Conceptual Modeling: A Case Study of a Creativity Facilitating Environment

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Abstract

The conceptual modeling process is needed, when various artifacts, phenomena, or processes need to be modeled and represented on a conceptual level. Previous studies have especially concentrated in developing tight process models that create concise conceptual models. Those studies also name various external constraints that affect the modeling process.

In this thesis, the previous approaches in conceptual modeling are combined with complimentary elements. Firstly, the conceptual modeling is suggested to be an inherently social activity. Secondly, the conceptual model is considered to be an act of communication between a concept designer and his intended audience. Moreover, this thesis emphasizes that a concept designer, who creates a conceptual model, is a subject, who brings his personality, his backgrounds, and personal qualities in the conceptual modeling situation.

The conceptual modeling process has been used in this thesis to create a concrete case, the creativity facilitating work environment, netWork Oasis.

ACM Classification: I.6.5 Model Development, K.4.3 Organizational Impact, J.4 Social and Behavioral Sciences

Keywords: Conceptual modeling, Conceptual model, Qualities of a concept designer, Creativity facilitating working environment

Foreword

The original reason for me to start writing this Master's Thesis was one meeting with Professor Sutinen in September 2002. He had earlier had discussions with people from Joensuu Science Park Ltd. about the possible future plans for the development of Science Park. In those plans one of the key elements was a student, who would write his[1] thesis about a new kind of workplace. That thesis would serve as a basis for further planning and lay down the basic framework of ideas, according to which it would be easy to realize the plans.

There I was, asked by Professor Sutinen, whether I would be interested in joining this kind of joint venture between the University and Joensuu Science Park Ltd. and writing my thesis, while working half-time for the University and the other half for the Science Park. I felt excited; after all it was a wonderful opportunity for me both to finally accomplish writing my thesis and gain some valuable working experience in the private sector. But little did I know then about the size of the task I was facing and the time it would take me to finish the task.

More than one year went by. My working period for the Science Park had ended and I had accomplished little what it came to my Master's Thesis. I did not feel too happy about it, but unfortunately other, more immediate daily work tasks always cut in between me and writing this thesis. Finally, in September 2003, Professor Sutinen and I sat down together and had a friendly chat as we often have done. He encouraged me to complete this thesis and get it off my shoulders. He somehow recognized, at least I felt like it then, that the pressure from the unfinished task suppressed my attempts to finish it.

The work, or namely the thesis, had grown to be gigantic in my mind; it seemed to be far too complicated and many-faceted to be properly discussed on the pages of a tiny Master's Thesis. Professor Sutinen or plainly Erkki, as we all tend to call him here in the Department, lowered the expectations in my mind into more

[1] For the sake of clarity, I shall throughout the thesis use only a masculine form of gender, when referring to an undefined person. Where applicable, a less biased and nonsexist plural form is used.

suitable and achievable level. We decided that a scheme of “five pages per week, a meeting on every week” would gradually lead me to the end – a finished thesis and a freed mind. Unfortunately, though the plan was good, the realization of it was not that easy. It still took me two years, before the thesis was ready to be read and evaluated by Erkki and Professor Piet Kommers, who I have had an honor to have as another advisor for my work.

In a conference that I participated in late autumn 2003, there was a discussion about Ph.D. dissertations. One person in the audience raised a question: When one can think that the dissertation is ready to be reviewed by the great scientific audience? The question was not that simple to answer, but one good advice came out loud: “When one hates the work enough and cannot stand even the slightest sight of it!” I personally think that this wisdom can also be applied to some extent to Master’s Theses. Even though I have not started to hate my work enough to not to stand it at all, I certainly think that my thesis is now in the phase, where it should be let free.

Acknowledgements

I want to thank Ilkka Kakko, Piet Kommers, and Erkki Sutinen for their almost endless patience, understanding, and support. Without your sometimes a bit paternal, but still positive pressurizing, this thesis might still be mostly in my mind only. I also remember with great gratitude the highly stimulating discussions that I have had with you during this process. Hopefully you all can share my happiness with the end results. I want to thank also Esko Marjomaa, Justus Randolph, Pasi Silander, Matti Tedre, and Marjo Virnes, who have read through drafts of my work and commented on those. Esko, thanks for all those mind widening after-lunch chat sessions we have had and your help in developing the conceptual modeling part of this thesis. Justus, thank you for reading through this material and helping me out with this language I thought I was fluent in. Pasi and Marjo, you surely have helped me being more precise and tight, thus developing the form of my thesis. Those are perhaps the worst comments a writer has to tolerate because of his deep affection to his text. Thanks for letting me to be more reasonable with that affection. And Matti, thanks for letting me to borrow your ideas and texts. They were of great importance to me while developing this thesis.

If you ever happen to lack ideas, try asking me for some. I am also in great debt to my family and girlfriend for the support that I have received from them. Kiitos!

Contents

1 Introduction

The purpose for this Master's Thesis is to find an answer to a question, *which kind of working environment would facilitate modern, creative work*? As I am looking this question from the computer scientist's point of view, I put emphasis on finding tools to support the creation of such environment.

This thesis also introduces the reader to the idea of concepts, the conceptual models[2], the conceptual modeling process and the demands it puts on the concept designers in their modeling work. The conceptual models are basically collections of interrelated concepts, which constitute together a model or a presentation of an artifact or phenomena. The conceptual modeling is a process of creating conceptual models, which is done by a person (or in some cases a software), namely the concept designer.

My contribution to conceptual modeling is two folded. Firstly, I present conceptual modeling in its social context based on the literature review. Secondly, I put forward a description of the qualities needed from a concept designer based on literature and my personal experiences. In addition to the theory part of this thesis, the main results also include a case study with its background work where I used the conceptual modeling method in a real modeling situation.

The conceptual modeling method developed in this thesis includes task analysis, objective setting, information gathering, work presentation and evaluation phases, all contributing to a goal of achieving a concise and need fulfilling conceptual model. This method is based on background work from the fields of philosophy, sociology, artificial intelligence, and educational psychology. The conceptual modeling method is also based on reflection of personal experience, which I gathered while working on the case study presented in this thesis.

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[2] It is important to note that in this thesis the term '*conceptual model*' is not used in its psychological meaning, that is person's inner mental models, but to describe more physical models of artifacts or phenomenon.

The case study presented in this thesis is a conceptual model for netWork Oasis (nW Oasis from here onwards). The nW Oasis is a place for a new kind of creative and collaborative working, which should also improve the productivity of the workers. The nW Oasis will be realized in the third enlargement phase of the Joensuu Science Park and should be in operation on year 2006 (Net05). In my conceptual model the nW Oasis is especially a networking and creativity facilitating working environment supported by suitable information and communication technology (ICT).

The conceptual model for such environment is inevitably rather multi-faceted and, therefore, I decided to define an idea of man to serve as a guideline for my work. This idea of man is based on Abraham Maslow's (Mas70) and Lauri Rauhala's (Rau89) works. The use of such an approach as this is especially justifiable in this kind of case study, since a design for a workspace is very much a design for a human being. Usually the idea of man is recognized and defined among the ”soft” disciplines such as humanities, but far too often neglected in natural science. My work here can also be seen as a critique of a missing or hidden idea of man in my own field of study, computer science. The development of the case study also demanded a collection of background material from very diverse fields, from history of arts to ergonomics.

As my thesis has got a constructive nature, developing the tools I use, that is the conceptual modeling method, and creating the end-results, that is the case of nW Oasis, I chose to use Lukka's Constructive Research Approach (Luk03) as my research method. The core idea in this research method is that the aim for research is to find answers or solutions to the practical problems through gaining deep knowledge about the subject area and actively collaborating with those, who are facing the problems at hand. Lukka's approach also stresses the importance of practical solution, the evaluation of it and the reflection of the results back to the previous knowledge. To support this approach, I chose to use five different instruments to gather and process the information. These instruments that I used were collaborative design sessions, research on books and articles, reading systematically newspapers and a magazine, doing local geographical survey, and processing the gathered information with the conceptual modeling method.

At first in my thesis, I shall introduce the research questions and the methodology I have used to find the answers to questions. After the methodology has been discussed, I shall introduce basics of the concepts, the conceptual modeling process and the needs it sets for the concept designer with my personal reflection. Then I shall discuss the backgrounds for the conceptual model. There I will create the framework based on the literature and other sources from various disciplines that have had an effect on the conceptual model. The conceptual model will then be described in a general sense with an analysis of the framework the conceptual model is bound to. There I also identify the uses of ICT to support the ideas presented in the conceptual model. Finally, I end my thesis with the conclusions reflecting my work in relation to research method, the conceptual modeling method and to the original research questions. The conclusions will be followed by an epilogue where I reflect my personal feelings and thoughts about the whole thesis writing process.

Throughout this thesis I am using rather wordy, a tour guide-like approach to the references I am citing. Usually I am first presenting the work of others after which I express my personal point of view to this particular topic or the linkage between the reference and my thesis. The reason for this approach is that in my opinion such approach is easier to read and comprehend by the reader and does not expect the reader to know all the topics or the references beforehand. I also prefer expressing myself in an active tone instead of using the passive tone, which is often used in scholarly publications. It is also noteworthy that in the text I refer to the original books or articles published in English. If I have in reality used the Finnish version, it is mentioned in references. The use of original titles in the text was chosen in order to make this thesis to be more readable for a non-Finnish reader.

2 Research Questions and Methodology

2.1 Research Questions

Basically, I have had one research question: *Which kind of working environment would facilitate modern, creative work*? In my thesis, the particular interest is to find ways how ICT could help in this task. Finding the answer to this question lead me to the realm of conceptual modeling, a method to collect, analyze, and represent a set of information. The research question and its answer should also bring answers to the original set of questions from which the research question was created (Fig 1.). This original set of questions was decided by the participants at the last of the nW Oasis design sessions, which I took part in as a Science Park employee on spring 2003. The purpose of these questions was that they would guide me in my work. That question set consisted of the following questions:

The first question of the original question set is *how to stop the brain drain from North Karelian region to southern Finland*? The reason for such drain is that there are not enough working possibilities for highly educated people in this region, which basically makes people to move out from North Karelia (Ero03). Therefore, it was necessary to create such an interesting idea that it would bring more companies that employ educated people to Joensuu. This way the brain drain might become less and open vacancies would lure people from urban areas to Joensuu to enjoy both lower living costs and a higher quality of life[3].

The second question is *how to create a space, which would bring together professionals of creative work, improving and facilitating them in their task of being creative*? Innovation creation is becoming more important in developed countries with knowledge economies. Creativity can be helped in many ways as people are intellectually stimulated in various ways: with the help of technology tools supporting creativity, bringing them together virtually or physically to share and compare their thoughts, and providing provocative, idea stimulating physical

[3] Higher quality of life in terms of close-by nature, lesser traffic, and closeness of the workplace (Ero03).

environment. These virtual and physical worlds do not necessarily need to be kept apart as the physical world can be represented in a virtual world similarly as the virtual world can be brought to be a part of the physical world.

The third question is *how to stimulate networking*? By stimulating networking, it is possible to help people discover ways to solve their problems, get new interesting ideas and find people to collaborate with. The networking promotes the distribution of new ideas among the people working in nW Oasis and allows the discovery of new connections between different companies. This helps in creating new business connections and creation of virtual professional networks, where each participating company contributes in their special area. In addition to organizations, networking also combines individuals from different cultures, disciplines, forms of talent, and views on world. This way the final product developed together by organizations and individuals may become better in comparison to the product each company or individual would have been capable of doing alone. Or in extreme cases, this kind of network actually enables the participating companies or individuals to achieve such products that would have been otherwise unachievable. (Bar02)

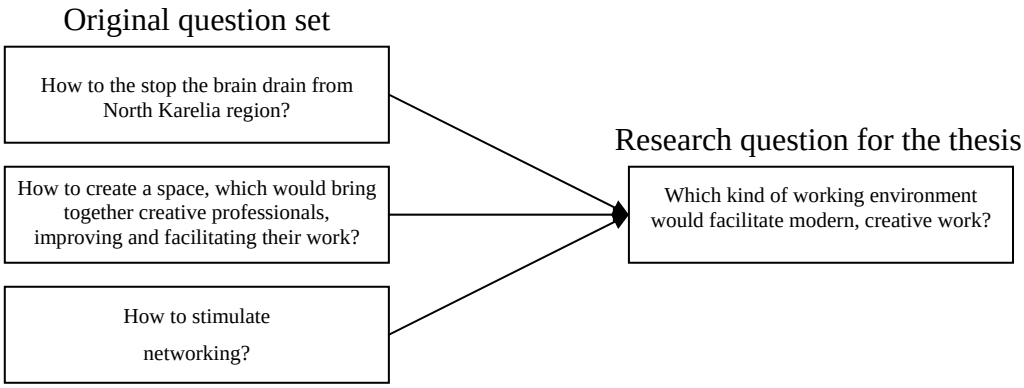

Figure 1. The relationship of the questions

All of these sub-questions have also got their connection to the area of technology. In the first question, technology is seen in the context of society, in the second question it is seen in the role of the facilitator for creativity and in the last question as a means for stimulating human relations. When I compare these

questions to “The Great Principles of Computing” by Peter J. Denning[4] (Den03), where he defines the field of Computer Science as a discipline, this thesis can be located under the domain of computing practices. In that domain, my thesis has its contribution to categories of modeling and validation and innovation, as I define and use a method of conceptual modeling and create a novel conceptual design. My contribution comes also in a form of a suggestion, which kinds of technological tools facilitate the creativity in the modern work place.

2.2 Methodology

Research Framework for My Thesis

The research framework of this thesis is based on the Constructive Research Approach method presented by Kari Lukka (Luk03). The method is supported by the selection of instruments. The reason why I decided to apply this method in my thesis is because of the constructive nature of my thesis, where my aim is to create a solution to a practical problem. The solution in the case of my thesis is in a form of a conceptual model derived from conceptual modeling process and the application of Constructive Research Approach as a general approach.

According to Lukka (Luk03), the constructive research approach provides the user with the means to solve a real world problem with the help of a construct of some kind. In addition, it states that the construct used in problem solving should somehow provide scientific feedback and benefit the science community of that certain discipline, where the method is being applied. It is also imperative that the researcher intervenes in the subject matter, which is quite different from traditional scientific methods, where a researcher’s intervention in the subject matter should be kept as minimal as possible. Lukka mentions four separate key elements that should be part of the application of the constructive research approach:

1. The practical relevance of the problem and its solution.

[4] Peter J. Denning is a former president of the Association for Computing Machinery (ACM).

2. The practical functioning of the solution.

3. The connections to prior theory.

4. The theoretical contribution of the study.

Basically, the theory is based on an assumption that if something works well in practice, it has also got something to give to theory. Lukka also mentions that there are situations where even unsuccessful practice may prove to be very beneficial to the theories of that area.

Lukka explains the process of this method to have seven stages:

1. *Find a practically relevant problem* where the ideal problem is such that once it is solved, it will both solve the practical problem and benefit the scientific theory.

2. *Examine the potential for research-collaboration*. Here the ideal situation is such that the researcher is part of a team solving the problem in the target organization.

3. *Obtain a deep understanding of the topic area*. Here the researcher should get acquainted with the problem area both practically and theoretically. It means that in addition to being a member of the team, the researcher also conducts field studies like observations and interviews.

4. *Innovate a solution idea and develop a problem solving construction.* This phase is the most critical of the project. If there is no innovative solution available, then there is no need to continue the project. The innovation process is supposed to be iterative and both the practitioners' and researcher's ideas should be involved in it. Also prototyping is encouraged to help the development of the solution.

5. *Implement and test the solution.* After the solution has been innovated, it is time to test it in practice. This means not only validating the solution

in technical sense, but also proving the validity of the process as a whole.

6. *Ponder the scope of the applicability of the solution.* In this phase, the experiences gathered from testing of the solution are analyzed. Then the researcher has to conceptualize the key findings and think about how the results could be applied to similar problem situations in other organizations.

7. *Identify and analyze the theoretical contribution.* This is the most important part when looking at the process from the scientific viewpoint. Here the results of the research are reflected back to the prior theory. This phase also serves as scientific justification for the whole process.

In the constructive research approach, there are basically two different kinds of anticipated results. Firstly, *the construction itself is one result*, which will also benefit the scientific community by providing the prior literature with a new case example. The important thing to remember here is pragmatic evaluation - is the solution for the problem, namely the construct, really working or not? Secondly, it is important to remember that *the relationships behind the construction itself, that is integration of scientific theories, are also tested* during the constructive research process. In this case also, the end resolution will give feedback to the prior theories.

In my case, the decision to take the constructive research approach as a general approach in my study was rather easy. There was a real world problem which needed a solution based on a formal study. My thesis is a construction (Fig 2.) which aims at developing a conceptual model which has a real world application. The conceptual model is based both on a prior knowledge about the conceptual modeling process and the background material being processed with it. My work has also followed the guidelines in its hardest part, where researcher has to have tight collaboration with the organization finding the solution for their problem. I worked for 9 months as a project planner for Science Park Ltd. in a project doing the background work for this conceptual model. I shall reflect in more detail the research methodology and how I applied it in my work in the conclusions chapter.

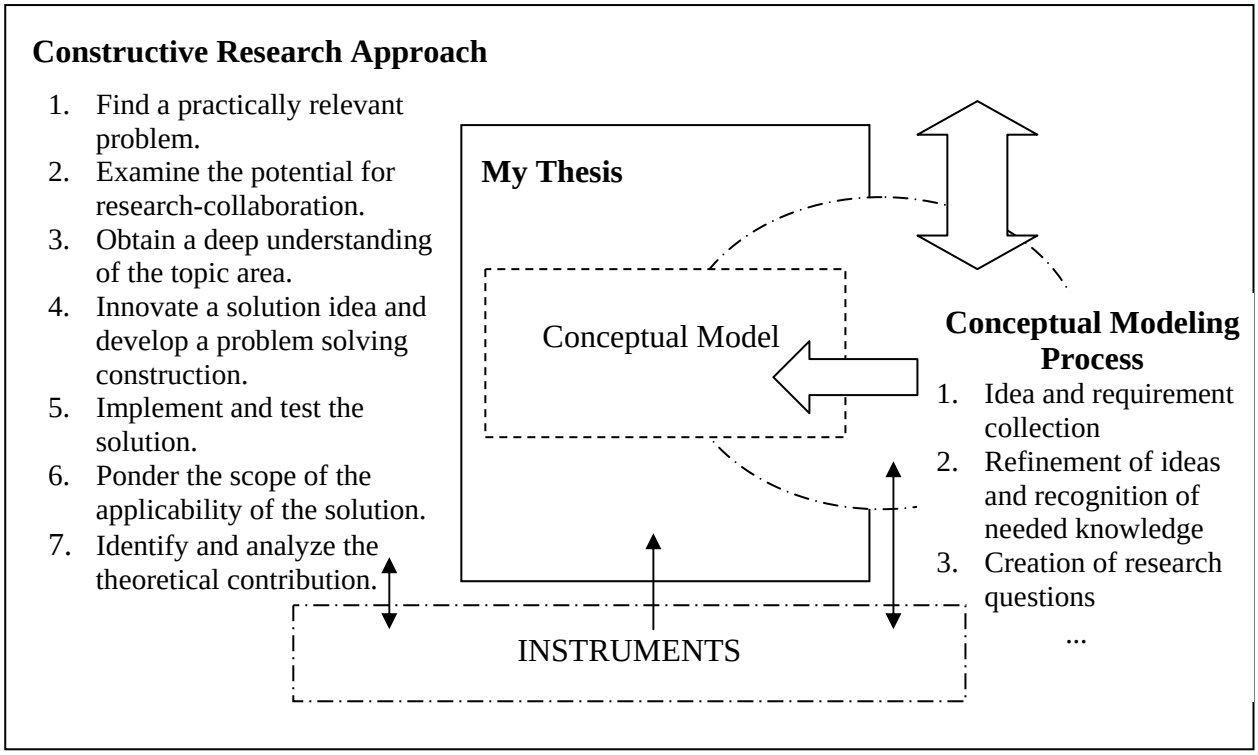

Figure 2. How the research framework affects the thesis

Instruments

In order to support my research, I chose five instruments to conduct the data gathering and processing for the research inside the framework of the constructive research approach (Fig. 3). First of all, I arranged *design sessions*, in which I participated with the core design team and several visiting professionals from various fields (see Appendix A). The idea of the design sessions was to collect ideas from the professionals who participated in the sessions. Not all the professionals mentioned above were present at all of the sessions; therefore, the sessions with different members started from scratch. With this solution, the rest of the core design team and I wanted to leave the sessions' end results as open as possible. As the participants were talented and recognized professionals in their fields, the amount and the quality of information received from them was substantial. During those sessions, both the conceptual modeling work and the Strengths – Weaknesses – Opportunities - Threats (SWOT) analysis (Kot01) were made. It provided our design team with opinions and suggestions from various vantage points. It would have been complicated to try to collect such information without bringing these professionals together to facilitate the design process.

Secondly, I did *a literature review on scientific books and articles* concerning innovation, creativity, the philosophy of concepts, an idea of man, conceptual modeling, the design of the real-life artifacts, and the premises for innovation and learning, to mention just some of the subjects. The knowledge acquired from these books and articles creates the scientific background for my thesis and the conceptual model in it. The selection process for the books and articles was partly formal, where I followed the citation chains and read texts by the well-known experts on the areas related to my work.

However, I also had another, less rational, means of finding books and articles to be referred to in my thesis. These means included suggestions from the advisors of my thesis, hints from my friends and colleagues, internet and electronic database searches and also sheer luck, when going through the shelves of books in the library. When choosing, which books and articles I would include in my thesis I analyzed, whether they would bring up any new interesting points of view to be discussed or would they benefit the building of the body of knowledge or the core in my thesis. In the selection process it was also important that I personally found it meaningful and justifiable to include those references, a recommendation by someone I know or respect alone was not enough. In some occasions I had to rely on second-hand references, because I could not get my hands on the original ones with a reasonable effort. I find that this is not a major problem in my thesis, since I have used the ideas in a form presented by these second-hand references. The ideas in their present forms are beneficial to my purposes and in my context, that is my thesis, even if they were misinterpreted or intellectually bent by the second-hand source I am referring to. Nevertheless, I do admit that this kind of memetical or evolutionary use of ideas[5] might be against the will or the meaning of the original authors.

[5] Here the memetical and evolutionary use of ideas means that ideas are important *per se* and are considered to be entities in their own right, whereas humans are more or less considered to be the vessels for ideas to be stored and changed. See chapter 3 and its part about memes for more information.

Thirdly, I *systematically read some newspapers and a magazine*. Those newspapers included *Helsingin Sanomat* (The leading newspaper in Finland, published daily), *IT-viikko* (an ICT newspaper published once a week), *Talouselämä* (an economics magazine published once a week), *Tekniikka&Talous* (an ICT and technology newspaper published once a week) for more than a one-year period of time between September 2002 and December 2003. During that time I took clippings concerning the core ideas of nW Oasis. These core ideas mentioned here included for example: new ways of working, innovations at the workplace, the situation of e-work and telework in the world and in Finland.

There are several reasons why I picked these newspapers and a magazine to be cited in my work. Firstly, Helsingin Sanomat helped me to see things from a national perspective, answering the question - What is important and discussed at the national level? Secondly, IT-viikko and Tekniikka&Talous gave me the viewpoint of ICT and technology-oriented professionals. It helped me to figure out what the new technologies that might be interesting for nW Oasis are, what it is like to work at ICT-companies, and what the recent trends in ICT are. Talouselämä included information and the perspective of people interested in economics, which helped me to understand things valued there. These newspaper and magazine citations helped me especially in putting the general, global ideas presented in literature into a more local context. With the help of the clippings, I was able to relate the references from literature to the reality here in Joensuu and in Finland. The original number of clippings was some tens of them, but I decided to include to my thesis only some of them. Often the problem was that the clipping did not serve the goals I had put on them, going either off-topic or being too vague to localize the general information from literature. However, even those clippings which I decided not to include here served my thinking and thesis in more informal way, for example by restricting the topics of interest or directing me to another source of information.

Fourthly, I did *a local geographical survey* in order to collect all the services available within a one-kilometer radius of the building site of nW Oasis. This was done in order to find out the variety of services and premises located in close proximity to nW Oasis. Thus, it gave me a chance to put the conceptual model of

nW Oasis into geographical context, putting it in its place in real world surroundings. It also gave me an opportunity to bring out my suggestions to develop that area. This local geographical survey is presented in the fifth chapter of this thesis.

Lastly, I created a possible solution to answer the research questions, namely the conceptual model, by using *the conceptual modeling* method. The conceptual modeling in this thesis is not only a method that I have applied, but also one of the research subjects of mine. I have done the background research on it, reflected on its use and thus have developed its use further. The conceptual modeling method is different from the previous instruments, because its sole intention is not to help in data or information gathering, but it served as a processing tool for the data gathered with other instruments.

