UNIVERSITY OF OSLO
Department of Informatics

Socio-Technical Systems Design as Collaboration with Employees in an IT Company in Norway

Master Thesis

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Contents

List of Tables

List of Figures

Abstract

In this thesis I have presented methods and techniques we have combined to develop the first version of a design methodology, referred to as Socio-Technical Systems Design, combing technical and organizational issues for an information system. The result of applying the method is a design solution that to a large extent have been constructed by employees in the case company. Its distinctive feature is that it is not followed on basis of requirements and functionality analysis methods (i.e. methods and techniques traditionally used in system development process).

This case study is our contribution to the broader field of systems development to bring both technical and organizational factors into play. It contains an example which shed some light on ICT practitioners' innovative approach towards combining a cluster of technical appliances into a generic product. It include a Web technology component to support aspects of internal communication customer relations, modeled after the company's envisioned work practices.

Acknowledgements

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I also hold appreciation towards my research-fellows Kathrine Nygård, Renate Andersen, Damir Nedic and Espen Olsen for making the KIKK project an exciting and stimulating research experience. My gratitute also goes to many more colleagues with whom I have shared many interesting discussion and enormus number of hours in the studyroom – Thank you each and every one of you. Speical thanks goes to my friends Karin Heiene, Torunn Gaupraa, Isabell Johansen, Ingunn Østren for their invaluable time and support during this journey. Thank you for lending me your attention whenever I needed to explore issues related to my research!

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Chapter 1

Introduction

The topic for my research concerns with development of systems design of ICT implementation in a work environment. The goal was to improve Company's existing web page. Company planned to achieve it by developing a web portal that can be used as supporting tool in daily work practice and which provides multiple functionalists. In this context I have followed the chain of activities that we (researchers) initiated in efforts to accomplish the task. Driving force for our design activities were led by the strategy to put the employees on driving seat for development of the systems design. Our role was to bring forward employee's analysis (explanation, reflections, experience and challenges) about the tasks and activities which they carry out at their work. More over it was important to search for employees needs and ideas for solution, and thereby also inquire about their thoughts on the intended web portal. We encircled the search to address one of their domain of work practice that concerns with Company's customer support service.

The intended plan was to study two aspects that were tightly coupled with the employees daily work:

(a) activities generating interaction and sharing of information among colleagues

(b) the communication which occurs particularly in the process to provide user support as it is viewed by the employees.

Our research scope was addressing towards a wide range of work activities in Company. However, because of the time constraints, the aspect of communication in employee–customer relationship remained the focal point of discussions.

1.1 Research Interest

I took part in a case study conducted as *the KIKK project* with a research team. It was carried at an Norwegian IT company, pseudo named *Company*. We adopted the view that an information system is used by employees as tool to carry out their daily work. The context for study is *"ICT use and learning at the work place"*. We added the role of *system user* to the employees at Company.

Target for the project was to develop an web portal that would provide the employees an communication facility in their daily work. The web portal was aimed to promote better interaction both at internal ground in the company and at intermediate interplay among employees and company's customers i.e. to support relationship with customers. The aspect of ICT use and learning represents the soft, emotional and social considerations with the system's user. Where as the ICT artifact is tightly influenced by the technological and physical constraints in the environment. On basis of this I bring in the framework of Socio-Technical Systems Design.

I have presented the process that emerged from collaboration among the multi-disciplined researchers team and employees in Company. The process evolved as we merged guidelines from planned project activities and incorporated additional events that occurred at the time. In planning of the systems development process, we in research team departed from the two perspectives which we represented; systems development inspired by the *Participatory Design* methodology, and for aspect *use of technology and learning* as it is perceived from *Socio-Cultural Learning* perspective. Since these both perspectives have influenced the way we have communicated and approached users of the *object system*, the design process carries elements from the two perspectives. With object system I mean as it is defined by Hirschheim et al. "the part of organization that is targeted for

change through an IS development project" (Hirschheim & Lyytinen 1995, p:10).

With Participatory Design (PD) methodology the focus of systems development process is turned towards early stages of the process when ideas and needs are emerged, and on refinement of which evolves the design of information system. The involvement of object system's actual users is regarded as vital contributors. That is because they bring with them experience and knowledge from the domain at focus and hold insight about work which otherwise is not made easily available for systems developer. Over the years, the Participatory Design practitioners have explored a number of techniques which can ensure object system user's participation, and thereby help to improve user's experience of use quality of systems. The methodology aims toward establishment of mutual reference frame in order to achieve active engagement by participants during the development process. Such process has shown to beneficial for all involved participants i.e. systems developer and systems user.

Learning is perceived to be a product of stimulation from social relationships and a process when the information is internalized by the individuals. In the study of learning at work places, the emphasis lies on the trivial relationships among employees and influence of attributes in the environment (Stevenson 2002, Mørch, Engen & Åsand 2004), . From the Socio-Cultural Learning perspective these factors are regarded as important pillars that contribute to development and knowledge building for people. In this context the tools play important role in the process of acquiring knowledge (Wasson, Ludvigsen & Hoppe 2003).

Information system or other technical *artifacts* are from a Socio-Cultural learning perspective considered to be tools, *mediating artefacts*, which people use to carry out some task. Example on such actions can be: person A helps to solve a problem for person B, person X tells something to person Y, or person Z makes a product P. With this in mind, I understand information systems to be tools in employee's work environment.

Mutual influence from PD and Socio-Cultural Learning perspective formed the joint project, therefore the activities for design where influenced by careful considerations about how to approach employees, what to focus on, how to formu-

late inquiries etc. This further inspired to revolve the design activities by asking questions like 'What is the work practice today?' and analysis from design and learning perspectives. That led to composition of design methods and techniques taking care of multiple views.

A third factor in this process was the role taken by the participants: research team as managerial role and active participation of employees as system users. Consequently, the design process is a result of collaboration of research team and employees.

I followed the timeline of the KIKK project and view the systems design to be accumulated by all the events leading it towards an object. The design process in the KIKK project evolved from an idea into a prototype of an web portal. The process developed into two parallel design processes, which resulted in two design approaches; *Organizational Design* and *Technical Design*. Organizational Design represents the social attributes and Technical Design refers to the technological factors.

Analysis of the design process showed that design was influenced by the planning stage. That has supported my understanding – design does not occur at a specific point in timeline. It is a process that integrates development of ideas that emerges from a need or desire to bring something new into existing environment. Explicit formulation of some suggestions and concertising them with experiment e.g by developing visible shape or prototypes.

1.1.1 Research question

I formulated the following research question to pursue my research work:

Research Question: How do the following techniques contribute in development of organizational- and technical design:

- Scenarios
- Narratives and Design Stories

Chapter 2

The KIKK Project

My research has been carried out in frame of a project. I will therefore first present the schedule and agenda for the project. Then explain the organization of activities, participants and tools that have been involved in the process. This is presented in their respective sections. Last section ”Path for design” is a summary of actual process which I present with an illustration.

KIKK is acronym for *”Kunnskapsforvaltning for intern kommunikasjon og kundebehandling”* and is translated as *”Knowledge management for internal communication and customer relations”*.

The KIKK project will contribute as empirical case study for an European research project on the issue of knowledge practice Laboratories (KP-Lab). The KP-Lab project is a collaborative work among researchers located in different countries and geographically distributed on various locations/academic institutes (Mørk & Moen 2006).

2.1 Timeline

The project was established in July 2006 and lasted till August 2007, see calender, Figure 2.1 on the following page. It was based on mutual agreement between

two actors; researchers from University of Oslo (UiO), and a Norwegian software development company. From now on I will refer them as *research team* and *Company* respectively.

The project's scope refers to a defined segment of Company's business. We looked into Company's relationship with it's customers. We followed the procedures for exchange of information and communication among the employees in Company regarding customer-support.

I have participated as one of the researchers in the project. Results which I present here are based on data material from my field work.

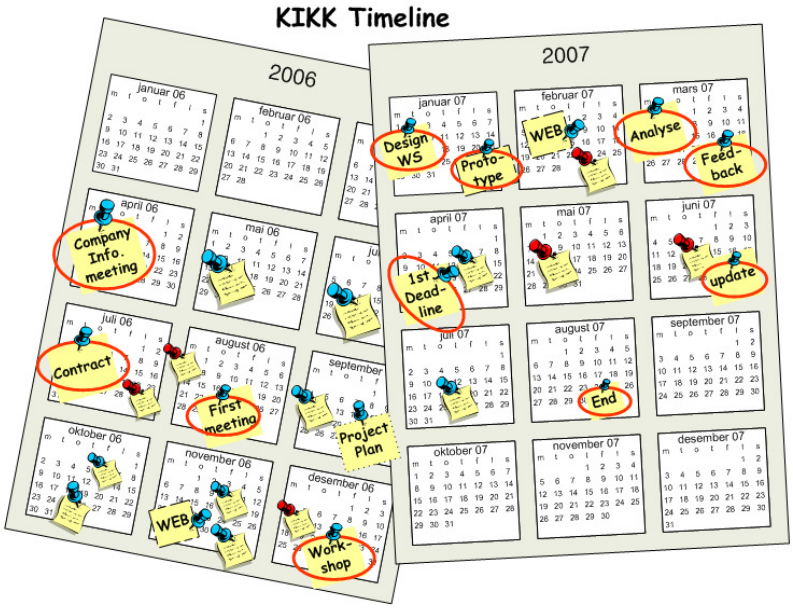


Figure 2.1: Time of research duration for The KIKK project, that formally started in July 2006, but first information meeting initiated in April 2006 – till formal end of contract time August 2007

2.1.1 Goal

Company was considering an ICT solution which would help them improve communication processes. They hoped it would contribute to establish a system for

knowledge management. The research team was interested in issues related to development of work practices and explore aspects that generated learning at workplace. They wanted to take into consideration all factors relating to occurrence of changes in work practices, people's adaptation to environment, and context of people's interaction with computerized information systems.

Company view point

A group of employees were in process of evaluating ideas on system for information sharing. They wanted to utilize web-technology for it. Their preference was to have simple and uniform user-interface towards the underlying information systems. This they regarded was possible with a web portal. The team had reached at a point where they saw it necessary to change strategy of *"Redesign-Rewrite-Rethink-Rebuild"* over to develop a plan that would entail shuffling of these four steps into *Rethink-Redesign-Rewrite-Rebuild* as an approach for renewal of their web solution. I will refer to this strategy as *Company's 4–Rs*. An illustration was presented by Company at *Brainstorming* meeting. It is reproduced with few amendments in Figure 2.2 on the next page to show their key ideas. The employees posed some questions inquiring about their needs. They even expressed their willingness to change their software application in existing ICT infrastructure.

Researcher view point

This project facilitated as mutual arena of exploration. Intended goal for the project was (a) to acquire more understanding on the social elements in working environment and (b) to develop ICT system that would support the process for knowledge sharing (see Figure 2.3 on the following page). We hoped to evolve a design of learning environment that would promote transfer of knowledge (i.e work experience) among employees. Project was formed into practical implementation work; with task to design a system solution and to develop prototype of envisioned web portal.

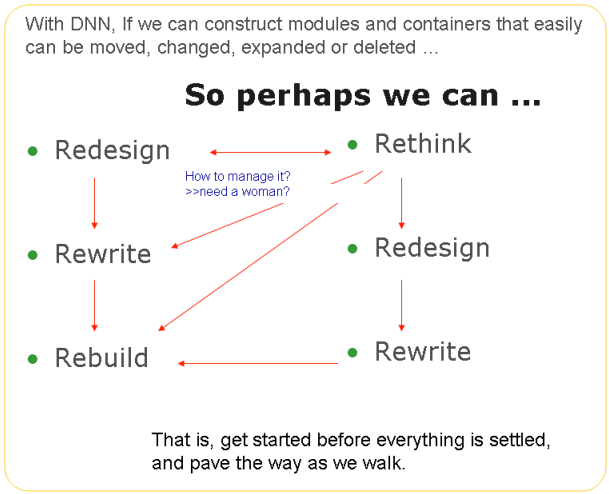


Figure 2.2: The 4 Rs by Company, pointing out ideas for new system under consideration, presented in *Brainstorming* in August 2006 (Modification: translated and combined two presentations slides)

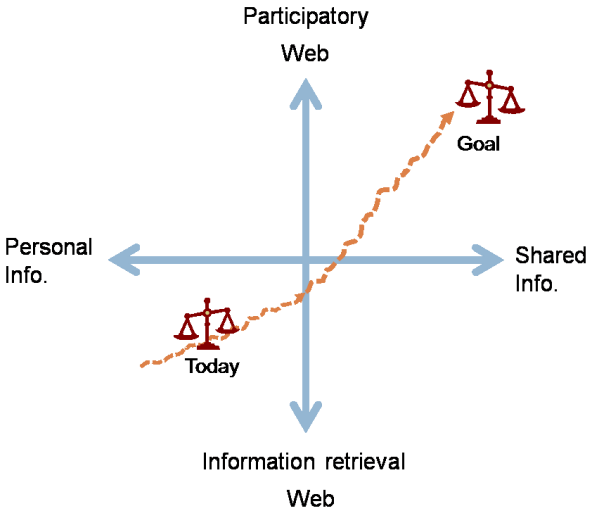


Figure 2.3: The intended goal as perceived by researchers

2.2 Organization of Participants

Project started off with four researchers. But later on, by middle of *Phase I*, two new researchers joined the project. In total the research team was composed of four master students, one PhD-fellow and an associate professor. The research team was divided into two groups. Both worked with their designated research areas. One group had focus on exploration of the existing work practice in Company. It involved activities to acquire insight about *soft attributes* and employees perception about their work. Soft attributes refers to social and relational attributes that focus on social bonding (Auh 2005). The second group's target was to develop the web portal. Within the research team, these members were looked upon as technical experts. Their work was concerned with ICT infrastructure and software development. So they focused mostly on aspects related to hard-core programming. The associate professor functioned as adviser and had the responsibility of project manager. My work is related to work carried out by both group. I have taken part as participant observer and inquirer in the technical group's work, and contributed in designing activities in explorer group.

In Company an employee was assigned the role as coordinator and collaborated with research team. This person played an important role in following-up project related activities within the Company. Coordinator helped the research team to get in touch with other employees, to allocate resources within Company and informed about decisions taken by management. This person acted as bridge-maker between the research team and other employees. During the project, more than one person has filled out this role.

Both Company and the two research groups were free to initiate activities. For emphasizes on this equality in the role, we made an agreement on to rotate the responsibility to host the meetings.

Mandate and division of responsibility

Agenda for the project and the work focus in the project was discussed in early stages. By quoting from minute of the meeting on 5th July 2006, I present the summery of the main points agreed at that time. This document explains the anticipated and previewed design process of the project, the division of work and the responsibility on each actor (researcher and Company). See quotation at 6.1.1 on page 74 and Appendix C.1 on page 123 for the content of minute.

2.3 Project Plan

Project started off with a preliminary schedule of operations drafted in consultation with Company. This schedule is presented in Appendix F on page 155.

Research team worked out details for research questions and defined activities for the project. We approached the field work with practical hands-on activities, collecting data and do system development (design and prototyping). We planned the project into three phases and referred to anticipated development and reflected parts of the process This plan launched the structure and schedule for the activities in given time frame. Those activities settled the milestones in the project.

Activities during *Phase I* were mainly designed towards mapping of existing work practices among employees. Development of the system (design and prototype) was put in focus as part of *Phase II*, along with operations to start rolling out the designed system in Company. *Phase III* was intended to finish off the implementation process and for the purpose to study implications of the work carried out throughout the project. To measure the effects of rolling out a system in the existing work practice.

2.3.1 Activities

A summery of the activities we undertook during the project is presented accordingly to the three phases we planned. Details related to many of these subjects are explained in Chapter 4 on page 23 and in Appendix D on page 124 :

phase I :

- brainstorming (Jul, Aug and Nov)
- status meetings with Company (Jul, Aug, Sept and Oct)
- minutes of research team's meetings
- email communication (to arrange meetings and for exchange of information)
- application to NSD for acceptance of the project
- data collection (presentations, interviews and workshops during Oct, Nov and Dec)
- followed up a selected IT system in the organization, a repository of documents

phase II :

- workshops; within research team and with employees (Dec, Jan, Mar)
- weekly group meeting for web development
- status meetings with Company (Mar and Apr)
- minutes researchers meetings
- data collection about Company and its customers
- analysis of data material
- presentation and participation in external research forums

phase III The design process was not developed further therefore this phase is not of relevance for my research studies.

2.3.2 Path for design

The work process was not scheduled down to details because we wanted to keep the flexibility to make adjustments. We organized sub-processes in the parallel and were able to generate information from several activities.

Following is my perspective of design development, as it succeeded from planning till the end. I illustrate this process as a curly line, each curl symbolizes a specific

activity on the path we have followed i.e surprises on the way, adjustments, and uncertainty about the outcome. Design activities and a number of other events are marked along the curve and points out where we applied the various design techniques. It portrays the continuity in the process, and also indicate the co-relation between activities. This *design path* was first published as poster at UiO (Mushtaq, Mørch, Nygård & Kaasbøll 2008), and it is simplified for the purpose. See Figure 2.4 on the facing page.

On meta level, it shows two perspective of the activities we have arranged; (1) activities that were well defined so it focused on particular topics, which resulted in some specific outcome (i.e a decision, a diagram, a product), and (2) activities that functioned as exploration of thoughts which led to gathering of more know-how (i.e information, issues, problems, clarifications).

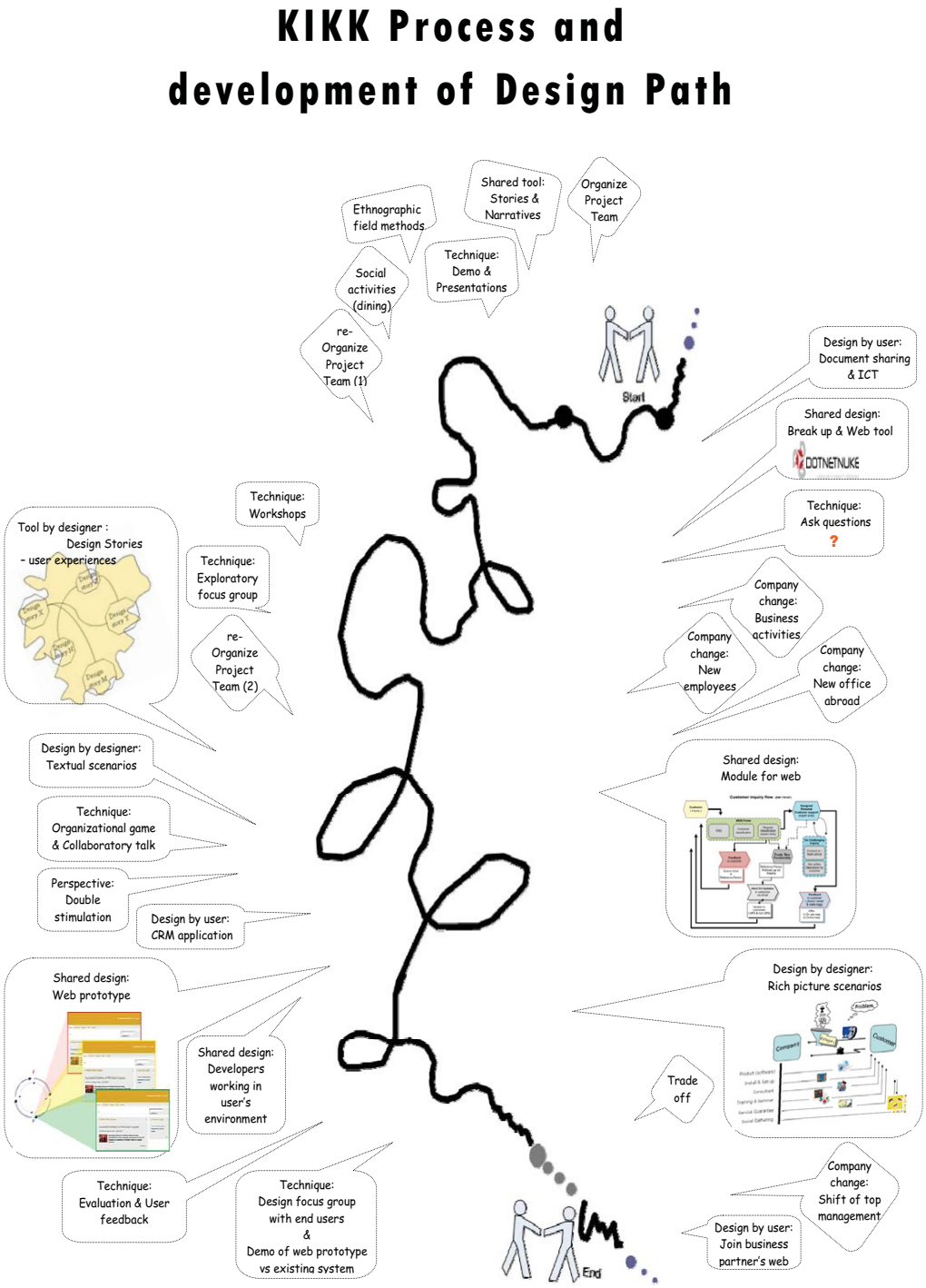


Figure 2.4: The evolutionary design process for KIKK.

