficial simplicity, but rather, deep simplicity that reflects the complex challenges that organisations are facing. Simplicity also needs to spread across departments of a development organisation, as well as span across the phases of the development process too, as Jenson (2002) argues.

> *"Creating simplicity starts at the strategic beginning and goes all the way to the bitter, bug-fixing end." (Jenson, 2002, p. 162)*

Projects are social endeavours, where various people encounter each other with a shared agenda. The people may not have initially a shared view of what to create. They may lack a shared language and understanding of what the others are talking about. They may not even know what the project deals with at its outset. On the basis of this study, it makes sense to understand the social process of designing in terms of communication and learning. This enables seeing the true potential of conceptual designing as an organisational skill that may be cultivated. This skill is increasingly needed in the ever more complex human world.

10.

Empirical and pragmatic contribution

11. Methodological contribution

This chapter presents the methodological contribution. Methodology is here understood as the development of not only methods but also of theory and analytical concepts. The chapter is thus divided into three sections, the first illustrating the theoretical contribution, the second explicating the contributions that the new analytical concepts provide for the analysis of conceptual designing, and the third part depicting the added value that the new method, Framing Analysis of Design Articulation, has for the development of empirically grounded analytical accounts of conceptual designing.

11.1. Theoretical contribution

The theory, which was developed in the present work, sees conceptual designing as project-specific strategic learning. The theoretical work of project-specific learning is in a phase of being an 'early' theory, as it still involves numerous areas calling for additional investigation and deeper consideration against other relevant theories of learning. A version of the theory is nevertheless presented, and it has proven to be valuable for the explanation of some of the key phenomena in conceptual designing, as the analyses in the empirical data justify argues.

The here-presented developments stem from four main theoretical footholds: 1) The theory of design thinking as documented by Nigel Cross, 2) the theory of reflective practice by Donald Schön, 3) Blumer's symbolic interactionism, and 4) Bateson's cybernetic explanation of the mind. The current work contributes to all of these theories with minor adjustments in order to make a greater overall contribution to the theoretical explanation of conceptual designing.

The main contribution with regards to the theoretical explanation of design thinking as documented by Cross, e.g. (Cross, 2011), is the complete circumvention of the notion of design problem as an explanation of conceptual designing. The presented theorising addresses the conceptual

design process in terms of the developing of the semiotic resources over the duration of longer projects as well as the bringing of these resources together in the articulation of a design concept. Also, the central function of a design concept as an indicator of project-specific strategic learning is new.

It is not claimed that the present theorising would render design problems obsolete for the explanation of design for two reasons: firstly, designers themselves use the notion of design problem to make sense of their practice; and secondly, the present focus on the early phases emphasises such aspects of design work that may be better explained without the notion of the design problem. Design problems may be a useful conceptualisation at later stages of designing, where problems become better identified and defined.

With regards to Schön's theory of reflective practice, see (Schön, 1983), the work contributes by developing a refined definition of the concept of 'frame' in order to operationalize it in video-based analysis of 'framing' in interaction. Frames became understood as premises for making sense of situations in particular ways. The distributed character of the physical materials that participate in frame-setting and orchestrating frame-alignment in collaborative designing was elaborated. Based on the present study it could be argued that the materials of the situation may have similar functions as the practitioners' repertoire of familiar examples. The material expressions that pre-structure conceptual design work in situated in interaction helps practitioners to set frames in a coherent fashion and to persuade their co-designers to proceed strategically. Conceptual assistance for the refinement of the theory was provided by Goodwin's (2000) notions of semiotic resource and semiotic field.

The contribution to symbolic interactionism, (see Blumer, 1998a/1969), is the detailed account of the process of learning in terms of the development of strategic resources for articulation. The emphasis on articulation, rather than on action, also provides a slightly different angle to approach the explanation of conceptual designing than what is presented in Blumer's (ibid.) account of symbolic interactionism.

The contribution to Bateson's cybernetic theorising of the mind, (Bateson, 1972b), is the added consideration of symbolic mediation. Bateson explained thinking in terms of cybernetics, which emphasises the functioning of the self-organising circuitry of thinking. The use of language and symbols are central to the ways in which people articulate and interpret messages, and once internalised, signs and language change higher mental functioning thoroughly (Vygotsky, 1981a). When mediation becomes

understood in the context of Bateson's work on categories of communication and learning, (Bateson, 1972c), it is possible to develop deeper theoretical insights into the processes through which materials are brought into the articulation of design concepts than have been presented before.

The set of the minor contributions to these established theoretical accounts enables the making of a greater theoretical contribution to the field of design research in the form of the new theory of conceptual designing in terms of project-specific strategic learning. The presented synthesis was brought together in conversation with the established theories and the empirical data.

11.2. Conceptual designing as project-specific learning

It was theorised in Chapter 4 that project-specific strategic learning is a means through which a project team may develop a global framing strategy for a project, and thus, it forms the basis for creating deeply coherent designs. The requirement that design concepts need to be well-justified is central to the process of conceptual designing. The justifications need to be grounded in a study of some area potentially related to the thing-to-be-designed. According to recent innovation literature (e.g. Brown, 2008, 2009), the areas to consider include "people's needs," "technologically feasibility" and "business viability". The here-studied projects considered the two former areas.

Bateson's (1972c) framework of the levels of learning was employed to ground the theorising of learning in the present study. It was argued that project-specific learning is a more constrained phenomenon than the life-long personal learning that Bateson's theory explained. It was suggested that high levels of learning, namely project-specific strategic learning, can also happen locally, i.e. within the duration and domain of a project. Project-specific learning is local in the sense that it does not have to be assumed to influence a person's life context outside a project, i.e. in the 'global' context.

A distinction was made between local and global framing strategies. Local strategies are limited within parts of projects, whereas global strategies transcend the individual parts. Theoretically, the attainment of goals can be considered to be small-scale projects. In the Multichannel Maps project the articulation of the multichannel map service concept was a small-scale project, and the design team followed particular strategies to attain the goals of this small project. The articulation of the 'alternatives'

was, in a sense, a small project in which the teachers in the Urban Planning projects were engaged. Within this they created yet-smaller projects, the articulation of the 'visions'. And in each of the levels the teachers had chosen particular strategies to set frames for their progression. The pre-framing scheme (grow/shrink/zero-growth) that the urban planning teachers used was a global framing strategy, as it was based on the experience from previous projects, and would be likely to be employed in further projects too.

So, projects exist within projects, and project-specific learning may be chosen to be analysed on any level of durations. In the present study the level of analysis was chosen to follow the durations of the projects as they are presented in the respective organisations as administrative entities, i.e. projects that have a project plan and a set duration prior the project starts.

A framing strategy is visible in articulation and in the making of design moves through how these express coherence with regard to the potential rules of an identified framing strategy. The broader the influence of a framing strategy appears to be, the more global the related learning may be considered to be. The articulation of the design concepts, which were analysed in the context of the crux events, marked changes in a project team's framing strategy in the length of the studied projects, i.e. the Urban Planning project and the Multichannel Maps project. Once the design concept was generated, the making of subsequent design moves and the articulation of what the project was to produce, became changed. This change was reflected across the subsequent events in the projects.

The multichannel map service concept actually persisted even beyond the project studied in Chapters 7 and 8, since the development of the multichannel map service prototype was continued in a follow-up project according to the principles outlined in the design concept. In terms of project-specific learning, it is thus possible to consider the two related projects as one, regardless of them being administratively separated, since they focussed on the conception and realisation of the same thing-to-be-designed. In the considerations of project-specific *conceptual* learning, the design concept can be used as the key anchoring point to ground the investigation.

The study recognises crux events to be the moments where project-specific strategic learning happened, i.e. such learning that was central to the studied design projects. In the studied crux events the teams generated the design concepts, which provided the project members a shared means to propagate a novel framing strategy 'globally' within the project after the

event. The expression of this strategy as a design concept functioned as an enabler of coordinated action to make principled design moves and judgments over the moves in the next phases.