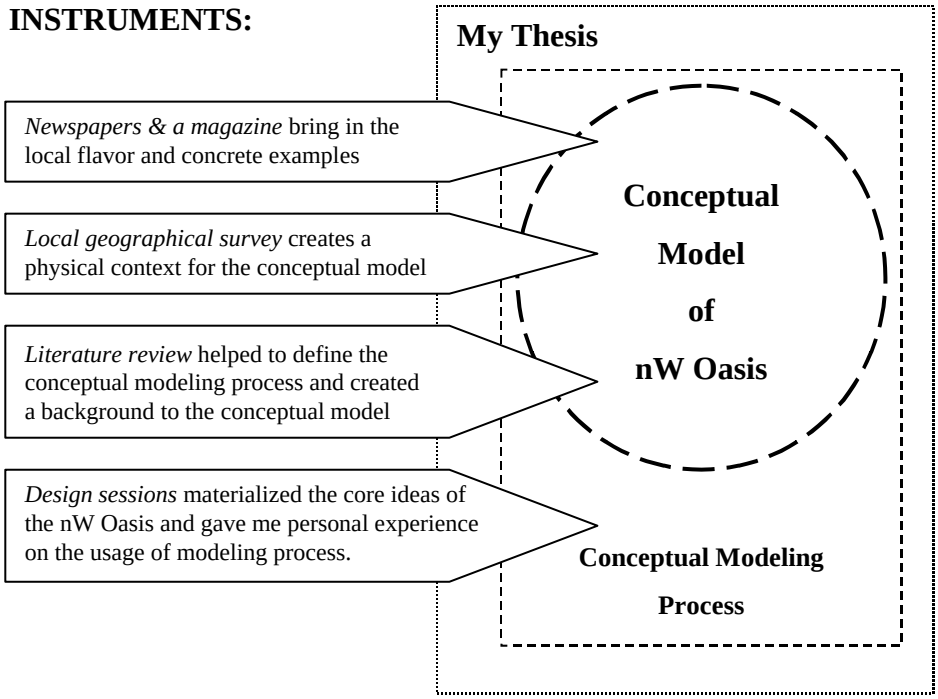

Figure 3. How the instruments support the creation of the conceptual model

2.3 Methodology's Relation to Research Questions

To find solutions to my research question, I decided to apply constructive research approach in my thesis as a general framework. It was supported by a selection of five instruments, which contribution to this thesis and its research questions vary

from the creation of a case file to localization of general issues into the local context (Table 1.).

The role for *constructive research approach* was to weave together the research questions, which serve as a driving force, with the instruments, which provide the content for the *conceptual modeling process*. That process created the *conceptual model*, which is my solution to the research questions.

The *design sessions'* role was to gather preliminary ideas and do a draft model, which would later guide me in my work. It also provided a stage where it was possible to test the first ideas and get some feedback from the professionals, who participated the session. The design sessions did for example an analysis to the draft model with SWOT analysis method, which gave a good feedback for my conceptual modeling work.

The *literature review* created a background both to conceptual model and the conceptual modeling process. Its function was to gather together material from various sources to build a solid foundation upon which the conceptual model and the conceptual modeling process could be built. The literature reviews idea was to find answers to questions such as "*What is creativity?*" or "*What is modern work like?*"

The newspapers and a magazine and the local geographical survey both served in localization roles. The idea was that the newspapers and a magazine would localize the more general ideas from the books and articles to the local context. Similarly the local geographical survey gave the conceptual model its physical context. The clippings I took from newspapers answered for example the question "*How the newspapers have seen the rise of the need for creativity at workplaces?*" The local geographical survey found out for example "*Which kinds of services and premises there are near Science Park?"*

Table 1. How the instruments and methods are related to the research questions

Research questions **Instrument/ Method**	**How to stop the brain drain from North Karelia Region?**	**How to create a space, which would bring together creative professionals?**	**How to stimulate networking?**	**Which kind of working environment would facilitate modern, creative work?**
Design sessions	Focus on the local issues that cause the brain drain. How the situation can be changed?	Collection of ideas for new kind of working environment.	Bringing together the professionals to do the draft version of conceptual model.	Doing a SWOT analysis for the gathered ideas and created drafts.
Literature review	What has been said about the reasons for brain drain? Which kinds of preventive tools have been used elsewhere?	What is creativity? Who are creative people? How physical space affects working? How to support collaboration?	What is networking? What has been written about networked work place and economy? How networking can be encouraged?	What is modern work? Are there previous pioneers, which would have been well documented? What can be done better?
Newspapers & magazine	What has been written about it local / Finnish newspapers? Which kinds of effects it has locally?	How newspapers have seen the rise of the need for creativity at workplaces? Which kinds of creative workplaces have been in media?	Are there local experiences about effects of networking?	Are there similar projects going on? Have they been in media?
Local geographical survey	Which kinds of services and premises there are here? What is missing?	Which services and premises are valued by the target group?	How can local services and premises support networking? Could this area be developed in this sense?	How the existing services and premises can be efficiently used to support newcomers? What more is needed?
Conceptual modeling process	To create such model that will not only keep people here, but also lures new people to move in.	To plan intellectually stimulating physical surroundings.	To create an environment which supports in addition to collaborative work also the informal engagements.	To create the final outcome, that is the conceptual model for nW Oasis
Constructive research approach	Constructive research approach weaves together the research questions, which serve as a driving force, with the instruments, which provide the content for conceptual modeling process. That process creates the conceptual model, which is a solution to research questions.			

3 Concepts and Conceptual Modeling

In this chapter, I shall at first introduce some things serving as motivational issues for the topic at hand. After that I shall discuss the concepts and conceptual modeling from the literature point of view. Then I shall reflect that information on my personal experience, which I had during the conceptual modeling process of nW Oasis. In the last part, I shall propose some preferred qualities of the concept designer, which is also based on my own work as a concept designer.

3.1 Motivation

During the writing of this thesis I continuously ran into the problem of ideas; where do they come from, do they exist before we “invent” or “discover” them, what are our means to bring about invention or discovery, and are there things that cannot even be thought about?

> *`I can't believe THAT!' said Alice.*
>
> *`Can't you?' the Queen said in a pitying tone. `Try again: draw a long breath, and shut your eyes.'*
>
> *Alice laughed. `There's no use trying,' she said: `one CAN'T believe impossible things.'*
>
> *`I daresay you haven't had much practice,' said the Queen. `When I was your age, I always did it for half-an-hour a day. Why, sometimes I've believed as many as six impossible things before breakfast.’ (Car05)*

I had an interesting discussion with Matti Tedre over the topic of existence of things. He claimed, citing an anonymous source, that there are three kinds of things existing in the world (Ted04):

- *Things that exist and we can imagine.* These are for example the objects of our surroundings.

- *Things that do not exist, but which we can imagine.* These are for example science fiction stories, in which there are things that do not exist in this reality, but which can be imagined.

- *Things that do not exist and which we cannot even imagine.* These are problematic to give any examples of because of their very nature. They are such things that at least at the moment a human mind cannot reach. An example of such a thing could be the infinite infinity, which cannot be understood with finite mind (Ruc98).

Rudi Rucker tells in his book, "Infinity and the Mind" (Ruc98), about his discussions with mathematician Kurt Gödel. In one of those discussions Gödel revealed to him that the mental objects in humans' mind are not actually created by humans themselves, but that they are picked by our minds from a higher level of existence. Gödel's way of reaching this higher level and finding answers to his questions was the practice of meditation. (Ruc98)

Charles S. Peirce writes in his article, "How to Make Our Ideas Clear" (Pei05), about the relation between existence and knowing. He gives a poetic example of the beauty and richness coming and going without being noticed or known by anyone. The reason for the example was to raise an important question - whether there are things that are beyond the reach of our minds? To quote him: "... *it is unphilosophical to suppose that, with any regard to any given question (which has any clear meaning), investigation would not bring forth a solution of it, if it were carried far enough.*" He strongly believes that given enough time, it is hard to believe that there would be a question which might not be ultimately solved (Pei05). This article also gives us an addition to the previous example by adding *the things that cannot be imagined by us, but nevertheless exist in the world.* A good example of such things is the old saying according which we can happily live our lives without knowing about or being aware of many things existing.

Philip G. Armour writes in his article, "The Five Orders of Ignorance" (Arm00), that building systems is not actually about building them, but more about knowing what to build. Thus, it is acquiring the necessary knowledge. As Armour was speaking of building a software system, I relate his theory to conceptual modeling.

Armour defines the orders of ignorance, from which I present here three top-most, which I consider being the most important for my work. They are presented here in bottom-to-top, or from most ignorant to least ignorant order (Arm00):

- *2nd Order Ignorance – Lack of Awareness.* This is the case, when I do not know that I do not know something. It means that I am not only ignorant, but I am also unaware of it. In the context of questions and their answers, I am in the situation where I do not have even a question.

- *1st Order Ignorance – Lack of Knowledge.* This is the case, when I do not know something, but I am aware of it. Here I already know the question, but I do not have any answer to it yet.

- *0th Order Ignorance – Lack of Ignorance.* This is case, when I am not ignorant anymore, but I do know and I can prove it somehow. Not only do I know the question, but I also do have the answer and I am capable of producing it.

I find that having the answer is not enough, but the nature or the quality of an answer is important as well. Carl Bereiter and Marlene Scardamalia introduced a scheme of the levels of working with knowledge in their article “Beyond Bloom's Taxonomy: Rethinking knowledge for the Knowledge Age” (Ber98). Their scheme has got eight levels of working with knowledge which describe how an individual’s perspective of knowledge develops. The levels are (Ber98):

- Knowledge as equivalent to “the way things are”.

- Knowledge as individual mental states.

- Knowledge as itemizable mental content.

- Knowledge as representable.

- Knowledge as viewable from different perspectives.

- Knowledge as personal artifacts.

- Knowledge as improvable personal artifacts.

- Knowledge as semi-autonomous artifacts.

Even though Bereiter and Scardamalia introduced their scheme in a context of children and how their idea of knowledge develops, I find it to be good also in describing how the understanding of knowledge develops. That understanding opens the door for an individual to start working with knowledge in a constructive manner. At first, things and knowledge appear to be as they are, but the deeper we dig into certain topic, we are able to articulate it, gain more perspective over it, improve our knowledge over it and can eventually find it as an entity in its own right.

The reason why I included this motivational part here was to lay a foundation for ideas concerning the concepts and conceptual modeling. For a concept designer, who is going to start doing conceptual modeling work, it is important to understand that something being unimaginable and impossible at the moment may not be in future. The conceptual modeling process is having a relevant question or problem at hand, mapping the unknown, revealing the concepts unknown to us beforehand, relating them together, and decreasing our ignorance over a certain knowledge domain. For a good conceptual model, it is important not to accept things as they are, but to try to find many perspectives over the topic and create a construct capable of living autonomously.

3.2 Concepts

Ontologies and Categories

Bertrand Russell writes in his book, "History of Western Philosophy" (Rus92), about Plato's theory of existence or ontology[6]. According to Russell, Plato made a strict distinction between the reality and the world of ideas. Plato considered that world, in which we live and feel through our sensory system is actually not real,

[6] Sowa defines the term '*ontology*' to be "*the study of the categories of things that exist or may exist in some domain*" (Sow00). The Cambridge Dictionary of Philosophy (Aud95) defines the term more widely to include in some cases the whole metaphysics, which is "*the philosophical investigation of the nature, constitution, and structure of reality*".

but just a manifestation of true reality of pure ideas or forms. Plato suggested that all the objects in the world are impure or imperfect versions of pure forms existing in idea heaven (Rus92). Plato can be said to be *a realist* in his ontology. It is typical for realism to separate the ideas and categories from the surrounding reality and even consider them being more real than the reality conceived by human mind. For the realist the pure forms, qualities and categories exist regardless of the human mind being conscious of them. (Nii80)

Plato had in his work, "The Republic" (Pla81), a metaphoric story about the cave, where the people, locked in chains, saw only the reflections of objects on the wall. And as they had grown there, there was no indication what so ever for them, that there would be something else existing than those reflections in the world. If there would be one who could go out to see the world outside the cave and come back to tell about that world, he would not be believed (Pla81). Plato described the difference between the surrounding reality and the reality of pure ideas; shadows on the wall are only manifestations, whereas the pure ideas can be found only by being freed from the chains of the surrounding reality. For Plato, the way to find pure ideas behind the illusionary "real" world surrounding us was through reason (Pla81).

Whereas Plato considered the idea heaven to be the real reality, Karl Popper defines the surrounding, physical reality to be as real as the realm of ideas (Pop94). In his ontology, the world, or the existence, is divided into three different worlds (Pop94):

- World 1: the world of physical existence.
- World 2: the world of mental phenomena.
- World 3: the world of human achievements.

Popper describes in his book that World 1 includes all the physical objects and phenomena (Pop94). For example, the book as a physical object is a part of World 1 as is the reflection of light (and the light waves) from the pages of it which are collected with my eyes and transformed into electric impulses. World 2, which includes mental phenomena, is interacts with Worlds 1 and 3 (Pop94). For

example, as the physical information transmitted through my nervous system in electric form is decoded to a mental state or thoughts, the physical information in the book is at the same time being transformed to be my personal mental phenomena such as wondering, thinking, and reflecting. World 3 is the world of human achievement and the collection of products of human culture (Pop94). In the case of the book, World 3 includes the idea of the book, where as World 1 has got its one physical representation and World 2 has my personal interpretation of that book that I have read. My collection of thoughts is created as an object of World 1 by this passage in my thesis. At the same time my thoughts are having their effect on World 3 as an interpretation of Popper's original ideas. Popper's ontological standpoint is *constructivist* as he sees World 3 to be up to some point a product of a human mind and not existing without human mediation to Worlds 1 and 2 (Nii80).

The greatest differences between the Plato's idea heaven and Popper's worlds are the following: Firstly, Popper's World 3 is not manifested directly in the physical world nor vice-versa, the human mind is always there mediating in between. Secondly, World 3 does not include all the possible entities that there can ever exist as in Plato's divine idea heaven. Popper's World 3 is an autonomous collection of human products and their potential (Nii90). The potential means that the discovery of prime numbers created a potential to find all the prime numbers (Pop94). Similarly, the discovery of scales in music lead to a potential to find all the pieces of music based on those scales, which is an infinite set as in the case of the prime numbers. Even though some potential exists, all the combinations or possibilities are not necessarily ever found by the human mind. It is also noteworthy that things that are discovered in World 3 are not lost even if there is not any physical representation existing at a certain moment of time. For example, the custom of raising one's hat as a greeting continues to exist even if no one is raising his hat at certain moment (Nii90).

Plato's realism and Popper's constructivism are two examples of various ontological standpoints. Other standpoints include for example *nominalism*, according which there are no universals, concepts or categories existing outside of the surrounding world's individuals or objects. Furthermore, there is

conceptualism according which there is no such place as ever existing idea heaven, but the concepts and ideas exist in the minds of the humans. (Nii80, Pal94)

Peirce writes in his article, “What Is a Sign?” (Pei05b), about reasoning as a manipulation of signs. To define those signs more carefully, Peirce introduces in his paper three different kinds of signs: likenesses, indications, and symbols.

The *likenesses* or icons are for example photographs, where the scenery being photographed is reproduced in photograph as it was seen through the lens of the camera, from point to point. Other examples of likenesses include the models that help an architect to describe his vision, or the sculptor to create his masterpiece. Likenesses can also be theoretical models, like the equations in mathematics modeling some domain. Likeness is to represent analogically the qualities of the object. (Pei05b)

The *indications* or indexes differ from the likenesses in a way that they do not represent anything in slavish manner, but are signs related to or pointing to their contexts. For example, the map with its notation and measurement units is a collection of indications, an abstract representation of the real world. Also things like clocks or weathercocks are indications of time and wind. The relationship is causal, the wind causes the weathercock to change its direction as the changes in the nature cause changes in the maps representing those spots. (Pei05b)

The *symbols* are commonly accepted signs, such as a flag represents certain nation, a money represents certain value, or a ticket or a password represents a possibility to receive something or to be allowed to do something. Second example of a symbol is language (excluding the onomatopoetic expressions that belong to likenesses), which is a collection of abstract symbols bound to their meanings by rules of the language and its proper use. Symbols are bound to their objects by the mind, which is using the symbol. (Pei05b)

John F. Sowa presents in his book, “Knowledge Representation” (Sow00), a very detailed categorization lattice with which the entities and phenomenon in the world can be put in certain categories. There are 12 different kinds of categories in Sowa’s lattice, which are derived from combinations of upper categories. An

example of such a category is script. Scripts are time bound or timelike sequences. A computer program is a script, as well as the music presented on scales or a recipe for a cake. (Sow00)

Plato's and Popper's ontologies are ways do describe what there is in the world and how the world is constructed, and what is the relationship between the ideas or concepts and the observed reality. Peirce's and Sowa's approaches are more about describing how to categorize things that exist, which kinds of things or entities there are in the world. From the conceptual designer's point of view, ontology defines our view of the world and the entities in it and categories help us in dividing the entities into their places thus helping to make sense out of the world. Basically, it can be said that the richer the categorization is the more detailed the view of the structure of the world we have.

If the ontology is interested about the question "What is there to know?" then the *epistemology* is interested about "What is the nature of knowing? How do we know? What is truth?" The classical Platonian view on knowing was to state the knowledge as true, justified belief. This statement differentiates the knowledge from an assumption, a simple mistake, or a plain guess. (Nii89)

According to *realist epistemology* the way to acquire knowledge is to use reason, understanding and intellectual intuition. The surrounding world is as it is regardless of the observing subject, which makes the sensory observations worthless. Therefore it is the reasoning which is the way to reach the world of true ideas. The *empiricist epistemology* is in complete contrast to realist epistemology. In empiricist tradition the collection of experiences and sensory observations about the surroundings is the way to gain knowledge. In the extreme, the empiricism has got inbuilt demands that testing knowledge in reality will tell the truthfulness of it. The *pragmatist epistemology* is most interested about how our knowledge will help in solving our problems. Usefulness is seen as a credit for knowledge, which in turn emphasizes the working dialogue between knowledge and actions. The pragmatist tradition also sees truth as a dynamic concept; it changes as our knowledge over the domain develops. (Nii80, Nii89, Wik05b)

From the concept designer's point of view all the epistemological approaches offer tools to weigh the quality of the own creation. As an example, the conceptual model's quality can be tested against reason (realist approach), empirical analysis (empiricist approach) and applicability as a solution to the original problem (pragmatist approach).

Concept of the Concept

In his dissertation, "From Concepts to Concept Theory" (Pal94), Palomäki divides the theories of concepts into two main categories, entity theories of concepts and dispositional theories of concepts. For *the entity theories*, it is typical to consider concepts to be either sensible, mental entities such as ideas and ideas, or supersensible entities such as universals and meanings. For *the dispositional theories* of concepts the concepts are not entities, but a means to move in a world both intellectually and morally. To have a concept means in dispositional theories to be able to use language correctly and to know what it is to have that certain concept. Palomäki also presents a larger set of definitions for concepts, which in also the entity theories and dispositional theories belong. According to him, concepts can be something of the following (Pal94):

- Supersensible entities: universals, meanings, abstract objects, definitions, or predicates and relations.
- Mental entities or states: composite images, ideas, thoughts, conceptions, or innate ideas.
- Neutral entities joining words, thoughts, and things.
- Items abstractable from families of sentences, or features extracted from similar things.
- Human or animal skills or abilities.
- The roles of certain expressions.

Piet Kommers defines in his article, "Concepts in the World of the Mind" (Kom04), concepts a bit differently. He makes a clear distinction between the

static view of concepts and the more dynamic view of concepts. He states that instead of seeing concepts as information packages they should be recognized being more like vivid or even independent personalities. Kommers argues that concepts are capable of reflecting on themselves, making contacts with other concepts, arranging contacts between other concepts, and even changing themselves.

This kind of view of concepts is rather far from the traditional view of concepts as being representatives of absolute truth or presenting categorizing classes under which individual entities go. Interestingly, Kommers proposes a more active role for concepts; they can be thought serving as guides or bridges that are necessary to lead us from one idea to another. Moreover, the concepts are actively participating in the reasoning of a person; they have their effects on our thoughts, memory, and understanding. The effects are not only directed from concepts to our consciousness, but the reflective processes also recreate the conceptual structures affecting our minds. (Kom04)

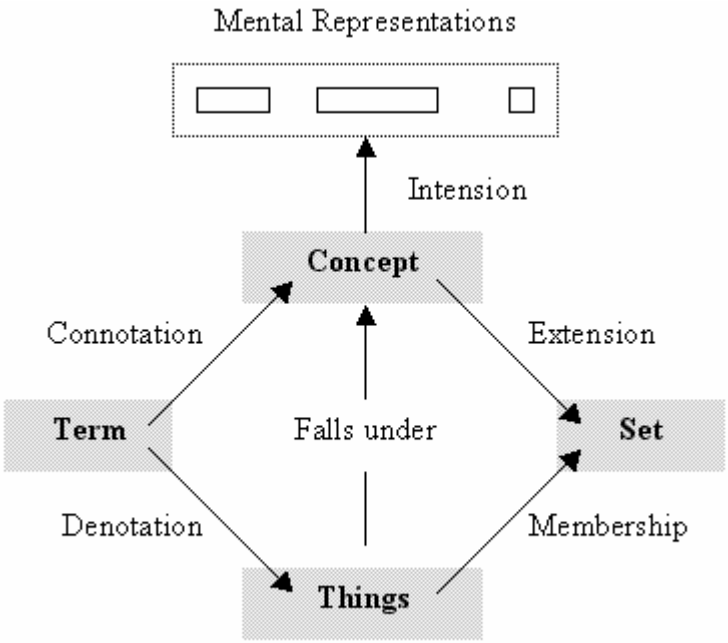

Figure 4. Diagram of relations of the concepts, the world, and mental representations (Pal94, Mar97)

Figure 4., which is based on Palomäki's (Pal94) and Marjomaa's (Mar97) works, represents the interrelations of terms (or words), concepts, things, sets, and mental

representations. If we for example think of the term dog, its connotation would be the concept of dog, dogness, and the denotation would be a certain dog, which in this case is the office helper dog on my MS Word program. The intension of the dogness or the concept of dog is my mental representation of a dog, which might include qualities such as four-leggedness and furriness. This particular dog on my desktop is a member of its set, dogs, in which all the different dogs in the world belong, in this case the imaginary dogs are included too, like this particular dog of mine or Mickey Mouse's dog Pluto. In addition to belonging to the set of all dogs, this dog sitting on my desktop falls under the concept of dogness as it is having the qualities of a dog. The set of all the dogs is an extension of the concept of dog, general rules of dogness can be found from the members of the set. (Mar97)

Esko Marjomaa (Mar97) makes in his dissertation, "Aspects of Relevance in Information Modeling", an interesting division between the mental representations of a concept and their extensions. Marjomaa argues that a concept as a universal could be called an "intersubjective non-physical representation", whereas its intension, a mental representation could be called an "individual non-physical representation" (Mar97). By this Marjomaa makes a clear distinction between the intensions of concepts, which are subjective, and concepts as universals, which are considered to be intersubjective or in other words shared among the people.

The importance of the concept of concept for a concept designer is to understand that a concept can be various things other than abstraction of some familiar artifact or phenomenon. Concepts can also be dynamic, changing in accordance with the changes in their environment. It is also noteworthy to realize that the concepts do have their own meanings for each individual, if the conceptual model is interpreted by the human being. Also the origins of the concepts, that is the extensions, can be such that only the concept designer knows the correct or appropriate way of interpreting the concepts in the conceptual model. In the case of the computer systems, the description of UoD for example in a form of a metafile will help the modeler and recipient to understand each other more seamlessly.

3.3 Conceptual Modeling Process

Conceptual Models

According to Colette Rolland and Corine Cauvet (Rol92), conceptual modeling has got basically two separate aspects; it appears as a process, which then has *a goal of producing the conceptual model of the subject area being modeled.* Dori (Dor03) describes the modeling process *as a human activity of creating models or abstract artifacts,* which are representations of designs of physical systems showing certain aspects of the reality. Marjomaa (Mar97) cites in his work Hannu Kangassalo, who defines a conceptual modeling as a "*process of forming and collecting conceptual knowledge about the Universe of Discourse (UoD)*[7]*, and documenting the results in the form of a conceptual schema*[8]." Shanks et. al. define the conceptual model as *a constructed representation of someone's or some group's perception of a real world domain* (Sha03). Marjomaa gives also another interesting description of conceptual models in his dissertation (Mar97). He discusses the problem of defining models; whether one means by *a conceptual model a transcendental model, a mental model, or perhaps a physical representation* (Mar97). In this thesis, conceptual model means a physical representation, unless it is clearly stated otherwise.

Marjomaa also presents some interesting classifications of models, which divide the models into three different categories (Mar97). I have picked two examples here; the first is by Marjomaa himself:

1. *Analogy models*, which represent the modeled domain area faithfully to the original. They can be for example prototypes, statues, concept descriptions, and metaphors.

[7] Marjomaa defines the term '*Universe of Discourse*' to be "*a collection of all those entities that have been, are, or ever might be in the selected portion of the real world or postulated world.* (Mar97)"

[8] A conceptual schema means here a conceptual model, which has got a physical representation.

2. *Idealized models*, which represent only the most relevant parts of the modeled domain area. They can be for example caricatures or microworlds.

3. *Models in logical semantics*, where the modeled domain is described as a set of entities with the help of some formal language.

And the second classification is by Atchinstein (Mar97):

1. *Representational models*, where an object or a system is represented by physical systems. They can be for example miniatures or analogy models, which are qualitatively different from the original ones, but are behaviorally faithful.