Chapter 3

The Case

Here follows an introduction of the company taking part in our case study. I have briefly described it's business operation (office location, products and customers), its history and the ongoing changes. Details helps to sketches the direct and indirect features which constructs the work environment. I consider this information provides the basic insight that helps to understand the design developed in the process.

3.1 Company

This case study involves a Norwegian IT company employing approximately 20–30 employees and is undergoing an expansion phase. Its business has evolved on in-house developed applications (hereby referred to as *"products"*) specifically for administration of project management. The Company's strength lies in its customer service oriented strategy, especially for customization of the products.

Today Company is run from two offices in Norway. See Figure 3.1 on the next page. These offices are geographically located several miles apart from each other. It's main office, established in 1997, is based in Stavanger, a west coast city. The units for administration and software development are located at this office. This office is referred as *"Stavanger-office"* in the report. The second office referred as

"Oslo-office" is established recently. It is located in the capital, Oslo. The Oslo-office holds responsibility for business in eastern region, and is undergoing new developments. Recently, in 2006/2007, Company has launched a third office in North America. From this office Company plans to cover demands in the global market.

Figure 3.1: Geographical location of Company's offices in Norway

Company is part of an international investment group, operating within the field of project management. Focus for our case study only concentrated on activities in Company, locally in Norway. Our study does not involve the business administrative aspects.

3.1.1 Products

The company started off with application product that was directed towards project management

Company proudly claims to hold loyal mass of customers. The *products* are regarded to be built up on consultancy experience at hand and through all feedback

they receive from customers. Company's policy has been to give first priority to their customers. Response from customers are highly valued.

Company's customers included within the oil and gas industry. Their projects are sensitive to detailed control on activities and budgeting. Such ventures deal with projects that holds budget's size on several million Kroner. Management of these projects demands for advanced features in the software application.

In recent years, Company has expanded its niche of customers. It has extended the variety of business *products* which allows them to widen the business horizon from one category of customer segment; petroleum and other off-shore business, to now include customer segments from new arenas; entrepreneur and construction ventures on-land.

Software applications

The project management products comprises of two stand-alone applications (one with extensive toolkit for complex projects and second is a light version for general purpose), and the third product is offered as add-on for advanced reporting and functionality to a third party stand-alone project management applications. Today it can be integrated with Microsoft's Project Management application.

Supporting functionality

Company offers several type of services to their customers. These services ranges from tailoring the product according to customer's demand and provide forums for network building among the customers. Their user-support is offered on various scales; remote assistance on phone, hire a consultant or if the customer's prefer they can learn to use the application in intensive seminars offered by Company. On-site hired consultant, ‘‘project plan maker”, is usually assigned the task to set up a project plan and carries out other related tasks at the customer's working environment. Customers use this possibility in configuring and using the system in the beginning. Seminars are arranged by organizing the in-house expertise.

3.2 Background of Development

3.2.1 History

The company started off by four professionals, with common interest and long experience in managing complex engineering projects on large scales. These people have merged their joint knowledge to develop the software that can be helpful to administrating challenges in projects. Such demanding challenges require coordination and scheduling of work at several levels in the project. For example to monitor deliveries on various small and big parts by subordinates or sub contractors. Company have designed the application to meet the need for detailed reporting and provide the possibility to generates valuable information on different variables (i.e on task or budgeting related issue). These components in the software has been very high in demand in a small niche of business segment, especially in the oil and gas related industry. Thus Company's business has mainly been related to ventures from these fields.

3.2.2 Expansion of business

Expansion in the business has been explained to be triggered by events occurring in recent time and which has evolved rapidly during short time.

It has been explained that some time prior to this situation, Company had won contract with a large venture based in eastern region. The contract was assigned to deliver a version of project management tool customized for the company's needs and it was to be installed for 5000–6000 computer users. Company had won the contest in a competition with several other companies. Among them was also one of world's largest company with similar application product. This new contract constituted to expansion of the business. Besides winning the contract, for delivering an application to be installed for a large number of computer users, which thereby secured good business potential for Company's future, it has also brought them a partnership with the world wide company which also participated in the contest. As a result of partnership, Company made an agreement to develop

a new product, and thereby extended their list of products with an additional new application. The partnership contributed to open new business potentials for Company. The new product is developed as plug-in for their partner's product. With these two additions, new product and partnership, it generated growth for business. Company could now account new product to their repertoire and because of the partnership they now got access to new customer segments.

3.2.3 Organizational changes

New office, new colleagues

Since Company had extended its business, it now started to run business from both offices. The company considered it important to employ more people to meet the business potential. So the plan was to establish an office with necessary number of staff members that would be able to meet the service demand from increasing number of customers.

The new changes for Oslo-office led to expansion of the organization. In past the Oslo-office functioned as site to support extension of business activities, and provided the benefit to be located nearby customers in the East. Some time in year 2005, the person in charge at Oslo-office changed his job and went to work for another company in Company's investment group. Then a new person was needed to run the Oslo-office. This person recommended a person from the network and the current person in-charge of the Oslo-office (referred to as *"Oslo-CEO"*) was employed by year 2006. The Oslo-CEO needed to increase the staff. At Oslo-office, they started a process of employing young and fresh graduates. During the year 2006 the office in Oslo had increased its staff with 6 new persons, including the new person to run the office as Oslo-CEO.

Knowledge sharing

In the process of hiring new employees, they experienced difficulties in search of consultants with expertise and skills according to what they looked for. This

shortage of qualified candidates generated the idea of to employ fresh graduates. It was a decision based on their profound believe to be able to provide training and supervision, as in mentorship, by people in the company. Most of the people working in the company were seniors and had several years of experience in project management field. Therefore the company had easy access to reliable human resources and assets of their skilled knowledge. Through such setup for transfer of knowledge and expertise in the organization, they hoped to mobilize quick training and learning process.

New work tasks

For Oslo-office the aim was to establish a complete functional unit which can operate according to the business marked in the eastern region. These kind of changes in the organization started to generate extended effects. Changes at office in Oslo also had impact on people in Stavanger-office. New customer segments generated new and different type of requirements than what was established with existing customers. With colleagues fresh in the field it also required demands for training and sharing of information. The situation caused noticeable change for the people in the product development section. Increased number of employees, and especially since these people were new from outside and unfamiliar with people already working in the company, they asked questions about where to find information and the way work was conducted. These spontaneous reactions also led to trigger questions about organization of work in the company.

3.3 My Understanding

At first the Company's both offices (Stavanger and Oslo) approached same customer segments but concentrated on the regional areas divided by them. The office in Oslo was extension of the business.

A simplified picture on current situation for flow of information in the company according to my understanding (see Figure 3.2 on the facing page). Company

initiated a process for overcoming the volume of inquiries. It is during this phase we were involved through the KIKK project.

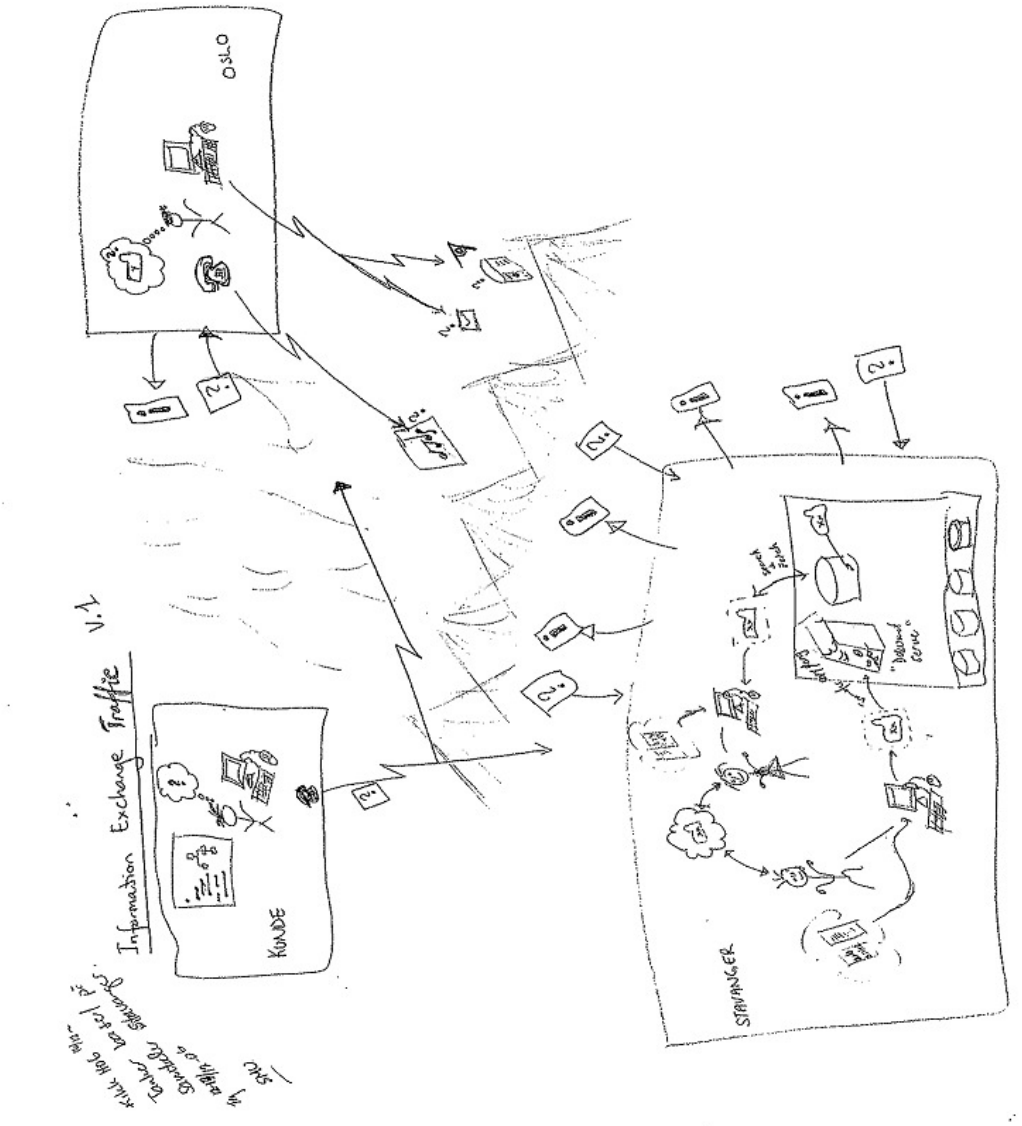


Figure 3.2: My perception of information flow at the macro level in the organization, per Dec 2006. It is the first picture I sketched to reflect up on volume and type of information that flow between Stavanger-office, Oslo-office and their customer. It was inspired by an employee's expression for 'oslo-office is just another customer'

However, with new product delivery-contract and partnership with big enterprise, it lead to changes for Company e.g introduction to new customer segments. This initiation set out to expand the Company's business. And subsequently it also served as a trigger within the Company, in such way that business focus for the both offices changes. With expansion in number of customer from new domain, followed the need for establishment of a fully functional office, the Oslo-office. As for now, Oslo-office's customer portfolio consists of from greater diversity than before. Along with these changes we also learn that Company intends to expand the business further and looks towards business potential of their product in the global market.

Authors of the book "Change" explains that "Second order change" is contributes to move the situation out of one position into another situation and thereby causing some alteration within the object. Whilst they describe the "first order change" has effect on surface (e.g.like changing one thing with its substitute). Such change primarily has visible effect while they don't contribute to bring change in behavior . It seems to me this new contract and thereafter partnership has led to changes that has taken the Company into new era of business.

Chapter 4

Research Method

4.1 Research Approach

I have been engaged in a case study using qualitative research methods, combined with action-based techniques, in a multi-disciplinary group of researchers.

Data material for my research has evolved over a period of 9 months, July 2006 – March 2007. It represents outcome from various research methods that we have carried out. Composition of these methods framed our research design. We adopted an exploratory approach (Befring 2007, Silverman 2005) which helped us to make adjustments and to intervene in the process. Examples of methods we have applied are interviews, group meetings, emails, telephone conversations, participant observation and design games. They all have served to provide us primary data . I have also made use of written and printed sources of secondary data (Befring 2007) such as booklets and employee's work diaries.

We made digital audio recording of interviews and group meetings (focus group meetings and workshops), and digital video recordings of some selected events. Moreover, we adopted the practice to write minutes of several meetings; both those arranged only for the research-team and those in interaction with Company. I have made use of all these sources of information to varying degree in my research.

In total 6 researchers from UiO, and 12 employees from Company have been involved in the research, which was constructed as a project to develop an web portal (see chapter 2 on page 5 for details). Among members of the employees were participants that had been recently employed up to people with longest seniority. An overview is summarized in following table, see Table 4.1.

Characteristics about Participants	
Description	Number of participants
Total number of researchers	6
Total number of employees	12
"active participant" employees	7
"passive participant" employees	5
Employees with seniority longer than 2 years	6
Employees belonging to ledergruppe	5
Employees with their respective seats at the office	7

Table 4.1: Some of the prominent characteristics about participants in the project

In the context of Participatory Design, the concept of *participation* is explained by Mumford and others (Schuler & Namioka 1993, Greenbaum & Kyng 1991) to yield engagement by "users" of the system in order to have influence, and it comprises more than "token representation in meetings or on committees" (Greenbaum and Kyng) . I make use of the term *active participation* to refer to the intended participation and *passive participation* as reference to "token representation". In our case, *passive participation* has also been of importance, since these people represented the social practice in the organization.

The selection of participants has mostly been organized through the contact person at Company. Since we were informed about people selected for the activity, we had opportunity to customize questions. Theoretically we made "purposeful selection" of participants (Befring 2007), because we took charge to express our interests and purpose of the activity. In this sense we indirectly conveyed to search for people from specific domain and with relation to certain work activities in Company.

Our research design provided triangulation of multiple methods (Silverman 2005,

Silverman 2006) These methods has followed from the matrix of theoretical perspectives that has been included in the case study. I have designed a diagram, Figure 4.1 on the next page which gives an overview of the factors that has impact on my research.

> Methods never solve problems; people do. In order for people to solve the problem [of designing usable computer systems], they need skills. No matter how a method is described and represented, there is always a risk that somebody follows the method minutely and still produces an unusable system. However, a method may be a way of acquiring a skill, in the sense that it reminds the developer of things to attend to and activities to undertake...
>
> *— Jonas Lowgren, p.7, 1993*

The way I perceive Jonas Lowgren, the benefit of using methods depends on how a method is applied in the practice (Silverman 2005) – how the possibilities that are opened with methods are utilized, and the ways we apply the method can help us to set a direction. This I believe is very important aspect especially when conducting qualitative research in the field of systems development. Because qualitative research contribute to find out issues that are previously unknown. There is a spectrum of methods and techniques developed to conduct fieldwork in this tradition. For a researcher this spectrum represents a toolbox, which has to be used according to its application area and agenda. Development of Participatory Design invite to a more creative approach as it involves exploration and discovery. Thus combination of the various theoretical perspectives supplements each other in search for information to fill in the gaps between underlying reasoning and the obvious factors detected on a first glance.

4.2 NSD and Other Formalities

Company had expressed their expectations to achieve some preliminary results by mid of December 2006, this meant within 5 – 6 months after the first initial meeting. However, we had reached month of October by the time we were ready

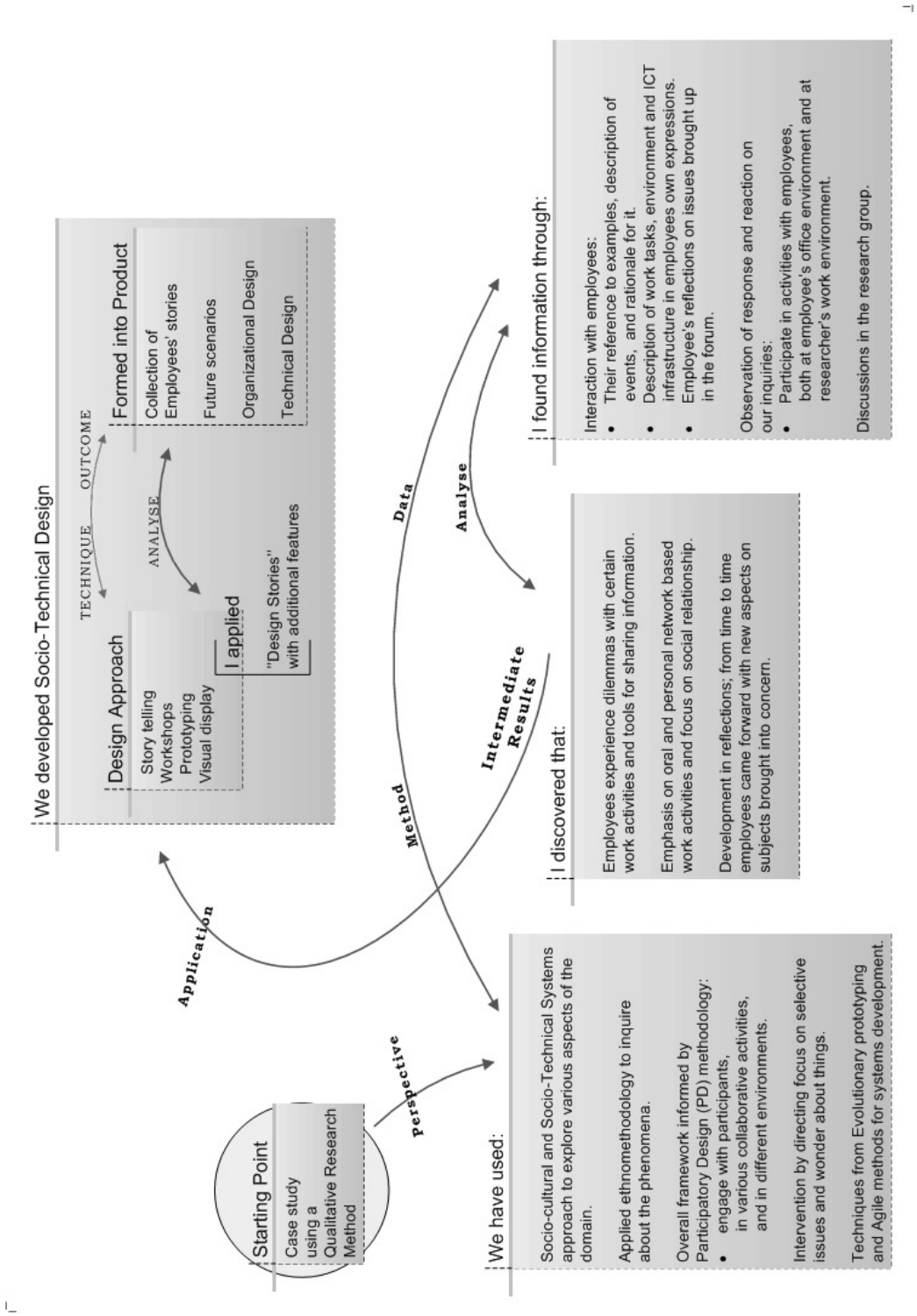


Figure 4.1: Overview of research design for my work, two iterative; defined by the project and the design process.

to resume the work. This had effect on our efforts to improvise the schedule and activities planned for the collaboration.