The levels of learning are bound together, and changes on higher levels of learning are reflected to the processes on the lower levels. It is argued that the way a project team talks about, refers to, expresses through figures, gestures, etc. articulates the thing-to-be-designed, is indicative of a particular way of conceiving of the thing. This *way* necessitates the possession of particular kinds of semiotic resources. Otherwise a consistent articulation, and re-articulation, of a design concept would not be possible across events. For example, the articulation of the Multichannel maps concept would not have been possible without the project team working on the multiple technical platforms prior to the crux event, and it would not have been possible without them becoming acquainted with relevant other examples they considered to be multichannel services.

It is assumed that learning through all the levels is displayed in the material expressions that people construct when articulating. This opens up the possibility to scrutinise the learning on any of the levels, given that the analyst has the access to the development of project-specific semiotic resources. This access is provided when the construction of these semiotic resources is explicitly mediated, i.e. expressed in a perceptible form in some material medium, such as by drawing or writing. In collaborative design sessions, this may occur quite naturally, which is the reason why the chosen design events for the study were all collaborative.

The FADA method, which was developed to investigate project-specific learning, was based on a bottom-up progression through all the levels of thinking before drawing conclusions on the potential project-specific learning in conceptual designing. Despite that the analyses progress through the levels in a sequential order, the studied phenomena took place simultaneously in parallel. The analysis only dissected the parallel happenings on the different levels by reading and laying out each level separately. The levels of project-specific conceptual designing that were exposed in the analyses were the material, the meaningful, the conceptual, the intentional, and the strategic (summarised in Table 4).

Understanding the value of the new theoretical account for the field of design research requires still further analyses of different sets of empirical data, which are likely to lead to refinements of the theory. Nevertheless, the here-presented work is just an opening towards a new kind of understanding of conceptual designing, and the presented analyses of concep-

Table 4. *Levels of project-specific conceptual designing.*

Level	Description
Strategic ▲	Principled structuring of frame-setting and the making of design moves.
Intentional ▲	Articulation and interpretation appears project-like.
Conceptual ▲	Symbolic interpretation and articulation become possible.
Meaningful ▲	Perception and articulation of Batesonian 'differences' on the most fundamental level.
Material	Messages are fundamentally expressions embodied in material substance.

tual design interaction shows that the theory has practical value in terms of providing the basis for the concrete method of the Framing Analysis of Design Articulation.

11.3. Method contribution

As part of the present work, a new method for the analysis of project-specific conceptual learning was developed. It was named the Framing Analysis of Design Articulation (FADA). The FADA method owes greatly to ethnomethodologically oriented studies of social interaction, especially to studies of interaction by Goodwin (2000) and by Melander & Sahlström (2009). Also Interaction Analysis (Jordan & Henderson, 1995) and Conversation Analysis (see e.g. Sidnell, 2010), have provided methodical insight for the present work. In order to explicate what FADA shares with ethnomethodology, and where it departs from it, the following ethnomethodological grounding is provided.

11.3.1. *Ethnomethodological grounding*

Ethnomethodology focusses on the organisation of everyday mundane activities that people engage in. The central assumption in ethnomethodology is that people are *methodical* in their concerted action. When engaged, for example, in talk with each other, people make their actions visible and understandable to the others in the situation in a systematic fashion. By attending to the minutiae of the organisation's ordinary activities, ethnomethodologically organised studies attempt to render the formal properties of everyday practices visible (Garfinkel, 2004/1967).

The starting point for ethnomethodologically oriented enquiry is *real action*. Interviews should not be used as a substitute for observing real action, as the particular organisation of 'real' action takes place only within the real settings in which they occur. Moreover, analyses of the action *should not rely upon preliminary understandings of generic rules* that the participants of the studied situations may be assumed to adhere to, but rather, attention should be diverted to the ways in which the participants of the studied situations respond to the contingencies of unique situations. Ethnomethodology treats social situations as self-organising with respect to the intelligible characteristics of how they appear. And being such, situations are organised in their properties *for the participants of the situations, and by them*, while they are interpreting and producing the circumstances they are embedded within (Heritage, 1984).

The role of theory in ethnomethodology has troubled many scholars over its history (Lynch, 1999). Lynch (ibid.) exemplifies how the two perhaps best known ethnomethodologists, Harold Garfinkel and Harvey Sacks, refused systematically to assign an important role of any particular cultural or social theory to their work. Ethnomethodology was developed, as Garfinkel (2004/1967) argued, to study the methods that people use in their concerted action without the necessary intervention of any social theory to guide them in doing so. People's actions display coherence with regards to shared rules of organisation regardless of any theory that an analyst might bring upon its investigation. Lynch (1999) concluded that ethnomethodology can be understood as a way to dissolve the unbridgeable gap between generic social theories and situated practices.

Examples of ethnomethodologically oriented studies that are relevant for the present interest in project-specific conceptual learning are, for example, the analysis of designers' interaction by Mondada (2012) and the study by Heinemann et al. (2012). Mondada (2012) who studied the use of inscriptions, i.e. texts, sketches and drawings, in architectural practice, argued that these are important mediators of the actions that happen, and that the participants of a situation make use of inscriptions in varieties of ways that make these locally relevant for the ongoing action. Heinemann et al. (2012) investigated the ways design constraints are developed in the social interaction of designers. The focus of both of these examples is the uncovering of the underlying social organisation of the work rather than the learning that takes place.

Conversation analytical approach is employed in the analysis of learning, for example, by Melander and Sahlström (2009), who argue that this

approach, despite that it is scarcely employed in studies of learning, can add substantial precision to analyses. The analyses by Melander and Sahlström (ibid.) are based on activities of short duration, such as the reading a children's picture book. This underlines a central limitation of CA for the analysis of learning due to its very high sensitivity to detail. CA investigates phenomena taking place in social interaction over durations of seconds and minutes, but learning in design projects may span days, weeks, and months. Thus the fine-grained analysis of CA would need to be complemented with another kind of investigation that may account for the changes that unfold over a longer time range.

CA, nevertheless, has been utilised to scrutinise details of longer projects as well. For example, Matthews and Heinemann (2012) utilised CA effectively to unveil important characteristics of designing in a project that lasted for 7 months. Their work, as well as CA research in general, nonetheless, remains implicit on how knowledge about the context of the studied circumstances becomes brought into the analyses. Moreover, Matthews and Heinemann (ibid.) remain silent about the contextual inferences drawn from activities prior to and between the analysed interactions, i.e. how the semiotic resources were constructed.

Keith Murphy modified the conversation analytical approach on the basis of Goodwin's theorising, e.g. (Goodwin, 2000), and investigated the role of various semiotic resources in design work. He (Murphy, 2003) investigated gesturing in architectural practice, the use of many semiotic resources (talk, gestures and drawings) while imagining together (Murphy, 2004). His study on 'collaborative imagining' (Murphy, 2005) argued that imagination is not constrained within the heads of the participants only, but is a distributed process across people and materials that they use. While the argument is not new, as it was made a decade earlier by Hutchins (1995), Murphy's begins to depart from strictly ethnomethodological analysis and description with the use of stipulated theoretical concepts from Goodwin (2000), which render the analysis of interaction into conceptual interpretation in the light of the proposed theoretical concepts.

One of the key challenges for the use of the conversation analytical approach in the analysis of design projects is narrowing down the focus to such brief moments that make sense so as to be analysed with the very high precision required by the approach, (see e.g. Hutchby & Wooffitt, 1998; Sacks, Schegloff, & Jefferson, 1974; Sacks, 2006; Sidnell, 2010). The authentic "in the wild" design work spans typically from days to months, which has led other researchers to abandon orthodox conversation/inter-

action analysis and reporting altogether, (e.g. Hyysalo, 2010, 2012), and rely more on an ethnographic style in reporting the analysis of video recorded design interactions. The challenge for the analyst is to develop a close-enough understanding of the project-specific context, and use this understanding for the interpretation of the key moments of the analysis.

Bucciarelli (1994) approached the investigation of designing 'in the wild' with ethnographically oriented participatory observation, which accounted for development over longer durations in designing. He also emphasised the importance for the investigator to develop a close familiarity to the context of the studied phenomena (ibid. p. 47):

> *"be around frequently enough and over a span of time sufficient to allow me to fill in the background, to fix the references, and to complete the statements left hanging."*

For Bucciarelli (ibid.) the active role of the participant/observer's personal learning was important in order for them as the analyst to be able to discriminate important technical statements from other kinds of statements. Only such an understanding would enable them to say what the 'foreground' figure is and what forms the 'background' noise. The analyses by Bucciarelli are far less accurate in detail with respect to describing interaction as compared to the analyses by, e.g. Murphy (2005) or Matthews & Heinemann (2012). However, the analyses appear well-communicated for discerning what is essential with regards to designing the 'objects' that the designers, or designing engineers, are involved with.