2. *Theoretical models* are collections of hypothesis and claims concerning an object or system. Theoretical models are idealized, thus being simplified from the original systems, but are meant to represent the modeled domain correctly inside certain limits.

3. *Imaginary models*. These are like the theoretical models, but they do not have any intention to be correct or alike in comparison to the modeled domain.

For a concept designer it is worthwhile to understand that there are various kinds of conceptual models that he can choose from. The models are not only idealized models over the domain area presented with some formal language, they can as well be painted pictures or tales written in some human language. The most important thing is that the type of the model suits the purposes of the modeler and his audience. For example the description for certain physical phenomena could be presented to physicists with the help of mathematical equations (theoretical model), but for high school students with an animation series (representational model). In computerized systems usage of the formal languages with logical representations are most appropriate, mostly because of their easy validation and limited room for varying interpretations (lesser expressiveness).

Conceptual Modeling Principles

Boman et. al. defined in their book,"Conceptual Modelling" (Bom97), the criterion for a good conceptual model. Their criterion has five different features (Bom97):

- Ease of understanding.
- Semantic correctness.
- Stability.
- Completeness.
- Conceptual focus.

The ease of understanding means that when a domain expert reads the conceptual design made out of the domain of his expertise, he should be able to comprehend the contents of the design as easily as possible (Bom97). The ease of understanding can be achieved, for example, by finding a common language that can be used in representation of the conceptual model (Mar97) and by emphasizing the key elements. *The semantic correctness* means that the conceptual model should represent the domain being modeled accurately, when perceived by the domain experts (Bom97, Sha03). If the model is not a representational model, but for example an imaginary model, then this part of the criteria is not important. *The stability* of the conceptual design means that if the domain being modeled changes a bit, it should not lead to restructuring of the whole conceptual model (Bom97). One way of supporting the stability is the invariance method, where only the invariant entities of the domain being modeled are included in the conceptual model (Mar97). *The completeness* means that all the relevant aspects of the domain being modeled have to be included in the conceptual model. For example, the creation of software based on the conceptual model should not demand using other sources of information for the domain area than the conceptual model (Bom97, Sha03). *The conceptual focus* includes the idea that nothing other than the relevant things should be included in the conceptual model; the redundant things should be left out (Bom97, Sha03).

The criteria presented by Boman et. al. can be supplemented by the following idea of Shanks et al. (Sha03) and principles presented by Marjomaa (Mar97):

- Conflict-freeness.
- Principle of formalization.
- Principle of conceptualization.

The Concept of *conflict-freeness* described by Shanks et. al. means that the contents of the conceptual model should not be contradictory in any way (Sha03). Marjomaa presents *a principle of formalization*, which is especially important, when thinking of conceptual modeling in the computer context. The formalization principle states that the conceptual model should be formalizable, that is representable with some formal language, in order to be implementable (with a computer) (Mar97). *The principle of conceptualization* states that only the conceptualizable entities in the domain being modeled should be taken into account, when creating the conceptual model (Mar97).

Conceptual Modeling Process

The modeling situation can be derived from the descriptions of the conceptual modeling presented previously. In the modeling situation (Fig. 5.) there is an object, a system, or a domain, which is being modeled. *A modeler*, who can be an individual, a group of people, or in some cases a computer, creates *the model* representing *the thing being modeled*. The modeling process includes the interactions between the modeled thing, the modeler, and the created model needed to create a conceptual model. (Mar97)

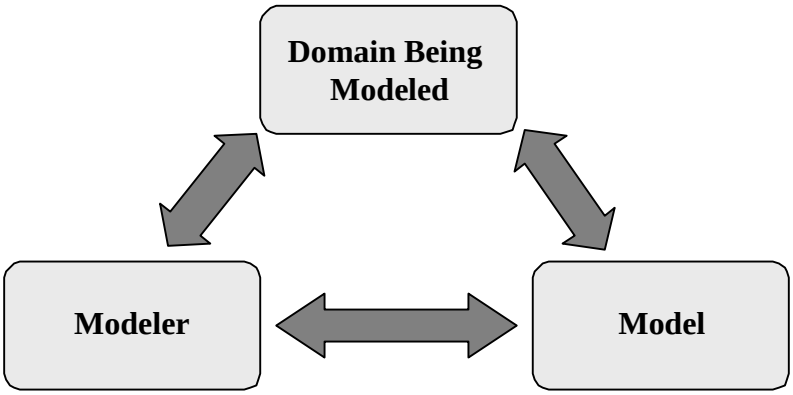

Figure 5. The modeling situation

The conceptual modeling process can be seen as analogous to other similar processes aiming at delivering or creating novel artifacts such as knowledge, research results or a piece of software. For example, Nonaka, Toyama, and Konno describe in their article, "SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation" (Non00), a spiral process to create knowledge in organization (Fig. 6).

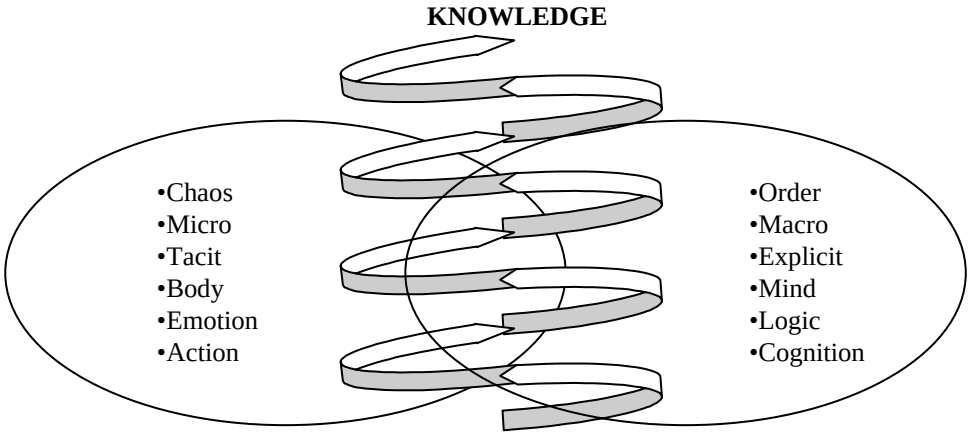

Figure 6. Knowledge creation spiral (Non00)

Nonaka et. al. claim that the knowledge creation process is dependent on dialectical processes, which are context-bound and which transcend and synthesize seemingly contradictory and antithetical concepts of the process such as presented in Figure 6. The dialectical process creates meaning-rich knowledge, since there are various perspectives to the certain subject. They state that the very nature of knowledge is subjective, active, dynamic and created in human interactions. Knowledge is not only explicit, like these words written in this

thesis, but knowledge has got also its tacit side, which is complementary to the explicit side and is being bound physically to a person. (Non00)

The knowledge-creation spiral with its multiple perspectives on a piece of knowledge is similar to the ideas of thinking presented by Marvin Minsky in his best-selling work “The Society of Mind” (Min88). Minsky asserts that the non-connected idea having only one meaning, or being the only solution to a problem is nearly useless, since if anything goes wrong, it leaves a person without any alternatives, any route to go next to. Minsky states that the rich meaning-networks with many sensible connection help, for example, in the problem solving process; if one approach does not work, one can always try out the next one. (Min88)

There is also an interesting idea, which I discussed with Professor Piet Kommers (Kom04b). He mentioned that learning from the unknown might also be as interesting in conceptual modeling as it is in education. Basically, if one has got readily planned route from the beginning point till the anticipated goal, everything in between is to some extent known beforehand. Professor Kommers argued that especially in the case, where the learner’s or in this case concept designer’s short-term memory is good, the planned route is kept more rigorously than in the case of worse short-term memory. In the latter case, the learner or the concept designer is more easily distracted by associations or sheer oblivion of original ideas thus being derailed from original course of actions to somewhere unknown. (Kom04b)

This derailed train of thought may lead to an unanticipated result, if it is let to go without stopping it and going back to the place of derailment. Professor Kommers argued that the time, how long the derailment can go on, is mostly depending on the learner’s or the concept designer’s capability to cope with uncertainty. Thus, the longer the train of thought goes away from the derailment, the stronger is the power of uncertainty. (Kom04b) This idea can be useful for the conceptual modeling process in the way that this derailment could be done purposely, or when happening, giving some room for it. In this way, the conceptual model will cover larger areas of the previously unknown and possibly interesting material and ideas leading to novel solutions. This would prove to be a good technique especially for the creation of innovative conceptual models, since conceptual

modeling aiming for development work is more about doing some controlled adjustments for existing concepts.

If the conceptual modeling process is seen to be analogous to the process of scientific discovery, we can define it through three principles, which seem to be common for scientific discoveries (Kla99, comments after each principle by the author):

- It is based on heuristic search in a set of problem spaces (instances, hypothesis, representations, etc.). (Mapping of the domain to be modeled)

- The search in the problem space is controlled by a set of mechanisms, such as trial and error, hill climbing, and means-ends analysis. (Modeling methodology used)

- Recognition processes that help to find familiar pattern in the phenomena under research. (Detection of entities that belong to the conceptual model)

The process that Rolland and Cauvet (Rol92) are discussing is described being analogical to the first steps in a software project plan. According to them the aim of the conceptual modeling process is to investigate the problems and requirements from the users and creating a specification according to those. (Rol92) For example, Watts S. Humphrey (Hum89) explains in his software engineering classic, *"Managing the Software Process"*, that the first steps in the software project planning process are the following:

- Finding out the initial requirements.

- Concentration on the areas being vague and in-complete.

- Defining the goals and objectives.

- Developing the conceptual model.

This process is according to Humphrey being iterative; thus, both the project plan and the conceptual model become more detailed after each iteration cycle (Hum89).

Tuomo Tuikka approaches in his article (Tui97) conceptual modeling from a different viewpoint than Rolland and Cauvet. In his article, he uses the term concept design for the process, which I interpret to belong to the same domain as term conceptual modeling. Tuikka defines the concept design process to belong in the early phase of the product design, where there are various views on the same topic or product and the uncertainty characterizes the work. The uncertainty can be related to the unknown goal of the work and the various perspectives on the same domain. Tuikka explains the process of concept design being group work, where information is exchanged intensively between the actors in the concept design process. Thus, articulation is one of the key issues in the concept design process. Tuikka proposes a model, where the innovation process is divided into five different phases, which do not need to follow each other sequentially (Tui97):

1. *Reality, history*. The participants of the conceptual design refer to related things or concepts that have been successful in history. There is also a discussion about existing things that belong to the design domain.

2. *Innovation.* Innovation arises from the existing solutions or from somewhere else. Innovation is a formed idea here.

3. *Solution space*. As there usually are plenty of innovations, they are collected into the solution space containing all the innovations.

4. *A possible solution*. From the solution space, some innovations are picked up to become possible solutions. The judgment is done according to the goals set for the concept design process.

5. *Solution*. The solution is one of the possible solutions, which is considered to be the best by its potential, when compared to the goals of the concept design. The solution is then taken further into development.

Tuikka is mainly interested in the content process; how the content develops in different phases of the modeling work. Marjomaa describes the conceptual

modeling process from the modeling process point of view. His process has the following main factors (Mar97):

1. *The explication of the tasks of modeling.*

2. *The explication of the use of the desired conceptual model*. This and the first factor give the practical constraints to the construction of a conceptual model.

3. *The definition of the new information* concerning the domain being modeled. Here the need for new information is defined according to scope of the model, set in the second factor.

4. *The available information concerning the domain being modeled*. Which kinds of information can be acquired from the domain being modeled? It includes also the information, which is out the scope for the modeling.

5. *The information acquisition*. In this part, the information concerning the domain being modeled is acquired using different kinds of methods.

6. *The analysis of received information*. The analysis of received information means analyzing the new information collected from the domain being modeled.

7. *The condensation of the analyzed information.* The condensation means finding the relevant and needed information concerning the domain being modeled.

8. *The development of a conceptual model* on the basis of the condensed information. In this phase, both the mental and physical models of the domain being modeled are created.

Marjomaa also brings up some background factors that have their effects on the conceptual modeling process and its end result, the conceptual model. He states that for example the following factors are all important and having their effects on the end results (Mar97):

- Practical constraints, such as money, time, and the number of people involved in the process.

- Skills of the modelers, whether they are aware of the conceptual modeling process and principles.

- Skills of the customers or users of the conceptual model, whether they understand the created conceptual model.

- The ways of representing and realizing the conceptual model, whether it will be presented for example with normal language or as a mind map.

As the previous examples portray, the conceptual modeling process can be described to be many-faceted. The designer should at first be aware of the practical and humane constraints for his process as discussed above. The process should have a problem or the question to start from or the designer should define it with his clients. In addition to problems or questions, also the goal for the modeling process can be set beforehand. The process should take into account many perspectives over the domain area, have links to the previous work or the context, map the area known and the boundaries of it and also focus on the unknown areas. In the case of innovative modeling, the process should aim at having many possible solutions to the problem (models) and have an open-ended goal. The information that is needed should be acquired, analyzed, and condensed during the process. The conceptual model should be created in a certain selected manner and evaluated with the clients and, if needed, elaborated further and refined through modeling iterations.

Conceptual Modeling in Social Context

I find the conceptual modeling and its result, a conceptual model, to be communicative acts. The conceptual modeling in the form of describing an information system, a program, a collection of interrelated pieces of knowledge, or an imaginary being is communication either to oneself, a customer or the community surrounding oneself. Therefore, I think that it is important to situate the conceptual modeling into its social context.

Henri Kynsilehto explains in his essay, "Innovaatio ja teknologinen edistys[9]" (Kyn04), Friedrich Dessauer's philosophy of innovation. Kynsilehto emphasizes in his essay that Dessauer's philosophy of innovation necessarily needs setting of relations where the inventor relates his invention to the other things that already exist. This observation puts inventions into their historical and societal contexts; *the ideas are not created in a vacuum, but the surroundings and the knowledge about it makes inventing possible* (Kyn04).

Berger and Luckmann present in their book, "The Social Construction of Reality" (Ber94), their theory about how a person constructs his reality and acts on it. The meanings are manifested upon the sensorial input, thus creating completely personal, subjective interpretation of the reality. For example, the values, experiences, memories, interests, plans, and social class of an individual affect how he perceives, interprets, and acts in the surroundings he exists in. The inner world of the individual can be objectified through various ways (writing, painting, talking), but it is according to Berger and Luckmann always distorted in some way, not being an exact copy of the personal feeling or idea. The produced object is always also being a snapshot, thus giving only the idea of the situation at a certain moment, since the created object is usually static, unable to recreate itself according to changes taking place the individual. (Ber94)

From my point of view the previous topics are very important. In the conceptual modeling context it is important that the conceptual model is first of all having a solid foundation through extensive background study. Secondly, it is important to knit the conceptual model tightly to its surroundings whether it means real world physical surroundings or more abstract, conceptual or even imaginary surroundings. Furthermore, conceptual model done by a human concept designer is a subjective and static view over the domain being modeled.

According to Boman et. al., semiotics is a study of communication between different agents. The agents may be humans, animals, or even artificial things like

[9] The article is published in Finnish, the title translated in English: "Innovation and the Technological Advancement".

pieces of software. Semiotics is divided into three areas: syntax, semantics, and pragmatics. (Bom97)

Syntax is a form of the communication, in which communication is constructed from the smaller parts (Bom97). For example, as I am writing this thesis, I am using a set of alphabets to construct the text. Instead of alphabets, I could have chosen to write in Arabic or in Chinese. I would have then changed the way in which I am delivering the message, but not the message itself[10]. In some cases, using non-standard syntax, unknown language or coding it in some way can hide the content (Nii89).

Semantics is the meaning of the message (Bom97). In previous example, I changed the syntax, but left the message inside untouched. In some cases, I can be syntactically correct, using right signs or real words, but the content itself is gibberish, non-sense. It is important to notice here that semantics and understanding them are based on the used terminology and their intensions and extensions (Bom97). If the one, who creates the message and the one, who interprets it, do not share the same extensions, the semantics can be lost or misinterpreted. It also noteworthy that the semantics have nothing to do with the truthfulness of the message, the message can be semantically correct and understandable, but still untrue (Nii89).

Pragmatics is concerning the actual use of the communication and its relation to the senders and receivers. It involves the purposes or intensions and effects of the communication (Bom97). For example, understanding a cry for help correctly is not enough for the sender, he wants that the receiver to do something to help him out. Or if one asks whether one has got the time, a simple yes is not enough for an answer, but one is willing to know what time is it (Bom97). Therefore, it can be said that the pragmatics of the message demand a change of state from the receiver, simple receiving and understanding is not usually enough.

[10] In some occasions the medium can also serve as the message, or as it is put in Marshall McLuhan's famous quote: "*Medium is the message*." (Fed05)

Claude Shannon published in 1948 an article called “A Mathematical Theory of Communication” (Sha05). In that article he presented a general view of the communication system (Fig. 7), which represents a message’s course in the communication system from information source to its destination (Sha05).

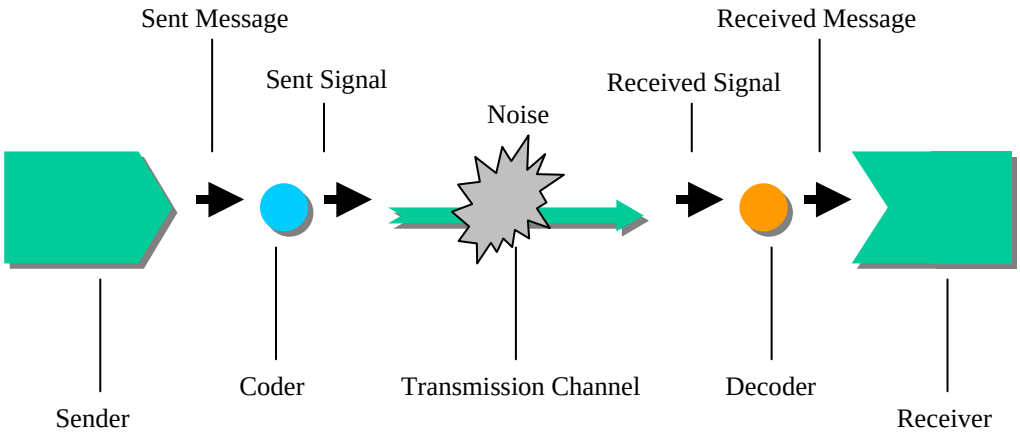

Figure 7. Shannon’s schematic diagram of a general communication system (Sha05, Nii89)

For example in conceptual modeling, the concept designer (sender) has an idea (sent message) for a model and draws (coder) a conceptual schema (sent signal) with a certain formal language. The conceptual schema is printed or copied and sent by fax or e-mail (transmission channel) to a customer, who is not fluent with the formal language used in the schema (various sources of noise). The customer looks (receiver) at the schema (received signal) and tries to make a meaning (decoder) of what he is seeing (received message).

The meaning of the previous example is to illustrate that the message sent is not necessary the message received. Even if the syntax goes through the communication channel untouched, the semantics of the message can be lost for example due to the fact that the receiver does not understand the language (human language, art, or formal modeling languages) used by the information source. Also the noise, such as speaking in noisy environment, problems with a fax or some sensorial impairment, in the communication system may break or hide the syntax and make understanding the message correctly impossible. The lost or broken syntax and semantics will have its effects on the pragmatics of the message, the

building under construction may become unsafe, the help may never arrive, or the contract is lost, if the problems in communication channel go unnoticed.

The meme theory, or memetics as a branch of science, which was originally founded by Richard Dawkins, goes past the human individual as a main actor (Daw05). It presents pieces of information or knowledge to be entities of their own right using our minds as their vessels similarly to genes using our biological being as their vessel. Good examples of memes include trends, catchy phrases, jingles in advertisements and scientific ideas. Basically, the whole culture can be seen as being a collection of memes supporting each other's existence. (Daw05)

The memes are having the same basic characteristics as any replicator, like a gene: they need copy themselves accurately, the faster the copying rate is the better, and the longer each copy stays alive in order to be copied the better (Daw05). For example, through this thesis I implant hundreds or even thousands of ideas or memes into a reader's mind. If any or some of them are interesting and acceptable, the reader will start telling them to his friends and colleagues and the dissemination process will have begun. The rate of duplication and the extent of spread depend of the meme itself and its capability for survival in various environments (Daw05). Good examples of memes with global recognition or effect are for example brands like Nokia, Coca Cola, or IBM and ideas like Christianity or alphabets.

Memes are not necessary only good or neutral in their effect on a human and his behavior. Learning the language and alphabets (considered to be positive memes) open the mind also for the infection or even contamination by more malicious ideas (Daw05b). For example, some ideas being superstition (like stories of voodoo magic or fairies and elves) or urban legends may prevent an individual from acting reasonably. From some points of view, teaching Darwinian evolution in schools is harmful for the minds of the children.

Recognizing conceptual modeling to be an act of communication is important especially when thinking of the conceptual model it produces. The concept designer has to carefully think about the representational form he is using, the contents he is including in the model, and the reason, why the conceptual model is

being made. In addition to these, the designer has to understand that his personality and subjective point of view will be presented in the conceptual model in one way or another. Also the ways, how the audience can interpret the conceptual model should be considered beforehand (for example the effect of cultural differences). The concept designer should also think of the results of the spreading of his ideas. As it was discussed in the case of memes, some ideas may be harmful, if they spread freely among vulnerable people. Nevertheless, in some cases as wide spread as possible is desired, for example in the case of the safe internet usage rules among the children or the HIV education in Africa.

3.4 Conceptual Modeling Process in My Work

I find that the role of the concept designer in a project, which aims to develop a novel construction, is very challenging. The challenge in nW Oasis project was basically two folded. Firstly the novelty made the UoD problematic and mostly unknown and thus very much unlimited. Secondly there was an urgent need for the first designs, which did not leave any extra time for defining the processes. In comparison to the orders of ignorance presented earlier, the starting point for me was at the 2nd level, I did not know about what I did not know and I did not even have any questions.

Through my own experiences in the nW Oasis project I developed a personal viewpoint of the concept designer's work. The viewpoint represented here is the one that I actually used in my work and is largely based on my intuition. The reason for the intuitive approach is that during the work period, when I had to develop the first conceptual models as a member of design group, I did not have time to develop an extensive literature review for the conceptual modeling process. From my standpoint at that time, the concept designer's work was a multi-dimensional iterative process with following tasks:

- He collects the ideas and requirements from the client of his work.
- He refines the original ideas and questions into more detailed ones and recognizes the needed knowledge through analyzing the requirements.
- He turns then the ideas and requirements into research questions.

- He collects the needed information and analyses it. The quality of information comes here through quantity; the gray area around the core needs to be mapped too in order to find the boundaries of the artifact being modeled.

- He finds connections throughout the material at hand to make the design concise.

- He filters the needed information from the unneeded information.

- He creates the conceptual model.

- He presents the conceptual model to the clients to collect comments on it and refine it further through modeling process, if needed.

In my work, the initial requirements on fall 2002 came in a form of a task setting. There were some ideas presented by the Science Park Ltd's people, but the ideas were mostly still in their infancy. I contacted Ilkka Kakko, the father of the nW Oasis idea, and met him. The discussion we had made the requirements for my work clearer.

There had been an earlier meeting among some professionals, who later became the core of the group participating in the design sessions. They had played around with Ilkka's idea of creating an Oasis for teleworkers and found it very creative and exceptional. While playing with the idea, they also created the basis for my work, the first conceptual model for nW Oasis[11]. They decided that the idea should be more closely examined in the form of a Master's Thesis. This was the point, where I joined the designing team as an author of the thesis.

In addition to the first meeting, where I was not present, there were three more of these design sessions arranged, which I participated in the role of a Concept Designer working for Science Park. The first two sessions were held in October

[11] At that moment, there were not any discussions with the name "nW Oasis". The name came into use in spring 2003, but is used throughout this thesis to connect all the original drafts and ideas under the same domain.

and November 2002 and the third one was held in February 2003. The first meeting and the second meeting were held more or less with the same pattern, but with partially different members. The pattern for the meetings was rather open, thus leaving room for making changes on the fly. The typical pattern for those first two design sessions held in October and November follow (points in bold are important from the conceptual modeling point of view):

1. Ilkka Kakko and I began the meetings by introducing the results of the first design session, namely the idea about the nW Oasis. (See Appendix C for the introduction slides)

2. Open discussion about the nW Oasis idea in general.

3. **Collection of new ideas belonging to the same domain.**

4. **Creation of the SWOT analysis.**

5. Discussion about the SWOT analysis.

6. **Synthesis of the ideas.**

The *collection of new ideas* was done in a brainstorming fashion (Cav05). As the domain was already introduced and discussion had clarified it more, there were lots of new ideas coming up. There were papers on the wall, where all the ideas were collected. These ideas were beneficial in defining the reaches of the conceptual model at hand, therefore helping me to find the areas that should be taken under closer consideration.

The *SWOT analysis* was done individually so that everyone had a marker and a pile of notes so that they could write their ideas. A wall in the room had papers with the titles - *strengths*, *weaknesses*, *opportunities*, and *threats*. The participant then wrote his idea on a note and put in under suitable category. This continued until there were not any new ideas to add to the analysis.

During the *synthesis* phase, the participants weighted different aspects that had come up during creation of the new ideas and the SWOT analysis and tried to then develop the original conceptual model further according to those ideas. This was

not merely the development of old ideas, but also the inclusion of new ideas into existing framework. In some cases it was also discarding old ideas, as was the case with nW Oasis to be plainly focused to teleworking and workers.