It was a trade off between collecting enough data and at the same time not to occupy too much time of the informants so they will feel it a waste of time. This balance has not been easy. We considered our role to be as researchers and to some extent advisers. Where as we might have been understood as researchers and consultants by Company. As I perceived it, various roles that we have carried out during this research are summarised in table 4.2 on the following page.

The delay was caused because we, in the research-team, got engaged in discussions that would help us establish directions for sharing of data, principals for how to work among us and how data was to be treated throughout the research project. To ensure authenticity for our research, we submitted an application to Norwegian Social Science Data Services (NSD) and had to bring in their acceptance on the approach we intended to apply in the project; type of data we planned to acquire, media for recording of interaction with participants, inform about intended time period for storage of data and protection measurement of data in the storage.

These processes required time and approximately 6 – 8 weeks went by before we were able to take up the collaborative work with Company's employees. It was important to get clarity on these issues in order to avoid conflicts in the research interest and to provide surety of personal security to the participants. We also took additional steps and designed an approval form. Each participant had to fill it out so that we can use information we acquire in interaction with that person for our research purposes. We followed this step carefully by bringing it up at the beginning of each meeting, and in this way made sure of that every participant was informed about the procedure.

4.3 Research Collaboration

My research interest is related to systems development, and concerns design of information systems. I wanted to explore knowledge sharing and learning processes

at work, how information is designed, and how ICT could be designed to mediate the process.

In the research-team, I considered my role to bring forward elements that would show the processes for information sharing in Company. Questions that guided my search concerned; Which information systems are in use, how they are utilized, what purpose do they serve, which communication channels are activated for exchange of information, and what medium does employees use when co-operating on a task, what ICT system is adopted, which helps them to transfer information /knowledge from one and other. By mapping the flow of information in Company, I hoped to contribute to identify needs and puzzles that would be taken into consideration when designing the proposed system.

I based my work on the principles of Participatory Design. One most important requirement in this relation is involvement of the ”system users” (Schuler & Namioka 1993). I refer to them as *employees*. Influence of this methodology is prevailing in activities included in the research design. In table 4.3 on the next page, it can be seen that participants from Company has been involved throughout the process.

Roles in the Project Work	
Role	Participating actor
Research team	Researchers
Employees and practitioners	Employees, user of the information system in Company
Project members	Employees and researchers
Technical team	Researchers carrying role of programmers
Facilitator	Researcher
Gatekeeper, translator, coordinator, system user	Employee representative
Designers	Employees and researchers together conducting joint design activities

Table 4.2: Overview of relation between role and actor, carried out by participants of the project

Design activities in KIKK					
Event	Activity (documentation)	Place and Actor	Participant (empl.)	Date	Duration
Interviews	Semi structured interviews with individual employee, digital recording (6 audio and 4 video)	in meeting room, at office in Oslo and Stavanger	9 (6)	Oct – Dec 2006	20–90 min each
First Brainstorming (Exploratory Focus Group)	Conversation, minute of meeting, no digital recording	in Oslo, both offices	8 (3)	Aug 2006	3 hrs
Web technical solution (workshop)	Demo, questions and discussion. Digital recording (audio, video failed)	in Oslo, both offices	7 (3)	Nov 2006	1,5 hrs
Workshop "Usual day at office" and use of ICT (Exploratory Focus Group)	Hands-on activities, demo, discussion and interview, digital recording (audio and video)	only users in Stavanger	8 (4)	Dec 2006	2 days (4 hrs + 2 hrs)
Preparation for Design Workshop	Brainstorming, minutes of meeting, no digital recording	only project team	6 (0)	Jan 2007	2 days
Design Workshop (Future workshop)	Hands-on activities, group discussion, future thinking techniques, digital recording (video)	only users in Oslo	8 (3)	Jan 2007	3–4 hrs
Prepare Status Meeting (Workshop)	Data analysing, hands-on activities and discussion, no digital recording	only project team	6 (0)	Mar 2007	2 weeks
Status meeting with presentation of results (design focus group)	Presentation of preliminary results by researchers, digital recording (video and audio)	in Oslo, both offices	10 (4)	Mar 2007	2–3 hrs
Followed use of existing IT system (IT object)	Demo, presentations and interview digital recording (audio 1 hrs)	various occasions	user driven	continual process (Oct 2006 – feb 2007)	5 month
Web system Development	Computer based prototype, group work and meetings, no digital recording	stationed in Oslo	4 (2)	Jan – Apr 2007	12 sessions
Presentation of Web Prototype (Design Focus Group)	Demo and discussion, digital recording (audio)	in Stavanger, both offices	7 (5)	Mar 2007	1 day

Table 4.3: Overview of participatory design (PD) activities that researchers engaged in during the project

The core of the *Socio-Technical Systems Design* (Mørch 2008) is product of the employees contribution and has been developed in collaboration with them. It was achieved by engaging them in workshops and address various issues in the meetings (i.e focus groups, interviews, presentations). We took the role as facilitators (Enid Mumford in (Schuler & Namioka 1993)) and therefore also selected the topics we found to be relevant in the process. For my research, the design activities and these forums for collaborations has served to produce primary data.

Data material collected from interviews, presentations, field notes, observations, meetings and other sources have served to ground claims along the way. Information attained from these activities has provided me background details and facilitated me when creating *scenarios* (Carroll 1995) and *design stories* (Stuedahl 2004). Moreover these activities served as forum to engage employees to explore ideas, discuss the issues and to reflect on outcome (Löwgren 1998, Löwgren & Stolterman 1998, Greenbaum & Kyng 1991). For instance interaction in those environments helped to bring forward employee's own understanding of their organization, and their perception of the changes that has occurred (Silverman 2005). This information is conveyed in *narrations* (Kvale 1997, Silverman 2005, Stuedahl 2004). I consider these narrations to generate information that has been helpful for me to link pieces of information about the Company and the web system they proposed to develop. Kvale elaborates these aspects (Kvale 1997):

> ...Omfattende forandringer i vår tids tenkemåte, som gjenspeiles i filosofien, betoner temaer som livsverdenen og dagligspråket, mening og innbyrdes forhold. Fortellinger og samtaler blir idag ansett som sentrale i arbeidet med å innhente kunnskap om den sosiale verdenen, innbefattet vitenskapelig kunnskap."
>
> ...den kvalitative forskningen innebærer alternative oppfatninger om sosial kunnskap: om mening, virkelighet og hva som er sant innen samfunnsvitenskapelig forskning. Det grunnleggende materialet er ikke lenger objektive data som skal kvantifiseres, men meningsfulle relasjoner som skal tolkes."
>
> ...I dagens forskning innhenter man ikke lenger kunnskap bare gjennom ytre observasjon og eksperimentell manipulasjon av menneskelige anliggender, men man fokuserer i stadig større grad på den forståelse som oppstår gjennom samtaler med de menneskene som skal forstås."
>
> *— Steinar Kvale, p.24-25, 2001*

It is challenging to restrain the boundaries for (what I call) 'pure traditional' systems design work in a project with multiple purposes, such as; to capture existing practices dealing with construction of knowledge, to develop an information system that will support process of sharing knowledge at a workplace, to apply state of the art technology to create web solutions, and to increase quality of communication to promote learning mechanism in the environment.

As described in chapter 2 on page 5, the project was conducted in collaboration among several participants, where the participants of the research-team represented different research fields. In addition to be able to work as a team in the project, each of us had individual research interests. Taking these factors into account, we decided to design a process that would provide data material for all involved researchers.

Before preparing the project plan, first we met to brainstorm about each researcher view point on their prospective needs in the fieldwork and methods appropriate to acquire the relevant data material. Through discussions we worked out a map of data that would serve our mutual interests, and a set of methods that would serve the purpose. We agreed to take advantage of cooperation in group work. It was decided to make joint efforts to carry out data collection process. In this way it would be beneficial for promoting collaboration, and at same time put lesser divergent pressure on Company's participants. Otherwise we ran the risk that employees would face repetition of similar questions and discuss same topic with several people. By incorporating as many as possible diverging field interest into common activities, it would also give us access to richer and wider prospects in the data material, and we would be able to take advantage of knowledge from the multi-disciplinary fields (Christina Allen in (Schuler & Namioka 1993) These clarifications helped us design the research project.

An important aspect to emphasis here is the information exchange we have practiced during joint activities. We (as facilitators in the process and researchers) have during the whole project also been engaged in parallel activities for internal assessment. We had frequent meetings, often on weekly basis. Some intended for planning the forthcoming activities and some for the purpose to summarizing

and reflecting on the experience from the field work. Agenda in these meetings were research related discussions and organization of activities. As example see Appendix D on page 124 for description of method and process from two such meeting. These events are exceptional as they are directly related to design process. For ease of understanding, I have labeled them ”prepare” in the activity title. See Tables: 4.3 on page 29, 4.4 on page 34, 4.5 on page 35.

Dysthe explains that *socio-cultural perspectives* are based on a constructivist view about learning. Knowledge is understood to be constructed through interaction among participants and it occurs in a context. Focus in this regard is not primarily on the individual processes, but on the context of social practices that stimulate the individual processes. Interaction and cooperation are looked up-on as fundamental elements necessary for learning. Learning is considered to occur in social settings. To be able to take part in social practices is considered a core component of learning.

Since my viewpoints for developing Participatory Design departed from a *Socio-Technical Systems* perspectives (Mørch 2008) I find that these methodologies as supplementary approaches to gather data that includes non-technical factors. And in this way it was feasible for me to make use of the collective data material. An example of an approach also combining several data material is described by Herrmann et. al (Herrmann, Kunau, Loser & Menold 2004).

As consequence, I can not exclude the theoretical impacts which are inherited from this joint process on collecting data material, since I use it for my analysis. With help of the diagram, see Figure 4.1 on page 26, I have made attempts to present an overview of the research approach. To emphasise the factor of heritage, I refer to the underlying methodologies in the boxes, i.e ’socio-cultural’ approach, which we used as guidance when generating questions to enquire about employees existing work practice. I consider this factor to be influential because of the latent implications it has on the sources I have used for analyses and the data I have extracted and drawn on.

4.4 Methods for Data Collection

A number of activities have been arranged during the project. Some of them were planned early during the planning stage. These activities functioned as milestones in the project. While other activities have been arranged in response to needs and circumstances at that stage. An Overview of activities is presented in following Tables 4.3 on page 29, 4.4 on the next page, 4.5 on page 35 and 4.2 on page 28.

The methods and techniques included in the research design were viable for customization of activities according to the situation at hand. They included the property of flexibility i.e to improvise. It allowed us to shape each activity according to each researcher need for information.

Some important project agreements had been settled early at start-up of the collaboration. That helped to regulate the scope of the engagement. Brief description of the agenda constituted for work we had undertaken is explained in following Chapters 2 on page 5 and 6 on page 71.

In addition to the methods presented in the Table 4.3 on page 29, I have also had access to some documents (i.e brochure, leaflets) and work diaries. These sources were produced for other purposes in Company. I have used them to supplement and to cross-check information. I considered it very useful to supplement information from these sources as these writings were produced for other purposes and in a different context. Therefore this material represented different views and perspectives on much of the same information that employees had mentioned for us.

To assure anonymity of the participants in the interviews and other meetings, I will not emphasize gender or position. Interviews has been carried out at Company's both offices, in the meeting room. Difference is that at the Stavanger-office we made audio and video recording, where as at the Oslo-office we only made audio-recordings. Workshops and Focus group meetings has been arranged sometimes at our office (UiO) and sometimes at Company's offices.

The interview guide was developed by three researchers. I had the responsibility

to construct questions concerning the IT use in the company. The interview guide was designed with socio-cultural perspective in mind. Questions we phrased with emphasise on employees work experience and we urged the employees to describe their work practice, their interaction with colleagues, social relations at the work, and their use of ICT. All interviews were conducted by two researchers. I have participated as interviewer in two of these, where as in one occasion we were three interviewers. See Appendix G on page 157.

With interviews we had the possibility to get the individual person's experiences. In this way each one had opportunity to express their personal opinion and their own way of working. For instance in question the interviewee was asked to chart their organization map as they understand it. Since there was no official organizational map of the hierarchy, each person sketched it differently. The semi-structured interview allowed us to ask questions relevant for the person's work

Activities to collect data (phase-I)		
Event	Purpose	Agenda
First Brainstorming	Get to know each other, narrow down on issues, envision future system, and settle plans for the process	User's requirements, ideas and suggestions for system, demand for integration of technology, requisite of commitment and participation.
Web technical solution	For systems development: decide tool for work, clarification of technical and functional attributes relevant for the process, acquire user's perception and demand for the solution. For design: involve users, collect user's perspectives and learn about the structure of information in the company.	Present results from evaluation of two technical tools, define functionality and use area, and discuss arrangements for further work.
Workshop about A usual day at office	Voice of various users, experience existing work environment, working relations and mechanisms for knowledge sharing.	Engage participants in open discussions.
Following an IT object	To let users show us where the shoe pinches, get experience on how users encounter obstacles in use of a specific IT system	Discuss about use of the specific IT system, and inquiry about it in various fora.

Table 4.4: Intentions and techniques implemented to establish user involvement in participatory design

tasks. In this way the interviewee was free to choose how much and what information (s)he wanted to tell us. Disadvantage is that we can not compare all interviews and map out statistical pattern. However by following the main question we were able to urge the interviewees to express their personal understanding on the topic.

4.5 Methods for Analysis and Design

My understanding is that best approach is to first decide what is to be analysed and for what purpose. This is helpful in the process of choosing the appropriate analyses method. Considering the rich collection of data material and remember-

Activities Scheduled for Design Work (phase-II)		
Event	Purpose	Agenda
Prepare Design Workshop	Express our understanding of the issues, and present users their suggested ideas for solution	Find a way to engage users and get feedback and concretize problem
Design Workshop	Benefit user from their participation into some purposeful /meaningful activity, to move further	Evaluate presented situation, discuss roles and suggest solution
Following an IT object	Understand the relation between work and knowledge sharing mechanism, observe the design process	Indirectly inquire about the development process
Prototype for Web	Develop design for envisioned web system, test the tool, and experiment integration of technology	Create a visible and concrete product
Prepare status meeting	Get feedback from users	Collaborative data analysing Workshop
Status meeting and Evaluation of Preliminary results	Present status of the project, ensure further involvement by users, get feedback	Discuss worst case scenario, present information given by users
Evaluation of Web prototype	Ensure perspectives from end users	Inquire feedback

Table 4.5: Intentions and techniques applied to obtain active user participation in Participatory Design

ing several of the employees references to examples from daily work events, it led me to focus on these type of data.

The analysis methods *Narrativ strukturering* and *Meningsgenerering gjennom ad hoc-metoder* , provided me the theoretical understanding that helped me find the intersection which helped me reached at intermediate understanding of the context. The *design stories* (Stuedahl 2004) provided the structure and tool which was helpful to explore the stories. This information material was then further reused in composition of *scenarios* (Carroll 1995), and especially in reconstructing the *Socio-Technical scenarios* (as explained by Mørch in an email to me on 11th January 2007).

In his book, Kvale (Kvale 1997, p. 123–126) presents five different types of qualitative analyses; ”Meningsfortetting, Meningskategorisering, Narrativ strukturering, Meningstolkning and Meningsgenerering gjennom ad hoc-metoder”. I translate the ”Narrativ strukturering” as *structuring the narratives* and ”Meningsgenerering gjennom ad hoc-metoder” as *generate meaning via ad hoc methods*.

Kvale [p. 131–133] explains that by structuring the narratives, a story is created. This analysis approach has the properties i.e to add new information, or develop the story further than what was originally told by the narrator. Important aspect to mark in this process that may lead to follow-up closely on a sub-topic of choice, to fill in the gaps (by adding information) or reconstructing a coherent story from several narrations. A story that is more rich, dense and flows smoothly. So the researcher needs to be aware of various roles (s)he takes on; from being a story explorer from an interview to become a story creator – one who is gluing together several narrations into one coherent story. I make use of these possibilities in favour of constructing understanding of the object system under design process.

In reference to Miles and Huberman (1994) who has discussed thirteen techniques such that generate meaning in qualitative texts, Kvale explains that by combining a set of ad hoc approached the researcher can reach to a condition of gaining a general impression of the interview. From which researcher can extract meaning and interpretations about specific phenomenas. This can help the researcher to reconstruct a coherent story (Kvale 1997, p. 135).

4.5.1 Design stories to glue pieces

Stories told by practitioners are small snapshots of the employees work. It narrates occurrence of a certain situation in the company that is told with the intention to exemplify the tensions e.g those introduced in Chapter 6 on page 71.

However, each story on its own does not prevail details that are necessary to capture its full essence. As first impression these narrations appears to be simple and straight forward descriptions of events. But, when studying them more closely and in context, it reveals there is much information which was trivial for the employees, while it needs further clarifications in order for us to understand things. Therefore it requires us to examine the issue that is brought forward in the story. Only by elaborating and describing the underlying details would it be possible to grasp its essence for us.

The question is, what should be done with the collection of narrations? Can such a collection be helpful in some way during the design work? How can we benefit from valuable information captured by the stories? I have chosen to approach this rich empirical data with the concept of *Design Story* as a design technique. With help of ”design stories” I intended to put pieces of empirical data together so it can be possible to draw a picture of the whole story at hand – the story about the employee’s existing work practice and their expression of need for learning and communication processes in Company. My attempt is to show how we can use this kind of empiricism by departing from these narrations, and at same time expose those elements /aspects which are present but not obvious. In other words, the intention is to make use of *Design Stories* as tool analysis during the design process.

Four design stories has been developed in context to our work, thus notice these has been designed to different /varying extent. The stories are presented in a separate chapter as attachments to this thesis. See Appendix E on page 137.

With this I understand design stories to be stories that are enriched with thick descriptions written by designer. Such descriptions prescribes the context of situation for narration, offers an interpretation of the message in story, offers the

designer's understanding of the domain and observations explicit. It is in this way design stories can help to construct a new story – that is coherent, flows and the fill out the gaps.