11.3.2. *FADA's relationship to ethnomethodology*

There are two main aspects that can be considered to distance FADA from a strictly ethnomethodological approach: Firstly, FADA aims at studying an *assumed* phenomenon, namely project-specific conceptual learning, rather investigate how design meetings or other concerted interactions amongst design teams (and associated efforts) achieve their social facticity as such, as 'design work' of very distinct sorts (Whalen, 2013); and secondly, FADA uses *an a priori theoretical structure* in its analyses, which in this study was presented in Chapter 4 as a synthesis on the basis of Blumer's (1998a) symbolic interactionism, Schön's (1983; 1963) theorising on designing, as well as, Bateson's (1972c) cybernetic theory.

However, regardless of these differences the influence of ethnomethodology for the present research is thoroughgoing, and it is especially visible in the adopted sensitivity to the minutiae of interaction. Moreover,

the separation of FADA from a ethnomethodological grounding may not be as total as could be assumed by the application of a theoretically informed framework in the analysis. The present method was developed in an ethnomethodological manner over the course of the last decade, and the presented theoretical grounding was made in close conversation with empirical material from the field, with design scholars, and with existing theories. For example, prior to having even heard about Bateson's theory, I had developed a framework (see Table 6) that had significant resemblances to Bateson's thinking. I drafted it on the basis of discussions with others, on my personal experience in the field, and through my work as a conceptual designer. I could trace back my sensitivity to the issues to be initiated by comments from Prof. Buur (personal communications in 2003) about how he saw different levels of students' learning through their presentations during my participation as a visiting member of a review board in a portfolio exam. These levels are summarised in Table 5.

Table 5. *Levels of student's learning report according to Jacob Buur (in the way I understood it in 2003)*

Level	Description
Single concept ▲	A single concept gives structure for the whole presentation.
Multiple themes ▲	Learning is explained in terms of themes, points, or lessons learnt.
Sequence of events	Learning is reported through sequential exposition of learning events.

It is possible to see these ideas reflected in my subsequent development of an initial framework to explain what I called 'connected thinking' (see Table 6), which was my early way to talk about what eventually has become to be expressed through the notion of conceptual designing. In this scheme I had made explicit how the layers were established on top of each other. I consider the students'[7] progression from experiences from individual events towards thematic considerations and ultimately towards a theory-like understanding, to be essentially similar to the learning that is displayed by practitioners of conceptual designing. That is why the categorisation by Buur came to be considered as potentially relevant for the explanation of conceptual designing too.

[7] These were Master level students engaged in explorative design projects.

Table 6. *Three layers of connected thinking (from my initial draft in 15th of June, 2011)*

Layer	Description
Theoretical ▲	Related to a systematic, principled, and simple description; based on the contextual level
Contextual ▲	Related to networked meanings, which are explicit, habitual, evolved in particular social, cultural, and historical settings; based on the situated level
Situated	Related to a chronological relationship with a place, partly implicit and unconscious; based on direct experiencing of and acting upon the materiality of a particular situation

Later I learned about Bateson's theory of the categories of communication and learning. Bateson (1972c) distinguished between four layers: Zero Learning, Learning I, Learning II, and Learning III. By Zero Learning Bateson refers to the situation when learning is 'complete,' and it refers essentially to what is commonly referred to as 'recognition'. The higher orders of learning are defined through the idea of *change in communicative process*. Learning I refers to a change in the process of Zero Learning, Learning II to a change in the process of Learning I, and so forth. I was tempted to explore relations across the depicted layers with my earlier categories. And the result of the exploration became formulated in section 9.4 and is also visible in the analytical phases that the method involves (explained in section 4.4.3).

The present work started without theoretical assumptions about what to find in the conceptual design practice with the realisation that there is an phenomenon referred to as the 'Fuzzy Front-End' (Cagan & Vogel, 2002) of designing, which was characterised as being ambiguous, uncertain, and difficult to control and foresee. With this initial impetus the focus was set on design activities, which could be characterised to belong to this 'Fuzzy Front-End'. The study began without theoretical pre-assumptions about the character of the real-life practice that would be studied, other than those mentioned above. The conceptual categories (situated, contextual, theoretical, as depicted in Table 6) came rather late in the process, after conducting and studying ten projects featuring 'Fuzzy Front-End' like characteristics. The realisation of the similarity of earlier thoughts presented by Buur (events, themes, concept, as in Table 5) came later. And even later still the connection to Bateson's work on the categories of communication and learning was discovered. The final addition to the

analytical instrumentation was the analytical terminology, such as 'semiotic resource,' introduced by Goodwin (2000).

As a consequence of the theoretical interpretation, combined with an appreciation of detail discoverable in video records of real action, a systematic procedure (FADA) for the investigation of conceptual designing became outlined. It is described in detail in Chapter 5, and therefore not repeated here. The analytical instrumentation was not governed by any a priori cultural or social theory in order to discover how it is displayed in interaction, but it was created in response to attempting to become acquainted with an unknown social phenomenon. The process proceeded through a close appreciation of the ordering that the studied activity displayed across multiple projects. And, since the phenomenon was anticipated to be substantive to a great number of design efforts, backing was searched from such established theories that seemed to resonate with the initial understandings arising from scrutiny of empirical detail and personal experience. It was only after a lengthy process that the studied phenomenon became conceptualised as learning activity of a certain kind.

11.3.3. *Uncovering project-specific learning in the wild*

Central to the interest of the present approach is the tracking of learning happening 'in the wild,' i.e. in real-life projects. Learning was traced by a careful inspection of the evolution of shared conceptual entities in interaction. A core methodological challenge was to decide how to treat symbolic concepts in interaction. The new approach centres on a particular conception about articulation. When people articulate, it is assumed that they use the available semiotic resources they find relevant *in situ* for the production and the expression of the message they want to convey. The notion of semiotic resource was adopted from Goodwin (2000), who used the notion to refer to a broad range of assets that people may employ to convey or conceive a message in a situation. He (ibid. p. 1490) defined semiotic resources as "e.g. a range of structurally different kinds of sign phenomena in both the stream of speech and the body, graphic and socially sedimented structure in the surround, sequential organization, encompassing activity systems, etc."

It is further assumed that articulation is directional. This follows from the basic assumption in conversation analysis that "any speaker's communicative action is doubly contextual in being both *context-shaped* and *context-renewing*" (Heritage, 1984, p. 242). The analyst has to build analyses on the basis of observable phenomena. When designers are intimately

working on a sketch, their articulation reveals plenty about the use of the externalised expressions in the production of new messages on top of the previous ones. Persistent messages became articulated in material or a semiotic field, a term adopted from Goodwin (2000) too, which functioned as a semiotic target. The same material also functioned as a source when the designers based their next articulations on it.

Collaborative sketching forced designers to be specific in what they wanted to express through their drawing and it provided them with a clear and persistent anchor on which to ground their articulation. Hence, it was the acts of sketching, and other persistent externalised articulation that appeared to cater the easiest, albeit the most detailed data on which to base the tracking of conceptual construction. With the close inspection of how designers treated the figures that they drew on paper, or wrote on a computer screen, it was possible to clearly identify the moments of transition when the concepts expressed through the figures were changed from being treated as open, i.e. when concepts became closed.

Much of the relevant context and semiotic resources are not observable in a situated interaction, as it is not possible to make direct observation of another person's mind. Interpretations of symbolic concepts were based on what was observed prior to the analysed crux events. The observation of the activities prior to the crux event proved to be especially helpful in the analysis of the Multichannel Maps project, which was more difficult to analyse than the Urban Planning project. In the analysis I encountered numerous times the problem of defining the goal of the analysed activity. The interpretation of the goals needs to be grounded in empirical evidence. However, when design is advanced mostly by the means of talk, there are few other cues available for investigating the conceptual progress, for example in the Urban Planners when the teachers were externalising the 'visions' on paper.