The reason, why two similar sessions held, was the eagerness to see, whether the SWOT analysis and the synthesis would be substantially different, when the design group was different. This also served as a way of validating the ideas. If the end result would be favorable for the idea in both sessions, then it would be worth developing further. It also helped Ilkka and I to collect as many ideas concerning nW Oasis as possible, to begin developing of the overall idea.

The third session was held after quite a long period of time in February 2003. During the time in between, I conducted research on the things that came up during the last two sessions, wrote a short study of the SWOT analysis and included it in a design session document along with the first version of the competitor analysis and research questions. This meeting did not create as much material for my thesis as did the last two sessions. The time for the meeting was more limited (only the morning was available, whereas earlier we had had whole day) and the number of items to go through was larger.

The design sessions that I had with the other members of the original design group and the SWOT analysis that we prepared together provided me with a good basis to start writing this thesis. It had good remarks about the environment, where the Science Park resides, and had also some nice design ideas for the services and the premises. I present here a table (Table 2), where I compare the different tasks of conceptual modeling as I described it earlier and the activities I have had.

Table 2. A comparison between the tasks and activities in my work

Tasks	Activities in My Work
He collects the ideas and requirements from the client of his work.	Meetings with Erkki Sutinen and Ilkka Kakko. They gave the scientific requirements and the requirements that Science Park ltd. had for this thesis.
He refines the original ideas and questions into more detailed ones and recognizes the needed knowledge through analyzing the requirements.	I had design sessions with Ilkka Kakko, where we discussed the concept of nW Oasis and developed it.
He turns the ideas and requirements into research questions.	I created the first research questions for this thesis, which I later revised after the third design session.
He collects the needed information and analyses it. The quality of information comes here through quantity; the gray, unknown area around the known core needs to be mapped too in order to find the boundaries of the artifact being modeled.	I had discussions with Ilkka and participated in a conference held in Paris. We held the design sessions with Ilkka, where I collected more information for my thesis. During the design sessions, the boundaries of this knowledge domain were revealed. I analyzed the design session materials. I also gathered information from the literature and other sources.
He finds connections throughout the material at hand to make the concise design.	As my thesis progressed, I had to combine information from many different scientific fields and medias in order to see the whole picture.
He filters the needed information from the unneeded information.	The material I had collected for this thesis included numerous clippings from newspapers, countless web pages, research reports and books. From all that material, I chose those, which seemed to be the most influential in my creation of the conceptual model.
He creates the conceptual model.	In this thesis, I presented the conceptual model for nW Oasis. It is not the first version of it and it is hardly the last one. It has gone through numerous redesigns during conceptual modeling. The comments from the reviewers of this thesis, Ilkka Kakko and other people, who read this, have affected this version. Also the surroundings of my self, the literature I have read and so forth have caused many of those changes.
He presents the conceptual model to the clients to collect comments on it and refine it further through modeling process, if needed.	In addition to this thesis, I have presented the ideas of it in countless occasions. Some of those presentations have been fruitful in a sense that I have received comments and thus made changes and improvements to my work.

As I mentioned earlier in this chapter, the original conceptual modeling process that I used was mostly based on my intuition about the modeling process and concept designer's work. During the literature review about the conceptual

modeling process my standpoint changed as my knowledge developed and I had already gathered some experience of the concept designer's work. According to the background study on conceptual modeling in this thesis and my experience as a concept designer, I have created my own framework of ideas for the conceptual modeling process:

1. *Question.* The Question or the problem will lead the conceptual modeling process, thus it makes it the most important prerequisite to begin conceptual modeling. The question helps to understand what is known and what is still unknown, thus reducing the ignorance (Arm00). The question or the problem also outlines the search space, the areas that have to be covered in order to have an appropriate solution.

2. *Methods.* The methods will determine the tools with which one starts to search for skills and knowledge in order to be able to create a solution to the question. The methods help as tools in revealing those areas that are unknown. They also define the sources of information used and how those sources serve answering the question. The methods should also support the learning process, since the concept designer is an active constructor of knowledge during the conceptual modeling process.

3. *Building the knowledge, skills and the model*. First of all, the building starts with the choice of content that will be included in the conceptual model. What is considered to be relevant for the model and what is not? Secondly, the concept designer needs to choose the suitable media for representing the conceptual model. In representation it is important to share a language with the client or the audience. The concept designer should also decide, whether his model will be a static snapshot or a dynamic, ever changing representation, like a microworld. In the building phase it is important to think about the environment that will be affected by the conceptual model. What are the anticipated effects; will there be unwanted side-effects? The concept designer should also be aware of the social dimension of his work, especially if working with people.

4. *Testing and Validation*. Testing serves as a tool to refine for example the questions leading the conceptual modeling process, improve the methods, or develop the representation. The idea behind the testing is not to finalize the conceptual modeling process, but to begin new iteration cycle. Validation can be done against reason, empirical tests or pragmatic evaluation. The main idea for validation is to confirm that the conceptual model is a suitable solution for the question.

In my mind, the conceptual modeling process is being an iterative process. The draft models have to be tested with the customers or the anticipated audience in order to make sure that the model is understandable and the modeling process is going to the right direction. Iterative process also supports bringing some dynamics in the modeling process. For example the questions can be refined, methods can be changed or more suitable representation can be chosen to achieve the better end result.

The conceptual modeling process is also having its constraints. As Marjomaa (Mar97) pointed out; time, money, and skills of a concept designer and his client all put their constraints to the modeling process. In addition to these, the concept designer may find himself from a situation, where he has to be ethically sensitive, for example when deciding what is appropriate to include in the model, whether the goal for the process is ethically sound, or whose vision to follow. Conceptual modeling can also be a test of courage for the concept designer, if he for example chooses to follow his own vision, includes questionable or challenging information to the model, or uses unconventional forms of representation.

If my intuitive conceptual modeling process is compared to the latter one based on the previous background study and my experience, the greatest differences can be found in the emphases. While in the first process the emphasis was greatly on the content process, in the latter the emphasis is put more on the pragmatics of conceptual modeling and the modeling work in its social context. The problem of not having a clearly stated question or the problem in the beginning was a major obstacle in my modeling work. I also did not have enough knowledge about the methods and their contribution to solving the questions. Later in my work I ran into the constraints, mostly time became a scarce resource.

3.5 The Requirements for the Concept Designer

A picture of a good concept designer interestingly resembles a picture of a modern learner (Mei03). In both cases it is important that one is able communicate his thoughts, construct a personal, argumented view on the subject matter and be able to represent it in some visible form and revise the work according the comments. The concept designer is in his conceptual modeling process basically trying to create a construct responding to the needs of the client and ideas of the background material. The product of this process is either a kind of introspection, being a collection of personal thoughts and ideas presented in a form of a construction or an extrospection, where everyone's ideas are attempted to be taken into account.

Especially demanding for the concept designer are those conceptual models, where there is not only one client, whose needs to fulfill, but a number of clients, who would like to have their ideas to be presented in the final design. I call this situation the purgatory of the concept designer. For that reason, the concept designer should recognize the stakeholders and their expectations in the question setting phase before entering the research phase.

Different stakeholders have different backgrounds, resources, and skill levels, which affect the kind of conceptual models that are suitable for them. They also may possess embarrassing or secret expectations, which they cannot say aloud or they are unaware of. This raises the ethical question - whether the concept designer should follow his own path and produce the conceptual model resembling his viewpoints, or kindly follow the needs of the clients and do a conceptual model according to their wishes, even if disagreeing personally?

One way of coping with this kind of situation is to turn from an introspective kind of working method towards the extrospective method, where the concept designer maps his surroundings by recognizing the stakeholders and their needs, their common points and areas, where they contradict. The extrospection shows that those needs being common are those in which the concept designer is having rather easy task of pleasing the client. Those areas, where the extrospection shows great differences are such things that easily become very problematic for the

concept designer. Most probably, areas where there are a lot of arguments, are those that are most easily left out from conceptual models, since the concept designer must choose his side in order to provide a conceptual model with concise solution. I personally believe that the areas, which seem to be contradictory, are those that are the most interesting, especially if creating something new. Things being known and approved by all are not interesting or new things anymore.

In my own work, my purgatory came in two separate forms. Firstly, *there was a collision between the needs of a business world and the needs of a science*. The business world demands solutions fast and clearly stated, but not necessarily well argued manner, where as science demands more matured and well argued presentation. For an idea and an argument to become matured and well-constructed demands time and unfortunately, time is often a scarce resource in the business world. Secondly, *there was a collision between creativity and conventionality*. As long as it was only about making drafts, all supported the crazy ideas, but thinking of actually realizing those ideas; it is totally different thing. This kind of banalization of the original work was also discussed and afraid in one of the design sessions.

My solution to this situation was two folded, I decided to take my time to do a matured construction and take the creative approach to my work. Basically, it has brought my work to the other extreme, if looked at the business world viewpoint.

From the original tasks presented earlier in this chapter, it is possible to create a comparison to the qualities or requirements that characterize the concept designer (Table 3.) at his work.

Table 3. A comparison between the original tasks and the requirements for the concept designer

Tasks	Requirements
He collects the ideas and requirements from the client(s) of his work.	Good communicational skills to find the true requirements.
He refines the original ideas and questions into more detailed ones and recognizes the needed knowledge through analyzing the requirements.	Analytical skills to analyze the gathered material and to pick out the key issues.
He turns then the ideas and requirements into research questions.	The requirements originate from needs and problems. Some of these origins might be unknown even to the client. Therefore, good social skills help a concept designer to investigate the origins of requirements and thus create the research questions.
He collects the needed information and analyses it. The quality of information comes here through quantity; the gray area around the core needs to be mapped too in order to find the boundaries of the artifact being under modeling.	Curiosity is needed to cover a wide enough area of knowledge, especially if the product of design is multidisciplinary. Also the openness towards anything new is highly appreciated in order to find the borders of the conceptual model.
He finds the connections throughout the material in hand to make the model to be concise.	The concept designer should have a positive attitude towards learning and the capability of taking advantage of using the modern learning methods. The construction of conceptual model is a construction of a concept designer's knowledge over the artifact or phenomena being modeled.
He filters the needed information from the unneeded information.	In addition to being open to new information, a concept designer needs to have the capability to criticize the knowledge at hand. The most important thing is to draw boundaries in the gray area to separate the most important issues from those not so important.
He creates the conceptual model.	The capability of expressing one's thoughts and ideas in a visible form is needed in order to have a concrete artifact. A concrete artifact, namely the conceptual model is needed to create a framework under which some product is produced.
He presents the conceptual model to the clients to collect comments on it and refine it further through modeling process, if needed.	A visible conceptual model is also needed in order to able to comment on it. Communication is based on some visible products, either artifacts of real life or virtual worlds.

4 People, Creative People and People at Work

In this chapter, I shall go into more details about the key issues affecting the conceptual model from the human point of view. The main purpose of this chapter is to describe which kind of demands the human needs put to the design of the work place such as nW Oasis. This chapter also explores the concepts of creativity and work from various points of views.

First of all, I shall present the version of the human centered design approach used in the conceptual model, which is based on Abraham Maslow's (Mas70) and Lauri Rauhala's (Rau89) works. Then I shall discuss creativity, which kinds of personalities creative people have, what kinds of forms creativity can take, how the creative process can be described, and present a social context for creativity. Lastly for the creativity, I shall discuss about Richard Florida's (Flo02) concept of the creative class. I shall also represent how the surrounding society, the workers in it and the work itself are changing and which kinds of demands they put on the conceptual model.

4.1 Human Centered Design Approach

Maslow's Hierarchy of Needs

Abraham Maslow (Mas70) presented in his well-known book, "Motivation and Personality", his suggestion for a source of the motivation of man. This suggestion was described in form of hierarchy, where motivation for human activities stems from the urge to satisfy a certain need. He stated that a satisfied need provided room for a higher need to appear and to be once again satisfied. Maslow also introduced the concept of a relatively satisfied need, which means that the needs do not need to be satisfied fully, but when the relative satisfaction of a need has been reached then there is room for other needs. In one of the examples presented in his book, Maslow referred to a person, whose needs can all be without their full satisfaction, but because of the need hierarchy, higher needs

are allowed to appear. In this example, an imaginary person's lower[12], that is physical, needs were more satisfied than the higher needs, that is the need for self-actualization. Maslow presents the need hierarchy in the following manner (from bottom to top):

1. *The physiological needs*. These are needs in us as we are beings of flesh and blood. We need to keep homeostasis, automatic regulation of our body temperature, bloodstream and for example chemical balance. This is achieved by eating food and drinking water.

2. *The safety needs*. We need a steady environment to live in. We need work to be financially safe and a home, to stay safely away from the changing natural conditions. In extreme conditions, we need safe surrounding where we have total control over everything.

3. *The belongingness and love needs*. As described countless times in novels, people need love and other people. We need a social group to identify ourselves with and we need friends to share our thoughts with.

4. *The esteem needs*. We need to feel ourselves to be able to master things, be strong, to achieve, and to be free and independent. We also have a desire for reputation or even prestige, to be recognized and feel important, needed, and necessary in the world.

5. *The self-actualization needs*. We need to express ourselves – to become something that we should be. Here the individual differences are the greatest; one may long for being an artist, while another longs to be an athlete. This need especially is such that Maslow says; one hardly ever is really able to satisfy the self-actualization needs.

Maslow later rearranged his hierarchy from its top-end. He introduced two new levels below the self-actualization and one above. According to Huitt (Hui05), Maslow defined that the *cognitive needs* and the *aesthetic needs* come before the

[12] Here in a hierarchical sense, not in a moral sense.

self-actualization. By cognitive needs Maslow meant needs to know and explore and by aesthetic needs he meant needs for symmetry, order and beauty. The level, which he considered to rank even higher than the previous top, the self-actualization, was the *self-transcendence*. In self-transcendence one goes beyond own ego and needs by helping others to find their fulfillment and becoming of something that they should be. (Hui05)

In my work, Maslow's hierarchy of needs is a good tool to understand some basic human needs. In the case of the physiological needs, the opportunities to eat, drink, and work in well regulated conditions are trivial in modern workplaces, especially in regular office work. What it comes to safety, it is important to create an environment, where one feels to be in safe. I find this to be in relation to atmosphere of trust and openness in addition to physical safety. It is also very important to provide the people working at nW Oasis a chance to meet their colleagues and facilitate their effort to spend time and socialize together. I also think that mentoring services, helping in achieving better self-awareness, are needed. The cognitive needs can be supported by offering tools to access the knowledge, when needed and by offering opportunities for intellectual exploration, such as invited speakers or workshops with peer workers. The aesthetic needs can be addressed by creating visually pleasing work environment with an opportunity to change the own "turf" to be personally satisfying. The hardest part of all is to find reasonable ways for facilitating people's self-actualization. In my opinion, providing tools for people to become better at their own profession and in self-expression will help in realizing this. The self-transcendence should in my opinion to be the driving force in nW Oasis. The collaboration, sharing of time, knowledge and skills, sincerity and reciprocity between people should prevail among those who work in nW Oasis to make nW Oasis successful.

Rauhala's Holistic Conception of Man

Lauri Rauhala (Rau89) promotes in his book the holistic conception of man. He writes that the holistic conception of man has got three different sides, which all

are strongly intertwined to each other thereby creating a full picture of man. These sides[13] are: *corporeality, consciousness, and situationality*.

Corporeality takes an organic, physically oriented view on man. Man is seen as being a physical entity of flesh and blood, a complex system of organs existing in a real world. Through corporeality man has a life, and a way to interact with the reality surrounding his. By affecting the corporeality, it is possible to have an effect on other sides of man as well. For example, through better physical condition, one improves the quality of life felt through consciousness and possibly affects one's situation in world, for example by having a new friend to go out jogging with.

Consciousness is the existence of man in a psychic/spiritual sense. Rauhala uses an explanation that portrays consciousness as a whole spectrum of human sensing. It is for example to know, to feel, to believe, and to dream. It is also the observations gathered through sensory input. There the consciousness is in collaboration with corporeality. We can have an effect on consciousness for example through a speech or teaching. The cognitive (non-physical side) processing as a mental feeling or an experience is part of the consciousness as a part of man.

Situationality connects the body and the mind to the world. It is a combination of various things affecting one's life. Some of the situations may be changed, but some are non-changeable. For example, one can choose his friends and what he does at certain situation, but one cannot choose own parents or culture, where he has born. A division is also made between concrete and idealistic situations. For example one can be affected by bacteria or nature's forces, but also by propaganda, and norms of ethics.

When Maslow's ideas are compared with those of Rauhala's, we can create a simple mapping between them. Rauhala's idea about the corporeality of man is in relation to Maslow's physiological needs, where as the needs for safety,

[13] The English translations of Rauhala's terms were taken from Mirja Lievonen's article presented in HCT 2003 workshop (Lie03).

belongingness and love, cognitive, and aesthetics belong to Rauhala's situationality domain. Rauhala's ideas of consciousness and Maslow's self-actualization and transcendence needs have something in common, but are not really exactly the same thing. In my opinion Rauhala's consciousness is more linked to human physiology and its sensorial capabilities, whereas Maslow's self-actualization and transcendence are more interested of man in pursuit for his true self and helping also others in that same process.

Rauhala's ideas with those of Maslow's generate the basis for the creation of the conceptual model presented later in this thesis. With their help, the approach for the conceptual model begins from the humanistic tradition, instead of beginning from the cold, technology-first viewpoint. By recognizing the different aspects of humanity, it is possible to find ways to have a positive effect on a person and recognize him as a whole. In the conceptual model, especially Rauhala's ideas of the situationality and consciousness are important.

Offering a person with a pleasing workplace takes in account Rauhala's situationality. One way of doing this is promoting the everyday usability issues at the workplace, recognizing the importance of both privacy and socializing, and providing a person with chances to have new, positive experiences in his life sphere. Consciousness is recognized by providing a person with opportunities to learn new things, express his ideas in various ways, and by promoting the creativeness. Corporeality and by that the organic well-being of a person is promoted in conceptual model by giving extended possibilities to have positive physical experiences. It is not only having physical exercise, but also for instance having a sauna or enjoying ergonomically sound work spot.

4.2 Creativity

Creative Personality

Hakala (Hak02) represents in his book, "Luova prosessi tieteessä[14]", a wide literature review on creativity. The descriptions of both the historical and present

[14] The book is published in Finnish, the title translated in English: "Creative Process in Science".

day creative personalities are especially interesting in his book. Hakala writes that the most often creative people are sensitive and flexible. By sensitivity he means the capability to be sensorially open for problems and their possible solutions. Also Csikszentmihalyi (Csi96) promotes in his article the sensitivity of creative personalities. He mentions that the sensitivity may also expose the creative person to suffering and pain. This may happen with a bad user experience of some appliance or the public's misunderstanding of one's creative work. Flexibility is an important issue for the both authors since it is seen as the ability to switch easily from one point of view to another (Csi96) or to think and act in an unconventional, non-rational way (Hak02). Hakala even mentions that some creative persons try to break the conventional way of thinking into chaos, which can then be assembled into novel constructs. In extreme cases, creativity can lead a person to the mania or depression. Trips to the brink of madness may serve as a passage to creative state of mind, Hakala describes (Hak02).

Richard Florida proposes similar ideas in his book "Rise of the Creative Class" (Flo02). Florida says that the creative person comes up with combinations that are both new and useful. In order to achieve these, a creative person requires both self-confidence and the ability to take risks and make mistakes. In addition to the constructive nature of creativity, Florida also mentions the destructive nature of creativity, where one has to break away from the old, change one's inner self in order to create something new, which is analogous to Hakala's (Hak02) earlier descriptions. Hakala also emphasizes the visual nature of creative thinking; a person may see dreams, visions or even delirium, while being in the middle of creative process. In more normal cases one uses models, sketches and technical drawings to support the creative process. Hakala also brings up the unconsciousness in the spirit of Freud as a helper in the creative process. He argues that those, who take a look within themselves and listen to hints of their unconsciousness, are more creative than those who do not do so. (Hak02)

Csikszentmihalyi's (Csi96) article combines the idea of unconventionality also with the rhythm of life; the life of the creative person is often not bound to and ruled by the calendar, the clock or an external schedule. Creative persons tend to work according to their inspiration. Csikszentmihalyi also presents in his article

the idea that creative persons exhibit both extroversion and introversion at the same time. They need both time on the sidelines and to be a member of thick crowds. Similar kinds of meetings of extremes take place, when a creative person is at the same time traditional, conservative, and rebellious. Csikszentmihalyi gives an example of an artist using folk tradition methods in her ceramics, while still producing novel constructs shown in a museum for modern arts. (Csi96)

Peter J. Denning commented on the personal foundations of creative activities in his article "The Social Life of Innovation" (Den04). His view on the innovation process is rather practical; he argues that certain personal practices are necessary for the innovation process to work. He continues by writing that "*Technical innovations require the innovator to be skilled both in the social dimension as well as the technical; one or the other will not do*". In his article, he listed the following eight practices important for innovators (Den04):

- *Awareness*. Awareness means ability to spot opportunities and concerns, and an ability to overcome personal cognitive blindness.

- *Focus and Persistence* means an ability to maintain the attention on the mission and avoid distractions. It is also refusal to quit, even if things turn out be harder than seen beforehand.

- *Listening and Blending.* Listening is openness and listening to people's deeply held concerns and interests. Blending means finding the solution being beneficial for both and including the important aspects of both parties.

- *Declarations.* This means an ability to describe the ideas in a manner, which touches people and make them understand the possibilities and potentials in those ideas.

- *Feeling of destiny* is a driving force, sense of the purpose for one's own activities.

- *Offers*. The innovator will at some point make offers that bring the innovation available to others. The offers have to be kept and there should be a deep commitment to obtain the results.

- *Networks and Institutions*. This means gathering allies, defending against the objectors, creating alliances to further the innovation, developing standards, and widening its acceptance.

- *Learning*. The innovator must give some time for learning new skills, acquiring knowledge, and understanding when learning should take place and what should be learned.

In the nW Oasis context it is possible to see many things that should be taken under consideration. First of all, the clients should be provided with help to visualize, model and construct their ideas into a more visible form. Also the process of breaking their conventional models and reconstructing them should be given support. The premises for work should be as easily accessible as possible regardless of the time of the day. The premises should also let clients withdraw into solitude when necessary and meet others and present ideas, when they feel like it. It is also important to offer support to one's mental well-being with mentoring services. Concerning Denning's practical view (Den04), it should be taken into account, when thinking of possible educational services for customers. Denning's practices are such that they can be taught and customers could be made more aware them, thus facilitating their businesses.

Forms of Creativity

While the Hakala's and Csikszentmihalyi's ideas presented before were more concerned about creative personality, Ben Shneiderman discusses in his book, Leonardo's Laptop (Shn02), the concept of megacreativity. He describes the magnitudes of creativity and different ways to look at creativity. According to those he proposes his own framework of creative actions. He suggests that his framework is different from others', since it supports all forms of creativity. His basic message is that by (technically) supporting the different forms of creativity, most people could take advantage of their creative potential, thus unleashing the megacreativity. (Shn02)

In Shneiderman's book (Shn02), there are three different magnitudes of creativity presented. Firstly, there is *everyday creativity*, which is very personal and context bound experience. This kind of creativity is present, when one makes for example decisions about the food, what he is going to cook, or when he is having lively conversation with someone he knows. This kind of creativity is closely bound to the situation and is impromptu, done without planning. (Shn02)

Secondly, there is *evolutionary creativity*, where the need for creativity is bound to refining and applying existing paradigms. This kind of activity is present, when a programmer refines his algorithm to be more efficient or esthetically pleasing. It is also present, when a researcher's work is based on certain scientific theories and the work's function is for example to develop them further. Here the creative action is not happening impromptu or even without noticing; there is often a clearly stated goal, where one is heading. In addition to the clearly stated goal, the result of creative action is a product or service, which can be assessed by others. (Shn02)

Thirdly, there is *revolutionary creativity*, where the concepts considered to be invalid or even ridiculous at the moment are found to be valid in the future. It means the total change of viewpoints in scientific paradigms, great breakthroughs in some technological fields changing also the others or radical, or unseen and unheard way of interpreting life and culture. Examples of such revolutionary creativity are Einstein's theory of relativity, the discovery of printing technology and Marx's theory of society. The revolutionary creativity is very hard to predict, since after all it is a break from the past and the beginning of a new era based on a new theory. Due to this, in some occasions revolutionary creativity may go unnoticed, because it is so distant from the contemporary way of seeing things (Shn02). One good example of such is the Dutch artist Vincent van Gogh, who died in poverty, but whose works are now highly respected and considered to be very influential to other artists (Wik05).

In the nW Oasis context these magnitudes of creativity are important for deciding, which kind of creativity should the working environment support. I agree with Shneiderman's proposal that basically only evolutionary creativity can be easily supported by the means of the tools and in this case also by environment.

Everyday creativity is bound with impromptu situations and revolutionary creativity is very unpredictable, which make them both hard to be facilitated from the outside. Evolutionary creativity's goal orientation, a certain kind of pragmatism and available methodology, help facilitate the creative process.