Composition of design story

A design story is built around some specific narration given by the employees to the researcher. This provides background information about who is telling, in what context this narration occurred, and the setting of the situation when it was told. Then I present my interpretation of the content by retelling the narration in my own words. This helped me to sort out elements that I found significant, which also turned my focus towards key points that have been emphasized by the narrator. I categorized these elements into two main chunks; one emphasizing the social aspects *From a socio-cultural perspective*, and second chunk presenting elements that has implications for development of an technical solution *From a system developer's point of view*. Another aspect present in the Design Story is the organizational and historical developments that had effect on the narrated situation. This provides rationale and setting of the event that had been described by the employee. Information presented in the Design Story was then arranged into prioritized list of goals, targets and activities. This list helped to extract an overview of intention, purpose and agenda as I interpreted the practitioners who has provided me the information. For some of the design stories, two additional information sources are referred to. (1) *Technical aspects*, which bring in ideas for very common and well known technical solutions that are worth considering when searching for systems design to fulfill the need (2) *Theoretical aspects*, which provides reference to similar cases, or research results that are relevant for the issue. It can be theoretical concepts that help us understand and explain phenomenas, or it can be studies of ICT application that we can gain benefit from; the rationale behind it and as reference case.

Each of the design stories are described by supplementing the specific narration with information about underlying contextual factors. That information is extracted from other information sources; something that we have come to learn

about during other activities that we had in collaboration with the employees. These contextual information is necessary in order to put tings in correlation, and this has shown to be helpful to develop understanding of the perspective presented by the narrator of a story. Mostly these additional information provides background information.

Application of design story

A Design story, as developed in this case, consists of several layers of information (Stuedahl 2004). It refer to an employee's description of his/her work experience, and provides background information on circumstances for occurrence of the narration. It gives space for interpretation of the content for my purpose. In this way I can assemble /adhere related information from additional sources. It is helpful to show how I interlink the information; by summarizing the main points, reflect up on relevant technology in use, refer to external information or experience dealing with related phenomenas.

Design stories can be utilized:

- To work out scenarios for design purpose
- Used for analysis purpose as it provides overview of domain
- Help to extract abstraction on complexity in information
- Collection of domain related true stories that can be helpful for various design and systems development purposes

4.5.2 Scenarios to visualize future use

On basis of empirical data, we have designed two different set of scenarios that were applied in conjunction of two different kind of purposes;

i *Socio-Technical Systems Scenarios*. It was intended as instrument towards developing the system design, and was introduced to set the stage for the employees in a future workshop. Story in the scenario predicted sequence

of actions in a work process at Company. It was text based scenario that explicated micro details.

ii *Scenarios to reveal design implications*. It was created to inquire and reconfirm the design that had been developed by the employees. It conveyed my understanding of the information flow that was depicted in the design which was developed at the design workshop. The scenarios was presented with help of pictures portraying rich descriptions. Results and discussion was presented at a meeting intended for feedback from Company.

Socio-technical systems scenario

A series of four design scenarios were developed, see Chapter 6 on page 71, Scenarios 1–4 on pages 98–99. They were intended as instruments to trigger participant's engagement and to give them a starting point when designing new information system. These scenarios were related to activities that occurred when a customer contacts someone in the company and issues a request to help him solve a problem.

The scenario was designed on basis of three ingredients; a suitable narration previously told by the employees, that story was modified and incorporated other problems experienced by employees and their ideas about new system to handle the dilemmas, all this information was extracted from collected empirical data. Additionally we made some adjustments on the technological infrastructure that would follow when implementing those ideas.

The overall storyline in the scenarios represent a similar event from the employees work practice. We had modified that story by embedding few other small stories and the technical changes that had been suggested by the employees. Our understanding is that employees knows their need best, therefore they had emphasized on tings that they perceived to be important. It would therefore be good experiment to present them [the practitioners] a preview of their own ideas. The improvements which they had expressed to be good solutions. In this regard, the activities carried out in the organization, the communication infrastructure used in

the process and the flow of information in these situations were necessary factors to look into.

Socio-technical scenarios in KIKK

At time of writing scenarios that were to be used in the design workshop, we had a wide specter of perspectives to focus on. That is because, during the process of inquiry, as shown with the list of tensions and possible solutions in Table 6.3 on page 82 and 6.4 on page 83, employees had brought forward several issues that were linked together. An immediate solution was to compose scenarios based up on the reasoning and clarifications presented by employees as major strategic challenge for the organization; namely, how to acquire the knowledge that is with each employee and which therefore makes the organization vulnerable and strongly dependent of individuals in the company? In this process we called together both research teams for collective analysis of the information at hand and to decide direction of discourse. This process is briefly summarized as part of method described as 'preparation of design workshop' (see Appendix D on page 124).

Constraints The intention was to create templates of generic scenarios intended to be developed further by employees attending the design workshop. For that reason, following constraints were outlined for composition of the scenarios (Mørch, A. I. ,Email, 09. 01. 2006):

- Socio-Technical scenarios and not technical scenarios,
- the content must be referring to any 'tentative' usual day at office for various actors,
- the scenarios ought to display the way an information system is to be used in order to achieve a goal,
- the action has to bee viewed from a person's perspective
- the actor should accomplish something in the discourse of a scenario (e.g carried out some activity, found information, exchanged information with a persons, received response on an inquiry etc.)

- examples on a person's perspective might be; a customer, the management, a developer, a consultant, a mentor, a secretary etc.

An emphasize was given to construct scenario that shows a customer's involvement. The scenario's story was decided to evolve on perspectives related to such concerns. The reason was because of Company's much emphasis on arguments that were coupling CRM (customer relational management system) application with the web portal (the content management system CMS).

Selection of Stories With help of textual scenarios a tentative future-oriented work process was simulated. From the data material I had a collection of employee's examples on their work practice. I selected narratives by employees who explained their perspective and involvement in the customer-support services. I adopted the story and in additionally applied amendments by following the suggestions given by the narrator of the story. The collection of stories provided me four perspectives: 1) how a customer should submit an inquiry, 2) how the inquiry should be received in the company, 3) how an employee should act up on a certain type of enquiry, and 4) the service and response that a customer should expect. The scenario was built successively and took form little by little. I arranged the stories accordingly to the sequence as it was described to be in the current practice. This created a number of work activities organized into a "chain of tasks" (Gasser 1986) to resemble a future situation at the work place.

The design activities we had arranged in prior to this point, contributed as platforms to meet the employees and learn about their view points. See list 2.3.1 on page 11 and table 4.3 on page 29. Those forums had helped in the process to bring forward information which illustrated the employee's perception of their work and the practitioner's role at the work. I used that information (i.e descriptions) to adopt the role of an employee and pre-viewed the simulated work process from the concerned actors' perspective.

In this approach, I combined the factual information given in the narratives with my observations and analysis. This process can be decomposed into following sub-parts:

1. simulate the work tasks and roles attached to different work
2. put pieces of information together in a certain order
3. in the process which presents/describes the glued work tasks, depicts organization of work and relates different parts of pieces to each other.
4. show role of technology in the process of linking and relating different stand alone/ interlinked tasks
5. scenarios as stimulation for discussion, bring forward conflicts and gaps
6. simplification of the real word, not to bring in hypothetical events
7. should give an overview of key issues/tasks

Reveal design implications

The researchers team undertook a joint analysis work. We arranged two workshops to collectively look at the empirical data and to analyse the results we had gained this far. The outcome would be presented for the employees in an status meeting for the project. The meeting was called up on initiation from the company. At that time the development of prototype for the web had initiated activities that inquired the employees about specific design solutions to functionality in the web. In relation to this, the practitioners eager to know our research results which might helpful to inform the design. This meeting was arranged in response to that request.

Intention with the meeting was to present the understanding we had reached so far, to get feedback in response to it, and to call together all participants for coordination of further work. Thus our goal was to attain reactions and reflection on work which we presented and in addition to fill out the gap of missing information about ongoing design processes in the company. With this we hoped to give some results back to the company and at same time get quality insurance on the understanding we were building about the company. We therefore approached the employees by presenting them the current status of the work and to inform them about results based on analysing the design work that had been developed so far.

In this forum I brought forward aspects that I found to create *discrepancy* in the design. Two scenarios were developed to present my analysis. See Chapter 6 on page 71, Section 6.3.3 on page 103.

Chapter 5

Literature on Systems Design

My perspective on development of systems design is grounded in theoretical discussion. In this chapter I present the leading thoughts providing the main guidelines related to design work. First I bring forward theoretical view points in support of user-centered systems development, which helps to define the concept of systems design, involvement of users, and concerns which has influence on the process of design. Then I turn the focus on three selected design techniques; scenario, narrative and design story. In last section I summarize the relevance of these theoretical perspective for my field work.

5.1 Information System Development

Research in systems development field focusing on reasons for performance failure or poor implementation process of many large system development projects has led to generate methods and techniques to improve the development approaches. In this relation a shift of thought has been established and it has become very common to involve employees in the process of developing information systems (Mathiassen, Munk-Madsen, Nielsen & Stage 2000, Moran & Carroll 1996). In the past, tradition was to base the development work up on specifications for requirements and functional solutions.

Devlin and Rosenberg (1996) describes the scenario of companies that introduces new computer systems to improve the information management, to make things better and efficient. Instead their new computer systems often turns out to cause chaos, for instance by providing information which can be of wrong kind, presented in wrong form, generated at wrong time, delivered to wrong recipient, or too much production of information for anyone to be able to use it. This can become reason for new kind of problems which did not exist with the old way of doing things. "Things which used to be simple request for information to one person over the phone becomes a tortuous battle with a seemingly uncooperative computer system that can take hours or even days, eventually drawing in a whole team of people" .

When the information system involves the processes for information exchange at the workplace, there is need for someone from inside to translate the code of conduct. This is necessary because an outsider can detect the visible and physical flow of the process, while the underlying rules, the small mechanism of communication and the shared understanding of culture needs to be expressed This is considered to be of importance as the information exchange process often involves the human participants at the workplace (Devlin & Rosenberg 1996) and the exchange process represents activities carried out in that context. The aim of studying information system often has intention to develop an improved system for information management. The computer based information systems are in that case supposed to facilitate in this process of information exchange (Kaptelinin & Nardi 2006).

Sperber (1995) summarizes this as "All human communication, linguistic or non-linguistic, is essentially inferential. Whether we give evidence of our thoughts by picking berries, by mimicry, by speaking, or by writing ... we rely first and foremost on our audience's ability to infer our meaning" . A translator from the inside (of the information exchange process) will contribute to reduce, or at best minimize the risk attached to wrong kind of inference of an information exchange process. This is the basic assumption in user-centered system development approached (Schuler & Namioka 1993, Greenbaum & Kyng 1991). Butler and Fitzgerald (1997) discusses the role of such translator (called user participation),

which can be of various type or degree of involvement. This I relate to the various aspects that a translator or an insider represents. In literature they are referred with varying names such as; informant, user, or participant, since it all depends on the context of situation. In KIKK we refer to all participants as “employees”, and only in the context when they carry out a specific role, there they are referred by the relevant term e.g coordinator, gatekeeper etc.

According to Pekkola et. al (2006) in the process of developing information system, it requires a vast set of requirements of the surroundings and the environment in which this system will be implemented into. These requirements can consists of information from various aspects such as the organizational structure, procedures for daily routines, the communication pattern and the channel used for exchange of interactions, the specific technical issues for the context, to involve political, cultural and personal issues. The process of gathering requirements and needs of users for the system development is considered to be essential and have an important effect on accomplishment of success (Hofmann & Lehner 2001) importance of requirement collection and the involvement of the informants at the workplace.

From this I understand that when bringing a computer system into an organization or a work place, people involved in the process have to make priorities and decisions on their way to final solution. The development process can therefore be viewed as a ’chain and tasks’ (Gasser 1986). Additionally, its important to be aware of that system development process is not a rigid straight forward procedure. Therefor several approaches can be applied before one reaches the goal of implementing a working and accepted version of the computer system.

5.2 The Design Concept

Design can be understood very broadly and covers a wide range of activities. It is a very general concept which is defined differently in many fields; art, composition of material, strategic planning in organization or politics, industrial product development etc. (Stuedahl 2004, p. 55). In my work, the concept of design is related to the field of information systems development. In this context, design is

associated with transforming issues (i.e ideas, thoughts or visions) into computer technology & software related *product* (i.e software, hardware, functionality or equipment) (Löwgren & Stolterman 1998, p. 1) . This "product" might also be an additional small detail or function to some existing information system, it can be work of altering and customizing a "product" or it can be a new invention.

5.2.1 How to understand design?

When working with a physical material the laws for behavior of that material governs the rules for working on it. In similar manners development of information systems is also grounded in rules functioning in same way. Development of information systems are bound by laws of *material* which constitute the system; in this case "material" consists of ICT and the environment where the system will be applied. The environment for an information system that is intended for activities at some workplace, will therefore also include context of use and the users of the system as important elements in it (Bratteteig, Wagner, Moertberg, Stuedahl, Blevis, Liestoel, Morrison, Sevaldson, Joan Greenbaum, Jevnaker & Knutslien 2007).

For example information system intended for a truck driver will have different properties than from a system implemented in an office space. Difference lies in situation for use, a driver who might use the system while driving on a highway contra to an officer using it at her desk. Design in such case will be the activity that takes these differences into account. During the design work variations in situation and expected behavior of system can be examined. This provide developers flexibility to experiment and follow-up on many different or challenging questions within the final decisions are made. This flexibility lies in possibilities as described with this proverb "It is better to travel hopefully than to arrive". Meaning that focus is on details related to the intended "product" 's area of application; its limits, operation, usability, performance or any other properties that can be clarified or improved before the expensive operation of hard coding the system.

5.2.2 What to design?

Use of technology in organizational setting has evolved over the time and thereby people gained knowledge and perspectives up on technology use. This shift of orientation came as consequence of more and more common use of computer technology in many work professions. Practice at work was no longer regarded as simple as to be captured completely only by using functional and requirement specifications, at time used by technical experts to find right solutions Researchers considered these techniques provided knowledge about the work as formalized and standardized processes but did not bring in social relations or the real users interests. Several large scale projects during late 1970's and early 1980's had been carried out, intended as to increase workers possibility to acquire new skills as part of the system development processes.

In Scandinavian countries it has due to strong worker's union been a tradition to involve employees into activities which concern employees work situation. This practice had also evolved to concern strategic ICT investments and as part of processes of implementing information systems at work places — having strong emphasis on workplace democracy(Bjerknes & Bratteteig 1995, Bratteteig 2003).

5.3 Design Perspectives

A wide range of considerations are brought into process of designing and design work is related to wide number of properties (Cross, Christiaans & Dorst 1996, Moran & Carroll 1996, Bruce & Jevnaker 1997, Lawson 2006). The concerns are related to physical appearance, the designed objects interaction with other elements (thing or human) in the environment, the internal structure or the implications on system. Based on the span of theoretical discussions on design activities, I have organized the various aspects into five 'design perspectives'. In each perspective I summarize my understanding of the theory. My perspective is related to the concern of social and technical influences.

1. *Problem solving and simulation* Design as a medium to carry out software

development work and as act of problem solving

2. *Work of creativity* Design as process for shaping, discovering and expressing needs and visions

3. *Participation from system users* Design as process for involving users and learning

4. *Choices, trade-offs and rationale* Design as process ofc exploring ideas and locating solutions

5. *Social and technical concerns* Design as a product of social and technical concerns about the artifact that is used in the environment.

5.3.1 Design as problem solving and simulation

In comparison with the science for nature, Simon defines the act of designing for being artificial. For him design is about giving shape to a solution. He describes design to be concerned with *"how a thing ought to be"* in contrast to natural science, which he claims, describes *"how things are"*. In this way he show the basic distinction of the way yo work with design is approached (Simon 1996, ch. 1).

Reference knowledge

Simon understands design to be work of knowledge. Because it is the available references and insight into issue which enables people to design. As example he sketches the way a taxi driver will find the route in a city he is familiar. It is only possible due to the extensive memory of map on crossings this person has of the city. For finding the route he has to design a route to follow. This design is effected by the driver's experience with combining the information he can extract from his memory and apply it to the situation he is part of.

Threads in complexity

Design can be carried out in many ways. Design of some complex system is possible and gives best results if the complexity is decomposed into sub-systems. In some situations it can also be necessary to break up the system into smaller units which can be independent of other parts and therefore be designed as individual parts. Design means following leads and to follow the idea for as far as it gives meaning. Some ideas might meet dead end early in the design process, other leads might be taken further. One way of solving complex systems can be to follow such leads and by this evolve the design work. For organizations the economical resources may set the time frame for design work. Therefore in many circumstances this factor might be the selection criteria for which design work is to be pursued.

Resolve concerns

Lawson explains that since designers works as 'futurologists' and their work is concerned with future oriented creations, they [designers] often get cornered with "at least two ways of being unpopular"; one because of people reacting on the design for it *being new* or secondly for *misjudging the future* and hence ending up with wrong design (Lawson 2006). He further refers to examples of rapid changes occurring in the society and many new relations caused by the computer technology. While discussing various aspects on these issues, he says "All of this makes life even more difficult for the designer who now has not just got uncertainties about the design but is even unsure of the nature of the world into which it must fit". He further explores these issues and shows how designer's work is tightly interlinked with multiple set of constraints (internal and external), to take on investigation roles, make subjective interpretations and several other factors which has impact. In Simon words, "...more generally the designer, is concerned with how things ought to be - how they ought to be in order to attain goals and to function" (Lawson 2006, p. 4).

Simon considers administration, organizations, economics, engineering, medicine,

business, architecture and painting to be fields of professions "concerned with rational behavior". This behavior he regards to be occupied with "thinking, problem solving and learning" as the main properties of their behavior. He argues their empirical and theoretical field does not behave as *natural science* despite these professions are based up on knowledge from natural sciences as their supporting science. He looks at these fields to be concerned about possibilities, to behave accordingly to necessity in the environment and to react up-on requirements set by the circumstances.

5.3.2 Design as work of creativity

The concept of design in general is related to the property of being creative and bring forward some fresh views. This process is theoretically presented to revolve around many various qualities. In sum design is explained to be creative work in the sense when; creating experience; playing with the estethics, provides entertainment; offering different feel and touch, visual effects attracting the viewer, have appearance that appeal to receiver's psychological mind, stands out to express a message (directly or indirectly), selecting a style, with intention is utilized to define your position (Lawson 2006, Ehn 1988, Greenbaum & Kyng 1991, Schuler & Namioka 1993). So technically it can be understood to be about finding a short cut to achieve the goal and to serve the purpose.

An additional perspective on creativity is brought in the discussion of learning during the design process. Since understanding and learning can be achieved by applying various techniques, this process is regarded to be creative journey. Because the process to obtain shared vision engage the participants in the learning activities which demand to formulate learning objects. Because the formation of design is believed to be influenced by the participants understanding of the phenomena (the object system). Designing (design process) is thus considered to be work of creativity (Stuedahl 2004) and knowledge (Simon 1996, Bratteteig 1997) enhancement.

5.3.3 Design with participation from system users

Participatory design as methodology

Participatory Design (PD) is a merging point for several researchers historical efforts towards bringing workers voice into development of computer solutions (Schuler & Namioka 1993). The research methodology is design oriented approach into systems development process and contributes with knowledge, choices, requirements, interest and preferences of actual (and thereby also potential) users of the system.

Design is very often understood to be carried out prior to construction of technical specifications for system development. However if a nonlinear, for instance if an iterative, system development method is applied, then it can be conducted as an parallel activity following the progress of system development. The Participatory Design methodology is explained to be concerned with:

- Focus on design activities as part of system development work
- Solution developed with involvement of users
- To encapsulate needs and perspectives of the users
- Feedback from users as important process. Quick response and feedback from practitioners contributes to development of design that will meet their needs
- Technology to equip workers and to promote their learning possibilities
- Based up on concept of democracy at work place

Categories of user participation:

It is recommended to differentiate between people and the role they play when participating in the design or system development process. The general term “user” can be difficult to mark distinction between the participants and thereby blur their interest. Specification of the role people hold i.e manager, intended user, or all

people that are using computers, contribute to clarify their position in the process or relative to the future system.