I chose to treat the dilemma of implicit goal in the following way: When the activity displayed an overall coherence with regards to a conceivable goal, i.e. with regards to a goal that I interpreted on the basis of seeing the situation several times, then it was possible to state this as a potential fact about the perceptible actions. It is not, however, possible to argue that the participants of the situation shared the same conceptualisation of the goal. It may even be so that the goals embodied in action are not formulated as explicit verbal statements in the first place. The embodied action as a whole simply appears goal-aligned, and enables the making of the interpretation of a verbally articulated goal.

Progressing from each analytical level on to the next was found to be problematic. Perhaps the most difficult step was the interpretation of frames, i.e. moving from second-order interpretation about the things-to-deal-with to a third step of interpretations through the explication of the material interaction, the use of concepts, and the goal-alignment of the action. Quite often, it seemed that these three aspects of frames (materials, concepts, and goals) are tightly interwoven. The interpretation, for example of Excerpt 14 in the MenoMaps project (in the section where the three-part scheme is introduced, starting from page 175), was especially difficult. In the example the design team is trying to develop a new scheme to give overall structure to the thing-to-be-designed. The team is developing an interpretation of the situation in terms of 'seeing-as,' i.e. seeing the MenoMaps service as a whole that comprises of three main parts. The move to 'see as' is hard to express in terms of a concrete goal. It is quite like what happens in Bateson's (1972a/1955) example of animal play, where the animals have a way to communicate that 'this is play'. Here the dilemma was to state 'this is a way to see the thing'. But what is the goal imbued in this kind of statement?

If the goal was to 'clarify a three-fold scheme' the assumed situation would be such where the three-fold scheme is taken for granted, and the work to attain this goal would display evidence of elaboration of the three parts of the scheme. And, if the goal was to 'explain a new scheme' it would assume a situation wherein the scheme is already known. And if it would be to 'construct a new scheme,' it would assume a situation wherein new material would be added in order to construct a new scheme. So, if it is claimed that the activity is aligned according to one of these goals, we must study in detail the characteristics of the activity. Hence, we can only say in the end what was the goal that the action was aligned to, not upfront. This may sound counterintuitive, since the traditional way to think about goals and action is to understand that there exists a goal a priori to action. This cannot be known in the framing analysis. It is a different thing to say that a goal was expressed at the beginning of action, and if the action is aligned towards the attainment of that goal.

Another challenge in the analysis of frames was the phenomenon that goals emerged in action in response to what has happened. For example, when Department Manager asked in the Multichannel Maps project (Excerpt 16), "Why are we now having this conversation?" he triggered a new exploration, and a new goal emerged to investigate the notion of 'multichannelness'. The action became aligned towards expressing a defini-

tion for multichannelness. It is obvious that the question was a response to what had happened earlier, i.e. that the new goal emerged out of the conversation. Once a team's actions displayed alignment with regards to a new goal, a new frame was interpreted to have been adopted into the communicative process shared by the participants.

In the study, the intentional work to impose new goals for action was called frame-setting. There were numerous instances in the analysed material where frame-setting was explicitly visible. In these instances several different ways for how the material and conceptual boundaries for the frames, in the sense that Bateson (1972a/1955) describes, were outlined in these situations were uncovered. For example, by drawing the lines in Excerpt 7, Master delineated clear boundaries for the articulation of the 'visions' on the paper. Similarly, the empty lines on the slideshow in the Multichannel Maps project functioned as material boundaries for the visual articulation. The labels of the areas in the town in the Urban Planning project as well as the labels on the slide in the Multichannel Maps project delimited what would be the appropriate things to express in the respective material spaces.

Only such articulations were produced that seem to fit the conceived frame. And these articulations guide as to which resources are needed in their production. It might make sense to think about articulation as the making of conceptual moves, as in playing a game. Once the goal, tools and rules of this game are clear, the participants of a situation may take actions to advance the game towards the goal. The setup of the game defines a play where only some moves are relevant.

Let us consider an example. In the Multichannel Maps project (Excerpt 12) I displayed the slide and conducted lead-articulation to express a potential name for the service in the empty row under the 'Name' label. With these actions I appointed a particular material space that would be employed for the articulation. The titling of this space set implicit criteria for the participants to recognise relevant semiotic resources to be used for the production of the responses that they would use in order to suggest what could be written on that space. Regardless of the fact that many such resources will remain implicit, it is possible to make justified assumptions about the necessary semiotic resources for the articulation that the participants of the studied situations produced. Substantial part of these resources are in the heads of the participants, although, the articulation may require the application of the conceptual resources in the head as well as the semiotic resources visible in the environment. As soon as the

participants articulate, some of the sources they use became identifiable for analytical inference.

On the occasions where the participants of the studied situations employed visible semiotic resources in their articulation, especially when they were drawing and talking about the drawings, it was quite easy to interpret what where the concepts, frames and framing strategies that the participants used in the situations. The visibility of the use of semiotic resources certainly supported analytical interpretation. For example, in the Urban Planning project Master had first employed (Excerpt 7) synchrony of her talk and pointing to assign a particular meaning for each of the figures that she sketched on the paper, and later (Excerpt 9) these images were employed in articulation aligned towards producing greater conceptual entities. The assumed meaning of the symbols was apparent.

In the study, it appeared to be important to make the distinction between semiotic sources, targets and guides. Each act of articulation has a source and a target, which are physical substances in the surrounding environment, or in the bodies of the designers. In the act of articulation the sign expressions embodied in these materials are habitually interpreted as signs or messages and interwoven into the process of conceptual thinking. For example, when a designer reflects upon a design move, as in the Quist example presented by Schön (1983), uses talking, pointing and sketching on paper to express and to refer to various signs, they resort to concepts that stem from different domains, such as use, building elements, form, scale, cost (see Schön, 1983, p. 96). They also discuss in English and use the architectural symbols in their dialogue about the plan. In this process the messages are transformed in contact with other signs, and then printed materially back into the semiotic targets through articulation. Goodwin (2000, p. 1494) has expressed essentially the same issues in these words:

> *"Spoken language builds signs within the stream of speech, gestures uses the body in a particular way, while posture and orientation uses the body in another, etc. To have a way of talking about these subsystems I'll refer to them as semiotic fields. The term semiotic is intended to note the way in which signs are being deployed, while field provides a rough term for pointing to the encompassing medium within which specific signs are embedded." (original emphasis)*

When signs become expressed on some physical matter, the matter functions as a target for the expression of a sign. Signs are conceptual entities whereas expressions of signs are material entities. Expression of a sign can be such as a figure on paper. The interpretation of the figure

as flower, if interpreted as such, is the sign it expresses. While these are old news from what Peirce (1955) has already expressed, the new issue here is the identification of the directionality of the process. The material expressions of signs follow the rules of physical causation. A sign is read from an expression of a sign, and it is articulated in the form of a material expression. The process of material manipulation happens over time, and takes place from sources to targets. Articulation is physically bound to the materiality of a situation. Any semiotic expression has a semiotic source and a target, despite that the sources often remain beyond the reach of the analyst's gaze.

In the analysis, semiotic resources refer to physical materials that are employed in symbolic interaction. Semiotic resources are constructed in and shared through *semiotic fields*, such as a paper, the surrounding air, and the human body, which are material surfaces capable of conveying expressions of signs. The capability of a particular semiotic field to capture, sustain and deliver a sign varies depending on its material qualities.

For the interpretation of project-specific learning at the level of framing strategies, a longer duration of time needs to be considered. A clear example of such framing strategy was found in the Urban Planning project, when the teachers articulated the 'visions' on A4-paper. It is possible to see hierarchical structuring of frames at this point in time. The construction of each individual externalisation of the visions happened in a small-scale frame. Each such frame featured a particular goal. Particular conceptual and material resources were employed in the attainment of each one of the nine goals that were assumed by the sketching of the 3x3 grid for the visions. The patterning of frames was governed by an overall frame, which was directed at the construction of externalisations of all the 'visions' that the students had created into a simplified pre-structured scheme.

Strategic framing in action happens when such principled nesting of frames takes place. Where a frame governs what will count as relevant moves, messages and resources, a framing strategy manifests a rule that the frame-setting follows. The goal inherent in a super-frame dictates what will count as appropriate sub-frames. In the above example the super-frame was to achieve the overall scheme with the visions, and this guided the generation of the sub-level frames for the construction of externalisations of individual 'visions'.