Creative Process

Shneiderman has also done a literature review to find out the characteristics of the creative process. From the literature, he has found a separation in three different kinds of creativeness supported by scientists. According to Shneiderman these three kinds of creativeness (or schools of creativity) are inspirational, structural and situational. (Shn02)

Inspirational creativity is based on the "Aha!" experience, where the light of wisdom suddenly illuminates the inventor and a major breakthrough is achieved. The inspirationalists believe that "luck favors the prepared mind", which means that before the idea can appear, one has to study the domain area carefully. It is also important to have a stated problem before one can find its solution. It is typical for people who want to acquire inspirational creativity to use techniques like brainstorming, visualizations and random words to break the normal chain of thoughts. (Shn02)

Structural creativity is, as its name implies, more explicitly defined way to approach creativity. In order to find a solution to a certain problem, one may use evaluation techniques, an idea refinement processes, process support, and documentation tools. Also, the creative process itself may well be structured like Shneiderman presents Polya's four steps: Understanding the problem, devising a plan, carrying out the plan, and looking back. Part of the structured creativity is to create models and their simulations to see whether the solution really works. (Shn02)

The third kind of creativity is *situational creativity,* where the creative process is seen as social or communal process. Creativeness as presented here is changing a common practice, ways of thinking and ruling standards. Shneiderman presents Csikszentmihalyi's ideas of creativity as being a core theory of situational creativity. According to Shneiderman, Csikszentmihalyi hypothesizes that the

novel ideas happen in a certain domain, where there are people creating a community or field of studies deciding which works are part of that certain community's paradigm. Creativity is thus, creating new artifacts to that field, changing the field's contents. If the artifacts are not accepted to a certain field or community, it leads to the creation a totally new community. Above all, the products of situational creativity are such that the communities, in which they belong, decide their worth. (Shn02)

Shneiderman (Shn02) presents in his book a combinatory process, where all these different aspects are taken into account. He proposes eight tasks, which should appear in creative process and should be recognized, when thinking of facilitating the creativity. These eight tasks are:

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

Those eight tasks can be divided into four different kinds of actions: Collecting (finding information, visualizing it), relating (socializing with peers), creating (free associations, exploring various solutions), and donating (spreading the results) (Shn02). In order to facilitate these actions, nW Oasis should provide means to effective and wide information gathering and processing, help people to find their peers to communicate their ideas with, offer solutions and support for creative work, and provide a medium or a forum for expressions of results.

Creativity in Social Context

Denning (Den04) commented also on the social aspect of creative activities in his article. Firstly, Denning makes a clear difference between an invention and an innovation. An invention is simply something new, an artifact, an idea, a device, a procedure, whereas an innovation is an invention adopted by a community. Thus, innovation can be described to be a change in a community's behavior. Denning reminds that even though an invention might be clever, there is not any guarantee that it will become an innovation. Innovation requires attention to other people, what they value and will adopt. (Den04) Here Denning's ideas are similar to Csikszentmihalyi's (Shn02) ideas of creativity's situationality.

Secondly, Denning introduces several opportunities for innovation. Instead of just seeing only a new knowledge as basis for innovation, Denning introduces a total of eight opportunities for sources of innovation. Those opportunities are (Den04):

- *Unexpected events*, which can be either successes or failures.
- *Incongruities*, which are gaps between the reality and common belief or aspects that do not fit together.
- *Process need*, which can be for example a bottleneck in a critical process.
- *Demographics*, which are for example changes in groups by age, politics, and religion.
- *Change of industry structure*, which are such as new business models and distribution channels.
- *New knowledge*, which is applying new knowledge that is usually acquired through scientific activities and involves a convergence of different areas.

- *Change of mood or perception*, which is a change in how we see the world[15].

- *Marginal practices*, which are the practices of a small minority of people in certain community or field, but that can become a way solve major problems in another field.

In the nW Oasis context, the opportunities that the nW Oasis concept is based on include the change of industry structure, the change of mood or perception, and new knowledge. nW Oasis offers a new way to work outside the organization in the shared space among the other similar representatives of other organizations.

The co-founder of the MIT's famous Media Lab, Nicholas Negroponte, commented on creativity in his article "Creating a Culture of Ideas" (Neg03). His approach in his article was rather pragmatic, giving advices to those making decisions both in business and in society. He underlines in his article *the need for diversity in the innovation situation*. By the diversity he is not only referring to the backgrounds and ethnicities of the people, but also their opinions, education and age. He especially points out the age issue; he argues that the age should not play too important part, when giving value to people's ideas. (Neg03)

Secondly, he proposes that people should be allowed to *do mistakes and learn from them*. No one should be stigmatized by failing in establishing a new venture or giving a wrong (depending on the point of view and expected answer) answer to a question. Negroponte points out the power in mistakes; by analyzing the mistakes, one may find new, interesting ideas. I see this as analogous to Piet Kommers's ideas (Kom04b) of going away from the planned path. Instead of following the normal route to the anticipated result, one should consider choosing something else. This goes well hand in hand with Negroponte's wish, that multiple points of views should be encouraged both in work and in education. Negroponte concludes that nurturing interdisciplinarity (diversity),

[15] Compare this for example to the change that took place in United States after 9/11.

encouragement to take risks (face the unknown), and promoting openness and idea sharing are good for innovation and creativity. (Neg03)

In an article (Hei03) that was presented in Finnish weekly magazine in the field of economics, "Talouselämä[16]", a Finnish point of view of creativity was presented. Mirva Heiskanen, the journalist who wrote the article, had interviewed some Finnish professionals, who had something to do with the creative work or with creativity itself. Similar kinds of ideas to those of Negroponte's, also rise from the interviews with the Finnish professionals. The professionals say that the creativity can be found from the places, where different kinds of people live side by side, enjoy their lives in many ways, and meet randomly or even surprisingly each other. They also mention that the haste in modern workplaces (e-mails, virtual networks, fast-paced production of unfinished products, and the endless flow of information) kills the creativity, while true social interaction with people would nourish it. (Hei03)

The similar kinds of ideas can also be found from Perkkiö's article published in the "Tekniikan näköalat[17]" newspaper (Per02). She had interviewed a couple of Finnish researchers doing their work in the field of the psychology of the workplace. The researchers also support the idea of withdrawal from the hasty routines to a place, where one can concentrate in peace. The idea of random meetings of unknown people comes up also in this article; the researchers encourage such design of workplace logistics, which facilitates people meeting each other (Per02). The Finnish professionals in Heiskanen's interviews mention also that creative professionals should be given enough time and freedom for their work. Creative professionals should be allowed to play around in a work environment that encourages risk taking and self-guidance, while offering stability to their work in a form of long-term work contracts (Hei03).

Florida (Flo02) presented in his book the social structure of creativity, which was built from three parts:

[16] The name of the magazine "Talouselämä" is in English "Business Life"

1. New systems for technological creativity and entrepreneurship.

2. New and more effective models for producing goods and services.

3. A broad social, cultural and geographic milieu conductive to creativity in its all forms.

He points out that the venture capital system is backing up the new companies entering the business with fresh ideas. The support that venture capitalists offer is both financial and solid knowledge about business. Florida also discussed the organizational changes, such as the thinking and learning organization and modular production, which have supported creative work. Lastly, he commented on the social, geographical and cultural things facilitating the creativity. Florida says that a supportive social milieu for creativity is open to all forms of creativity, whether they are artistic, technological or economical. He also promotes the importance of a vivid cultural scene offering authentic experiences. The social and cultural milieu should attract new and different people and support the quick transferal of knowledge and ideas among them. (Flo02)

The last paragraph concerning Florida's work supports the earlier points of view: tolerance for diversity, encouragement to take risks and break personal limits, and promoting the meeting of people are all important for the facilitation of the creative work. These are issues that nW Oasis should take into account and try to support. Concerning the social structure of creativity, there are possibilities to support these structural elements behind creativity in a larger context. It means that nW Oasis must take a very active role in its relations to surroundings. This can for example mean attracting investors and venture capitalists to stay in nW Oasis, consulting client companies to become more flexible organizations to be ready and open for new ways of working. The consultation of client companies should not only be limited to giving out some promotional material, but also for example giving out ready made schemes or "cook books" for working efficiently in a modern environment like nW Oasis. Also the close collaboration with local

[17] The name of the newspaper "Tekniikan näköalat" is in English "Prospects of Technology"

city officials is essential in order to support the development of the city of Joensuu to become more tempting, tolerant, and welcoming in the eyes its future citizens. In my opinion, even if one spends a short period of time in nW Oasis, both the close surroundings of nW Oasis and the city play a major role in how comfortable and welcomed one feels. After all, nW Oasis is not located in a vacuum, but is a part of local geography and society.

The Creative Class

Richard Florida presents in his book (Flo02) the concept of *creative class*. He does not use the term class in its traditional meaning, nominator of social status, but the term is based on the economics. The creative class consists of the people, who are creating and adding economic value through their creativity. Thus, their role is more bound to economy than in society or the traditional division of work. Florida emphasizes in his book that the members of the creative class do not necessarily own great amounts of physical property, but their property is mostly intangible, knowledge possessed by them. This is very much analogous to the ideas presented for example by Castells (Cas96) and Vähämäki (Väh05), which promote the shift from the tangible capital to intangible capital and valuation of abstract knowledge over concrete product. Usually, the members of the creative class do not feel as a part of unique group, but according to Florida, they do share many similar values, desires and preferences. The strongest and the most distinguishing attribute for the members of the creative class is that they engage in work, whose function is to create new meaningful forms. (Flo02)

Florida separates the members of the creative class into two groups, the super-creative core and the creative professionals. *The super-creative core* of the creative class includes for example scientists, university professors, novelists, and designers. Their work consists of the highest order of creative work that produces new forms or designs that are readily transferable and widely useful. Their work is not only consisting of problem solving, it may also include finding problems to be solved. *Creative professionals* are highly educated people working in various sectors of life such as business management or knowledge-intensive industries. They do complex problem solving in their work and most importantly, they are

expected to think on their own and exercise their own judgment. Mostly, in the latter case, the solutions are bound to a certain context. (Flo02)

According to Florida, individuality, meritocracy, diversity and openness, personal development, and self-actualization are highly valued among the members of the creative class. They want to be themselves, express their ideas and opinions both through their appearance and their actions. As most of the physical needs are satisfied in modern society, their interest is to become their true selves, doing things that are meaningful and thus rewarding for them (compare to Maslow earlier). They respect people, who have achieved something in their lives (see Csikszentmihalyi earlier). They also want to see and experience new things, which make them long for diversity in all kinds of services available. That is also related to openness, as they are often considered to be different from average people; they enjoy places, where they can be themselves openly. (Flo02)

The most important thing about Florida's creative class is his finding that in places, where creative class people are thriving, the economy is also growing steadily. Economic growth does not come only by attracting the creative class members to a certain geographical area, but it comes through the new ideas, new businesses, and regional growth that they support. Florida promotes the idea of the three T's, Technology, Talent, and Tolerance. The creative class is most likely to stay and benefit the local economics in the places, where those three T's come together. (Flo02)

Technology of those T's is related to the number of high-tech companies, the level of technology and the vacancies in that sector in the certain area. *Talent* means the number of highly educated people working, living and studying in certain area and *Tolerance* is related to how open the community is to newcomers and different people. The places, which understand the needs of the creative class members and actively work on the three T's, have a chance of becoming the places, also where the creative class and its products are located. (Flo02)

The original book by Florida (Flo02) was strongly related to American society, which left open questions, like how would the ideas work in European context? Richard Florida coauthored with Irene Tinagli a study, which is named "Europe in

the Creative Age" (Flo05). According to that study, the same characteristics seem to be valid in Europe as well as in the United States. It states that those countries, which have got a large percentage of creative class members in their societies and are highly ranked in three T's presented earlier, enjoy also a high standard of living and have a well-developed economy. In European context the possible winners of the creative era seem to be the Northern European countries, including also Finland, which are very well positioned also in comparison to the United States. Finland was placed very high in its concentration of members of the creative class and in technology and talent reviews, while the problem area was tolerance, especially in terms of rather old-fashioned values and negative attitudes towards self-expression. (Flo02)

Interestingly, but not surprisingly, Florida's observations about Finland are well analogous to Mika Kulju's documentation of the rise of Northern Finland's "silicon valley", city of Oulu. Mika Kulju, a journalist, has written a book called "*Oulun ihmeen tekijät"*[18] (Kul02), which includes interviews of those people, who are considered to be behind the Oulu's rise from an industrial city to a modern city with large number of ICT-sector employees. Basically, the book is a description of creating a technologically oriented talent pool in Oulu by establishing the university in the city. The availability of talented people in the field of technology lured some large companies to the city and later it led also to the founding of new high-tech companies (Kul02). Clearly, Oulu is an example of a city built on two of Florida's three T's, namely the talent and technology, as is Finland as a nation. Whether this shall be enough in the future, especially, if we want to lure also high-quality foreign expertise is another thing.

From the nW Oasis point of view, it is important to understand the creative class, since the clients will most likely be members of this class. Therefore, one can see that only developing a great workplace is not enough, but the change should also include the community, where the workplace of creative people is located. The change must not be limited only to physical changes like parks and biking trails,

[18] The book is published in Finnish, the title translated in English: "The People Behind the Miracle of Oulu".

but must also occur on the attitudinal level and have an effect on it, for example plans for spreading tolerance and supporting social and cultural diversity, should be taken under consideration.

4.3 Society, Work, and Workers in Change

Society and Individual in Change

In 1997, The Swedish IT-commission published a report, in which they had interviewed 13 respected experts about the possibilities and effects of ICT on the future's information society. The report was cited in Sundqvist's article (Sun02). The citation included a unanimous perspective that society was changing to become a postindustrial society, where the virtues of industrial era had become vices. The Swedish experts foresaw that the ruling values of the post-industrial society would be heterogeneity, individuality, a humane approach and locality. As mentioned, these values are in contradiction to values of the old society: homogeneity, collectivity, an engineering approach and nation. (Sun02)

The Finnish National Fund for Research and Development (SITRA) has funded a similar kind of project in Finland, where several workgroups of national decision makers and respected professionals of various fields came together to make future scenarios for year 2015. Their aim was to map the success factors and challenges of the future for Finland. This project lasted for four years (1999 – 2003) and one of the reports that the workgroups produced was written by a group of young professionals. The report was named "Best before 01012015" and it includes selected young Finnish professionals' scenario of the future of Finland. (Kau05)

In that report, the young professionals foresee that the present, rather homogeneous, Finnish culture will be transformed to be more diverse and multicultural with a growing number of immigrants coming to Finland. The work will change to be more high-level knowledge and expertise oriented than basic manufacturing oriented. The workers' skills will be utilized in a more holistic way than they are at the moment; creativity, innovativeness, learning, entrepreneurship, and networking will be encouraged. The workplace, its culture and organization, will have to change to accommodate the changes in the surroundings. The nine-to-five rhythm of life will change as people are considered

to be freer to choose their own schedules. This can also mean that the length of the workday can change quantity will give way to quality as the other spheres of life are appreciated along with the work. The work involves not only creating technology, but also creating high-class services, art, and cultural experiences. (Kau05)

Society is going to change to become more individual oriented as the respect for traditional communities slowly crumbles away. This will make the individuals seek their identities. Nevertheless, people will still associate with their peer-groups, but the peer-groups will be more bound to values, hobbies, or profession and can be multinational and thus not bound to any local space. The activism and participation in the third sector, namely in various kinds of civic organizations, will become more important. Even though, society is seen to be created through small peer-groups of varying values and emphasis, the general caring for others is still an important factor. The report also underlines the effects of globalization. As Finland is becoming a part of larger communities, the changes will also affect us. But through globalization and extensive information networks also we can have an effect on things far away from us for example by participating on different international forums available on-line. The views of the report were quite heterogeneous, which is also an indication of the diverse values of the participants. It also tells that the picture of tomorrow is not one, common, and shared by everyone; rather it is more like fragmented and multi-faceted. (Kau05)

Inkinen (Ink02) discusses in his article about the essence, the zeitgeist[19], of the the present day society. His findings are pretty closely connected to the same domain as the Swedish IT-commission's findings and The Finnish National Fund for Research and Development's report cited before. He presents a picture of an individual, who is searching for his personality and identity. The postindustrial, or postmodern as Inkinen puts it, individual is in the middle of chaotic individuality superstore offered by different media, where one can choose the values and personal qualities suitable for his needs. The needs are recognized through

[19] According to Sam Inkinen's definition, the term '*zeitgeist*' expresses the values, goals, themes, mentality and feeling present at specific time in a specific culture (Ink02).

reflective processes, where one tries to understand one's own self and being. The chosen values and personal qualities may change according to the social group, which one belongs to at a certain moment in a certain space. Sometimes this leads to contradictions and conflicts inside the individual's personality producing anxiety and even mental problems. (Ink02)

Inkinen also suggests that globality is becoming one the key phenomena of the new society. Even though, it may at first sound being like it is in conflict with the Swedish IT-commission's locality, it is not, since globality can be achieved through locality[20]. Globality is in this context for example seeing and living in other cultures, traveling and meeting people from different countries and following happenings around the world. The globe has shrunk as the different means of communications have become more efficient and available. Globality also means that no one can consider being safe from global events. Economical crises or wars affect everyone in the reach of the global networks of money, people or media. (Ink02)

In addition to personality, also one's relation to one's own body and its processes provides a playground for a postmodern individual. Shaping it according to the examples set by the peer-group or models in the media provides a way to promote one's own values and personality (Ink02). Having a pop idol's picture on one's t-shirt can be a message indicating that one wants to promote the same, personally meaningful, values in his life as that branded pop idol. Promoting individuality on a personal level has its reflections also to the community and at the far end to society level. Cities define themselves as "human technology cites" (Hum05), companies have their explicitly set values (Nok05) and countries promote their image as "Northern Europe's Technological Heartland" (Efi05). Promoting individuality creates heterogeneity into society or the global set of countries.

Inkinen also brings up the technology beliefs, utopias and the concept of risk society, a society which is continually threatened by some catastrophe caused either by man himself or by nature. The last word for him is, nevertheless, that

[20] Compare to the well-known environmentalists' slogan:"Think globally, act locally!"

there is not really any all-describing picture of the society of today or tomorrow and that the picture is different from place to place. It is also important to remember the historical context of our times, for example the belief of technology in bringing the utopian state was very apparent also in modern times, nearly a century ago. (Ink02)

A well-known Finnish philosopher Pekka Himanen, who wrote the book "The Hacker Ethic – and the Spirit of Information Age" (Him01), has also commented on the zeitgeist of the present day. He argues that there are certain recognizable core values among hackers[21], who are basically the fueling core of the information society by creating the technological means to create it. All hackers do not share all the values that Himanen presents in his book, but they are more or less useful in defining this group of professionals. Himanen also presents the idea that through the technological development these values will be having more and more importance also outside of this group. Himanen sees that the hacker ethic challenges the present work ethics and they may pave the way for the rest of society to follow. (Him01)

Firstly, Himanen speaks about the work ethics of hackers. Hackers respect over anything else *the passion for the work at hand and liberty*. This means that just a job is not enough, but it must be personally and intrinsically rewarding and it must allow creativity and offer possibility to fix it flexibly with other passions of life. Secondly, on the subject of ethics concerning money, hackers are not motivated by it; *they value social dignity and openness as compensation for their work over money*. Hackers belong to their peer groups through their shared passion and want to have social recognition from them by doing something that is considered to be valuable (compare to Florida's creative class presented earlier). Openness means here that they want to share their expertise and creations with others, who may use, test, evaluate and further develop their work. Thirdly, Himanen speaks about

[21] The term '*hacker*' means in this context such users, who are abiding the law in their computer profession. This term is in contradiction to the term '*cracker*' which means those computer professionals who illegally break into information systems and cause harm from the society's point of view. (Ray05)

nethics meaning hackers' relationships to different kinds of networks. According to Himanen those relationships are defined by activity and caring. By activity he means that hackers value full freedom of speech in networks, privacy for creating a personal way of living and actively living out personal passions instead of being a passive customer for others creations. Caring means in this context allowing as many people as possible the chance to take part in networks, understanding the effects of their work, and taking responsibility for it. (Him01)

The ultimate value, according to Himanen, for hackers is *creativity*. Himanen defines it being able to take the full and imaginative advantage of one's skills, overcoming own limitations, and giving a valuable contribution to the world (Him01). When compared for example to the opinions presented in the report published by The Finnish National Fund for Research and Development (Kau05), one easily sees that the key ideas are very close to each other. The hacker ethics described by Himanen and the future scenario by Finnish young professionals both promote the individuality and personal passion as the basis for work. Creativity, an expression of one's true self, is seen as key factor for personal well-being. Also being active in one's own peer-groups and caring for those in lesser position are factors in personal well-being.

Himanen has continued to work with values also after his much-cited book (Him01). He has created a set of suggestions for values for Finland (Him04). The set of values is meant to be a supporting guideline for the Finnish government in their effort to change the Finnish society to be competitive in tomorrow's world. He listed in his work 10 core values that should help politicians in creating a caring, encouraging, and creative Finland. Those values were:

1. *Caring*. Caring means equality in a very traditional sense, doing things to someone in a way that one would like them to be done for oneself.

2. *Trust.* Trust gives people a safe basis to work in. With caring it removes the atmosphere of fear.

3. *Communality*. Communality is the traditional value of brotherhood, the inclusion of people, collaboration, and belongingness.

4. *Encouragement.* Encouragement is here, in combination with communality, enabling the individuals to accomplish more together than they can alone. It is also understanding that the other's success is not away oneself.

5. *Freedom.* Himanen describes freedom as consisting of individual rights, rights of expression, the protection of one's privacy, and tolerance for diversity.

6. *Creativity.* Creativity is bound with unleashing the one's own potential in a variety of ways. It is a human need to express oneself and develop.

7. *Courage.* Himanen mentions that courage is a value and a factor needed to fulfill the other values mentioned here.

8. *Visionarity.* Visionarity goes hand in hand with courage. It is about having a perspective, daring to dream, and having a willingness to create a better world.

9. *Balance.* In Himanen's definitions balance is a meta-value, which suggests that all the values should be in balance with each other. It is also related to temperance, a traditional cardinal virtue.

10. *Meaningfulness.* To let people allow their lives be more meaningful. It can be reflected by asking a simple question from oneself, "*Will this make my life more meaningful?*" (Him04, translation by the author)

These values can also be compared to Maslowian hierarchy of human needs, which were presented earlier. Himanen promotes through his values the ideas of hope, inspiration, autonomy, belongingness, and safety. His idea is to let people's lives have content, which makes their lives to be worth living. (Him04)

Another Finnish philosopher, Jussi Vähämäki, works in the field of occupational philosophy. He published an interesting article, titled "General Intellect" (Väh05), in a Finnish anti-capitalistic web magazine called Megafoni. He reflects the theories of Marx into present day society and makes interesting points about them. He argues that Marx foresaw the coming society, which is not based on the

production of goods, but of knowledge. Thus, the work is no longer measurable by normal measurements like time units or produced objects. Work becomes one's free time and one's free time becomes work. Therefore, a certain skill or physical contribution is no longer enough, but the worker's whole personality and presence becomes his working tool, which leads to defining himself through his work (Väh05). This can be seen as analogous to Inkinen's article (Ink02) presented earlier, where peer-groups are seen as tools to self-definition and the expression of one's own values, belonging to one's personal image.

Vähämäki (Väh05) cites Marx and defines how everything – interests, hobbies, culture, and enjoyment – become an individual's tools for work. This kind of work lives in communication, collaboration, and human networks. The results of this kind of work are new ideas, which may never become materialized as physical objects. This leads to the situation, where the products are not created alone, but are created from the beginning in the communicative network, where the products can be dynamic and ever changing and where they can be advertised and sold. The problem comes through the measurement: how can one's whole personality with all the gathered knowledge be valued in terms of currency, if it is taken into the processes of the workplace? (Väh05)

Taina Schakir interviewed Jussi Vähämäki for IT-viikko (Sch02b) in her article, where Vähämäki argues that being trendy means that one is being competent and useful for the modern company. Vähämäki argues in Schakir's interview that those, who are following their time, know what is happening in the markets. He also repeats his argument that modern work demands the whole personality, so that things done outside work may become more important than those done at work (Sch02b). Jakke Holvas also interviewed Vähämäki for Helsingin Sanomat (Hol02). In that article, Vähämäki argues that things considered to be vices in industrial work, like being social, chatting and gossiping are the virtues in the modern workplace. Through communication, the ideas spread through the organization and are not only kept in certain people's minds (Hol02).

From my point of view, perhaps the most interesting idea presented by Vähämäki comes forward in Vierula's article (Vie04) published in Yliopisto[22] magazine. In that article Vähämäki, who was interviewed by Vierula, mentions, "C*ompanies do not need anything else from men except their brains. The body represents tiredness and diseases...There is a tendency to get rid of the weaknesses of corporality. The body is not seen as a necessary part of humanity"* (Vie04, translation from Finnish by the author). This sounds very much like a Fordism for the postmodern age, an antagonistic contradiction to Henry Ford's famous quotation, "*How come when I want a pair of hands, I get a human being as well?*" (MSN05). The idea of getting rid of the body or the parts of it is not a new idea; Karl Marx (Mar99) saw the technological advances as the capital owner's tools in a battle against the working class employed in manual labor. The introduction of a steam engine and the mechanical tools it ran decreased the need for strike prone workers (Mar99). Thus, society influenced the technological advances and the technological advances had their effect on the surrounding society. Now that mass production is mostly automated, the new struggle seems to be for the brains and lives of the employees.