> "Previous research indicates that user participation takes many forms from formal to informal, direct to indirect, and strong to weak. For example, Mumford (1979) suggests that there are three types of participation consultative, representative and consensual. Ives and Olson, on the other hand, argue that there are several degrees of participation, ranging from no participation at all, to symbolic participation, participation by weak control, participation by doing, and participation by strong control."
>
> *— Tom Butler and Brian Fitzgerald (1997)*

Learning for participants:

Participation by users in development process is understood to provide engagement from users, and this way hopefully be factor to attain attachment and sense of ownership by participants. In additionally, much literature brings forward the effect as exchange of knowledge and achieve learning processes.

"Learning is an important part of Participatory Design (PD)" (Bratteteig 1997, p. 1). Since the systems developer and the user of system, they all contribute in the design process, learning is expected to occur for participants. Participants can obtain mutual understanding and shared vision by sharing knowledge.

It is commonly advocated in the PD literature that the best way for systems developers to understand the domain of problem, is by involving system users into systems development process as early as possible. In this way systems developers will have better opportunity to increase (ensure) the quality of system as they can develop a system that match up to the user's needs as close as possible. The practitioners are viewed to hold best knowledge of their domain. Their insight will contribute systems developers to learn about the environment her system is intended for and help to developed the future system according to the actual use practice. (Schuler & Namioka 1993, Greenbaum & Kyng 1991)

5.3.4 Design as choices, trade offs and rationale

Design is iterative process, however trade-offs and choices along the road caves the path forward. Not all design gives best solution, several ideas must be pursued to get preview of possible solution and thereby find solution that is sufficient enough for the purpose.

According to Kyng, projects with PD are concerned with questions that are focused up-on in cases like:

- which techniques and tools are effective for users and for user– designer cooperation in PD (in what stage of a project, in what setting, for what kind of contribution)
- the development of specific techniques and tools
- ways in which designers support the use of such techniques and tools

Bettina Törpel's provides analyses on this debate and attaches following concerns to be addressed over the time "..But PD is not only about multiple voices and their inclusion in design - but also has multiple voices: PD approaches and efforts, their proponents, their assumptions, their design focus etc. are diverse." (Törpel 2005, Törpel 2006).

Organization of process for product development has traditionally been based up on technological standpoint and therefore activities related to the production has been organized thereafter - by focusing on the technology. Donald Norman advocates the importance of bringing user experience into account early in the product development process. By explaining the role and function of various sections attached to a product in production chain (from development of concept, quality checking and till it is sold to purchaser), Norman refers to the constraints, requirements, considerations, choices and decisions that can come into conflict between subdivisions of a company; e.g. sales, marketing, engineering, quality control section. Norman explains it all comes due to their various perception and understanding of buyer of the product. Therefore he states trade offs are important to make during the development phase (Norman 1998, p. 211).

These arguments are based up on his reasoning explained with following word:

> ...have all the affected parties participate together in the development process. ...The moral is simple: Don't test it in, design it in. This occurs when each of the experts in the many different disciplines that are relevant to the end product have a say throughout the entire process of product development, from conception to final delivery.
>
> ...Who does own the development process? Who should make these decisions? if there is anyone in charge of the product development process, it is those involved with the business side of the company, often the product manager.
>
> — by Donald A. Norman (1998, The invisible computer [p. 212 & 218])

In other words, since it is costly to make changes after a product has been constructed, it is useful to bring in the diversity of understanding and knowledge during the process of development and not after the product is finished. That is argued from the economical viewpoint, because manufacturing cost, and other products can be made to become dependent of the product that is being designed, thus increasing the cost attached to its production.

5.3.5 Design as social and technical concerns

Dependency as a factor

Historically the term *Socio-Technical* originates from era of industrial transition from manual machinery based labor into organization of work with advanced technical tools and techniques, e.g electronic hardware to control the equipments in the work processes . Researchers at Tavistock Institute of Human Relation launched the term *Socio-Technical system* . It addressed the changes in the industry and pointed out factors that contributed to organize the work structure. They brought forward *dependency* as central factor; both among people through their engagement in work role and the tools which each of them used to complete their work. This is supported by results from two studies; one by Trist et. al in 1963 on mechanization of work in coalmines, and the second about textile industry introducing semi-automatic machines for weaving by Rice in 1958

Work systems vs. the Individual

According to Eason , the early understanding of Socio-Technical systems theory was concerned with ”work systems” for people working together daily and meeting face-to-face, who knew each other and carried out their work jointly, and technology was used to help them attend to their tasks. In an article explaining the diversity of practice within Participatory Design, Bettina Törpel explains *Socio-Technical Approach* was carried out as help towards improving the organization of work, in similar manner as therapeutae do ”... scholars specializing in work improvement help - or heal - the workplace by means of their particular expertise ...”. She further explains the research was designed to address whole unit of workplace and did not take into account the individual people in the unit. So the term *Socio-Technical systems* was introduced to refers to structure of these local workplace units (Törpel 2005).

Technology to mediate in social relations

The term Socio-Technical systems was extended with new context by Enid Mumford in 1987. Eason gives credits to extension by referring to her work and introduction of a user-centered design process named ETHICS.

In her studies Mumford had discovered people perceived computer systems as threat to freedom. The pervasive use of business applications provided possibilities for control and monitor of the workers activities . Referring to his own studies conducted year 1996 and 2005, Eason provides his findings about the use of application systems; leading towards unexpected organizational consequences, failure in usage or minimal use of system, and that people found new ways to work with the systems. He refers to example of medical staff using the information system in a hospital, which in practice contained mostly administrative information and leaving out the clinical information because staff was cautious about keeping it under own control. Referring to present-day application of the term Socio-Technical systems on to virtual communities, Eason argues that “The term Socio-Technical is a good description of the virtual communities we are now

forming - they are social systems in which the communication between people are mediated by technical systems."

Individual, organizational and technical nterplay

Eason recommends to design systems that take into account the way people can retain in control of the information so they have trust and confidence in using the system. He proposes to give attention to issues related to access of information; "who can do what with the system, what degree of local flexibility is possible and how the system can be changed as the organization evolves". For the design purposes he (referring to work by Cherns 1979, 1987 and Clegg 2000) suggests to integrate the technical design elements along with gradual changes that occur in the organization as response to the development process.

> "Although proponents of the Socio-Technical Approach acknowledge that conflict, struggle and power on levels beyond the local organization can be relevant, research and practice activities within the approach have continued to be geared toward local organizational phenomena [p. 33 & p. 70]. The aim is for social and technical systems to be locally optimized within a specific organization, especially in their interplay, and in ways that are beneficial for the workers/employees, e. g. in terms of work satisfaction and working conditions. Local conflicts and obstructions are mainly resolved by local structural change."
>
> — by Ken Eason (sociotechnical workshop, 2008)

Adopting theory-based design perspective towards Socio-Technical system, Mørch brings forward example of interior designers and architectures and show how the socio and technical factors in interplay leads to creative work (Mørch 2008). Departing the discussion from Human Computer Interaction HCI, Computer supported cooperative work (CSCW) and computer supported collaborative learning (CSCL) concepts, Mørch brings the focus to socio-technical systems. Building on the argument that Socio-Technical systems provides access to study workplace activity, to people's social relations, the technology people adapt and use to interaction in the system, all these things in combination provides correlation between social and technical components.

> "Appropriation is the adoption of idea from the source domain into the target domain, and translation is the step-by-step work to "move" an object through the space, from the inception of an abstract object in the theory domain to a concrete instantiation in the technical domain in the form of interaction design"
>
> — by Anders Mørch (sociotechnical workshop, 2008)

5.4 Design Techniques

Techniques and methods from many fields has been applied in Participatory Design approach. In order to suit them for the PD concept modifications has been added and invented new ways of utilization. Thus making them field tools that have been applied in non-laboratory projects, and which has been influenced by experimental and interventional approached case studies. Such these techniques are characterized as "hands-on" activities developed on the principle of "design-by-doing" concept (Ehn 1988). I have summarized them into following two tables: PD table with successful techniques, see Table 5.1 on the following page, and a listing of PD techniques that has not shown results, see Table 5.2 on page 61.

In process for developing design there is need for techniques and methods that can facilitate in making the design explicit. Because only than is it available for collaboration among stakeholders. In KIKK project we have applied multiple design techniques; workshops, focus groups, brainstorming etc. Here I present theoretical discussion on techniques that I have applied in my field work, which is development of design with following three design techniques:

1. Scenarios
2. Stories, Narratives
3. Design Stories

Table 5.1: Commonly used Participatory Design methods

Brief Overview PD Techniques and Tools	
Technique or Tool	**Reference to source**
CARD	Muller et. al 1995
Computer-based techniques and tools	SIMULATION of Simula 67 (Nygaard et. al 1971) and SIMSET (Grønbæk et.al 1991 and Madsen et.al 1993
Design in use	Henderson and Kyng 1991
Ethnographic techniques	Blomberg, Giacomi, Mosher and Swenton-Wall [ref PD book 1993]
Future workshop techniques	supplementing the goal based techniques Jungk and Müller 1987, and Kyng 1989
Mock-ups	Pelle Ehn and Morten Kyng (1984)on artefacts being built, later in 1994 also for ”use situation” and breakdowns
Organizational Games	Ehn and Sjögren 1991
Organizational tool kit	Bødker m.fl 1987
Prototype	
PICTIVE	Muller 1991
Role playing	
Representational artifacts	Kyng 1994, Suchman 1995
Pair; Work situation and Use scenario	Kyng 1994
Scenarios	Ed. Carroll et. al [ref. book scenario-based design 1995]
Storyboard	
Storyboard prototyping techniques	by Adnriole 1989, Madsen and Aiken 1993
True Stories	
Use in design	
Workplace visit	Kyng 1989

Table 5.2: PD projects reporting techniques that have not been successful (Kyng 1996, p. 26)

PD techniques and tools not successful as intended	
Technique or Tool	**Reference to source**
System Description for Users	system description techniques and tools by Kyng and Mathiassen 1982
Goal based	techniques based on the derivation of demands for changes based on goal by Kyng and Mathiassen 1982
computer-based techniques and tools	Bødker and Grønbæk, 1989, 1991, Kyng 1993,1994.
user-proxy	Hughes, Randall and Shapiro 1993 and Kyng 1995

5.4.1 Scenarios

To overcome design problems when predicting how a system might behave when it is put into the environment it is intended for, it can be helpful to learn and interpret significance of systems behavior in advance. The concept of looking into the ”imitated system” that simulate behavior of some phenomena has similar resemblance as with *scenarios*. Scenarios can be constructed as to prevail existence of some problem, or it can be oriented towards future solution of the problem.

Briefly, the use of Scenarios is known to be:

- useful tool to present design at very early stage
- commonly regarded as technique used to simulate the envisioned system
- possibility to view the behavior of a system onto the environment
- can be presented as text, story board or with other suitable means

Computer systems and applications are understood as ”cultural artifacts” (Carroll 1995, p. 1). Artifacts which people make use of to carry out their tasks, and which therefore also facilitate people when they participate in social relations. These activities are perceived as complex human activities that can not be specified in all its details, and therefore also difficult to be prescribed for systems development purpose; to understand how people will make use of a system when its brought

into use.

In user-oriented approach for development of systems, it is necessary to have methods that can give impression of possible use and its effect. In design process a possible approach can be development of *user-interaction scenario*. Scenario that may show picture of potential use; the integration of users and the artifacts.

> . . . user-interaction scenario, a narrative description of what people do and experience as they try to make use of computer systems and applications. Computer systems and applications can be and should be viewed as transformations of user tasks and their supporting social practices.
>
> — by John M. Carroll (Scenario-Based Design, 1995, p. 3).

The *user-interaction scenario* is a perspective that by narrating the situation can provide the description of people in use situations. In this manner the involved participants (practitioners, users and other stakeholder) can make ”rich” and appropriate image of usage, and by virtue of this it will give them possibility to perceive the effects of the envisioned computer system. Carroll proposes the use of scenario as technique to be suitable for ”representing, analyzing, and planning how a computer system might impact its users’ activities and experiences.” (Carroll 1995, p. 3). Supporting this idea, also Hohman emphasis the use of scenarios make the design of a system visible for the environment is to present it in future perfect thinking. With *scenarios* a textual design is generated of the phenomena (Hohmann 1997).

The book ”Scenario based design” presents thirteen chapters with research contribution from various researchers. All with focus on scenarios as method for design purpose. It comprises of theoretical views that are reporting on application of scenarios at different stages and for a variety of purposes throughout the systems development life-cycle. Robert L. Mack summarizes these contributions in a discussion and says: . . .

> ”Most broadly, scenarios are intended to express an understanding of the intended users’ tasks and needs to a sufficient level to guide design of new software, which enables those tasks to be completed using that software with greater facility than can be done with existing software or work practice.”

— by Robert L. Mack (Scenario-Based Design, 1995, p. 362).

Content in scenarios

Scenarios are generally understood to be textual design of some phenomena. Carroll explains that scenarios can also be in other form than of textual narratives, e.g storyboards of annotated cartoon panels, video makeups, scripted prototypes, or physical situations contrived to support certain user activities. ”Scenarios also can be couched at many different levels of description and many grains of detail” . This is further explained “scenarios can have varying levels of generality and completeness” [by Robert L. Mack in (Carroll 1995, p. 362).

> ”The defining property of a scenario is that it projects a concrete description of activity that the user engages in when performing a specific task, a description sufficiently detailed so that design implications can be inferred and reasoned about.”
>
> — by John M. Carroll (Scenario-Based Design book, 1995, p.3–4).

Role and types of scenarios

Summarizing the cases presented in the book ”Scenario-based design”, Mack gives overview of the various practitioners perspective on the role of scenarios in the design and development of software technology. Scenario is a familiar technique used for design purposes. The appearing distinction is attached to the strong position that are assigned to scenarios. Researchers has emphasized on scenarios significance for the work related to design and development activities. He says that experience and outcome presented in the research cases testifies the impact of scenarios. However the role played by scenarios is not static and it varies accordingly to its use. Role assigned to scenarios depends up on when they are applied during the design process, and how they are used. Because scenarios are formed differently for the various stages. [Mack on p:361-365 in (Carroll 1995)]

Carroll presents an arrangement of scenarios into categories that corresponds to phases in system development life-cycle; Requirement Analysis, User-Designer

Communication, Design Rationale, Environment, Software design, Implementation, Documentation and Training, Evaluation, Abstraction, Team building. (Carroll 1995)[p:7] This taxonomy gives orientation on various modes of scenario use in research cases that are presented in the book. [Mack on p:362 in (Carroll 1995)]

As an example of variation of use and impact of scenario as technique for the work, Mack draws parallel to practice from other fields and explains;

> ”In usability engineering practice, scenarios of use are used to help set overall design objectives, especially usability objectives, and for guiding various aspects of design and the evaluation of design implementations.”
>
> — by Robert L. Mack (Scenario-Based Design, 1995, p. 362).

5.4.2 Stories and narratives

Stories

In article ”Narratives in mathematics teacher education” Olive Chapman advocated for use of stories and narratives as pedagogical instruments for teachers learning. In his argumentation he refers to previous work by peers within the field of learning i.e Schön (1983), Carter (1993) and many more all emphasizing on the teacher's experience and learning is closely attached to stories. A teacher's knowledge is explained to be structured around events since they acquire knowledge from actions in situations. Because of this ability with teachers, Chapman and his fellow suggests stories can be considered as relevant approach to get access to teachers knowledge (Chapman 2008). Reporting on mechanism triggering the employees learning process, the authors bring forward several of small incidences at the workplace in a Norwegian service company which also shows connection between stories relation for work processes in daily work (Mørch et al. 2004).

Narrative intelligence

> ”By telling stories we make sense of the world. We order its events and find meaning in them by assimilating them to more-or-less familiar narratives. It is this human

> ability to organize experience into narrative form that David Blair and Tom Meyer call "Narrative Intelligence" (Blair and Meyer 1997)"
>
> – by Michael Mateas and Phoebe Sengers (Narrative Intelligence, American Association Artificial Intelligence Article PhD, 1998)

5.4.3 Role of language

Pelle Ehn considers language as important tool mediating for construction of understanding between participants in design work. In Participatory Design approach, where designers, developers and users of the system all work together to design a system, it requires of designers and developers to get to know user's domain, to learn about their work situation and to bring use context into design work. Achieving this demands for active involvement from users and access to their knowledge. *Language-games* are introduced by Pelle Ehn as technique for participants to acquire knowledge of each other. Language-games is suggested to be considered as any other game, where the rules can be set by the participants, and that not all participants have to understand each other completely. However Language-games provides mutual reference point for the participants. Making language-games as instruments for creating learning process in *design-by-doing* activities, it can provide users perspectives and at same time also be useful for designers and developers to see the relevant connections (Ehn 1988) and

I understand we have also been involved in playing language game in KIKK project. They were created when employees narrated stories from their work and then in return when we introduced employees to a set of scenarios in the design workshop. Those scenarios were formulated on basis of stories and events told by participants. So the language we used in the scenarios, provided the *family resemblance* as is proposed to be important element of language-games.

5.5 Bridging with Design Stories

5.5.1 Definition of design story

I understand that a *design story* is not like other ordinary tale. Stuedahl **?**p. 242]stuedahl defines it as consist of a content which an informant intentionally produces for the design purpose in order to provide insight into a phenomena. It is orally delivered or written narration of something that takes place at a particular time. It can be description of specific work procedure or refers to certain incidents. The characteristic feature of a design story is that it is told with intention to illustrate the subject matter or to make a point. Aspect such as *who is telling, when it is told and why it is narrated* are important factors that needs to be taken into consideration in the analysis of the narration & story.

In our research work, we have experienced similar stories. Examples from events, experiences and short stories are told by practitioners, on various occasions and by several people. These were sometimes spontaneous reflections during some conversations or used as arguments in discussions and group work. This all happened during the time we worked together on design related activities.

In her doctoral thesis, Dagny Stuedahl 2004, discuss about processes and strategies which people apply in order to clarify and to help the recipient to understand their view points. In this discussion she brings forward meaning of culture, traditions, negotiations, persuasion and communication as important ingredients which are used as help. She points out stories and narrations to function as building bricks in these processes. She approaches this by showing how stories and conceptual words are perceived in many disciplines.

> ”Design og utvikling av IKT involverer kunnskapsbygging der kunnskapen om og evnen til å forstå andre, deres historie, tradisjoner og verdier, er akutt nødvendig.”
>
> – by Dagny Stuedahl (PhD, 2004, p. 11)

I have used design stories to connect work of design with narratives and scenarios, see Figure 5.1 on the facing page. As I understand it, her point is that story

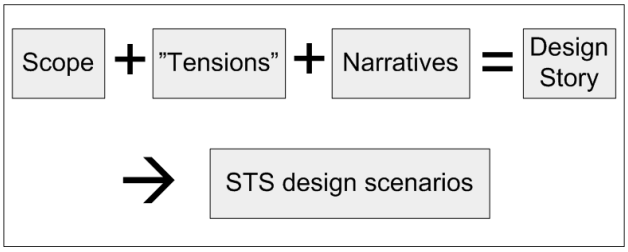


Figure 5.1: Composition of design story: from accumulation of narratives to construction of scenarios

telling contribute in creating common platform to make things understandable and it builds trust in the relationship between participants. Stories may especially be fruitful in situation that involve people from various background (representing a variety of field disciplines). Stuedahl brings forward examples from between engineer's and architect's work practice. Their use of artifacts, such as sketches and drawings, which helps the practitioners to bring the team closer and to establish common understanding.