The Urban Planning example also featured one-step more generic framing-principle. This was made visible as a suggestion for a two-phase approach by Master. In Excerpt 7 she had proposed to first go through the

'visions' and then proceed towards the more generic 'alternatives'. Such a step-wise framing is analogous to having a generic recipe to follow. Despite that it was already recognised by the early design methodists, (see e.g. Jones, 1992), that designers seldom follow recipes, there were several occasions in which *strategic re-framing* took place.

Two other forms of framing were also discovered: namely, *thematic re-framing* and *conceptual re-framing*. These two kinds of re-framing were evidenced in the Multichannel Maps project. Thematic re-framing took place in Excerpt 13, where Department Manager proposed that instead of talking about the service in terms of the multi-component core, it would make sense to talk about it from the point of view of how users experience the service. Such re-framing caused the team to start to talk in terms of 'checking the options in the service plan', and so on. Conceptual re-framing took place in Excerpt 16, where the Multichannel Maps design team moved from the articulation of the MenoMaps service concept to construction of a definition for a 'multichannel'. The concept of multichannelness is generic, and MenoMaps is just one instance of such a service. Once the team had faced the dilemma that they did not actually have a definition of multichannelness, they moved on from this one step more generic discussion. And, during the dialogue that addressed the definition of multichannelness, the team was actually about developing meaning for a concept, which was different from the original thing-to-be-designed.

Some generic framing-strategies were also identified, such as the use of re-articulation, use of persistent visual articulation, search for difference, tolerance for cognitive dissonance, enabling participatory contribution, re-refreshing things-to-deal-with, and using a priori schemes to give initial structure for articulation.

In sum, the analysis of framing was conducted in four phases: 1) transcription, 2) explication of the things-to-deal-with, 3) frame-analysis, and 4) identification of framing strategies. The analysis of a particular level was not complete after a single interpretation and articulation. Each interpreted level was re-articulated through several rounds in dialogue with the formation of the discoveries on the other layers. There were two reasons for this: 1) to ensure that the analysis document would not become too extensive by including only argument-relevant data, and 2) to cultivate only such arguments that could be grounded in an analysis that would justifiably transcend the layers, as each analytical level forms the foundation for the next ones.

12. Reflection

This theoretical work aims at concretising the notion of 'design thinking' that has attracted substantial public attention recently. Since the 1950s design thinking is typically explained as a form of problem-solving, and as problem-setting in later studies. The latest explanations of design thinking have concluded that the design-problem solution construct is the result of some sort of co-evolution. The aim in the present study was the generation of an explanation for how the conception of what should be designed emerges.

So-called 'concept design' or 'innovation design' projects are a rather recent phenomenon. These are projects that aspire at generating radical renewal or ingenious novel ideas. The central result that these projects may provide is a new design concept that may set the grounds for the creation of a potentially world-changing innovation. The problem-centred explanations of design thinking are not able to credibly account for and project what happens in the construction of design concepts. They are also incapable of guiding designers in planning the projects so that these would result in possibly relevant outcomes. This insight functioned as the impetus of the present work.

The work is grounded in my personal over a decade-long working in concept design projects, and it was fully design practice-driven. The initial aim was to understand design practice for its improvement. During the process this premise proved to be a challenging one, since the resulting work would be analysed in terms of an academic contribution rather than design work. The recent evolution of so-called practice-based research, which is also called 'artistic design research,' appeared to provide salvation. However, it appeared problematic too.

Practice-based studies are conducted through practice, which is to say that they are fundamentally non-academic. The academic reflection is grounded in the making of something, and typically this sort of research provides exemplars, well-functioning specimens, which function as test cases for the researchers of issues of similar kinds. A key problem of such

studies is the inherent lack of theory as basically anything can be argued to be 'reflective academic work.'

Academic research is conducted through the methods that are accepted by the academic community. Philosophic-artistic reflection did not appear to be a proper premise for grounding the present academic study as a means to explain what happens in user-centred conceptual designing. The aim was to provide a well-justified explanation that is based in empirical discoveries and relevant theories that are capable of producing a credible account for the phenomena in our social reality. A lengthy review of literature, lecturing, writing, and being involved in a designing research community, resulted in distilling the central theoretical footholds for the study. These became Cross's theorising on design thinking and Schön's conceptual work on 'reflective practice.' Later the theoretical grounding was deepened by Blumer's symbolic interactionism and Bateson's cybernetic theory of learning and communication.

Intense work to make sense of what happens in conceptual designing eventually led to the realisation that a new research method may be necessary in order to explain what was at the focus of the study. The video-based analysis method was initially formed on the basis of conversation analysis and interaction analysis. However, associated with these methods is certain absolutism with regards to the lack of assumptions about what there is to be discovered. Designers work in concept design, which I later began to talk about in terms of conceptual designing, appeared to me to be organised around some underlying principles on the basis of my years of working in the field. These underlying principles and foundational structures remained hidden, unexplained, for a long time.

Based on the work in more than ten concept design projects, on discussions with scholars and practitioners in the field, on the review of relevant literature on the earlier theories, and on my previous sketching of ideas about how to explain conceptual designing, an early structure for the 'levels' of conceptual design began to form. These led into the description of the premises for the new method as well as to the realisation that conceptual designing might possibly be explained in terms of learning, as a special case of it, i.e. as project-specific learning. This required the development and the unambiguous description of new analytical concepts.

What was the value of moving from one set of concepts to others in the explanation? What particular value did the adopted 'learning lens' (i.e. studying designing as project-specific learning) add to the study of design interaction? Bateson's idea of the levels of learning had the key role

in setting new expectations for what to see in the empirical data, and it sensitised my perception to phenomena that are not highlighted by the use of the problem-centred approach. Two aspects of conceptual design work began to attract novel attention: firstly, the key transitions that could be identified as events of learning, and secondly, the development of the resources that enable the performing on a new 'higher' level.

Through further work on the analysis of the empirical data, and through the work on literature, the study began to pay attention to what was conceptualised in term 'semiotic resources.' The interest was on the production of new semiotic resources, the use of these in the central events of learning, and their role in the change that was apparent in designers work once they realised what they were creating.

Over the duration of the study the approach was refined and the analytical concepts became increasingly sophisticated for revealing the essential aspects of the project-specific learning that happens in conceptual designing. The approach appeared all the time as increasingly better justified. It was especially the new discoveries about conceptual designing, documented in the empirical chapters, that provided confidence about the relevance of the method. Especially, such discoveries about phenomena in conceptual design work that would enable arguing for certain concrete ways through which conceptual designing could be facilitated appeared valuable.

Such phenomena were especially what were later named as *priming* and *pre-framing*. Priming was given the meaning that it refers to the production of semiotic resources that are necessary for articulating the design concept. The idea was simple: It is not possible to articulate and think about something radically new in a relevant and consistent manner without having the required resources for it. Pre-framing was a means to conceptualise the transcendent use of such structures that enabled designers to employ a model to see the situation that had proven useful in previous endeavours. Such a model enables the paying of attention to such aspects that have been relevant and they provide concrete guidance on making sense of the findings and expressing them. The use of such models appears especially useful in complex projects. And, in the current environment, projects are inclined to be increasingly complicated as their realisation necessitates the conception of increasingly complex entities.

Designers' ability to see relevant simplicity in their projects in order to pursue this simplicity is a central skill of designers, and it is becoming increasingly challenging. Thus the title of the work: frame it simple! The

work was conducted in the hope that this would become part of the emerging tradition of design studies that are able to make a dual-contribution – to influence both the academic study of designing as well as design practice.