Pierre Lévy introduced in his visionary book, "Collective Intelligence" (Lév97), a concept of molecularity. Molecularity is opposite to the molar in all aspects of life, for example in society, technology and biology. While molar is a collective, mass and bulk oriented point of view of things, molecularity aims to handle each individual or object separately and at the much finer level. A molar worker is bound to a certain work situation or task, where he can use only a fraction of his cumulated knowledge, skills, and experiences. Whereas, in molecular organization the worker is able, allowed, and encouraged to take advantage of the whole repertoire of his potential. (Lév97) The organization is thus becoming more efficient; the hidden talent of the workforce is harnessed into the use and advantage of the organization. I find this to be very much analogous to Vähämäki's ideas presented earlier.

[22] The name of the magazine "Yliopisto" is in English "The University". The University of Helsinki publishes it.

What is important from the nW Oasis point of view is to recognize the plurality of future visions. It makes predictions for the future very challenging. From my personal point of view, it is more about deciding in which scenario to believe in and have a trust in rather than having a clearly defined vision for the future, since there is not really any “correct” alternative to play safely with.

By analyzing the reference material we come back to the issues of individualism, creating a personal vision, and acting accordingly. It seems that heterogeneity is strongly stressed in the literature and articles that my citations are referring to. According to that, recognizing customers as individuals they are, serves as well now as in future. Reflection or introspection as a means for better self-understanding may also refer to a more humanely-oriented society. Personal qualities and values are as much for drawing public attention as they are tools for individual separation. This process should and can be supported also by the working environment. As these examples by Himanen (Him01, Him04) and other studies (Flo02, Kau05, Ink02, Väh05) show, value-based thinking seems to be one of the cornerstones for understanding the future. Therefore, the respected values or even virtues in the culture of nW Oasis should be recognized and then be manifested into concrete actions that take place in the daily working environment. But the question remains, whether workers of a workplace, which has got real diversity, can agree or even be able to find any universal values respected by all?

Also Vähämäki’s (Väh05) concept of strongly mixed work time and free time should be taken under closer examination. Not only providing a descent place to work is enough, but also the time outside work, if there is any, should be somehow supported by facilities and the services linking it back to work. But here the question should be kept in mind: whether creating a 24/7 working paradise is simply a new, more efficient, and enjoyable way of exploiting the human capital?

It should also be noted that caring and enabling those in lesser positions seems to be one of core values for both for today’s and tomorrow’s professionals. It suggests, along with striving towards heterogeneity, that nW Oasis should not be a tower of glass and steel meant only for the top elite. More preferably, nW Oasis should offer open access to its public places (like workshop rooms and restaurants) to groups of children, elderly people and other groups willing to

enable themselves to actively participate in today's society. This would integrate nW Oasis better in its surroundings and also provide customers with a chance to create benefits for the surrounding society and those in need by doing volunteering or similar unpaid activities. I also want to emphasize here the human centered design approach introduced earlier. Even if there seems to be "a trend of getting rid of corporality", nW Oasis should be against it, thus considering the multidimensionality of being man.

Work in Change

Manuel Castells (Cas96), who is one of the most well-known researchers of the information society and its effects on our daily lives, has told in his book "Rise of the Network Society" about the changes in work. He criticizes the over-simplified and widely spread theory of postindustrial society. The theory, he criticizes, has got three main arguments:

1. Economical growth and productivity will be based in the future on the generation of knowledge, extended to all aspects of life through information technology.

2. There will be a shift from manufacturing and agriculture to service sector jobs. The more advanced a society is, the more of its labor will be concentrated in the service sector.

3. The most growth in job markets will happen in white-collar knowledge-based labor markets (management, specialists) and the general importance of such workers in society will grow.

Castells denies the validity of these arguments globally. They do have their validity in United States, but elsewhere in the world the changes vary. Depending on the culture in certain country, the changes vary accordingly from the basic postindustrial theory. (Cas96)

Castells proposes in his book some changes that are common to all the cultures changing from an industrial society towards an *informational society*, as Castells calls it. Here, I present those that I find to be important for the conceptual model of nW Oasis:

- The steady decline of manufacturing employment.
- The rise of the producer and social services (namely business services and health services).
- The rapid rise of managerial, professional and technical jobs.
- The relative upgrading of occupational structure over time. The more demanding jobs increase their share on labor markets.

Castells' global vision of the labor markets sets also signs for the conceptual model. It proves that the change to informational society will also have its effect on labor. This change has to be taken into account, when thinking of making investments in infrastructure (Cas96). I interpret Castells' ideas, even though they are more like global megatrends instead of local, to be in support of creating more room for highly-educated knowledge workers. Castells' presentation of global trends is also supported by Florida's argument for the rise of the creative class (Flo02). Florida sees the highly-educated, creative workforce to be the core of future competition, especially in Western societies, where he has done his research. The economies, both on the local (city) and on national levels, where the percentage of the creative class (belonging to Castells' managerial, professional, and technical jobs category) is high, the economy is also doing well in comparison to those economies, where the percentage is low (Flo02).

In addition to changes that occupational markets go through, Castells also presents interestingly new division of labor, which has got three dimensions. The first dimension refers to the tasks that the employee actually performs, the second concerns the relationship between the organization and its environment and the third dimension concerns the relationship between the managers and employees inside the organization. (Cas96)

This new division of labor is very interesting from the conceptual model point of view, since it is also a tool, with which it is possible to choose the typical client using the services offered in nW Oasis. With the help of Castells' typology (Cas96), I have created a picture of an anticipated worker in nW Oasis:

He will belong to either to a *managerial*, *researcher,* or *designer* group in his organization. He will be *a networker*, who has got the right to make new connections outside his own organization and has got good connections inside his own organization. He is either *one of the deciders or the participants*, thus either making the last decision or being able to participate in the decision-making process.

Apart from Castells' visions, Risto Linturi, along with Markku Vuorinen, created a table (Table 4) to represent the workers, who might be interested in working in the nW Oasis environment, which was discussed during the design session. The reason, why Linturi and Vuorinen made such a table, was to concretize the discussion by creating a believable profile for potential workers.

Firstly, Linturi and Vuorinen decided to create a table, the dimensions of which would be the situation at home and the situation at work. The *situation at home* dimension describes the employee's situation in relation to his spouse and children and includes whether the spouse will be working and where and whether the children will be in school. The *situation at work* illustrates the work task at hand, when working at nW Oasis. The work tasks range from the prize earned because of the good work to research work conducted at nW Oasis. After the dimensions were set, then the working combinations were selected, from which the most plausible profiles (market in table with larger, bold X's) were picked by Linturi and Vuorinen.

The table they made makes it possible to envision situations, which are favorable for working at nW Oasis. According to their table the most probable situations are:

- The employee is a part of a virtual team brought together to meet and collaborate in face-to-face environment.
- The employee does the last concentrated push in some project.
- The employee conducts research work.
- The employee founds a company of his own.

The home situation dimension shows that the situations, where the employee is single or in a relationship, where there are no children and both can actually move to and work in Joensuu are the most appropriate. The situation, where the employee has got children at school age and the spouse has a job elsewhere is the most unlikely situation to be successful to work at nW Oasis. According to the table, short-term time intensive tasks, which are not dependent on one's life situation, are the easiest for the employees. The longer the task and stay in nW Oasis, the more demanding it is of the employee's personal life.

Table 4. A profile of a probable worker in nW Oasis by Linturi and Vuorinen

	Situation at home						
Situation at work		Children are not yet in school	Children are in school, spouse's work?	Single	No children, spouse will have work in Joensuu	Decided to move away from Helsinki	Waiting for retirement
	Short project, where networkers come together	**X**	**X**	**X**	X	X	
	Telework to present employer				**X**	X	
	Final, concentrated push to finish the project	**X**	**X**	X	X	X	X
	Research spot	**X**		**X**	X	X	
	Employer from Joensuu	X		X	**X**	X	
	Founding the own company			X	X	**X**	**X**
	Working in nW Oasis as a prize for good work	X		X			
	Goal oriented work under guidance of some specialist						

When compared to Castells' views, it is possible to see that the employees in nW Oasis should be independent, have power to do decisions about their tasks, and have a certain reason or goal for their stay at nW Oasis. In the case of the longer or permanent stay in the Joensuu region, they should also be offered a chance to

relocate their families (in case there is one) successfully to Joensuu. That means that jobs for spouses should be easily arrangable and social services, like schools and day care facilities for children should be readily available. These services should be made available also in English, in order to make relocation possible for the international customers.

Personally, I mostly agree with the Linturi and Vuorinen's table (Table 4), but I think that founding an own company should be made probable in all the home situations. It can be achieved through services that help and support the situation at home. Also goal-oriented work in collaboration or under guidance of some professional should be more probable than it now appears to be in the table. Project workshops, seminars held by internationally recognized professionals and similar events would promote those kinds of activities in nW Oasis.

5 nW Oasis as Interiors and Exteriors

The main idea in this chapter is to explain which kinds of things should be taken under closer consideration, when designing a physical side of a modern workplace for collaborative creative work. Firstly, I shall explain how English Arts & Crafts and German Bauhaus movements from the end of 19th century and the beginning of 20th century can prove to be useful in modern workplace design. After that the workplace design is also considered from the ergonomics point of view. Lastly in this chapter, I shall discuss the surroundings of nW Oasis and the SWOT analysis, which was done during the design sessions.

5.1 The Arts and Crafts and Bauhaus Movements

The Arts and Crafts movement flourished in England and elsewhere between the years 1880 and 1920. It was a reaction to the industrial revolution, its soullessness, the mechanical conception of man, monotonic designs, and the poor working conditions in factories at that time (Cum01). Its core philosophy was founded already on mid-19th century including the three key ideals to follow, the unity of art, the joy in labor, and design reform (Cra97).

The unity of art meant that artists and craftsmen were brought together on equal terms instead of staying apart and being arranged hierarchically, where painting and sculpture were considered high arts and decorative arts were on the bottom. Equal footing was realized by creating for example guilds, where all the artists could meet and share their professional expertise and learn from each other. *Joy in labor* was directly contradictory to the industrial worker's reality in those days. The goal was to support the idea that the work can become a source of pleasure through the play of imagination. Another goal was also to support the creative freedom of an individual. *Design reform* was meant to improve the design of the products consumed by the public. In some cases, it also broke the tradition by creating products that were in sharp contrast to those available at that moment. (Cra97)

The *Bauhaus* school for arts and crafts was in action in Germany between the years 1919 and 1932. The school espoused a new concept for the teaching of arts

and crafts, based on an earlier English Arts and Crafts movement. In the Bauhaus concept, the earlier divided studies of arts and studies of crafts were brought together and studied under the supervision of each discipline's masters. The students of the school were also encouraged to understand their relation to industry and the general public; art for the art's sake was not enough. The students were also spurred to stick to the modern views of arts and crafts and take no refuge in the fashions of times past, to follow the spirit of the time, zeitgeist. Students were expected to create constructs, which showed the unity of arts and crafts. The school and its workshops were considered to be laboratories, where new combinations of arts and crafts were developed and studied. Industry was then invited to take the products into mass production and available to the public. The Bauhaus was, therefore, a reflection of the pragmatic movement in philosophy of that time and in the modernistic belief in machines. (Usv89)

In my opinion, the core ideas behind the Arts and Crafts Movement and Bauhaus are still very much useful, when thinking of creating a new kind of workplace for gifted individuals and groups, where something novel and innovative is created. In Arts and Crafts and Bauhaus, the following features were encouraged:

- Bringing together masters of disciplines that are normally considered to be far-apart in equal terms.
- Enjoying the work one is doing.
- Taking an effort to find a new unity of disciplines in the form of intellectual or real world constructs.
- Close co-operation with industry, which realizes the constructs.
- Finding novel solutions and constructs.

nW Oasis should follow these rules of thumb. Thus, nW Oasis should promote the idea of professionals from different disciplines coming together and finding ways to collaborate and create something new, thus, taking full advantage of each other's professional skills, backgrounds, and knowledge. nW Oasis should be a place, where something new is created and then later taken to a home organization

to be matured and produced. Lastly, nW Oasis should be considered to be a place, which provides the opportunity enjoy the work one is doing. nW Oasis could be described as being a mill, where people from different companies bring their grain in form of talent, personal background and knowledge, meet new people and collaborate with them, and return to their organizations with flour, new ideas or a construct of some kind.

5.2 The Premises and Customers

Robert Grant (Gra99) discusses in his paper about Berlin's ideas of negative and positive liberties. Negative liberty is such, where an individual basically has got the rights to do what ever pleases him without explicitly setting restrictions, as long as it does not affect other people's liberties. This kind of kind of liberty does not specify what to do with one's liberty, only the idea to enjoy from it. It regards liberty as a relative notion, as some may enjoy it more than others thus making them freer. The distinction between the negative and positive liberty comes with an education of one enjoying one's liberty. Through education and other forms of facilitation, one has got the means to really free oneself, to pursue one's true self. Facilitation may in this context mean for example giving financial possibilities, supporting expressions of ideas, offering technology for use, or creating services equally accessible to everyone. (Gra99)

Erich Fromm (Fro76) wrote in his book, "Escape from Freedom", about positive and negative freedoms. He wrote that a negative freedom is freedom from something and a positive freedom is freedom to do something. According to Fromm, *a freedom from something* will free us from the thing that we want be freed from, but then we are easily left with feelings of uncertainty, insecurity, and isolation. This kind of freedom from something often makes an individual to relieve himself from freedom by escaping through acting out authoritarian or submissive behavior, by expressing destructiveness towards himself or the environment, or through denial and the losing of true self through extreme adaptation to the demands of the surroundings. (Fro76)

Contrary to freedom from something is *a freedom to do something.* This kind of positive freedom is a self-guided expression of the whole spectrum of personality.

It involves doing creative activities, which can be affectively, intellectually, or sensorially oriented. The key element in overcoming negative freedom is through these kinds of spontaneous acts; through those, one finds one's connections to the world, people, nature, and to one's own self. This way one does not feel those negative feelings of negative freedom, which make person escape from one's freedom. Fromm gives two examples of concrete activities that substantially help finding positive freedom; such as true, equal love, and creative, self-guided work in its various forms. (Fro76)

These ideas serve also the conceptual model for nW Oasis. The services and premises of nW Oasis should be supported with such help that would enable all the customers to take most out of their use. Tutoring services can vary from help to take advantage of using the software, creativity and mentoring services, to help in finding persons to collaborate with, just to mention couple of examples.

Working in factories during the early industrial period or in the standard cubicles in modern offices can be seen as Lévy's molar approach to organizing work. There are no individuals in the molar approach; everything is standardized for the collective. (Lév97) To make a workplace, which would be realized in a spirit of Lévy's molecularity, it is important to understand the needs of the individual. A molecular workplace is an adaptive workplace, which is personalized according to each individual's needs. One can make changes in one's surroundings to make it more suitable to one's needs. One may use the technologies or work processes, which are best for one at that time. One may also interact with others and be part of self-organizing professional networks, organized specifically for certain purpose by the participating individuals.

For the design of nW Oasis Lévy's utopia means that the customers' needs should be recognized and the setting of the service structure and physical premises should promote an individual worker's chances to modify them to suit his needs. It is impossible to offer a standard set of cubicles for everyone, if individuality and the personal choice of customers are respected.

Regarding the design of workplaces, Harrigan (Har87) describes a design process, where the workers are key contributors in the workplace design. In Harrigan's

article, the workers and their work habits are studied closely before the design of the workplace. This is done in order to find out, how people actually do their work in their workplaces, which resources they use and what their preferences are. This information can be then used to design a workplace, where the work routines of the workers are as easy, convenient and safe as possible. Harrigan also promotes the idea that the design of the workplace does not end to construction and the furnishing of the workplace according to the plans. The design has to be validated through real usage, when fine-tuning becomes possible. (Har87)

Sundstrom argues in his book, “Work places” (Sun87), that the best possible satisfaction with the work environment is achieved through enabling the worker to adapt his physical surroundings. He explains that for example lighting conditions, temperature and colors should be decided by the workers, when possible. Also workstations should be such that one can fix them to fit one’s physical needs and therefore enable ergonomically sound working. Fixed lighting, temperature and workstations may prove to be even problematic, if for example the use and users of the premises change from the anticipated ones. Therefore, adaptivity promotes also the flexible use of the premises and offers to individuals a chance to have an effect on their surroundings making by them more pleasing. (Sun87)

Sundstrom in his book and Wells in her article (Wel00) both promote the idea of personalization in the workplace. By *personalization* they mean making the workplace personal by changing its appearance with personal objects. According to the studies the authors cite, the approach allowing personalization seems to improve the commitment to the workplace and the satisfaction with the work environment and with work itself. Sundstrom (Sun87) especially supports the idea that the workplace should facilitate the personalization process by providing places, where personal objects can be put, hung up or nailed down. By allowing personalization, workers are allowed to be individuals and not parts of the machine as one of Sundstrom’s citations mentioned. Personalization is largely bound to each individual’s own working space. Wells’ article (Wel00) suggests that the personalization of shared space is not considered to be as important to workers as is the personalization of their own space. Wells found also differences

between men and women in her study. She argues that women are more eager to personalize their workplace than their male colleagues (Wel00).

Interestingly, it seems that in companies there are other kinds of office innovations than promoting individualism and personalization of the environment, which were mentioned in literature. According to articles by Taina Schakir (Sch02) in IT-Viikko and by Arja Haukkasalo (Hau03) in "Tekniikka&Talous"[23], companies are now looking for more universal and efficient solutions. In Schakir's article, Sun Microsystems presents their office solution. The office space in the main building must be reserved beforehand, since there are one and half employees for each vacant place. The change was a result of noticing how much the employees travel and do not spend their time in the office. By the end of day, employees clear their desks and thus prepare the spot for the use of the next employee. (Sch02)

Haukkasalo (Hau03) presents in her article Nokia's model for modern mobile information work. In that model there are, similarly to Sun's case, less work spots than the employees. Each employee has got a carriage, where his personal belongings must fit. In Nokia's model, the importance of group work premises, negotiation rooms and special silent rooms for concentration is emphasized. All the premises are also equipped with wireless networks, which enable employees to move from place to another freely, allowing them to be connected on the network in the same time. (Hau03)

Even though, it seems that the developments that the articles presented and the ideas presented in the literature review earlier contradict strongly, they both are very important from the nW Oasis point of view. One of the challenges for nW Oasis and especially for its interior and furnishings is to find a way to combine the optimum number of work spots (less than number of clients) and a way to allow clients to have their personalized work environments.

[23] The name of the magazine "Tekniikka&Talous" is in English "Technology&Economy".

From the nW Oasis point of view, adaptivity and personalization means that the clients should be allowed to and even encouraged to personalize their work space. Work spaces, furnishing, walls, lighting, and temperature should all be such that they support interaction between them and their user. In the end, the clients should have as much power over their surroundings as possible; thus their individual needs would have been taken into account. It also means that market research should be done on the anticipated clients before the design of spaces. It would serve well in preparing the general settings for nW Oasis. The fine-tuning would then be done partially by the clients themselves and partially by the nW Oasis organization. The personalization could also be seen as letting the design of nW Oasis be open and unfinished in a way that the environment would be dynamic by living according to its inhabitants. Thus, the work environment would become a reflection of the people working in there.

5.3 Surroundings of nW Oasis

The SWOT analysis, which will be introduced later in this chapter, suggests that the area, where nW Oasis will be located is one of the strengths of this conceptual model. Such a combination of leisure, recreation, accommodation, science and work is hardly found anywhere else. Here is a brief overview of the possibilities available in this region.

The Science Park is a place, where companies, service providers and educational institutions share the same buildings. The Science Park is not only an office space providing company, but a company that provides the means for the hosted companies of different sizes to develop their activities. The services that are provided start from help and guidance for people wishing to create new start-up companies and continue all the way to supporting established companies with their internationalization processes. In addition to the premises and services provided by the Science Park, the companies find it interesting to be close to other companies in the same field (ICT) and the educational institutions, which provide them with new employees and are partners in research and development activities. (Joe05)

The educational institutions include the University of Joensuu with its main campus area located just next to the Science Park and its Department of Computer Science and the Development Center of Educational Technology, both of which are located in the Science Park premises. The University of Joensuu is a multidisciplinary university having 6 Faculties with 23 departments. The multidisciplinarity provides interesting collaboration opportunities for high technology companies (Uni05). For example companies can have their people to attain more expertise in the university classes, provide the university with special classes offered by the companies' professionals or have research co-operation with some research group in the university. Another educational institute is the North Karelian Polytechnic and its media studies study program being located inside the Science Park. The polytechnic has a media workshop called Cadimef with quality equipment in the Science Park premises (Poh05).

The surrounding natural environment has three specialties. One on the east is a river called Pielisjoki. One in south is a lake called Pyhäselkä. The last is the forests located west from the building site of nW Oasis. The river, running right through the city center, divides the city in two halves. The riverside has a park, where it is popular for people to sit down and have a picnic in the summer time. The riverside has also services like boat terraces with refreshments in the summer and hotel Kimmel on the other side of the river. The lake is available for swimming, beach activities, windsurfing, jet skiing, water skiing, sailing, motor or row boating and fishing during the summer time, but has many things to offer also during the wintertime. In the winter, it is possible to go ice fishing or skiing on the lake; it is also possible to take a motor sleigh and run with it on the frozen lake. The nearby forests offer trails, which are taken care of by the city and have lights during the dark hours of the night. On trails, one can jog or walk nature and use equipment put along the trails for doing physical exercises like sit-ups, push-ups and chin-ups. The trails are further connected into longer paths for trekking and mountain biking.

Most of Joensuu's sports facilities are located next to the Science Park. In the indoor ball sports center there are possibilities for bowling, playing squash and badminton. During the summer time, it is possible to play mini-golf outside the

center (Pal05). Right next to Science Park is Joensuu's sports complex including numerous sports facilities in a compact area. There are the fields for playing football in the summer time and ice hockey or practicing skating in the winter. There are also fields for playing street basketball in the summer time in the front of the ice stadium. The ice stadium includes an indoor ice rink for ice hockey and figure skating clubs with room for up to 3000 spectators. The ice stadium can also be utilized for large events like fairs or concerts. The sports complex also includes a track and field stadium and a public indoor swimming pool with some amusement rides and a gym for physical exercise. The area also includes an outdoor skating park and a stadium for the national sport called Pesäpallo, a game bit similar to Baseball. The area includes the Joensuun Areena (Joe05) - a multipurpose hall, which is the biggest wood-made building in Finland. It offers increasing possibilities to practice summer events like football and track & field events also during the winter. This hall can also be used for large happenings which need plenty of room; the maximum capacity is around 10 000 people. Well within a one-kilometer radius there is an indoors athletic center which provides space for martial arts clubs and play arenas for basketball, volleyball and floorball teams.

As well as sports also the cultural activities are well within the reach for those working in nW Oasis. The nearby Laululava, an open air singing arena, hosts many large-scale happenings during the summer time, from the midsummer celebration, traveling amusement parks and a religious festival to Ilosaarirock (Joe05b), the second oldest rock festival held in Finland. The events may attract more than 10 000 people. The variety of events held in the Laululava provide a ground for meeting people representing a wide spectrum of life itself. A little further away from nW Oasis is the city center with services like the city theatre, churches, art museum, the North karelian museum called Carelicum) and many more.

5.4 SWOT Analysis

During the design phase, two design sessions were held, where experts of various professions came together and evaluated the original concept for nW Oasis. The evaluation was made using the SWOT analysis scheme (Kot01), where the

concept's *strengths*, *weaknesses*, *opportunities* and *threats* were evaluated and written down (appendix B).

Strengths

One of the most visible strengths was the surroundings of nW Oasis, which was described earlier in more detail. The experts argued that nature, high quality infrastructure, good services and local safety are the things supporting the concept. Also the geographical position close to the Russian border and connections to Russia considered to add interest to this area. The quality educational institutions (University and polytechnic) and the educated workforce that they provide were also considered local strengths. Moreover, the motivation and the spirit for local development were brought up.

The innovativeness and international uniqueness of this concept were also considered to be strengths, as well as its internationality, multiculturalism and multidisciplinarity. Also the humanistic approach and tolerance for different kinds of clients were discussed as supporting feature for this concept. In addition, the religious and political stability of Finland were stressed, as was the positive exoticism of Finland.

Weaknesses

The weaknesses included some concerns about the geography. Joensuu was considered to be an internationally unrecognized city far east and up north, suspiciously close to Russia. Local services were also seen insufficient for foreign specialists, for example there is no English language school. Also, the local people living here were described as being hostile to foreigners and being resistant to all changes and new ideas. The image of Joensuu was considered to be problematic for this kind of new venture.

The greatest problems in the idea were connected to its novelty. Since there is not such a product existing in the markets already, its marketing and promotion will be difficult and money consuming. The start was considered to be a matter of life and death for this project, if it does not go well, the whole concept could be buried

right away because of bad publicity. There were also questions, whether there really are markets for such a concept outside the group who designed it.