In reference to Henderson 1999, Stuedahl argues that stories and narrations act as creator for a mutual platform for a short time. And even if it has temporarly function, the use of such stories early in an establishing phase gives it characteristics of being a "boundary objects in-the-making". The explanation is that narratives & stories are used in efforts to establish user participation, for example as it was brought into the NEMLIG project.

> Designfortellinger benyttes som begrep fordi de skiller seg fra fortellinger i for eksempel folkekultur eller i media ved at motivasjonen for å fortelle er relatert til designarbeidet. Eksperimentet med designfortellinger hadde to mål: dels som metode for å stimulere brukermedvirkningen i designarbeidet - og dels for å samle informasjon som var relevant for designet av læringsarenaen. Det er imidlertid uklart hvordan man skal forstå disse designfortellingene. I motsetning til fortellinger der forteller tar initiativet og forteller fortellingen fordi han eller hun vil fortelle noen noe, er designfortellinger en *villet fortelling* som er igangsatt med et annet mål enn at lytteren skal få en opplevelse eller lære noe nytt.
>
> Designfortellinger har som mål å gi informasjon til et designarbeid - eller å stimulere menneskene som skal arbeide med design.

– by Dagny Stuedahl (PhD thesis 2004, p. 180)

5.5.2 Application of design story

Details from an organization's working environment can be widespread and difficult to grasp. Since my perspective is both to look from a system developer's point of view and also to see it in light of the cultural and social meanings related to the information, I needed to apply mechanisms that could help me categorize and sort out the data. In my opinion the traditional techniques from system development methods would not cover the soft parts of the task. By traditional system development methods I refer to activities like constructing requirement, building use cases dictionaries etc. These techniques are developed with focus on information flow, abstraction of systems to find patterns and has focus on functionality in the system (Booch 1994, ch. 1, 4 , 6, 7),(Mathiassen et al. 2000, ch. 1, 6). Where as my focus was revolving on needs and tensions. With design stories I could bring in the individual perspectives from various participants and analyse the information accordingly to its content. In this way I would depart from the individuals view point, and thereby also keeping the soft attributes attached to the content. Analysis with help of Design stories help to structure the various viewpoints that could be used to make link between the work practice and the situation. In this way design stories would contribute as a means for understanding the basic fundament and the underlying intentions for interactions in the environment.

Design stories can be understood to construct some kind of profile of the working environment. Perhaps a vague parallel concept to refer to could be the design tool of constructing Persons, which is a technique developed to present profile of a relevant and interesting system user (Pruitt & Grudin 2003, Grudin & Pruitt. 2002). The important thing is that narratives used in the design stories are told by the participants. And that these stories point out certain things which they wanted to describe. Keeping this in mind, the design stories can therefore be understood as to be description of their work situation.

I have adopted this tool with intentions of to be meaningful in the system design

process. Thinking it might help in order to see bits of information in context with other parts of data, and hoping for the junction of these narrations to function as description of the work practice, which could further contribute to inform the system design. For in this way meet the desired improvements of work environment which has been expressed during this project. Secondly my concern has been to anonymous the identity of participants and in this way avoid the possibility of to recognize who has said what, based on what issues and how the person relates him/herself to the information.

5.6 Relevance for Research

It is difficult to separate the activities in my field work into one specific phase because the design work on social consideratioons took place in parallell with activities for developing technical prototype. Referring to the life-cycle of systems development process, these are actions taking place back and forth between ”thinking” and ”construction” stages. So in a way it is an interplay occurring at a intermediate stage between the stage of exploring and the process of ’making place’ for the information system in the organization. I make use of design stories to inquire details about social concerns and the role of technology in the context that is narrated. Narration about events clarifies how the elements are understood or reflected up on by the participants.

Difference in *Design stories* from Stuedahl’s research and in my research is the intentions, circumstances, actions and occurrence of these *design stories*. Stuedhal uses the concept of design story in reference to story narrated by the practitioner. Where as I have made modifications to the definition. I define design stories to be the analysis method on the stories and narrations provided by the practitioners. Those are the stories and narratives that has occurred spontaneously in various situations. The practitioners have told stories to direct our attention towards events they have experienced and therefore have the intention to express that knowledge as contribution to add valuable information in the discussion.

An example of content in such spontaneous stories is when we have asked for how

a certain task is solved:

> ”Researcher ask: how do you know when a contract has been settled?”

In response to this we were told story from an event describing process from sales consultants finalizing a deal, making announcement of it and till it is entered in the database.

Chapter 6

The Socio-Technical System Design

In this chapter I present the empirical data and my analysis of the design process. On basis of data material following emerges to be three prominent topics from the practice; *Design by Planning, Point of Departure and Design by Doing*.

I first introduce the organizational structure of the design path that we have followed. Then I will describe the three topics in their respective subsections and relate the empirical data to the corresponding parts in the design process. With help of diagram I illustrate the process and some vital details related to activities. The diagram provides the overview of activities as well as it will facilitate as 'map of the road'.

6.1 Design by Planning

In organization of the design activities we have made efforts to follow the Participatory Design methodology, and this endeavor brought empowerment to the employees for design development. Besides the composition of activities, a second important factor is the commitment and influence acted out by the participants in the process.

The purpose of research was to design an information system that provide flow of information in such way that it contribute with (a) learning in the organization (b) to establish sustainable communication culture in the company; between the offices, and towards the customers. It was in this conjunction that we had to design a process which would lead to achieve the desired results. The concept of culture and learning are interrelated with social attributes.

Being a research team with multi-disciplinary research interests, it was decided to adopt an inquiring attitude and to focus on employees existing work practice. This approach directed the focus towards considerations to employees engagement in the environment, relation to other colleagues and organization of their work process. The technical considerations were dealt in separate forums. Subsequently, this led to development of two sub processes of design activities:

(A) Broad and explorative organization of information exchange

(B) Functionality and technical solution development

In this way, we gained various degree of information about the employees work environment, the ICT systems that were used in the company, and the requirements that were expressed towards the envisioned solution.

In a previous chapter I have presented the curly design path to expose the evolutionary development of the design process (refer to Figure 2.4 on page 13, in chapter 4.1 on page 23). on page 13 It is a symbolic representation, which I have composed. Each curly shape represents a specific activity, and tagged with outcome from each technique and method that was implemented. The purpose has been to visualize the fallout of techniques we applied and the data we gained from it. So the curly path is result of joining all the activities in the sequential order as every activity was applied.

To bring forward the differences of the two sub-processes and which can be of help in following the successive development of design process, I present a simplified model of the role-based diagram, see illustration in Figure 6.1 on the facing page and 7.1 on page 108. The design process is thus a result of both actor's (researchers and Company employees) contribution in development of the design,

carried out as collaborative process. Because, in parallel to taking part in joint activities, both actors followed independent agenda. This established two work platforms; one separate sphere at each one's workplace, and a second joint sphere (design activities) where we shared information and ideas for development of the information system.

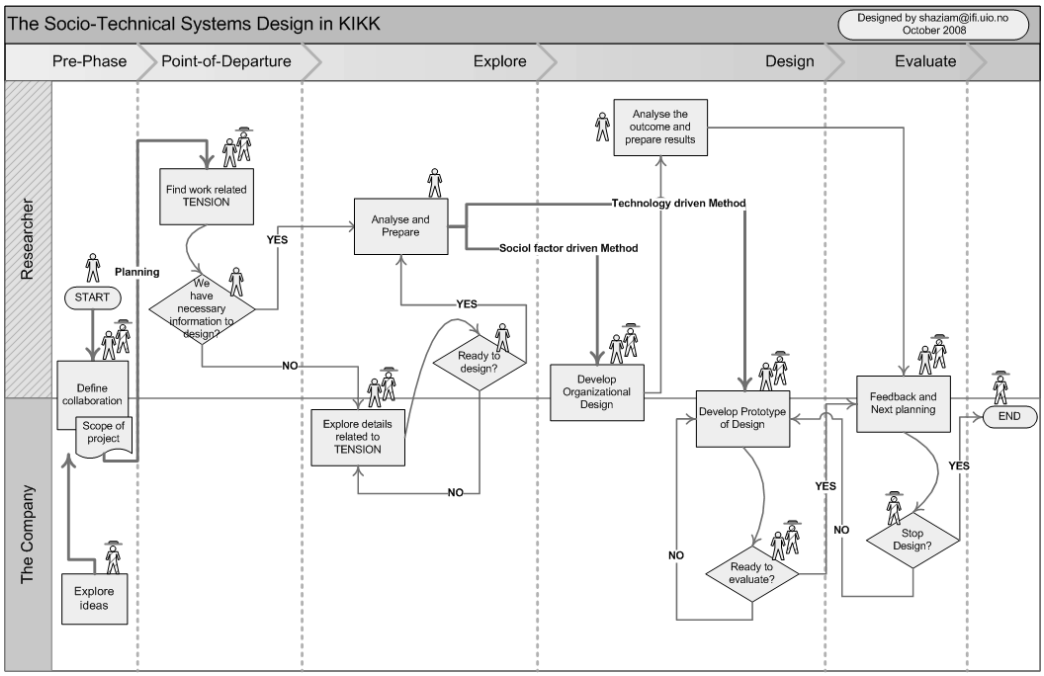


Figure 6.1: Brief representation of design process with the factors indicating action, actor, phase and place for major tasks

This illustrations requires to enter the details belonging to the three topics presented as the introduction. So, in relation to development of the design, I'll first bring forward the underlying basis for the starting point, pointed out as 'start' on the diagram.

6.1.1 Preparatory phase

Ground work for the project had been transformed into two main documents. These documents defined the theme for the project and provided the scope of

the work. In meetings and through email correspondence during this phase, both actors had arrived at common interests. Content of these documents summarize the key points. There is also reference to arrangement of responsibility discussed at that time. Minute of the meeting includes a protocol of participants. It shows agreement is developed in joint concert of representatives from both participating actors; the company and the researchers.

In this way, the *document 1* has contributed to identify the domain for the work. Some selected extracts from the minute is included below. Additional information can be supplemented with extracts presented in chapter 2 on page 5, section 10.

The document describes subject area is concerned with work relations between the employees in Company, that joint efforts will be put together in order to develop an ICT system that will support communication processes, and focus will be on activities concerning information to company's customers. Details in these documents gave them the status as to be our main guidelines for the collaborative operation. I interpret these as to display important project constraints for the design purpose.

Document 1: Formulation of focus area for the collaboration:

> "... Moreover, on the basis of two previous documents (emails)..., one on the use of knowledge management systems and second about the puzzling processes in Company (internal communication, customer handling).
>
> ... It is the focus on knowledge practices (problems from customers, internal communication, sharing of information, and OCT used as mediating artifact) that is particularly of interest ...
>
> We discussed these issues further by relating them to the information processes: how information flows today, inquiries from customers about how to get things work with the application product, help customers to solve problems, reporting to office where the [Company's] system developers are, update on new information, etc.)...
>
> — translation of minute (meeting held 05.07.2006, written by researchers team)

Document 2: A provisional project plan that stipulated the scale and duration of work. It was presented to project members at *point of departure*

This second document, *document 2* the provisional project plan, was developed in cooperation with an employee. This employee took part in initial activities to plan and prepare for start of the project. Such collaboration was helpful for research team in allocating the relevant information sources in Company (e.g documents, persons). Also Company considered this role to be necessary as it would help to interconnect both actors. At start of the project this was beneficial when we needed to define agenda of the introduction meeting.

The exchange of ideas through correspondence with Company is summarized with following illustration. See Figure 6.2 .

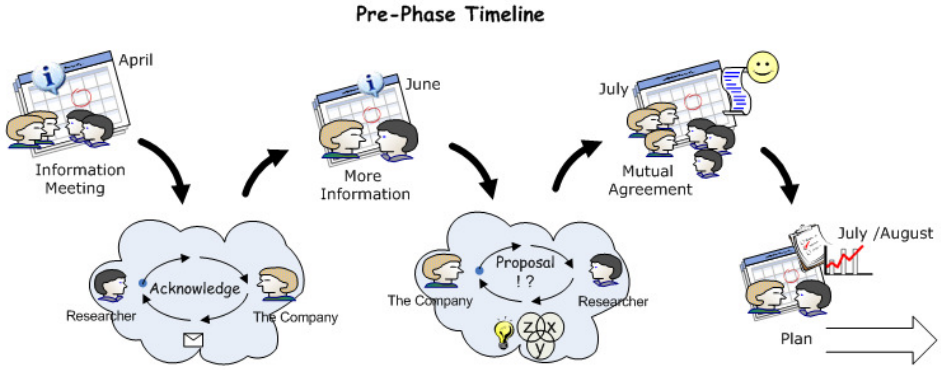


Figure 6.2: Activities in the preparatory phase, April – July 2006

Excerpts from emails that were exchanged between the actors during pre-phase, exemplifies the type of information discussed at that time. These emails indirectly exposed the steps taken in Company that made them discover puzzling elements in their work environment. This exchange of ideas with researchers led them to render concrete obstacles. For design perspective this means that some need had emerged and a process had started for solving the challenges. Thus at Company, the design activity had been initiated prior to establishment of this project.

> . . . Brief summery of meeting . . . on 10Th June.
>
> – There are two main activities related to “knowledge management” and our plans is to support these with help of a web portal

a) Information sharing in the company's complex activity systems (agreements made with customers, course material etc.)

b) Demands for handling customer services (towards the customers)

– Make use of groupware (MS Sharepoint) to support the collaborative activities

– Couching the Company's product, i.e professional project management tool intended to be used with MS Project

– UiO researchers can contribute with new people in August

– Translation of email sent by researcher(3 days after the meeting, on 13.06.2006)

In summary, this extract shows the initial ideas that were shared between the researcher and Company. Issues are related to knowledge management tasks, concerned with two particular areas; communication with customers when providing customer services and secondly on internal communication when carrying out various activities. Further on it is expressed Company is in search for a solution by using web technology. We get to learn that an commercial off-the shelf application promoted to support social relations building and providing shared space for users on the net, is under consideration. A third factor brought forward is activities related to give training in use of a tool. Then we learn that researchers suggested possible cooperation in August.

Following acknowledgment from Company states their interest in research proposal. More over it also reveals about work at their end and concretize the activities they are interested in. Here I have tagged their three suggestions as *dilemma*:

"Hei!

I have discussed with <manager-in-the-Company> about the KP-lab. ... Vi har jo hatt en periode med brainstorming, der det har kommet opp flere alternativer som hva som kunne blitt undersøkt og tatt tak i hos oss i <Company>. Det vi ønsker nå, for å komme et skritt videre, er å velge ut et fåtall av de mange alternativene som er forslått. Vi har planer om å utvikle en portal som kan hjelpe oss med informasjonsflyt og kundeoppfølging..."

≪ Suggested three problem areas for investigation ≫

— Email from The Company (in response to email 13Th June 2006)

The company's Suggested Dilemmas:

Dilemmas expressed by Company	
Dilemma	*Explanation*
Dilemma 1	"Vi ønsker at dere kunne ta tak i den ustrukturerte informasjonsflyten (informasjonshåndtering, informasjonsdeling) vi har internt i firmaet. Innunder dette emnet kan dere gjøre mye av datainnsamlingen her på kontoret i Oslo. (Kanskje Stavanger også)"
Dilemma 2	"Når det gjelder det andre punktet, er det kundeoppfølgingsproblemer. Vi har per i dag ingen struktur på hvem som gjør hva, hvilke kundecaser som er prioritert etc. Dette har tidligere i <Company> ikke vært et problem, da de var så få ansatte. I dag som vi er lokalisert over flere steder, samtidig som antall ansatte vokser, har dette blitt mer komplisert. Ved denne problemstillingen må datainnsamlingen skje både i Oslo og i Stavanger."
Dilemma 3	" Hvis vi skal velge å se på selve produktet (<company's project managment product for professionals) og brukergrensesnitt, rutiner rundt kvalitetssikring av funksjonalitet og lignende, er det kun <Company's Head-Office> som kan gi nyttig informasjon til innsamlingen av data."

Table 6.1: Company suggesting possible dilemmas for investigation

Research Team's Proposal:

> " . . . For å velge en fokus foreslår vi alternativ 1 (studere den ustrukturerte informasjonsflyten internt i firmaet) og 2 (kundeoppfølgingsproblemer) som utgangspunkter/problemstillinger for en empirisk undersøkelse fordi disse to henger (delvis) sammen. . . .

> ...I første omgang bør vi starte med et felles møte hos dere der vi kommer frem til en felles problemstilling samtidig som vi legger en plan for det videre forløpet...."
>
> — by researcher (email, suggestion, 17Th June 2006)

This process of exchanging ideas, suggesting activities and proposing solution for mutual interest initiates a chain of negotiations. At same time, this development also reveals refinement of thoughts and the participant's approach for concretizing the topic for research. This short series of email correspondences summarizes the information that is helpful to compare with the outcome of design process and to see if it has met the requirements and how differently the design evolved from the initial ideas.

6.2 Point of Departure

The project started off with a meeting targeted as platform for the participants to meet each other for the first time. It was the first coherent introduction of the project and the project goals. Theoretically this design activity is characterized as exploratory focus group. We identified it by title *Brainstorming* in order to convey the purpose of the meeting. To help establishing work relations between the participants and to put emphasis on essence of conversation, the meeting was organized in informal way by arranging it as "working lunch meeting". In this way allowing space for the social elements in the setting. Figure 6.3 on the facing page.

The chairperson selected four segments of scenarios from the introductory discussion and directed the discussion to brainstorm about employee's concern in relation to those topics. The participants were asked to leave aside emphasis on possible solutions and talk about issues they believe are causing problems.

The Four Segments of Scenarios Selected for Further Discussion:

- SEGMENT 1: about search and reuse of documents

- SEGMENT 2: developer experiencing lack of time to concentrate on development of product
- SEGMENT 3: how does the company desire to meet its customers?
- SEGMENT 4: a customer seeking solution to a problem they facing in the application.

The chairperson wrote notes on a flip board. In this way all participants could follow the discussion and at the same time had the opportunity to influence the notes taken from the discussion. A picture from the meeting describes the setting, see Figure 6.3 and Figure 6.3a. In response, this session contributed to bring a number of issues on the table. These are presented in form of a numbered listing in section 6.2.1 on page 81. These were characterized as things experienced as causing problems. In relation to these problems, the participants also exchanged ideas about potential technology, and briefly discussed its impact and functionality. This part of brainstorming is presented as listing of solutions in section 6.2.2 on page 81.

(a) Brainstorming

Figure 6.3: Relxed and informal work setting in the meeting *Brainstorming*

Content of Table 6.2 on the next page provides summery of the key-points rel-

Two Main Perspectives	
Customer Relations	*Internal Communication*
• many phone calls $\Longrightarrow$ customer satisfaction rate is high • possibility of to use web portal on inquiries repeated frequently? • new customers vs first customers (existing, 'old customers') • think about support in new ways • several of the inquiries are responded to by the office in Oslo, whereas the expertise is with people at office in Stavanger • target with support service is to solve customer's problem $\Longrightarrow$ how can a customer learn? • Arrange seminars!	• The example narrated: 1. Henvendelse til Oslo 2. Kontakt videre til Stavanger – ansvaret ovenfor kunden 3. Kunden savnet svar • Reuse of existing /previously created documents (gjenbruk av tidligere doks) – organize /structuring of this information (make it easy to relocate relevant documents) • Active and passive information systems

Table 6.2: Key notes about customer services and communication in Company (writing from flip-over used in the meeting)

evant to the two main topics *Internal Communication and Customer Services*. These two topic were taken out of the employees answers in the discussion concerning (a) communication processes in the company and (b) work activities that are related to and has effect on the relationship with the customers.