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Appendix:
Transcripts in the original language (Finnish)

Urban Planning scripts

Excerpt 6

```
01 M:   Mun mielestä niinku me tehään kolme vaihtoehtoo. Ja mä en
02      nyt vielä tiedä onnistuuks tää multa. Mut yritetään.
```

Excerpt 7

```
01 M:   Mum:mielest yks lähtökohta on selkeest se et jos
02      tässon tää vesialue. Ja tässontää kaupungin keskusta.
03 A:   Mmm.
04 M:   ja täällon tää nelostie.
05 A:   Mmm.
06 M:   Ni yhdet haluu niinku sitä uutta tänne.
07 A:   Mmm.
08 M:   Ja. Ja:ja samalla ne uskoo niinku..
09      Voisk.. Käviskö.
10      Hetkinen. Pitäskö mun tehä tää niin et me ensin käydään
11      alueittain läpi ne visiot ja sit yritetään.
12      ((Työntää paperin edestään))
13      Joo. Se voi olla
14      helpompi, helpompi nii. ((selaa paperipinoa))
```

Excerpt 8

```
01 M:   ((piirtää))
02      Nyt jos me mietitään ni Ruotasen osalta
03      aika moni halus säilyttää sen
04      ennallaa.
05      Joo:et. Pieniä parannuksia. Ei: suuria.
06 M:   kirjoittaa 'RUOTANEN'
07      Joo mut joku sano et sinne vois tuoda matkailua.
08      Ni Ruotasesta meill on semmonen visio et se on aa
09      ((Kirjoittaa kirjaimen 'A' ja ympyröi sen))
10      asumisaluetta.
11 A:   Mmm.
12 M:   Aa plus är äm.
13      ((Kirjoittaa edellisen alapuolelle 'A', jonka ympyröi ja
        lisää kirjaimet RM kuvion viereen))
14      Katsoo avustajaa
15      Ne on oikeestaan ne
16 A:   Mmm.
17 M:   perusvisiot.
18 A:   Mmm.
```

Excerpt 9

01 M: No miten nää liittyy nää jutut toisiinsa?
02 (1.9)
03 Nää ei tyypit
04 (2.0)
05 Onksne niitä jotka uskoo sen keskustan (0.5)
06 M: Tavallaan nyt se niinku logiikka näiden?
07 A: No no tässä oli et
08 tällä houkutellaan niinku pysähtymään.
09 Sit on jotaki tienvarsijuttuu.
10 Ja. Se lisää keskustan aktiivisuutta.
11 Siis täss oli se.
12 Tietysti kaikkihan nää nyt sitte uskoo siihen et rahavirtoja saadaan
13 sitä kautta
14 M: Mmm.
15 A: kaupunkiin ja seki JO niinku
16 M: Mmm.
17 A: tuo
18 M: Mmm.
19 A: mahdollisuuksia ja kehittämisiä.
20 M: Mmm. Mmm.
21 A: Mut ehkä se niinku tavallaa se hh.. keskustan (.)
22 rankin täydennysrakentaminen
23 M: Se paikallisuus
24 A: liittyy juuri
25 (1.0)
26 M: No mä mietin et liittyskö se että.
27 (..) Nii.
28 (1.2)
29 A: Ja sitte toi (0.8) <paikallis> nii.
30 (2.5)
31 ↓paikalliset lähtee, paikalliset >lä<, et tulisse
32 aa bee see ja kehitetään vaskikelloo.
33 M: Mmm mmm
34 A: Ni se ehkä liittyy semmosee enempi semmosee nollakasvuvisioon.
35 et vähän täydennetään
36 M: Mmm mmm. Nii mä ehkä pistäsin nää niinku yhtee.
37 Paikallisuus
38 A: Mmm mmm
39 M: ja pienimuotosuus. Vähä varovaisempi
39 A: Joo.
40 M: tekeminen. Hyödynnetään se mitä on. Nää kuuluu yhteen.

Excerpt 10

01 M: Mä mietin et jos näitä yrittää tyypitellä, ni yks ois
02 tosiaan tota teollisuutta, perinnettä ja paikallisuutta.
03 M: tää nollavisio.
04 A: Mmm. Kuulostaa hyvältä.
05 M: Sit se se, niinku se yks, se semmonen
06 keski-määränen voisko se olla jotenki niinku
07 hyvinvointipalveluja.
08 Tietenki se sopis
09 tohonki
10 mut jos sen yrittäis jotenki tyypitellä.

```
11 A:            Mmm.
                 (1.4)
12 M:            Hoiva.
                 (1.1)
13               Sopiiks toi ranta sit siihen kumminkaa?
                 (6.9)
14               Miksei.
15               (0.9)
16               Onhanne se yrittämistä ihan yhtälailla. Sen
17               ei tartte olla teollista yrittämistä siellä rannassa
18               mut niinku
                 (2.0)
19 A:            Tässähän se oli oliksenniinku pääasiassa asutusta ja
20               tässä se oli
21 M:            Joo.
22 A:            Joo.
                 (0.8)
23 M:            Ku mä mietin et tähä malliin se
24               jotenki sopis et jos oletetaan et täällon isoja toimijoita ja
25               työpaikkoja ni sillon tarvitaan...
26               Ne ei o..
27 A:            Mmm.
28 M:            Niinku se on eri paikassa. Tää vois olla semmonen
29               asuminen ja työ yhdessä.
30 A:            Joo.
31 M:            Ehkä. Et jos jotenki yrittäis..
32               ((kirjoittaa ”HOIVA” sanojen ”hyvinvointi” ja ”palvelut” alle))
```

Multichannel Maps scripts

Excerpt 12

```
01 I:            Meillä on aika monipuolinen
02               arsenaali erilaisia juttuja ja taustatyötä sen
03               ikäänku kiteyttämiseks
04               et mikä
05               mikä tän meiän menomaps
06               karttapalvelu. Mikä tää nyt on sit tää
07               meiän
08               palvelu nimeltään. Oisko se sit menomapskarttapalvelu
09               jos ei tuu vastalauseita.
10               Osataanko me
11               tälle karttapalvelulle >Me ollaan täs tällä viikolla
12               JO harjoteltu tässä osaston strategiaa kirjotettu ja
13               varmaan koko laitoksen strategiaa yritetty
14               viilata< lyhyesti terävästi ytimekkäästi sitä että miks
15               tää on olemassa
16               ((tekee käsieleen))
17               Pystyyks sitä laittaa jotenki lauseeks?
18               (5s)
19 Dept.Manager  Siinähän se on tutkimussuunnitelmassa. Heh. Kai.
20               Heh. Täyty vähän latistaa.
21               (12s)
22 I             Jätetää on perjantai. Aika haastava juttu=
23 Project Mngr  =elikkä siis...
```

Excerpt 13

01	I	Karttapalvelu tarkottaa nyt tässä sitä että meill
02		on yks palvelu. Elikkä kun me nyt puhutaan
03		monikanavapalvelun suunnittelusta.
04	SW Engineer	Mmm.
05	I	Mä ainakin näkisin jollakin tapaa et meill on yks ydin (.)
06		palvelu, joka määrittyy joittenkin komponenttien kautta.
07	SW Engineer	Mmm.
08	I	Mitkä nää siellä sitte ytimessä rullaa.
09	SW Engineer	Mmm.
10	Factilitator	Siellä on jotaki paikkatiedollisia määrityksiä ja
11		prosesseja.
12	SW Engineer	Nytten tässä tulee tää justiisa. Eli ydin on
13		esimerkiks sitte joukko (.)
14	I	((nousee ja kävelee fläpille))
15	SW Engineer	Se ei oo käytännössä mikään fyysinen sovellus tai
16		prosessi. Tai se on joukko termistöjä.
17	I	((Ottaa kynän ja seisoo aloillaan))
18	SW Engineer	Joukko käyttöliittymäkomponentteja, jotka on
19		yhtenäisiä. Joukko rajapintoja mitä käytetää jotka on
20	Dept. Manager	((Nostaa käden))
21	I	((Osoittaa Dept. Manageria sormellaan
22		ja kääntyy häntä kohti))
23	SW Engineer	yhtenäisiä. Koska tää on nytten ni.
24		Menee web-sovelluksessa ja
25		kännykkäsovelluksessa ni me ei voida missään nimessä käyttää
26		samaa ydintä.
27	Dept.Manager	Niin mut tota. Voisko tässä nyt ajatella.
28		Tai mennään. Peruutetaan vähän.
29		Nyt et tää termistöjen käyttö. Tää
30		on iha tää on iha hirveetä kun se on niin vaikeeta.
31	SW Engineer	Mmm.
32	Dept.Manager	Mut et tää on. Tää on niinkn. Koska me..
33		((elehtii kohti SW Engineeriä ja Iia))
34		Vähän riippuen siitä mikä näkökulma nin
35		täsmälleen sama sana voi tarkottaa aikalailla eri asioita. Mut mun
36		vielest ((osoittaa kalvolle)) se mikä tässä nyt voiaa
37		ottaa tämmöseks niinku ajattelutavaks et. Et
38		tavallaan tää karttapalvelu on jonkunlainen
39		palvelu, jossa loppukäyttäjä. Sen vois
40		periaatteessa ajatella et jos tää ois
41		maksullinen, ni sä samalla tavalla ostaisit kuin sä
42		ostat Soneran liittymän ja sitte jopa ruksaat että
43		((tekee eleen ikäänkuin merkiten ruksin))
44		mitkä optiot sä otat siihen päälle. Otatko
45		iPhone option päälle. Otatko webbi-
46		option. Ja otatko multitouch option. Ja
47		Ja otatko vielä tulostuskarttaoption.
48	I	((kävelee fläpille ja alkaa kirjoittamaan))
49	Dept.Manager	Et tavallaan se on se palvelu on nyt se mitä se
50		loppukäyttäjä niinkun kokee tässä yhteydessä.
51	SW Engineer	Jo’