Economical issues were also raised as weaknesses. Residing in nW Oasis and usage of its services might prove to be too costly for the companies in comparison with its effects on their businesses. Moreover, the economical situation around the world at the moment is problematic and justification for large investments like nW Oasis is hard to provide. Funding, especially if it includes public funding, is also a problem; it might prove to be complicated to sell this kind of risky and novel idea to people responsible for the municipality's money.

Opportunities

The greatest number of answers and comments were written in the opportunities section. It can be seen as a positive signal from the evaluating experts. This concept was seen to provide the Science Park, the city of Joensuu, and the local area lots of good things. This area was thought to benefit from the new stimulation and good spirit resulting from this kind of large-scale project. The concept is hypothesized to facilitate the local and global personal networks, thus helping the development of the region in different forums. Internationalization would encourage the area by bringing new people, ideas, projects and improved services here. The nW Oasis project was also thought to increase the local well-being through the creation of new employment possibilities and improving mental agility.

The opportunities were perceived to be enormous. The concept was seen to have prospects to become a franchise business. It could be copied and created as chain throughout the world. Also the uniqueness of this concept got praise with an encouragement to move quickly into markets as a first service provider of this kind. The right timing for this kind of concept was considered to be right now since teleworking technologies have rapidly developed, the concept of work has changed a lot recently, and managers in companies have started to realize the meaning of employees' well-being in productivity.

This concept is also seen as great opportunity for those participating in it. The specialists thought that with nW Oasis there is a chance to find a better, more

natural balance between work and leisure. The clients were also seen to gain enjoyable living and working environments with good quality services. It was appreciated that the conceptual model was inspired by studies on humanity and human needs, thus satisfying the clients' needs better.

Threats

The threats for nW Oasis come from challenges of creating a good service concept. Where it is possible to find enough well educated and high quality labor for demanding service tasks? It was also feared that the realization of the original conceptual model would turn out be torso, trivial or even banal. Then the innovativeness and originality would be lost at the same time as the anticipated customers. Connected to this threat, is also the idea of the concept being too novel and complicated to be easily understood by financiers. Also, communication to possible customers was considered to be a challenge; how be able to market something totally new that has never existed before? Moreover, the concept is seen to be easily copiable and thus in danger of being realized someplace else, perhaps in a place more suitable for international companies.

Local decision-making is also seen as a threat, as is the economical situation of the city of Joensuu. Is this concept such that it can easily be sold to local financiers? Will it create jealousy, ambitions and problems in local political decision-making? Is there enough will to try out something totally new and risky, or will there be delays until the window of possibilities has already closed?

On the topic of threats concerning the conceptual model itself – the safety, client's experiences and the atmosphere were mentioned. Is it possible to create such concept, which will provide the client with the best possible perceived security without losing the open and unlimited atmosphere? Is it possible to have people network with each other in a way that we want or will the communications be similar to official negotiations? Is it possible to create such premises, where technology is ubiquitously present, without losing the soft values and humanistic approach beneath cold steel and glass?

6 The Conceptual Model for nW Oasis

In this chapter I shall present the conceptual model, which serves as a case study and an end result of my conceptual modeling process presented in this thesis. The conceptual model is based on the background material presented in two previous chapters. Firstly, I shall briefly analyze and discuss the key issues that rise from the material and, secondly, I shall present the conceptual model, which takes those key issues under consideration and transforms them into premises and services in a work environment – nW Oasis.

nW Oasis will be in the third building phase of the Joensuu Science Park building complex. The first and the second phases were built more or less with the traditional science park scheme: room for companies, some basic services, business incubation services and some educational institutions feeding the companies both with innovations and with a well-educated work force. The nW Oasis's idea is to be something different from the traditional scheme of the first two phases. The conceptual model for the third phase changed a bit from the original mind map (appendix D), which I developed to serve as a guideline for this part of the thesis. Here the conceptual model is not limited to the nW Oasis itself; the closely related topics are also discussed. These topics include nW Oasis' connections to the outside world and the Joensuu Creative Technology Campus.

6.1 Brief Analysis of the Background Material

Firstly, understanding human needs will be central for nW Oasis. It is important to facilitate the fulfillment of physical needs, needs for safety, esteem, cognition, aesthetics, self-actualization and transcendence. Where self-actualization can be seen as doing and also finding things that one loves to do and get to know oneself better, transcendence can be seen as helping others to become their true selves and find their enjoyment. The atmosphere in nW Oasis should be tolerant of the diversity of people regardless of their profession, ethnicity, gender, or age. It should also support various means of self-expression and creativity, like arts, music and other cultural activities. It should encourage people to try out different

things, even with the risk of being wrong. Encouraging people to try out new things also includes encouraging people to find their limits and break them. nW Oasis should facilitate the meetings of random people, thus helping people to find viewpoints and ideas from each other. Also learning new things should take place, when working in nW Oasis. Learning is not only obtaining new knowledge and skills, but also learning about oneself, learning about new ways of working and learning from new people. The people, who will work at nW Oasis, should be considered to be individuals, not a mass or tightly restricted niche. In addition to individuality, also the human need for peer-groups and belongingness should be addressed by facilitating the emergence of a community or tribe in nW Oasis.

Secondly, as creativity is a key element of everything done in nW Oasis, there should be means to support it. In addition to gossiping and chatting with interesting people, one should be offered a chance to be with oneself in privacy to digest new experiences and ideas. Creative work and its processes should be understood in a way that people would be offered the means to collect information they need, discuss it with colleagues, play around with it creatively and make constructs of it, and then be finally offered a chance to share the results with others and receive constructive feedback

Thirdly, nW Oasis as a concrete environment should be as easily approachable as possible. The premises should take the lessons learned from ergonomics into account and offer a usable and not frustrating environment for working. The environment should be dynamic in a sense that it allows people to express themselves in it by offering them their own space with their personal stuff and allowing them to make changes in their environment. The lighting, temperature, and other environmental attributes should be changeable for the people working in the premises. The premises should also recognize the change in work culture; nine-to-five culture is becoming more like 24/7 culture, where work and free time are mixed and supportive of each other.

6.2 nW Oasis

nW Oasis is a place, where people come to create novel, groundbreaking ideas, and find intellectual stimulation from people working in different professions. The

people also come to be innovative and to weave new networks with people, with whom they can later contribute together. nW Oasis is designed to provoke people to think personally and unconventionally with help of other people working in the same premises.

The interior of nW Oasis is basically divided into three layers of publicity. Some of the premises are available for everyone like members of the surrounding community. These premises are the lobby, restaurant, cafeteria, pub, library, workshop rooms and meeting rooms, the latter two through subscription only. Then there are half-public areas, where all the people, who are part of nW Oasis community, can enter and use the services available there. These kind of half-public premises include a gym, sauna, recreation corners, idea chambers, silent rooms, and shared working spaces. The private areas are areas, where only a certain person is allowed to enter at certain time. These kinds of rooms are mainly personal working rooms, where one, a pair or a small group may work in total privacy to further develop the ideas gathered using other premises.

Basically, the public space is more or less located close to the main entrance and the more private areas become the further inside the building they are. Another thing concerning the public areas is that they are very important in facilitating the networking effect. They must be located in a way that makes peoples' paths from one place to another to cross, thus helping people to meet each other. Here we can say that the logistics of humans and their ideas is a key element in interior design. It is a top priority to have people to meet each other and share their thoughts. This is analogous to the design of the international airports, where the top priority is to guide people and their luggage from one place to another as efficiently as possible, in this conceptual model people's intellectual property and their meeting is a top priority.

The conceptual model for nW Oasis includes the following services and premises:

Eat & Drink:

Restaurant changes its style according to both the season of the year and time of the day. It begins as a breakfast room, continues as a lunch restaurant, turns into an a la carte restaurant, and finally into a nightclub with live music on selected

nights. It also serves as a place for having special theme nights, organizing a party for customers or going out to play and jam with the others.

In the lobby, right after entering nW Oasis is the piazza, where *the cafeteria* is located. The piazza is, as its counterparts in Italy a place, where people gather to spend some time together, read some newspapers and enjoy drinking their coffee or other refreshments and eating some small snacks.

The English Pub is a place, where things can be taken more easily and the atmosphere is relaxed and unofficial. After the work, a pint or two is comfortable way of getting rid of the dust in one's mouth without forgetting fish 'n' chips for to satisfy the minor lust for salty stuff. In a pub, it is also easy to chitchat among the friends, meet new, interesting people and play a game of billiards or have a darts session.

Vending machines with snacks and drinks are located around the working space providing fast and convenient help for slight hunger or thirst. In addition to drinks from the vending machines, there are plenty of spring water coolers available on the premises of nW Oasis. Vending machines serve also at those late night hours, when other food related services are already closed.

Physical Health

nW Oasis offers the customers means to take care of their physical health. For this purpose, there is a gym, a place for physical treatments, and a sauna premises in nW Oasis.

The gym includes all the modern equipment needed for exercise. The facilities are always open for nW Oasis people, which allow relaxation through sports to be taken anytime needed. Usage of facilities is made as easy as possible, which includes personal lockers and shower gear provided as free of charge amenities. The gym includes also some room for guided physical exercise classes, like aerobics, dance and other such activities. One can also order a time for massage or other such treatment to make sure that the tension of the workday does not leave its mark.

The sauna is a place for creating visions; therefore the views from the sauna should be far-reaching and aesthetically stimulating. The sauna brings everyone together as equals and offers a location for open and honest discussion. In addition to a hot bath room, the sauna premises include showers and other sorts of baths for those not interested in a hot bath. The sauna is similar to the Gym; it is open all the time for purification and relaxation.

Personal Well-being

In addition to the physical side of humanity, also the mental side is important, when considering humanity from the holistic point of view. This kind personal well-being is encouraged in nW Oasis in two special ways. nW Oasis takes also into account, with *the silent room*, the human urge to retreat into silence and the urge to entertain oneself intellectually, which can be done in the same room, since the room is for the individual's own use. As the silent room is soundproof, it can serve as place for meditation or religious acts. The same room can be serving also in an entertaining way; one can watch there movies or listen to music.

Personal well-being is supported also through *mentoring services* that help people discover their true self and the ways of getting most out of their stay in nW Oasis. Personal well-being is also recognized by offering the customers with other means of self-expression besides physical ones. nW Oasis has *a club with activities*, where one can do art, play in a band, or act in play. The Club also facilitates the meeting of people by providing interesting activities, like adventures to nearby nature or expeditions to local culture and its events. Local cultural expeditions can include for example taking care of farm animals, participating in the harvesting, going to a smoke sauna, or going to an organically-oriented farm.

Play corners serve as meeting point for people and a place, where relaxation can be achieved through fun and play. Play corners are built around modern video games, old school computer games, board games, or a pool table and corner for darts. As the tastes for recreation vary, the play corners will also vary.

Workshop Rooms

The workshop rooms are rooms, where ideas which are still abstract can be further developed in the concrete form with the help of concretizing tools. This kind of concretization of reference projects or prototypes can be done either alone or as group work. Concretization methods include both software and hardware prototyping tools, tools to edit digital material and self-expression tools. Workshop rooms are such that can be easily adapted to suit various kinds of workshops, the furniture can be moved to suit both larger and smaller groups and also the walls can be moved in the case the premise itself should be adapted. As the Workshop rooms are part of the public space, they can also be used by the community surrounding nW Oasis, educational institutions or companies outside nW Oasis needing special premises for their working. The workshop rooms can also accommodate professional meetings, where people can hold open lectures over the topic of their expertise sharing it with the Oasis community.

Some of the workshop rooms are dedicated to serve as *idea chambers*. In idea chambers idea creation and development is facilitated through technology and the support to use it. In idea chambers, the methods for idea creation are explained to make it easier for people to take advantage of them. The idea creation process is also promoted by offering the concrete tools with which it possible to create microworlds, simulations, or models of the idea in mind.

Meeting Rooms

The meeting rooms are specially designed for communication purposes. While in the meeting room, one is able to communicate efficiently both inside the room and has possibility contact locations outside nW Oasis through a preferred medium. In addition to having all the needed communication technology available, the meeting rooms also take the context of the meeting into account, since different professions and individuals may have a culture and preferences of their own. Therefore, nW Oasis is having a variety of styles in its meeting rooms, including a home-like style, a technologically-oriented techy style, a design and fashion style, and normal, casual one-fits-all style.

Library

The library has two purposes; firstly, the normal routine activities that are typical for libraries, that is lending books and other material (including also recreational material like movies, etc) and secondly it is the root of all knowledge. A correct metaphor for the Oasis library is an old English university library, a place where you sit down in old leather armchair, read classics and smell the education in the air. The library should have a great amount of old classics in its collections and be furnished in the Victorian style with embedded technology for information retrieval purposes.

The library is a place to challenge one's mind, to be a source of innovation and creativity. In addition to a collection of classics, the library is offering access to the latest scientific information available in the world. The library will have subscriptions to digital libraries and publishers of scientific knowledge around the globe. The customers of nW Oasis will have access to all that material from their personal computers, even if not located inside the premises of nW Oasis.

The library is not only a place, where information can be acquired from but it offers a set of tools with which a person can create meaningful compositions of the knowledge. Such tools can for example be computerized mind mapping or concept mapping applications or tools for shared knowledge building as in virtual learning environments.

Virtual nW Oasis - Blending the Real and Virtual

In addition to the physical construction (premises) and the mental effect (atmosphere), nW Oasis is also having a virtual side. *The virtual nW Oasis* is a place on the Internet, where all the customers both inside the physical nW Oasis and outside of it can have access. An important element in accessing the Virtual nW Oasis is that it supports different kinds of end-user devices and in the physical nW Oasis the wireless network enables communications regardless of the physical location. Building common social capital and therefore an atmosphere of trust and caring (Pre02) for the whole nW Oasis customer network is one of the main reasons to build the Virtual nW Oasis system.

The virtual nW Oasis offers tools for the facilitation of networking and communications since the customers include their profiles to system with their contact information, interests, and collaboration preferences. Customers can use the forums, chats and instant messaging services for the electronic communication. Virtual nW Oasis supports also various forms of on-line collaboration, where virtual teams can be constructed regardless of their physical location. The collaboration processes can include for example collaborative knowledge construction, process and project design and follow-up, shared learning in peer-to-peer and in group situations, and collaborative artistic design. Virtual nW Oasis serves also as an information channel bringing the access to all the needed information about services, happenings, and news for customers.

Virtual nW Oasis becomes part of the normal physical space through large flat screens showing the contents of the system. It is contradictory to common custom, where normally objects from the physical world are taken into the virtual world. This different kind of mixing the physical reality with the virtual world supports the awareness of the on-line social activities in physical space. It blurs the boundary between the physical world and the virtual world and the activities related to those. It also motivates both on-line and the face-to-face community participation (Chu04). Some of the screens are interactive, to enable also those without any end-user device at hand to use the services of the Virtual nW Oasis.

6.3 nW Oasis and Connections to Outside World

As the logistics of knowledge and humans are important inside of nW Oasis, also communications with outside world are important for the functioning of the premises. Easy and fast connections are also important for diminishing the problematic geographical location of Joensuu. Especially inside Finland, the Joensuu region is often considered to be distant, inconveniently reachable and a less developed area than places located in southern Finland. These thoughts are analogous to those in continental Europe about the whole of Finland. In order to fight mistakes in people’s mental geography, nW Oasis should be physically as easily approachable as possible.

To facilitate easy connections to and from nW Oasis, there are some considerations to take into account. First of all, *connections between nW Oasis and the airport* are important, since international customers are considered to be major sources of income. At the moment, the trouble is that the airport buses travel using a route, which forces people to move approximately 500 meters away from the Science Park buildings. That distance is problematic especially during the wintertime and in other harsh weather conditions and when having heavy luggage or lots of equipment needs to be carried. Changing the route of the airport coach so that it would have one stop at Science Park, thus supporting also the people of nW Oasis, could solve this problem.

In addition to improved airport couch services, *a taxi stop for the Science Park* is proposed here. At the moment, the need for a taxi stop is questionable, since most of the people are working or studying in Science Park premises, thus using their own means of transportation. But if this area is developed to have accommodations, like a hotel, and if the employee structure of the Science Park changes because of nW Oasis to be more visitor like, then there is an increased need for easy and fast transportation to the city center, to other accommodations or to some local company. The clients should also be offered other means of transportation in the nearby region than the motorized ones. A collection of bikes or roller skates for rent would nicely serve for explorations inside the city and its surroundings. The bikes and roller skates should come with the information leaflets and maps of the surroundings to encourage seeing local attractions and using the services available here.

Thirdly, there is an idea about *a dedicated car in the train*, which would have the technology supporting working and wireless communications during the travel from Joensuu to Helsinki. Train connection transfers people straight from one city center to another with an easy access to the train without time taken for boarding and security measures. Even though it takes more time to use the train, in many cases the time can be used more effectively, especially if there is a train car providing customers with e-working possibilities, namely an ergonomically sound working spot with networking and printing capabilities.

6.4 The Joensuu Creative Technology Campus

As described in the earlier background chapter, the area, where nW Oasis will be located, has got a lot of potential. It is a rare combination of higher education, nature, recreation, sports, services, accommodation, and job possibilities. All this is located within a one-kilometer radius of nW Oasis. The area is a place to work, study, and live for more than 7000 people. Above all, all the mentioned possibilities except the nW Oasis itself actually already exist.

When describing the nearby surroundings of the Science Park, I put all the existing institutions under same tag – the Joensuu Creative Technology Campus. The reason for it is that the area is a place, where people refine the qualities of theirs, whether it concerns knowledge, skills, relations to other people, or their personal or physical well-being. Unfortunately, at the time of writing, only few people recognize the potential of observing the area and its development as a one solid construction. Promoting the whole area would in my mind, support also the image of its parts. It would open people's eyes to the uniqueness of the area, its services (especially sports, recreation, work and education – shops, restaurants and such are unfortunately still missing because of the lack of proper real estate), and the opportunities it offers.

Even though the surroundings include accommodations, they do not support short-period stays outside the summer time. Through the changes in the area close to Science Park and the third phase building plans at the Science Park itself, there is a growing need for short-period stay accommodations. The summer time hostel with its limited service time and quality is not enough anymore; the other Joensuu hotels are located at the other end of the city. There has already been some discussion over this issue, and a hotel is proposed to be built on this area around year 2006. I find this idea reasonable, since all the services located on this area and nearby would benefit from close accommodations. The University's guests, the Areena's clients, and local companies' visitors would most probably choose the closest accommodation to their target institution.

I also promote connecting this area closely to the city center, both mentally and physically. The area should be easily approachable, as I mentioned earlier about

vehicular approach, providing services and experiences also to normal citizens. By this, the community, where the development of the Joensuu Creative Technology Campus is seen beneficial, grows larger. It also would promote the idea of turning the accomplishments happening in that area into a benefit for all the surrounding community. It would also help the process of turning local, personal networks into global networks. One idea is to build a wireless public information network with open access, which starts from the marketplace, goes from there towards Länsikatu and ends at the Joensuu Creative Technology Campus, covering the campus totally. A wireless network would then weave together educational, cultural, recreational, and professional institutions. The wireless network could serve for example as a test bed for creating virtual services for citizens, offer a medium for students of media arts, and a research lab for studies in the modern mobile lifestyle.

Furthermore, I support the idea of dedicating this area to the pioneering spirit. There is a potential for this area to become a place, where new technology could be developed, be researched, and be tested in a real life context with real people.

7 Conclusions

In this chapter I shall firstly comment on the methodology and how it was applied in this thesis. I shall reflect here, how successfully I managed to apply the constructive research approach. I shall also comment, whether the conceptual modeling process and the conceptual model it produced brought any answers to those questions, which I presented in the beginning of this thesis. For the last, I present some thoughts on how the ideas presented in my thesis can be taken further.

7.1 My Work in Relation to the Methodology

In relation to the constructive research approach, which I chose to be my key method defining the process in this thesis, I find that my success was partial. As the description of the method in the Methodology chapter of this thesis says, the core features of constructive research approach (Luk03) are:

1. Practical relevance of the problem and its solution.
2. Practical functioning of the solution.
3. Connection to prior theory.
4. Theoretical contribution of the study.

I find that the problem in the beginning of my study was authentic, since it was a problem that a real organization, Joensuu Science Park Ltd., wanted to solve in order to develop their business. To define the practical functioning of the solution I present in my thesis is a harder question to give a clear answer to. It has received good feedback from Ilkka Kakko, who was my contact person at the Science Park, but its practical functioning and its evaluation depend largely on the fact, whether my conceptual model, the construction of my research will be realized. Only after that, the practical functioning of my conceptual model can be evaluated. Concerning the third feature, my work's relation to prior theory, I find that everything in my conceptual model is based on the framework created with the help of scientific literature and other information sources. Of course, the

framework is strongly subjectively biased, since I have personally chosen the material, upon which to build my framework for conceptual model. The theoretical contribution of my study also depends very much on the realization of the conceptual model and its careful evaluation. Unfortunately, the conceptual model still exists only in this thesis and in the minds of the people, who participated in the process of creating the conceptual model. Therefore, it is justified to say, that the conceptual model part of my thesis in comparison to the key elements of the method is half way, waiting the real life manifestation.

In addition to the key elements of the constructive research approach, I did a comparison between my activities during the research and the process model described by Lukka (Luk03). In Lukka's model, the process for the constructive research approach follows:

1. Find a practically relevant problem.
2. Examine the potential for research-collaboration.
3. Obtain deep understanding of the topic area.
4. Innovate a solution idea and develop a problem solving construction.
5. Implement and test the solution.
6. Ponder the scope of the applicability of the solution.
7. Identify and analyze the theoretical contribution.

The case with the research process is pretty much similar to the key elements of the constructive research approach. In my thesis I have had a relevant problem to solve and I have worked in close collaboration with the people from Joensuu Science Park Ltd. I have taken advantage of the scientific literature and newspapers, design sessions with SWOT analysis, and a geographical survey to obtain deeper understanding of the topic area. I have also innovated according to the gathered knowledge, a solution construction to solve the research problem. But I have not been able go any farther from this point in process. The

implementation, its evaluation and contribution to theory have not been done in this thesis.

The picture changes quite dramatically, if we change the object of evaluation. The conceptual model was not the only result of my thesis; the thesis also considered conceptual modeling as an instrument for the constructive research approach, a tool with which the construction, the conceptual model, was made.

In this case when compared to key elements and the process of the constructive research approach, there were not any explicitly set problems to further develop the instrument, but it was done in order to make the conceptual model possible. The conceptual modeling process was based on earlier research done on the subject; it was described as combination of philosophical, psychological and societal aspects. I tested it in action to create a conceptual model presented in this thesis. I also reflected on the application of the method, I thought which kind of qualities a concept designer should have. In my opinion, there are also contributions back to the theory of conceptual modeling. The theory, I went through, did not include any information about the personality and subjectivity of a concept designer and qualities he needs in his work. In my opinion, these things should be taken into account, since they do affect the work of the concept designer. I also find it interesting from the theory point of view to understand the "playing field", where the concept designer works. He must understand the stakeholders and map their needs (extrospection), but also reflect on his own feelings and ideas over the subject matter (introspection).

When thinking of the framework of my research, the constructive research approach, and the instruments I chose to support it, I find that the instruments especially supported the knowledge acquisition and solution development. The problem creation, the solution evaluation and reflection back to the original theory was not formally supported, but was more like personal reflection, a collection of my own thoughts over the subject.

7.2 My Answers to the Research Questions

As I wrote in the research questions and methodology chapter, I had basically one research question, I was going to find an answer to. The question was based on

the set of questions given to me earlier. The main question was "*Which kind of working environment would facilitate modern, creative work?"* and the sub questions were *"How to stop the brain drain from North Karelian region to southern Finland?", "How to create a space, which would bring together professionals of creative work, improving and facilitating them in their task of being creative?",* and "*How to stimulate networking?*"

If I begin by answering the sub-questions first, the brain drain from North Karelia is very likely close to Florida's (Flo02) ideas about the behavior of creative class. Even though, the University of Joensuu and local polytechnic educate people, they tend to move away from this region after graduation. According to Florida, talented people move where there is intellectually stimulating and a diversity-tolerating environment for them to live. As I mentioned in the part concerning the Joensuu Creative Campus, the high-class athletics centers are not important[24], but the culture and other activities must be taken into account in city planning. Nature trails and beautiful landscapes are good things to start with, but people also need other kinds of intellectual stimulation and interesting jobs to stay. By luring the innovative jobs to Joensuu, it helps people to decide to stay here. The talented people hardly are interested of working in the manufacturing plant or in heavy industry. From the technology point of view, Florida had a clear message, technology know-how and companies depending on it and applying it are the key elements of luring professionals to come and stay in certain area. Another point of view to this topic is seeing the "keeping the people here at least as long as they study" plan to be a defensive one, which aim is mostly to postpone the inevitable move-out with some years. I find ideas such as nW Oasis to be more offensive and active. The goal in nW Oasis project is to bring talented people from other places to here and to create such activities that will continue luring people to come and stay here.

The second sub-question was about creating a space for creative professionals. My approach to find an answer to this question was to define, what creativity is,

[24] Actually, according to Florida's book, the large sports stadiums have a negative effect on the region from the creative class's point of view.

which kinds of processes occur in it, which kinds of personalities creative people have, and what is the social context for creativity. My answer to this question is to give people the chance to decide about their work environment, about their schedules, and their work styles. In addition to environmental issues, creativity can be supported in certain ways with technology, by helping in the creative processes, like designing products and projects, supporting process planning and giving room for personal expression. In some cases, also personal mentoring could be helpful, especially when trying to find oneself and the way to express one's true self.