The employees elaborated their arguments with help of examples and description of events from their daily work environment. In this way they told us several examples that referred to things they characterized as puzzling situations. In this context they also suggested where they think the problem might be situated, and then presented some idea to solve it. In doing so, they also described how they consider things would become. Such explanations helped us to understand the arguments and their rationale behind the issues.

From design perspective, I understand these examples of events as employee's *stories* of self-experienced situations. With these narrations they described to us

their observations from challenging situations. These stories contains information that I interpret as representations of their work environment. Since these stories has occurred naturally during the meetings, either as direct response to questions or as reflection on activities they were engaged in, I find them viable and trustworthy. A selection of these *narratives* are presented in section 6.3.1 on page 87 [ref. section presenting the 4 narratives as stories]. Employee's stories have been reproduced from the collected data sources, and has been used further to develop *Design Stories*, described in section 4.5.1 on page 37[ref. section about Design Stories as technique etc].

6.2.1 Issues raised

In the *Brainstorming* meeting the employees talked about issues that were generating tensions at their work. Here is a summery of each issue. See Table 6.3 on the following page. It is reproduced as numbered list of items. Closer look at content shows that these issues concern many aspects of the social and operational matters in the work culture. See Appendix A on page 117 for description of each point. Some of them have one or more elements in common and can be subordinated. However, I present them separately to distinguish the details associated to each point.

An important factor while studying the list is to know that the employees participating in the focus group take on various roles in their office environment, therefore they are representing concerns from several stand-points; such as management, sales person, technical and software developer, new employee. They bring forward factors concerning senior-junior experience with the system, different office culture, and they all represents consultants with varying experience.

6.2.2 Tentative solutions

By the time we had this introductory "Brainstorming", at Company's end they had already been working on the idea with web solution for some time. Analysis of

Summary of issues	
1. Infrastructure based on culture in Company	2. Access to Information
3. Information is not lucid	4. Ownership of information
5. Sense of belonging	6. Learn from colleagues
7. Sharing of information	8. Information about updates and work status
9. Channels for communication	10. Variety of applications
11. Relationship with customers	12. Providing customer services
13. Communication with customers	14. Overload and redundancy of work
15. Need of feedback from customers	16. Response to Customer inquiries

Table 6.3: Dilemmas raised and discussed in the "Brainstorming"

empirical data (emails and presentation of idea in the meeting) reveals their process started at beginning of the year, approximately 5-6 months ago. The shuffling of 4Rs was explained to be result of their exploration (see chapter 2 on page 5, Figure 2.2 on page 8). In this meeting, the employees suggested a specific technical solutions for implementation of their idea – a content management platform that is modules based web technology. Employees expressed interest of to explore about it further in context of this project.

As follow-up on discussion on elements causing the tensions, some tentative answers to issues were brought up, and further on this cultivated ideas for possible solutions. Here follows a reproduction of the discussion, it is organized into a list of topics that we touched during the brainstorming. See Table 6.4 on the facing page provides an overview, and Appendix B on page 120 contains elaboration for each point.

Ideas for Possible Resolutions	
1. Module-based web technology	2. The resulting web
3. New work practices	4. Software development
5. Common information repository	6. Electronic boards
7. Active information system	8. Single medium for communication
9. Rank customer request	10. Build knowledge bank
11. Set criteria for customer service	12. Customers tracks their own request
13. Customers register information about them self	14. Direct information towards customers
15. Ask customers for idea	16. and more

Table 6.4: Ideas explored to discuss possible resolutions on dilemmas and issues raised in "Brainstorming"

6.2.3 Employee's early involvement

Outcome of the *Brainstorming* was considered to be meaningful for both parties. This meeting was planned and prepared in cooperation with the employee appointed as resource person by Company. So operationally, the users of the system [the practitioners] were involved from early start of the process. As consequence this close working relation helped to bring about optimistic results.

> " Hey, I think the meeting today was very good. You were very good to note down today. Attached is a draft of an information flow chart . . . (on part regarding customer support). Looking forward to read the minutes. "
>
> — by resource employee appointed in Company (email, later on the same day)

Judging from the response received afterwards, the meeting was directed towards topics that addressed questions of mutual interests. As can bee seen from these two excerpts from emails summarizing the initial meeting.

> "Hi, I found the meeting with Company, on Thursday, as to went really well and I have received positive feedback from <coordinator> that they think the same.
>
> ... in the meeting the focus was on informing each other and discuss what are the actual issues at Company, as it was seen from both their and our point of views. We take the information with us into further work of the project."
>
> — by researcher as project administrator (email, a day after the meeting)

A noticeable element, which is of major importance, is Company's willingness to provide necessary support in the operation; by dedicating one reference person, setting that employee's time at disposal for project work, giving access to company's resources and the possibility to engage more employees on need. This active involvement also provided guidance in selecting the direction of project; it contributed with helpful insight to formulate theme of the project, to work out a provisional project plan, and in additional to arrange the first project meeting. With help of the resource employee's insight of work environment, the project gained benefit from tailoring the project according to the needs. This I interpret to represent Company's perception of ownership towards the goal of the project. It can be induced from their active engagement throughout the project; from point of establishment till end of design activities.

6.3 Design by Doing

6.3.1 Exploring issues and tensions

Departing from tensions generated in the *Brainstorming* meeting (see section 6.2.1 on page 81), we initiated the design activities by inquiring about various tasks and working procedures at Company. This process was conducted by combining various design techniques with etnomethodological approaches, e.g presentations with semi-structured questionnaires, workshops with hands-on activities etc.

In addition comes several of the changes that emerged in the process, that had impact on forming of the project and things happening in Company that brought

forward new information. For instance that frequent visit to the office in Oslo, facilitated us to observe changes in the physical environment. These changes help us when analyzing the development in the organization during the time we were engaged in the design process. We observed (and was also informed by the employees) that office in Oslo increased the staff with a couple of new employees, a new room was constructed and it had place for two office desks, employees stationed at the office at start up of project were sent to customers on assignment and therefore not as much in office as in the beginning, changes implemented in the ICT infrastructure are a few of the factors we have believe were initiated in parallel to this project.

We learned that employee's personal approach in dealing with the customers is beneficial for Company's core business and it is highly treasured by the customers. Therefore this created a loop of win–win situation for both The Company and its customers. However, in efforts to accommodate inquiries from an increasing number of customers, it had brought about challenge to encounter their established practice of customer services at same level as previously. The company was now looking for new approach that would help them to maintain their reputation for holding close relationship with customers. They were interested in exploring alternative ways for communication and organization of information.

One rationale behind emergence of this need was explained to originate from the work situation for the developers of the application system (company's business product). Developers are experiencing that much of their work preoccupied with tasks to solve inquiries which should be handled by others. They argued often they are required to solve cases with similar problems as they previously had provided solutions for. More over they explained that it is difficult for them to be assured of that they will manage to get through their plans for the day. Because their work was often defined by incoming inquiries, and such tasks are given priority over other work. This situation had made it challenging for them to execute their own plans for the day. They consider such interruptions to be exhausting, ineffective and resource demanding

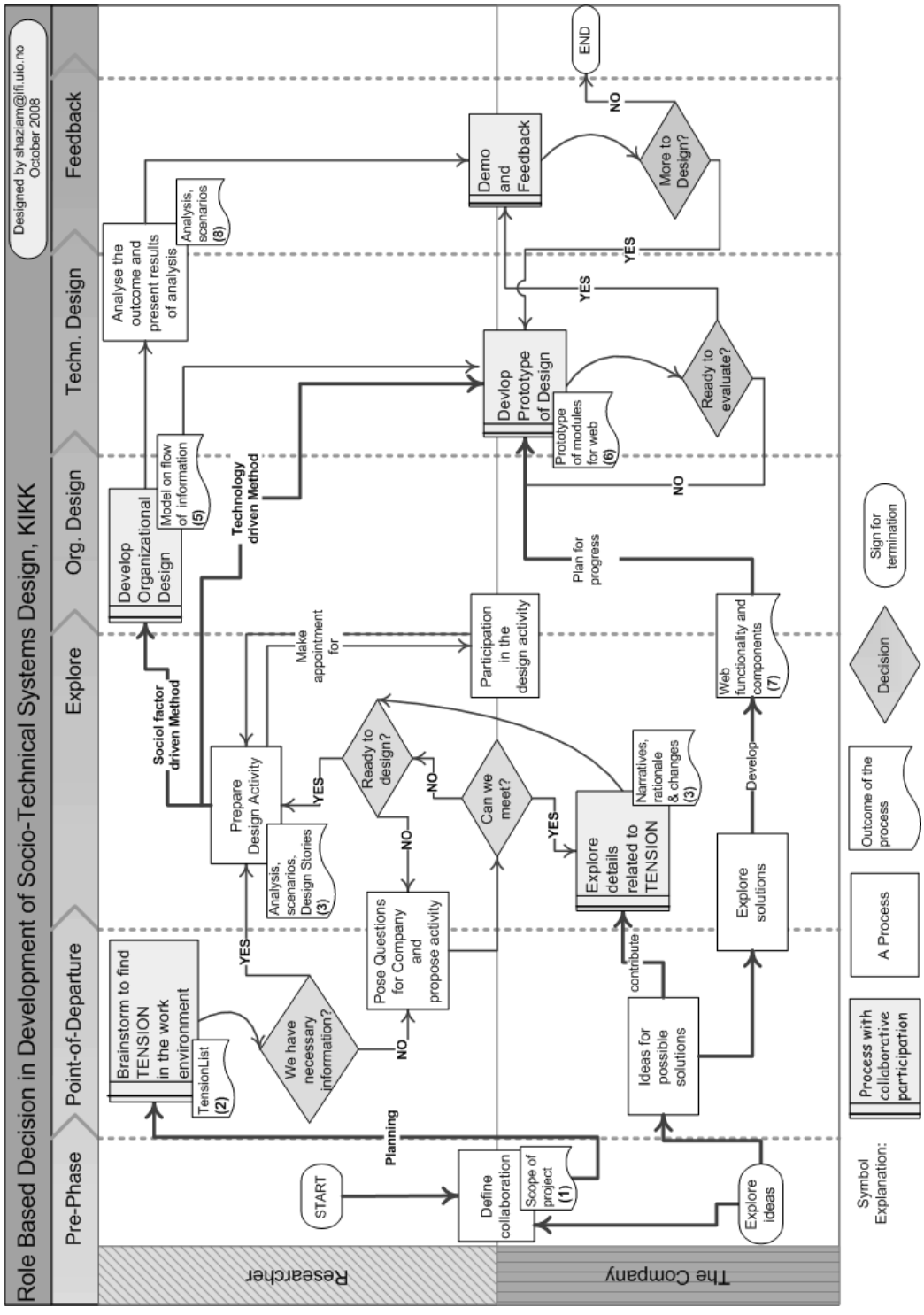


Figure 6.4: Overview of decisions and outcome in development of Socio-Technical Systems Design

Stories told by employees

Very often in the conversations (during interviews, discussions and workshops) the practitioners has made use of examples of an situation to explain their point. Also in several argumentation the practitioners has referred to events from past when presenting their perspectives. Some are mentioned very briefly, while others are described with varying degree of details. Most of such narrations occurred spontaneously and had not been inquired about from our part.

I have made a small selection from several interesting narrations. These are presented as excerpts from data material we have collected. It is therefore reproduction of examples, explanations and stories that we have been told by participants at different stages. Practitioner's narratives has helped me gain some insight about Company. I consider the narratives presented here to be key stories about the practitioners work culture.

Since these situations are described by employees, I interpret the content to be information about their experience with certain events or activities. In this context each narration provide glimpse of employee's experience that is referring to specific time, place and action. This I consider to be insight which is difficult to capture without participating in the employees daily work culture or by acquiring first–hand work experience. More over, by looking at the ICT factors involved in these narrated events, it helps to make rough idea of the technical infrastructure for communication and information sharing in The Company.

In the process of analyzing these *narrations*, they will contribute with information for design process. In this context we adopted a design technique. The narrations are revised with details we encountered as part of data collection activities. Our analysis of details are presented in Appendix E on page 137separate chapter, we present them as design technique titled *Design Stories*[ref. name of section??].

Narration 1

Vi diskuterte rundt emnet samhandling mellom ansatte som har ekspertrolle

og nyansatte i Company, og tredjeparten som er Company's kunder (eksisterende kunde og potensielle kunder).

I dag foregår kommunikasjonen fra kunder på Østlandet via Oslokontoret. Siden det er nyansatte ved Oslokontoret, må de ansatte der kommunisere med ansatte i Stavanger for å kunne hjelpe kundene. Denne kommunikasjonen foregår ofte via telefon og epost. Ved bruk av telefon i en slik situasjon er det ikke mulig å ta vare på informasjonen, slik at de nyansatte kunne tatt lærdomen i bruk ved en senere anledning. Det er heller ikke lett og dele informasjonen med ansatte. Ved bruk av epost, blir informasjonen dokumentert skriftlig, men lokalt på hver ansatts innboks (pc). Målet er å kunne benytte webportalen, slik at kundene henvender seg til Company via den. På den måten blir all kommunikasjon logget derfra og det blir enklere å følge opp en kundecase, samtidig som det blir enkelt å søke opp problemcasen ved en senere anledning. I tillegg blir informasjonen tilgjengelig for alle ansatte som ønsker tilgang. På sikt vil en slik kommunikasjonsflyt gradvis bidra til å lette arbeidet til ekspertene i Stavanger, slik at de kan frigjøres til andre arbeidsoppgaver. Dette kan være en fin måte for de nyansatte å læres opp på.

— Source: Minute of meeting 21.07.06 written by Company (Original text)

Narration 2 The narration:

From experience in past, informant Ken brings forward an example about solving customer request. The customer contacted Ken with an inquiry. Ken found it difficult to solve, and thought of lacking competence necessary to deal with the issue at hand. Therefore Ken contacted an experienced colleague in Stavanger office. They discussed the case and Ken interpreted the response as the colleague will look into the case. Considering the issue will be handled by the colleague, Ken does not follow up on the case. One week later the same customer contact Ken and inquired about the case. The customer had been waiting for his response. Ken has to return to the case and finds out the case is pending. Reason turned out to be due to a misunderstanding between Ken and the experienced colleague. Ken had regarded the customer inquiry was handed over to the colleague. Ken questions: who

was supposed to answer the inquiry? A discussion followed on issues raised in this example. By end of discussion a further aspect came forward. It was clarified that earlier that morning Ken had come to learn there exists an application for entering customer cases. This customer support system provides tools to make log of information related to customers and inquiries. It is referred to as Help desk. Employees at Oslo-office were unaware of this system up till now.

— Source: Minute of meeting 17.08.06 written by me as researcher
(translated text, with pseudo name "Ken" for an employee)

Narration 3 Summery of the narrated details:

In general the news, discussions, messages or any other information exchange today is mostly passed on to colleagues in occasional meetings in office or via email. There is not any fixed way of conveying information. The sender includes recipients whom he considers to be interested in it or to those who has expressed interest to receive messages. One of the participants referred to his own case with signing up for receiving as many as possible information messages that are passed on. He finds it helpful as it provides him overview of things going on in Company. In additionally it gives him the possibility to follow up on issues at hand. Referring to his colleagues, he mentions many prefer emails only relevant for their activities. Further more the participants also pointed out the drawbacks with such practice. They exemplified situation of when a recipient send response. Who is further included in the email thread can turn out to be arbitrary. According to their explanation, it all depends up on whom responder chooses to reply to. Whether if a reply is sent only to sender, to selected people or if all recipients in the original message are included. More over, the participating representatives also expressed their concern for employees (especially young and newly engaged) as consultants stationed at sites outside the office. They fear these employees will feel lack of affiliation, and therefore they consider it important to find solution to also encompass their need.

— Source: Minute of meeting 17.08.06 written by me as researcher
(translated text)

Narration 4 Presenting an employees explanation of work as "planning consultant" for an assignment at a Company's customer:

> Jim kommer ikke til å være lokalisert på Oslo kontoret lenger da han er blitt leid ut til en annen bedrift i 2 år.
>
> Jim har blitt engasjert som planlegger i en bedrift som skal bygge et oljeskip. De har kjøpt programvare og konsulenttjeneste av Company. Det er da Jim som skal være på denne bedriften i 2 år og ha en overordnet kontroll på prosjektets fremgang og struktur. Jim vil da få tilsendt 7 ulike prosjektplaner, hvor han skal sette opp en felles totalplan, og koordinere mellom ulike prosjektledere. I tillegg skal han justere på totalplanene slik at de samsvarer med prosjektets tid og kostnader.
>
> — Source: Minute of meeting 21.09.06 written by a researcher (original text, with pseudo name "Jim" for an employee)

Usual day at office

We arranged a workshop to describe *A usual day at office*. Theoretically this activity is also categorized as exploratory focus group. Our aim was to involve voices of various employees in the project. We considered it important to meet employees from the first office and who had been with Company longer period then employees at the second office. Purpose of the workshop was to allocate work relations among employees, to learn about Company's established work culture and to get information on mechanisms for sharing of knowledge among colleagues.

The workshop was arranged at office in Stavanger, and involved only employees from this office. This was the first project meeting held at the office and we made appointments to visit the office two consecutive days. Workshop on the first day, and second day was designated for follow-up activities. The employees were invited to play-full games with colorful post-it notes and discussion to elaboration on issues raised in the *Brainstorming*.

We learned about the *usual* tasks these employees carry out during a week, the various tools and ICT applications they use to support their work, and the colleagues

they interact with in context to these described activities. More elaboration on details on this workshop are presented in another master thesis (Andersen 2008).

6.3.2 Two sub-processes towards outcome

The Company desired to utilize web technology in the solution. This requirement set the constraint for design to be developed. We arranged two workshops aimed to design an envisioned solution: (1) *Design Workshop* with focus on social and organizational aspects. Activities in-prior to and results acquired in this workshop, all in combination informs the *Organizational Design*. Where as (2) *Web prototype* focused on technology (because of functionality) and requirements to data in the web portal. Implications of work carried out in relation to this process (i.e choices of technology, implementation of functionality etc.) had impact the prototype that was developed. With *Technical Design* we refer to all such aspects.

Design Workshop instantiated as hands-on tasks that explicitly focused on constructing design in collaboration with employees. It was organized into three units; (1) introduction to a set of scenarios and some questions related to them (2) immediately afterwards the participants were divided into two perspectives as things are viewed today; one looking from an external viewpoint (pretending to be Company's customers) and second to present the experience from inside (as it was for the employees in Company) (3) then the task was to merge these two perspectives into a new joint perspective – to design an information system that used the web portal as medium for communication in the new future company-customer relationship.

Web Prototype was organized as Agile approach for system development with pair-programming technique. Tasks carried out in this context portraits the second design activity that focused on constructing technical design in collaboration with employees. A team worked together on this process, were as two people had responsibility to build programming code of the modules. These activities started off immediately after "design workshop". The prototype was developed in DotNetNuke (DNN) environment (which provided the web modules), and it in-

corporated functionality for import and export of data from a .Net based Customer Relation Management(CRM) application. See section 6.3.2 on page 100.

In a diagram I have presented details from the process we have followed, see Figure 6.4 on page 86. The diamonds portray the main decisions, rectangles refer to the activities and outcomes we achieved from each such activity. Placement of the activities processes (on Company or Researchers sphare) is used as symbolic indication to point out where the activity was held and who had the responsebility as the host. The decisions phrased as questions to point out the factor of making choices and decisions as we proceeded to next activity.