Excerpt 14

```
01 I              Mä näkisin et meillä on kolme kolme juttua.
02                Tai siis nää on niinkun. Kaikki käyttää sitä samaa
03                niinkun dataa jotenki. Tää ny risteytyy tossa. Eli
04                tääll on niinku toi iPhone tai..
05                ((nostan molemmat kädet ilmaan))
06 Dept. Manager  Kännykkä.
07 I              iPhone. Sitte tuloste on niinku yks kokonaisuus.
08                Sitte toi painettu. Joka on tommonen kertaluonteinen
09                on-demand joka on business-to-business tyyppinen
10                juttu. Ja sitte meillä on tota
11                toi touch wall joka on sit tämmönen niinku
12                julkinen palvelu.
13                ((elehtii fläpin suuntaan))
14 I              Tämmönen kokonaisuus.
15                Sit meill on MenoMaps-palvelu joka ikäänku niinku
                  jotenkin mist
16                me puhutaan ni on toi tuoll
17                keskellä
18                mis nää risteytyy.
19 SW Engineer    Eli
20 SW Engineer    Sitä[mä
21 Dept. Manager      [Miksi
22 SW Engineer          hain >Sitä mä hain justiinsa<
23 Dept. Manager  Nii=
24 SW Engineer      =että mikä on nyt tässä[   ] niin
25 Dept Manager                            [Aaa]
26 SW Engineer    nää sy-karttsymbolit esimerkiks. Samaa=
27 I              =yhtenäinen visuaalinen ilme
28 SW Engineer    Nimeomaa. Tie[                ]tyt
29 Proj. Manager               [Samat aineistot]
30 SW Engineer    tyt käyttöliittymäkomponentit. Tiettyy eli pisteeseen asti
31                ainaki on samat aineistot. Inan samoja
32                ei voida. Ihan samoja symboleita ei
33                voida.
34 Proj. Manager  Jollakin tavalla yleistettynä
35 SW Engineer    Yleisesti ajatellen samat mut mitä meill tarkottaa
36                nytte[   ] tässä ni nyt karttapalvelu et..
37 Dept. Manager       [Mut]
38                Mut mun näkökulma oli kyllä eri (.) kuin
39                Iin. Mä ajattelin et se karttapalvelu on
40                näitten kaikkien summa. Eikä toi ydin.
41                (3.2)
42 Participant A  Ulkoreunoihin asti.
43 I              Elikkä sul ois niinku tämmönen
44 Dept. Manager  No mä sitä yritin selittää.
45 I              Elikkä onkse niinku tämä,
46                vai onkse niinku tämä?
47 Dept. Manager  No mummielestä jos jos niinku lähdetään tota
48                meidän projektisuunnitelman näkökulmasta. Mun
                  mielestä niinkun
49                tietyssä mielessä on niinku ilman muuta tää ulkoreuna.
50 Dept. Manager  Siin on niinku se..
51 Proj. Manager  ((Keinuen tuolissaan sivuttain)) Jotka kaikki
52                yhdessä muodostavat metakäyttöliittymän
53                ympäröivään luontoon.
```

Excerpt 15

01	Dept. Manager	Mitä me tarkoitamme sanalla ydin?
02	SW Engineer	Koska tää on tää on mulla itellä tullu mieleen.
03		Koska kaikki muut mä oon vapauttanu
04		aivan täysin. et mä en ajattele lainkaan web.
05		sovellusta. Ne mitä mä en ajattele et tarttis olla
06		ydin tässä. Tavallaan. Jos ei tarvii olla symbolien
07		tyylittelyn samaa ni
08		siel voi olla periaattees ai:van muita.
09		Ihan muuta.
10	Dept. Manager	Kyllä kyllä mutta
11	SW Engineer	Nimittäin jos meiän ei tarvii käyttöliittymää
12		tehdä niin me ollaan täysin vapaat tekemään.. Täl
13		hetkel mä oon odottanu et millon mä saadaan se
14		päätös että mikä ois se käyttöliittymän tyylittely,
15		et otetaan se. Ja jos se ei
16		kuulu ytimeen, ni me ollaan vapaita web sovelluksessa
17		päättämään käyttää jotain muuta. Sillä
18		ei yhdistetä sitä samaks.
19	I	Toi:: Yks mahdollinen tapa yrittää hahmottaa asiaa
20		Et meill on täällä juuseri.
21		Sit meill on täällä tota. Meill on täällä ATK
22		insinööri
23		joka osaa tehä softaa iha helvetisti. Sit meill on
24		kartografi, tommonen geodeetti
25	Dept. Manager	Tai.. Päätä kumpi.
26	ParticipantA	Valitse nyt oikein. Eli
27		mikä?
28	I	Kart.. Paikkatiedosta ymmärtävä ihminen
29		ihminen, joka.. Kertokaa te, siis... Pointtina mullon
30		tässä se että ikäänku ydin määrittyy näitten eri
31		tekijöitten silmissä ehkä vähän eri tavalla.
32		Ja niinkun käyttäjälle ikäänkun mitä hän kokee
33		tämmösenä niinkun palveluna tai palvelukonseptina tulee
34		siitä et mitä se näkee visuaalisesti. Semmonen brändi-identiteetti ja
35		mikä siihen liittyy. Tämmöset visuaalisen yhtenäisyyden
36		periaatteet. Ja vuorovaikutuksen tai yksinkertasuuden
37		periaate ja luonnonläheisyyden
38		tai sosiaalisuuden periaate, avoimmuuden periaate. Mikä siinä nyt sit
39		onkaan semmonen käyttäjän vuorovaikutukseen vaikuttava
40		periaate. Sit meill on ATK insinööriin vaikuttavat
41		periaatteet et justiin mitkä ne on ne
42		tietokanta-alustat millä tehään. Miktä ne on ne formaatit
43		millä pelataan. Mitkä ne on ne rajapinnat, millä
44		pelataan. Et sillon niinkun ihan oma tää
45		niinkun, ikkuna tohon juttuun.
46		Ja sit meill on vielä tää (.) geoihminen.
47	Dept. Manager	Tota
48	I	Joka sitte kattoo että mitkä ne on ne paikkatiedon
49		mallinnuksen periaatteet. (cont.)