The third sub-question considered the idea of how to stimulate networking. In my conceptual model this is provided in many ways, for example there should be places, where non-professional relationships can flourish. These places are sauna, pub, restaurant, recreational areas, and such. In addition to non-professional networking, there is a virtual service with which one can find people having desired professional background for example for short-term collaboration. This idea could be taken even further by thinking of Maslow's self-transcendence (Hui05), some people might enjoy becoming mentors in there area profession and help the others with their knowledge and skills. In addition to the previously mentioned things, the architecture will be such that brings people together, while going from one place to another or when using the public, shared areas for work. Also the activities offered by nW Oasis, for example adventure services or such, will make people get to know each other.

I also think, after reading Florida's (Flo02) description of the creative class that a workplace offering means to express one's physical being (sport clubs, gym) is not enough. Also the expression of one's creativity in a variety of ways should be facilitated. Art classes or training places for musicians would certainly be interesting to try out in nW Oasis. Technology can also help in networking; friend network sites like Orkut.com (Ork05) can be found from the Internet. nW Oasis community should have a similar service too, such as the Virtual nW Oasis mentioned in previous chapter. Furthermore, I suggest that the companies and organizations located in nW Oasis should be presenting all the different members of the value chain from financing the business to end-users. In my opinion that

kind of environment would promote the emergence of new value chains as the representatives of different parts of the chain would get to know each other.

From these sub-questions it is possible to suggest that the creative work cannot be supported only by interesting interiors or nearby nature or technological appliances. Creative people need in addition to good personal tasks an intellectually stimulating work environment, where there are interesting new professionals to get acquainted with. The environment and the technology should always support the individual, not any stereotyped class. In addition to nW Oasis itself, in order to make its clients satisfied, the surroundings must also support the needs of the creative class members. This must happen in close collaboration with city planning policies. Thus, the creation of nW Oasis should not only be creating an interesting and novel workplace; it should also be directly bound to development of city of Joensuu. The workplace, in this case nW Oasis, is not self-sufficient; it is in constant dialogue with its environment.

7.3 My Work in Relation to Present Design Activities for nW Oasis

In this part of the conclusions chapter, I shall briefly discuss the other design activities that have taken place in addition to my thesis. During the writing of this thesis, the nW Oasis design process has also gone forward in other ways. My work is based on the ideas, which were presented during my work contract with Joensuu Science Park Ltd, which ended in beginning of June 2003. Between that date and present day, I have had contact with Ilkka Kakko and rest of the design group every once in the while, but kept the premise such as the research questions for my thesis unchanged. I had a meeting with Ilkka Kakko on June 2004, where he gave me his comments on my work and gave me a copy of the latest draft of the nW Oasis concept (Slå04). The draft paper and the contents of the nW Oasis garden, which is the on-line shared workspace (Net05b), serve as basis for relating my work to the latest progress in nW Oasis conceptual modeling.

The nW Oasis project has now officially been launched as the opening press conference and seminar were held in the beginning of June 2004. The launch was preceded by the conceptual modeling work done during late autumn 2003 and spring 2004, in which there were altogether more than 40 people participating.

The preceding modeling work, which is still going on, was done both in intensive modeling sessions held in Joensuu, where most of the participants were taking part, and through remote work in small groups or through the on-line learning environment. The participants represent various disciplines and professions, ages, and nationalities. There are also some females participating in the modeling work, though they are a minority in comparison to the males. There are not any other ethnicities participating in the modeling work other than Caucasians. It is also noteworthy that there are not any representatives of possible clients (like companies) in the modeling group. (Net05b) The introduction of large number of professionals from several different fields of expertise does, in my opinion, support the idea of creating an interesting and complex construct. The number of experts is also in a way assuring that the conceptual model for nW Oasis will be multifaceted and thus serving many kinds of people.

During the last year, the research questions that I had for my thesis have changed a bit. The overall question that I had, which was "*Which kind of working environment would facilitate modern, creative work?*", has stayed the same, but the sub-questions have been rephrased. The first of the sub-questions that I had, "*How to stop brain drain from North Karelian region to southern Finland*" has changed to more positively oriented "*How to attract the members of creative class to Joensuu?*" In my opinion this change is basically a metaphor for an attitudinal change, it is not important to try to keep people here, but to lure new people here. And succeeding in this new task will certainly affect also those thinking of leaving this region. The second sub-question has also been changed from the original "*How to create a space, which would bring together professionals of creative work, improving and facilitating them in their task of being creative?*". In the new version, a space is changed to be a community or a tribe, thus reflecting a change from space-orientation to interaction-orientation. The third sub-question concerning the stimulation of networking has been kept the same. (Kak04) I believe that the changes in the research questions have a positive impact on nW Oasis. The changes reflect a healthy trust on the concept and belief that human-oriented design is the key for success. Concerning the background work that I did for this thesis; I find that it is serving also finding the answers for the new questions.

In this thesis, I defined nW Oasis to be:

> *nW Oasis is a place, where people come to create novel, groundbreaking ideas, and find stimulation from people working in different professions. The people also come to be innovative and to weave new networks with people, with whom they can later contribute together. nW Oasis is designed to provoke people to think personally and unconventionally with the help of other people working in the same premises.*

Torfinn Slåen defines, in his netWork Oasis Concept Paper, nW Oasis to be (Slå04):

> *To make "knowledge productive" by creating "higher value" (inspirational, mental, emotional and physical) for all persons involved by empowering them to their higher potential.*

and:

> *netWork Oasis at Joensuu Science Park is intended to be an innovative working environment that increases the productivity of creative work. There is a special emphasis on developing the flexible working methods and it will create a totally new culture for project work, mWork and network. It will be the meeting zone for Art, Science and Business.*

I find that networking, meeting new people, developing new ways to work, and enjoying creative work are present in both my and Torfinn's definitions. The expected higher work productivity, which is basically the economical justification for the whole project, and a clear inclusion of arts and emotion are the elements that my conceptual design is mostly missing. Where my conceptual model might be helpful to improve the present draft is the emphasis on learning, whether it is happening in certain premises like the library or in peer-to-peer situations.

In addition to conceptual modeling and the discussions concerning it, the participants of the design group have been developing user scenarios and sub-projects to support the creation of nW Oasis. In user scenarios, the participants have written scenarios describing how the nW Oasis will appear to the customer who is in there and using its proposed services. The sub-projects aim at creating

for example some of the needed technologies or a service certification framework in separate projects. Even though the sub-projects can be independent both financially and from the organization point of view, they are still contributing the main project with their results. The sub-projects are actually in a way realizing one of the ideas of the nW Oasis already now. They are separate entities having their own goals and resources, but when they are networked together and collaborating, they are capable of creating together something larger than their own individual results.

7.4 My Suggestions for Future Studies

In my opinion, this thesis is basically a starting point for further studies on the subject. I have done a vast and general overview over nW Oasis and other ideas closely connected to it. In future studies, the key areas of the conceptual model should be taken under closer consideration. Such key areas are the conceptual model itself, inclusion of possible clients in the planning process, ubiquitous learning at workplaces, the effect of the premises on conceptual modeling process, and the creation of an organic conceptual design. I propose that, if there are more studies done on this subject area, they should focus on following areas and questions:

- Continuation in the area this Master's Thesis in a way that themes presented in my conceptual model would be more closely bound to reality and its limitations. The researcher should conduct some preliminary research on the costs and attitudes. For example, the questions could go something like following: How much would the rent be per square meter, if all the services proposed here would be realized? What kind of opinions does this kind of conceptual model awaken in financiers and clients? I also suggest that my version of the conceptual model would be once again evaluated with experts in a design session like the one described earlier.

- I also suggest that the conceptual model should be validated and developed further with stories and scenario building. This is something that Risto Linturi suggested, when he participated in the design session.

He said that the idea would be much easier to understand, if it would be concretized with true-life examples, scenarios and stories. Therefore, I suggest that scenarios should be built upon discussions, interviews, and observations, where real users and clients tell about and show their needs, lives, and work habits. I want to emphasize here the collaboration with real users and customers, since they provide a valuable link to the real world environment, where nW Oasis will act. Imagining the customer or reading about the customer is not enough.

- There should be a study of facilitation of ubiquitous learning at workplaces. I personally think that all modern workplaces should encourage people to learn, even while working. How this could be done in nW Oasis, which kinds of technological means there are for this, and how premises could support modern learning theories and human cognition?

- As the whole concept of nW Oasis is based on creativity and its applications to conceptual modeling process, regardless of the actual product of conceptual model, I propose that research should be conducted about the question: how the premises can support the conceptual modeling process?

- I also suggest that the technologies, which can help both the various kinds of conceptual modeling processes in their different phases and various kinds of modelers, should be researched.

- The emotional aspect of humanity and its effects on the design of a workplace should also be researched in addition to human needs, motivation and ergonomics considered in this thesis. For example Donald A. Norman has written an interesting book, “Emotional Design” (Nor04), which might include some good ideas also for the design of nW Oasis.

- I strongly encourage that even now, during this conceptual modeling phase, there should be a member in the design team, who thinks about the evaluation of nW Oasis. By evaluation I do not mean evaluating the

unfinished conceptual models, but creating a set of tools with which the nW Oasis is able start changing itself right from the beginning. If the evaluation methods and measurements are found after the launch, a lot of time is wasted and it will take a considerable amount of time and effort to include processes to change the finished and running system. I find it would be easier in the design phase to plan nW Oasis to become an organic (or cybernetic) system, which has got its feedback (evaluative) systems affecting and changing the system.

In generally, for the coming design sessions to become as successful as possible, I suggest that some kind of talent pool should be created to allow even more professionals of different fields to join the design process of nW Oasis. It would benefit the design process by creating it based on more deep, accumulated knowledge from special areas of knowledge. In my opinion, these areas of knowledge, which should have professionals participating in the design sessions are: economics (of business infrastructure, marketing, and business analyst), psychology (work psychology and environmental psychology), computer science and engineering (ubiquitous computing, technological issues), sociology (effects of society and groups), anthropology (cultural issues in groups and society), futurology (future scenarios of society, technology, and work), history/philosophy (putting things in their historical and philosophical context), ethics/theology (business ethics and personal ethics), education (ubiquitous learning, learning at workplaces, educational technology), architecture (exteriors and interiors, creation of sketches), and design (furniture, arts, creation of sketches).

In addition to knowledge and know-how representatives, there should be representatives from the possible users groups (business, culture, civic organizations, education, science, and the arts). Otherwise the solution will suit the conceptual modeling group, but not the real customers and their needs. Also governmental and local authorities and the financiers should be invited, since with their help and commitment, the project will become financially possible. In addition to the groups mentioned earlier, I strongly believe that age, gender and ethnic issues should be raised here; the conceptual modeling team should have a

substantial number of people of different ages, genders and representatives of various cultures and ethnicities. Failing that, the result will become easily suitable only for Caucasian males between 35 and 55 years of age voting for a certain political party.

I also strongly recommend that there should be as many visible and concrete prototypes as possible during the design phase for observing, commenting, and touching. It would help people to have a shared vision of the present status on each moment (Tui97).

8 Epilogue

This Master's Thesis is rather different from most of the Computer Science theses that I have personally read so far. Only Matti Tedre's impressive thesis has in my mind really made a sharp distinction to the mass of other theses thus providing also a great basis for controversy and discussion at our Department.

Whereas Matti was clearly confident with the methods he had chosen and the way of presenting his results, I felt quite different. Because of the sheer difference between my work and the rest and the lack of methodological studies at our Department, I felt it problematic to justify the scientific value of my thesis. Which methods to use in order to get results that are both plausible and backed up by some scientific evidence?

I had been brainwashed by the idea that only certain means of research can provide those results that I thought to be meaningful for a successful Master's Thesis. Luckily for me, I had both Erkki and Matti helping me out with the methodological issues. I found out that the conventional methods in natural science in general and particularly in computer science are not the only ones with which one can make research with. And as I read some literature concerning the philosophy of science, I got more confident. There are various ways of doing science, which vary a lot between different disciplines and even within a particular discipline. Thus saying that only by using certain methods, especially those that are traditionally used in a certain discipline, lead to good and acceptable results sounds now rather hollow to my ears. Through my own experience and my personal journey of learning about science, I feel that our Department and other computer science departments should serve their students better by providing them a package of studies that concern epistemological issues (especially from the epistemological pluralism point of view) and methodologies of doing science.

Another problem I faced was setting a solid research question. As the end result, I am now having three rather vague research questions, which are loosely bound together. To put it bluntly, I am not really happy with them anymore, but as I mentioned in Conclusions chapter, I think that I managed to give some well-

grounded answers to them. For the future studies that I shall make, I learned a good lesson, the importance of well defined research questions.

I feel that even though it took me nearly three years to finish this study, the time put on this thesis was definitely not time thrown away. I think that both this study and I have matured a lot during that time. Of course, as the time went by, many things changed in the environment in which I was writing my thesis. That was reflected in my thesis in a way that I had to take more things under consideration, which expanded the area my thesis had to cover. I would call this a problem of "two masters", where I had to do my very best to serve both the needs of the Science Park and the supervisors of this thesis. But even if it meant more work for me, and one more delay to my graduation, it proved to be a good reason to learn new things from disciplines different from of my own.

I sincerely think that people should be encouraged to break the artificial borderlines of various disciplines and explore the unknown areas more boldly. I strongly believe that it would serve as an eye-opening experience for those who dare to do it. At least it served me well. Here I want to express my gratitude to Erkki, Matti and Piet, who lead my journey to places where I would not have gone without their encouragement.

Some people say that the importance of a Master's Thesis is over rated in the Finnish University system and that writing such a thesis is of no use. I think quite the opposite. The thesis work may prove to be a wonderful, though sometimes long and painful, way of learning more about the content, the process and oneself. I think that even if I highly respect the first two areas also in my work, the last one was the most important for me. I have struggled with myself many times beforehand, but the struggle to finish this work was the worst by far. Sometimes I felt almost like being in trenches, forcing myself to charge to start writing and begin finishing the work. Fortunately, I did not have to fight alone; I had wonderful brothers-in-arms, who helped to overcome my problems and win my fights one by one. As the work is now finished and this thesis is finally ready, there is a ceasefire inside of me, at least until the next battle will take place...

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Appendix A – The List of Professionals, Who Participated the Design Sessions and Description of Their Expertise

Names appear here in alphabetical order:

The Core Design Team:

Ilkka Kakko – ICT-Development Chief at Joensuu Science Park Ltd. Ilkka is the father of whole idea behind nW Oasis and therefore he was the best available expert in it.

Urpo Lehikoinen – Project Manager in ICT-Develoment at Joensuu Science Park Ltd. Urpo was a project manager in Oasis Cottage Network -project and therefore key person in also realizing the future nW Oasis. He is actively involved in different realization phases of nW Oasis.

The Visiting Professionals:

Piet Kommers – Associate Professor in the Faculty of Educational Science and Technology at Twente University in the Netherlands. Piet was one of the experts providing the human approach to developing the idea further.

Risto Linturi – Futurology consultant. Risto is one of the most known evangelists of future technologies in Finland. He brought his visionary approach to the design sessions.

Keijo Mutanen – Managing Director of Joensuu Regional Development Company JOSEK Ltd. As Keijo is responsible for developing the Joensuu region, therefore he has got very good knowledge of characteristics of this region.

Markku Pölönen – Movie Director. Markku is the director of many very popular Finnish movies of 1990's. He brought along with him the viewpoint of a creative artist.

Erkki Sutinen – Professor in Department of Computer Science at University of Joensuu. Erkki is internationally well known researcher in a field of educational

technology. He was in addition to Piet one of those supporting humanistic approach in designing of nW Oasis.

Markku Vuorinen – The Former Managing Director at Joensuu Science Park Ltd. During the design sessions Markku was still the managing director at Joensuu Science Park Ltd. Because of his position, he had got a vision of Science Park's future and development.

Appendix B – The Collected SWOT analysis for nW Oasis

STRENGTHS	WEAKNESSES
Not only for weirdoes! - Being from multiple backgrounds - Different business areas - Not only for geeks / nerds New concept, something innovative International pilot planning Joensuu area surroundings - Nature (fresh air, clear waters) -Good availability of health services -Good availability of educational organizations around -Good basic public services (daycare, unfortunately not in English) -Availability of highly educated people -Safety Crossing borders - Disciplines of study / research - University and Industry - Cultures - Industrial Fields Technical Infrastructure excellent Pioneer Spirit of the concept - Attracts new students from outside North Karelia, Finland, Europe - Attracts new industries; Better knowledge economy Exotic culture for foreigners Reputation of reliable society The Oasis will get the newest devices from the stake holders for free as a test site Less distraction around Politically and religionally stable Low crime-rate Location Near USSR Far away from other Oasises - Lonely Planet? Spirit for local development? Concept might be easily duplicated Concept easy to copy around the world Toimiva terveydenhuolto (Well working health care) Itäinen mentaliteetti (Local, ”eastern” mentality) Riittävän hullu (Idea crazy enough) Uusi idea (Novel idea) Idean monitahoisuus (Multi-faceted idea) Peruskoulutuksen korkea taso (High quality of local education) Kasvatustieteellistä osaamista valmennukseen (Educational expertise in University for company training purposes) Korkeatasoinen ja laaja alan koulutus (YO, AMK) (High quality and wide ranged higher education i.e University and Polytechnic) Olemassa oleva Tiedepuisto (Already existing Science Park) Tiedepuisto miljöö (Science Park and its atmosphere) Alan yritystoiminta paikkakunnalla (The local companies already working at the same field) Vapaa-ajan huippupalvelut (Excellent services for recreation) Hyvät koulut (Good schools) Kotiavustuspalveluita saatavilla (Hyvät liikenneyhteydet (Juna, Lentokone) (Good connection i.e. Train and Airplane) Hyvä sijainti Joensuussa (Joensuu being a location) Ympäristö & Luonto (Surroundings and the nature) Elämisen ja Asumisen laatu (High standard living and accomodations)	Location Near USSR Far away from other Oasises - Lonely Planet? Spirit for local development? Concept might be easily duplicated Concept easy to copy around the world Too good to be true Location Unknown far away city Not much world class cultural events around International English school missing How to measure the effectiveness of the Oasis? The Oasis needs a belief from the beginning Economical factors? Too expensive for "common" businesses Local people fearing change and foreigners Finnish people are quite lazy to move / change their everyday routines Amount of interest outside the "design-group"? The Oasis visitors may get home sick Difficult to generalize from Joensuu to the rest of the world Vulnerable for failure --> Negative publicity Local areas of expertise are still limited but on increase Too unfamiliar, complicated concept for potential customers to market The Oasis needs first class group facilitators The Oasis visitors need to over come self-comfromtation Nykyinen Joensuun imago (The image of Joensuu at the moment) Joensuun asenneilmasto (The attitudinal atmosphere in Joensuu) Kapasiteetti nousee isoissa portaissa (Tiedepuiston kasvu) (The capacity of Science Park grows in too large steps) Liian pieni mittakaava (Too small scale) Ei valmista markkinaa (There are not any ready market for this) Markkinointi vaikeaa (laaja kohderyhmä) (Hard to market –wide niché) Etäisyys (Joensuun sijainti) (Joensuu’s location is too distant) Uusi idea (New idea) Liian hyvää ollakseen totta (Too good to be true) Kuntatalous --> Rahoitus (Economical situation of city of Joensuu --> Problems in funding)

OPPORTUNITIES	THREATS
Possible to use as testing environment for various things Independent of business area Global environment Increased quality of life and self-assessment for those participating as employees New balance between work and other spheres of life Place for people with nature related hobbies Stimulus for Joensuu area Internationalization of the town --> more colors, program and better services Increased cross-cultural understanding Creation of new jobs and services Creation of world class service concept New co-operation concepts (unexpected ones) Really new, original "First ever" concept From local networking to global networks Inspires also outside the Oasis New, Relevant problems for research New research area for Joensuu university New activities for polytechnic and pilot projects Government attitude --> SITRA and other financial possibilities The Oasis can change itself easily Increase productivity Employees establishing a company in Joensuu Order from Chaos - unexpected results IT-development new technologies War on talent Use of university services and knowledge for technology transfer and research support Erilaisten ihmisten tarpeiden huomioiminen (Understanding of the needs of various people) Ulkopuolinen riskiraha (Outside investor willing to invest on more risky projects) Takaisinmuuttohalukkuus (People willing to move back to this region) Tiimivalmennus suureksi liiketoiminnaksi (Team training into large business) Markkinointi (Marketing) Humaanit lähtökohdat (Humane origin of the idea) ”War on Talent” alkaa (”War on Talent” will begin) Personointi (Personalization) Uusi idea (New idea) Oasis Franchising maailmalle (nW Oasis as a franching business throughout the world) Idea kopioitavissa (Idea is copiable) Idea kopioitavissa franchisingingiksi (Idea is copiable into franchise) Työteon muodot uusiutuvat (New forms of work) Uusi seminaari-idea (New seminar idea) Uusimuotoinen työn ja elämän yhdistäminen (New way of combining work and life outside of it) Alueellisen ilmapiirin kehittäminen (Development of local attitudes) Kuka johtaa? (Who will lead?) Jokin saariselkä-ilmiö (Rapid regional growth phenomenon) Joensuun seudun uusi imago (New image for Joensuu region) Freelance-työkulttuurin yleistyminen (Freelancing becoming more general) Langaton tiedonsiirto (Wireless communications) Verkostoitumisen kasvu lisää tilapäisen etätyöyhteistyön merkitystä (Workshop) (The growth of the networking will facilitate the relevance of non-face-to-face collaboration) Turvattomuus lisääntyy maailman suurkaupungeissa (Insecurity will grow in world’s metropolises) Ilmastonmuutos (suomessa) parhaat kesät Euroopassa (The enviromantal change – the best European summers are in Finland) Suomen maine ”ihmemaana” (The reputation of Finland as land of “miracles”) Maailma muuttuu nopeasti! Positiot! (The world changes rapidly! The positions!) Uudenmuotoinen työyhteisö (The new kind of work community)	Where to find manpower for versatile, functional services Service quality management critical Security problems Political decision making unbelievable Municipal decision making Local jealous people Fear to realize really new Funding Idea too complicated to be easily presented for funders? Investment goes down, so does the city of Joensuu? How to find marketing channels to find right persons to join? Indentified as convent instead of a living and creative community and society Correct way of marketing critical Danger that the Oasis becomes techy Some Oasis visitors may give-up their job Timing of events and group making is delicate Needs a lot of support at early stages, first 2-4 years Copying and duplicating in/to better locations Someone does it before us Danger associating the cottages with climate conditions Tilapäisen asumisen verotus (The taxation of temporary living in Finland) Jatkuvuuden takaaminen vaikeaa (Securing the continuity will be hard) Idea liian monimutkainen (Idea is too complex) Munitaan alku/käynnistysvaiheessa (The beginning / starting phase is badly unsuccessful) Rahapula (Lack of money) Etäläsnäolon teknologiat kehittyvät nykyistä videoneuvottelua paremmiksi – ei luultavaa (The telepresens technology will develop to be better than videoconferencing systems nowadays – not likely to happen) Tarvittava teknologia vaatii jatkuvia kalliita investointeja (The needed technology requires large, regular investments) Ei mene läpi kunnallispoliitikoille (Local politician will not accept the idea) Kilpailevat paikkakunnat (Competing places) Etäyhteydet paranevat kaikkialla (Teleconnections are getting better everywhere) Rahoittajien asenne (The attitudes of the funders) Helsingin kustannustaso laskee (The cost level at Helsinki region will decrease) Työnantajien asenne ei muutu (The attitudes of the employers will not change) Asiakashankinta (Acquisition of clients) Ei uskota uuteen ideaan (No trust on new idea) Ei erotu mielikuvana muista, vaikka onkin erilainen (Does not distinguish as a mental image from other similar ideas, eventough is being different in reality) Uusien ideoiden hylkääminen varsinaisessa toteutuksessa (Getting rid of the new ideas, when it is time to realize nW Oasis) Banaali ratkaisu (Banal realization) Kuka johtaa? (Who will lead?)

Appendix C – The Contents of the Slides Presented in Design Sessions

The Oasis - Concept

The Second Design Session
29th of October, 2002

Basic Idea

- To provide premises for companies for their teleworkers
- The first phase - about 7000 m2 and 300 workers
- Not ”just” teleworking, but much more:
  - Innovative and creation enchancing environment
  - Center for state-of-the-art knowledge and know-how

The Surroundings

- To fulfill the customers needs, the holistic view of humanity should be used: The mind, the body and the situation
- The surroundings offer key to fulfill the needs:
  - Sports
  - Relaxation
  - Education
  - Culture

The Oasis - Inside Out

- Not ”just” office space, but
  - Places to create
  - Places to meet other people
  - Places to gather more knowledge
  - Places to enjoy your time
  - Places to rest and be in silence
- The Oasis - Beacon of knowledge and creativity?

The Oasis - Even more

- Oasis Network
  - To meet all the others working in the Oasis virtually
  - To see what’s going on
  - To take advantage of services available
- Oasis power two
  - The cottage network for solitude with all the services
  - Teleworking from telework!

Appendix D – nW Oasis Mind Map