Excerpt 16

01 Dept. Manager (cont.) Sano et. Sanos nyt vielä et
02 niinku (.) Se mitä sä sanos ni ihan ookoo
03 mut et (.)Minkäs takii me nyt käytään tätä
04 keskustelua?
05 I Me käydään keskustelua jotta me pystytään
06 artikuloimaan meiän MenoMaps monikanavapalvelu.
07 ((Avaan kädet levälleen))
08 As simple as that.
09 What is MenoMaps multichannel service.
10 Dept. Manager Mmm.
11 I Ja tää artikulointi tässä on auttamassa sitä et
12 me pystytään sanomaan se ääneen et mitä me ollaan täs
tekemäs
13 mahollisimman yksinkertasesti ja ymmärrettävästi.
14 Dept. Manager Ni tä'ä tää. Pysähdytään nyt tähän oikein kunnolla
kymmeneks
15 minuutiks tai puoleks tunniks tai
.. (keskustelu aikataulusta leikattu) ..
16 Dept. Manager Koska thää on silleen ni niinku ihan hyvä kysymys
17 et et mitä mitä ylipäätäsä maailmalla tarkotetaan
18 ku puhutaan jostai monikanavapalvelusta tai
19 monikanavaisuudesta. Hirveen sumee käsite. En
20 tiä
21 Proj. Manager Ku sä paat Goo Googleen laitat ni
22 Dept. Manager onks sitä kukaan määritelly.
23 Proj. Manager se heittää sieltä ää meiän projektin ensimmäisenä.
24 Kokeilkaapa.
25 Dept. Manager Ja sit siit on jotain synonyymejä. Et onks
26 se just moni monikanava mut
27 I Täähä viittaa siihen et mehän tehään uraa uurtavaa
28 tutkimusta.
29 Proj. Manager Kyllä.
30 Dept. Manager Siis tavallaanhan meillä voi olla monikanavapalvelu
31 ja me voidaan esimerkiks päättää et joka
32 kanavalle annetaan aivan oma visuaalinen
33 ilme. On se siitä huolimatta niinku monikanavapää
34 palvelu.
35 I Ja siin on yhtenäinen prinsiippi.
36 Dept. Manager Ja sen takia mä tän visuaalisen
37 ilmeen niinkun nostin niinku eri eri tasolle. Mut et
38 ei.. On vaikea ajatella et se on
39 monikanavapalvelu jos ei siellä oo niinku samoja
sisältöjä.
40 Et monikanavapalvelu. Se siihen keskeisen
41 periaatteen.. Mum mielestä sisältyy se ajatus et
42 meill on yhteisiä sisältöjä. Ja niitä
43 halutaan (.) jakaa.
44 Proj. Manager Mutta sitten jos kaikki kanavat on brändätty saman
45 visuaalisen periaatteen mukaan according. Se on
46 käyttäjälle tunnistettava kokonaisuus.
47 Dept. Manager Ni e periaattees et siell on se MenoMaps logo
48 joka paikassa. Et se on se.
49 ParticipantA Mut voisko kuvitella ni niinpäin et se sitova tekijä
50 oiskin visuaalinen ilme? Taustalla oiskin
51 eri aineistot. Seois pohittava et oisko se sitte

52 vielä monikanava. Et tavallaan.. ei. On
54 vaikee keksiä et mikä se esimerkki tästä asiasta.
55 Dept. Manager Yritä ees. Et jos sä pystyt löytämään jonkun jonkun tota
56 esimerkin sille ni niin hyvä sitten. Mu mun se sillon
57 ku tätä nyt projektisuunnitelmaa, ni mä jonku verran
58 selailin et mitä tarkotetaan tällä monikanavaisuudella.
59 Kyl mum mielest se et esimerkiks ku ottaa Hesarin
60 ni Hesarikin pohtii tätä
61 monikanavaisuutta et koska paperi kuolee
62 ja weppi on tullu ja kännykät tulee. Miten
63 siinä eletään?

Excerpt 17

01 Dept. Manager Ihan niinku Participant D toi tossa tän hyvän
02 esimerkin. Oikeestaan Googlen karttamaailma on niinkun
03 monella tavalla monikanavainen.
04 I Mmm.
05 Dept. Manager Et me tot. Siin on Google Earth olemassa ja
06 siihen on maps.google.com ja toi
07 toisaalta mun iPhonella on Googlen kartat. Ja
08 ja sä voit Nokialla tai kännykällä ottaa mikä
09 se on gmapsin tai jonkun näin. Se on
10 ihan oikeesti monikanavapalvelu. Siin on samat...
11 I Eli mitä kaikkee.. Mitkä? Jos sä määrittelisit
12 ton Googlen. Jos otetaan semmonen esimerkki nin..
13 Voiks näihin?
14 Ni tämmönen tekninen toteutus,
15 sisällöllinen toteutus
16 ja toi tunnistettavuus toteutus?
17 Dept. Manager No onhan niissä niinkun. Siin tulee.
18 Mä en tunne sitä niin syvältä tai. Mut et on
19 siellä samoja samoja. Jos puhutaan nyt. Rajotutaan
Google karttoihin
20 Ni taatusti siel on niinkun samat
21 samat kartat. Samat kartat ja niillä kartoilla on öö
22 osin sama ilme. Että et mun iPhonella
23 ne Google kartat näyttää suurin piirtein samallaisilta kun
24 kun maps.google. Sit ku mennään Google Earthiin niin sit tää
25 ei enää pidäkään paikkaansa.
26 I Joo.
27 Dept. Manager Ja mitäs
28 I Tää tekniset periaatteet?
29 Proj. Manager Meiän slangilla se tarkottaa kuvaustekniikkaa.
30 Dept. Manager On ne osin samoja rajapintoja takana siellä. Et
31 kyl siellä samoja niin tota käytetään. Samat
32 karttaprojektiot on käytössä läpi läpi linjan.
-- *(leikkaus)* --
33 I Nii eli tämmösii juttuja mitä nyt tuli
35 tosta Dept. Managerin selityksestä liittyen
36 Google esimerkkiin oli että on sama
37 ilme. Voidaan tunnistaa. Googlel on
38 tietynlainen yksinkertaistus. Tietynlaiset
39 värisävyt niis kartois mitä se käyttää. Tietytlainen
40 pehmennys niissä reunoissa sun muuten. Että ne
41 näyttää heti Googlen kartoilta.

42 Lataa.. se on tietyl...
43 SW Engineer Sä voit kirjottaa siihen..
44 I Mä laitan tänne et latautuu nopeesti. Eli Googlel
45 on se periaate kun ne on nörtti lähtönen firma.
46 Se teknisesti toimii helvetin hyvin. Toimii
47 joka alustalla. Muun muassa se
48 toimivuus on semmonen tekninen. Eli tää..
-- *(leikkaus)* -
49 I Sisällöllisesti niisson samoja karttoja..
pääpiirteissään
50 ainakin. Ja samat karttaprojektiot.

Excerpt 18

01 I Me yritettiin tässä kuvata jonkin tämmösen ä
02 monikanavapalvelu nimisen hässäkän semmosta niinku
03 identiteettiä. Ja jotta jokin on
04 monikanavapalvelu niin sil oli jotenkin
05 tämmösiä. Ilmeeseen toiminnallisuuteen liittyvä
identiteetti
06 jonka käyttäjä kykenee tunnistamaan. Ja sit siinon
07 semmonen identiteetti jonka atk-insinööri
08 pystyy tunnistamaan liittyen rajapintoihin ja ehkä
09 semmoseen tekniseen niinku hifileveliin. Sitten tota
10 öö siinon geo-ihmistä.. hänen suhteen
11 semmonen identiteetti et tunnistaa sen karttamateriaalin,
12 ne projektiot. Eli sillon tämmönen
13 niinkun identiteetti. Eli jos joku asia on ikäänku tämmönen
14 monikanavapalvelu luonteeltaan, niin sillä
15 ois ikäänku tämmösiä piirteitä. Eli pitäskö meiän
16 sitte liittää tähän että me puhutaan täs
17 monikanavapalvelusta ihan niinkun
18 projektisuunnitelmassa että tässä tehdään monikanava
19 palvelua, et vielä neljänneks laittaa
20 tää et tässä tää tehdään monikanavapalvelun
21 periaatteilla, tai jotain
22 sinne päin.
23 Proj. Manager Ee
24 I Vai liittykö se, voisko sen jotenkin kirjottaa jotenki
25 tohon? Kosk mummielestä
26 Proj. Manager Mä: mä: [laittasin sinne vaan otsikon
27 monikanavapalvelu. Ja sit mä laittasin noi
28 siihen kohdiksi alle. Se määrittää miten me näemme
29 monikanavapalvelun.

This book introduces an early theory of conceptual designing in terms of project-specific learning, and outlines several theoretical concepts that are necessary for the explanation. The work is related to the topic of innovative design thinking, which has recently attracted substantial interest not only from academic scholars but also from design practitioners and businesses. The theory sheds light into innovative design thinking, and explains the role of the construction of novel resources for the development of a design concept.

The book also introduces a method, Framing Analysis of Design Articulation, for the analysis of project-specific learning. Real-life conceptual designing is analysed through two carefully chosen projects that are scrutinised in detail. The book shows concrete examples of well-functioning strategies for conceptual designing and outlines theoretically and empirically grounded arguments in order to plan successful conceptual design processes.

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