Design workshop

Activities carried out in the *design workshop* helped the participants to arrive at a model of web based information system. The employees designed a communication path as they foresaw will be in their future work environment. Further more it implicated processes that would occur to provide service to customers. In Figure 6.7 on page 96 we see a visual version of employees perception of their envisioned system.

Employee X: Alf has encountered a problem, he accesses the web portal

Researcher eo: ... tries to search for solution in the knowledge base /repository

Employee Y: ... answers and questions ... search

Employee X: yes, shouldn't we have something ... didn't we also talk about – email – where you can write ...

Employee Y: ... that's what the portal is ...

Employee X: yes, but, this is a list to search through

Employee Z: ... this is what we want him to do first

Employee X: OK

Employee Y: there could be a search function there too, so you can search on words ... yes and then it goes over to there ...

Researcher sm: could you write it on some yellow post-it note and paste it there ... about search or something

Researcher am: I must ... this become a new scenario doesn't it? you may write it in qoutes.

(a) Under Construction

Figure 6.5: Participants are re-organizing the post-it notes on the whiteboard. Employees are given the assignment to sketch a future oriented solution. It is to depict the envisioned future with web portal as medium for customer-support services. Result is labeled “organizational design”. Employees and researchers are working collectively in the “design workshop”. An excerpt of the dialog about “FAQ” is present at on the facing page

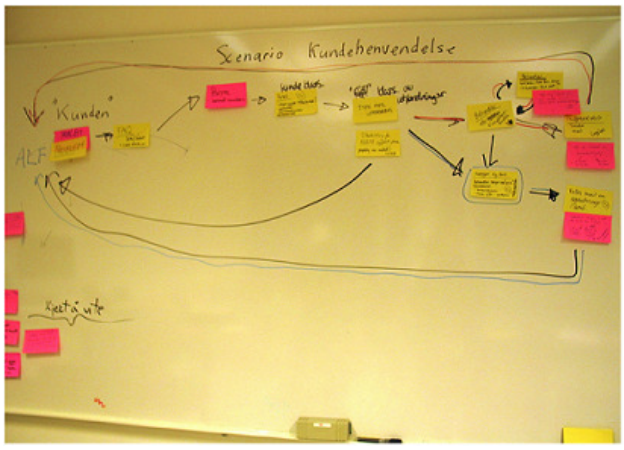


Figure 6.6: Diagram designed in collaboration

> **Researcher eo:** but are you thinking of that he will have access to some kind of search-able repository /knowledge database – is that so?
>
> — source: Translated transcript from video recording of "design workshop" part three (17.01.2007)

We observed that this scenario of communication with customers also included infrastructure for internal information handling in the organization. As it can be seen in the employee's design, there are 4 loops and 3 possible communication routes that a request might travel. I interpret this as indication of organizational elements that function as backbone when Company comply to a customer's inquiry. My perception of this design is portrayed with help of another diagram, labeled as "Information Exchange in the Organization", in Figure 6.8 on page 97 (Nygård, Mørch & Mushtaq 2007). Two hexagons depicts complex processes in the organization, and these occurs outside the web technology. One hexagon is tagged as "Person Assigned for Customer support (expert area)". It represents the process where some person is given the assignment (e.g received customer inquiry). This is mandatory operation and therefore this process will always be activated. Where as the second hexagon "Create New Functionality", is effectuated only when a request triggers the process that requires to add something to Company's "product" (e.g the software applications). In addition to these two processes, comes the loop generated by the actions to find solution to received inquiry. This loop might be a simple task like getting clarification about the problem at hand, or it might start an extensive search for expertise to handle the case e.g by involving a colleague who is competitive person for the assignment. The steps for information exchange depicted in this design has analogy to the off-the-shelf products on the market which handles similar task, i.e receive inquiry and automatically generate a receipt to sender with a ticket number. Immediate difference occurs to be employee's design solution that will provide the customers a name of reference person. Employees explained that along with auto-generated confirmation reply to inquirer, a person shall also be appointed. And the reply will include reference to this specific person. In this way the customer will know whom they shall contact in Company. During the development of the design, the employees analyzed this functionality to imply that the information about reference person

would required to be generated on the fly. In order to provide the required information, it will be necessary to make some organizational arrangements, and in that will help to find out who will be appointed as those reference persons.

As an extension of the design activities, a group of developers constructed prototype of the web portal. Details on this is covered in the master thesis written by two of the researchers involved with that task, Damir Nedic and Espen Olsen (Nedic & Olsen 2007, p. 63-81). Same is for the process with "Create New Functionality". Some aspects on the inter-relationship between customer inquiries and product updates are addressed in a second master thesis, by Renate Andersen who also participated as researcher in the project (Andersen 2008, p. 83-126).

Four design scenarios

We (researchers) arranged a workshop for our assessment. Here we explored data and discussed issues that we had come across or observed during the work in previous phase of the project (analysis and data collection). Through discussions in workshop, we decided to focus on one specific relationship between the company and their customers, namely the situation in concern to customer-support process.

To clarify the narrowed area in focus and to approach better understanding of it before development of web could start, there was need to reach some guidelines to follow. In order to make the task applicable we needed to draw and set the priorities.

At this stage, our information consisted of description of tasks and routines carried out in work, and it contained explanations and suggestions for how the participants foresee a future solution.

As described earlier, fundament of the company's business is built on the human relationship and their personal approach in dealing with the customers. The company was on search for an approach that would help to maintain their reputation about holding close relationship with customers. In efforts to accommodate inquiries from an increasing number of customers, it brought about challenge to encounter their established practice on level of customer services. The devel-

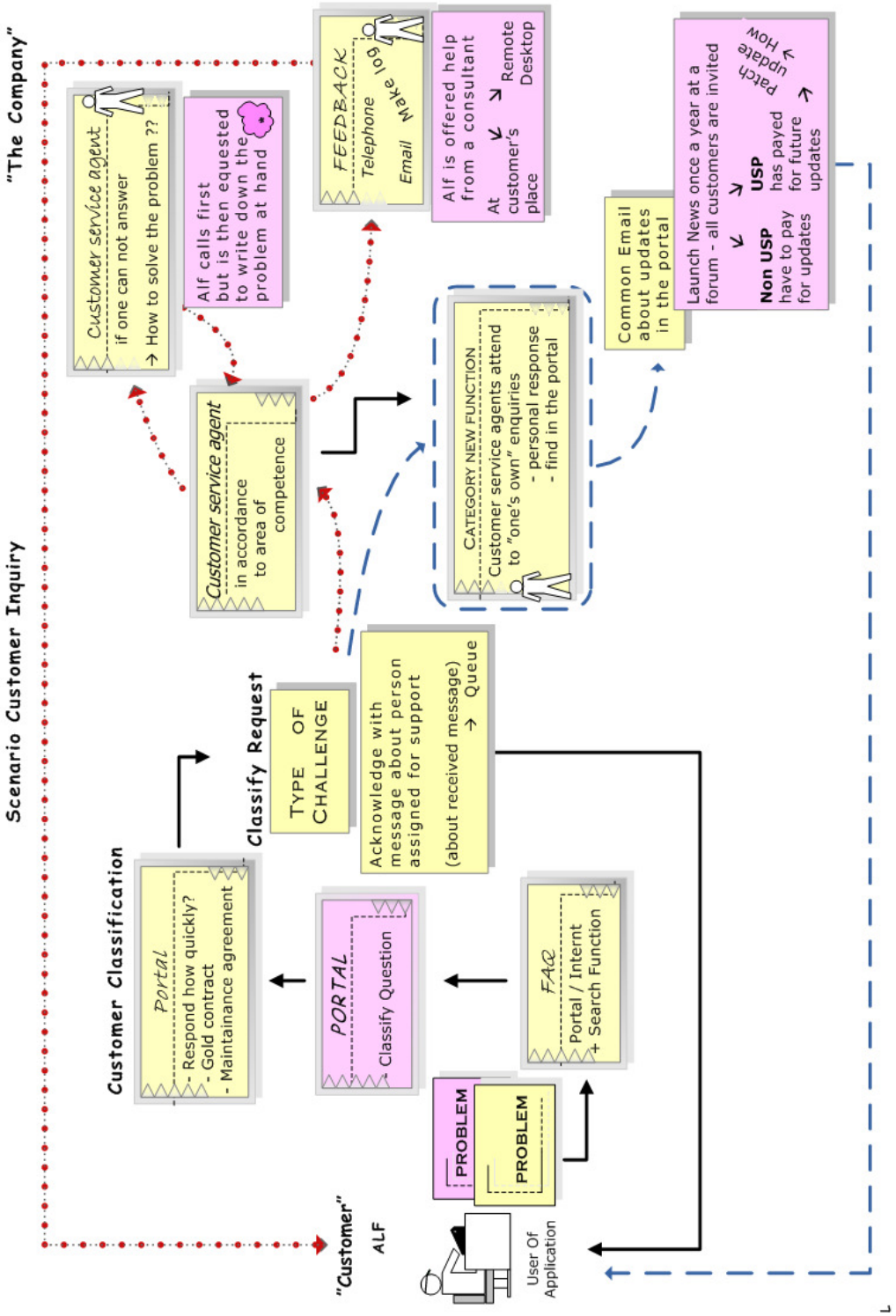


Figure 6.7: This is a copy of diagram "organizational design". Originally it was sketched on the whiteboard by participants in the "design workshop". It was developed in response to assignment for part 3 of the workshop. Original drawing is shown in Figure 6.5 on page 93

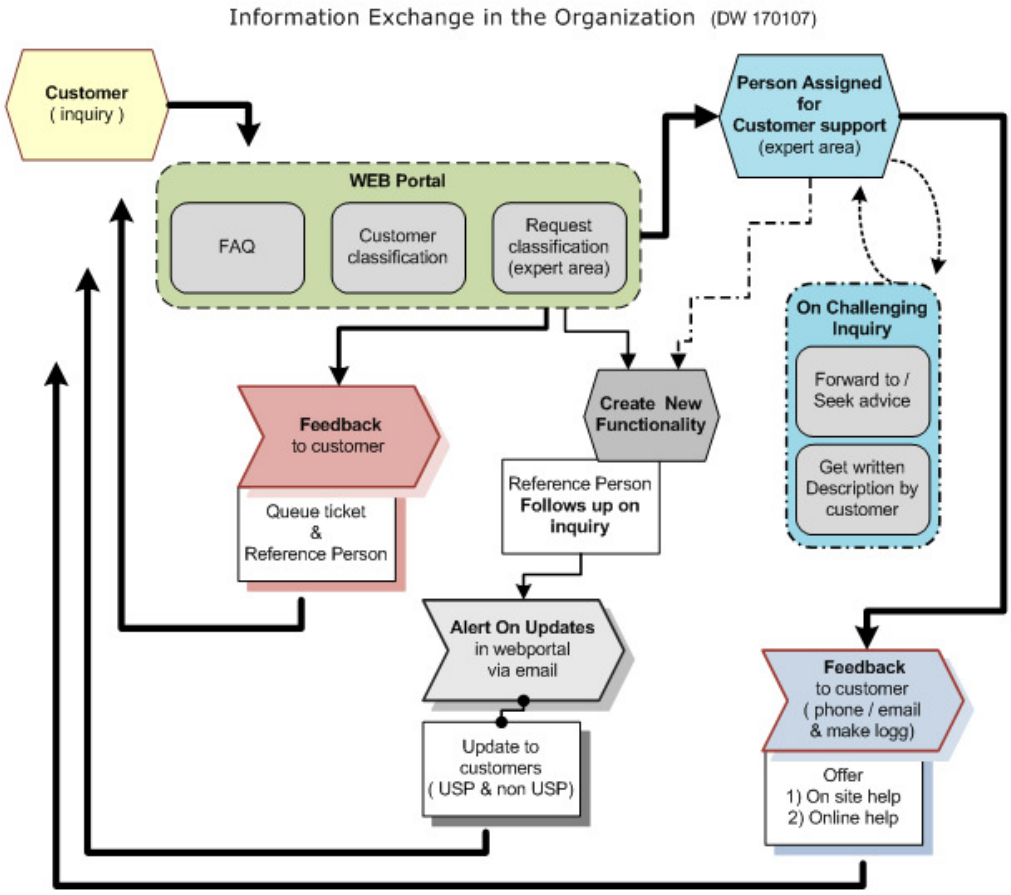


Figure 6.8: Diagram portraying researcher understanding of the employee's "Organizational Design". The solutions seems to describes information exchange in the organization when implementing new WEB solution, encompassing several activities related to the simple customer-support relationship.

opment department was experiencing that their work was too often preoccupied by solving inquiries which they previously had provided solutions for. They had started to consider such interruptions to be exhausting, ineffective and resource demanding.

Scenario 1: WHEN A CUSTOMER WANT TO REPORT SOME ERROR IN SOME OF COMPANY'S PRODUCT

> Kunde MurBygg har nylig fått installert den siste versjonen av Company's Proff-Project og har nå komplett pakke med Company's produkter. I følge kontrakten har MurBygg 24 timers support avtale. Tidligere hadde MurBygg en Company's planleggingskonsulent fast stasjonert på kontoret. Alf er en av ansatte i MurBygg og er nå ansvarlig for prosjektstyringen.
>
> Alf har fått i oppdrag å generere en rapport ut i fra de dataene som er lagret om prosjektet. Han bestemmer seg for å søke hjelp hos Company fordi han ikke finner funksjonaliteten og må spare tid fordi fristen er om 2 dager. Alf finner fram medlemskoden sin for Company's supportavtalen og sender deretter en e-post til kunde@company.no. Han velger å sende første henvendelse via e-post fordi han er usikker på hvem han skal kontakte.

Scenario 2: RECEIVING QUESTION RELATED TO COMPANY'S PRODUCT – WHO IS GOING TO HELP THE CUSTOMER

> At the Company:
>
> All e-post til kunde@company.no blir av mailserveren sendt videre til et kundebehandlingssystem. Derfra sendes en kopi av e-posten videre til alle konsulentene som er registrert i systemet. Den konsulenten som først svarer på henvendelsen er ansvarlig for oppfølging av henvendelsen inntil kunden har fått et svar.
>
> Ellen er den som besvarer henvendelsen fra Alf og lover å komme tilbake til han med detaljer snarest mulig. Ellen jobber med utvikling men har lite kjennskap til prosjektstyringsmekanismer. Ellen ringer til Geir, som er planleggingskonsulent, for å høre om han har svar på det kunden spør etter. I mellomtiden sjekker Ellen i gamle logg i kundebehandlingssystemet for å se etter om samme spørsmål tidligere har blitt sendt fra MurBygg.

Scenario 3: SENDING FEEDBACK IN RESPONSE TO THE SUBMITTED INQUIRY – COMMUNICATION RESOURCES ACQUIRED TO PASS INFORMATION TO THE CUSTOMER

> Ellen ringer Alf sent neste dag. Hun ringer han flere ganger, men får ikke noe svar. Mot slutten av dagen sender Ellen e-post til Alf og ber han ringe henne da hun trenger å spørre han noe ytterligere for å forklare hvordan problemet kan løses.
>
> Alf ringer tilbake neste morgen og klager over dårlig behandling og at det tok altfor lang tid før han fikk hjelp, spesielt når han hadde forklart situasjonen. Ellen beklager forholdet og fortsetter videre med å forklare Alf løsningen for å generere rapporten han etterspurte.
>
> Etter samtalen avslutter Ellen saken i kundebehandlingssystemet.

Scenario 4: UPDATES ON BASIS OF SUBMITTED INQUIRY – WHAT TO DO WHEN IT NEW FUNCTIONALITY IS REQUIRED?

> At the Company:
>
> Funksjonaliteten som Alf v/MurBygg etterspurte viser seg for å kreve mye manuell manipulasjon. Etter noen uker kontakter Alf igjen og etterspør en enklere løsning. Ellen retter spørsmålet videre internt i utviklings- avdelingen.
>
> Som svar får hun vite at funksjonen allerede er implementert i Safran Produkt hos kunden RailRoad på spesial- bestilling.
>
> Etter noen ukers arbeid har utviklings-avdelingen den nye funksjonen klar til bruk, og funksjonen gjøres tilgjenglig for installasjon.

Questions Related to Scenarios A list of control questions were formulated in conjunction to the design scenarios. These were written on a whiteboard. After the presentation of scenarios, the practitioners were proposed to take these with them when working with design of new information system.

1. Is there anything wrong in the scenarios?
2. What other alternative communication medium is there for Alf to get in touch with Company?
3. How many people will be engaged to deal with customer services?
4. What makes Ellen sure that Geir is the right person to help her?
5. How are customers informed about updates, new additions or new functionality in the product?

Web prototype

Company desired to launch new web platform, and therefore eager to have a prototype ready by couple of months. According to the schedule of the project presented in *Brainstorming* meeting, duration of the development phase is set to start from September to beginning of December 2006, and the responsibility of the task lies with Company. So, by end of October a project team was organized, and three new project members joined the project. Their primary task concerned development of the prototype.

> "Company's technical department had responsibility to develop the web portal, but they have expressed shortage of resources, so we have been asked to include team member with programming skills. Therefore we are looking for master students interested in the field of component based web development."
>
> — by researcher (internal meeting with researchers, held on 10.10.2006)

This work proceeded in parallel with other design activities that we had initiated in order to learn about issues that had been raised (as described in section 6.3.1 on page 84. Company had already suggested to build the web platform with DotNetNuke. The process started off by evaluating two equivalent applications for development of web platforms, open source CMS systems (content management systems) DotNetNuke and Joomla.

> "A content management system is software that keeps track of every piece of content on your Web site, much like your local public library keeps track of books and stores them. Content can be simple text, photos, music, video, documents, or just about anything you can think of. A major advantage of using a CMS is that it requires almost no technical skill or knowledge to manage. Since the CMS manages all your content, you don't have to."
>
> – Official website for Joomla (URL: joomla.org on 27112008)

Thereafter the employees were invited to a web workshop to think aloud ideas, needs and requirements. This forum helped us (researchers and employees) to arrive at mutual understanding. establish an overview of main target with the

web portal. Then as second stage of design started with programming of the DotNetNuke modules to compose the prototype. For this part of the work, the team adopted an Agile software development approach and applied the technique for extreme programming as method to conduct the development process. Design of the information system evolved as consequence of technical solutions chosen for the prototype. During this process, the group met on regular basis, and scheduled the to meet two adjacent days a week at Company's office in Oslo. With these arrangements they had quick access to prospective users of the components, and in this way would be able to make adjustments to the prototype according to the feedback and evaluation on the way. Thus activities during those two days were structured into workshops, one day reserved for evaluation and feedback, and one day to incorporate changes to the prototype. This working arrangement continued over a 10-12 sessions, which lasted from January till April 2007. Details of this process and outcome with prototype is reported by two of the participants of the team in their master thesis (Nedic & Olsen 2007).

Technical Issues : The *web workshop* served to explore the employees expectations on functionality in the web portal. In this meeting participants met to exchange idea that were related to application of technology. The discussion evolved around questions concerning the technical details like type of functionality, programming language to be used, and applications that will be necessary to bring into the system. Two alternative platforms had been evaluated; Open source Linux based (Joomla) or commercial closed source, .NET based (DotNetNuke). This clarification was necessary discussion that provided basis for further workout, in which both actors (researchers and the practitioners) started to direct towards same concurrent interests.

Functionality for the web portal was portrayed to include features which would interlink information between several work operations. Employees were aware this required communication and data transaction across various databases.

With the proposed technology, they saw the possibility to customize information. At same time as providing information outwards (to the customers), the employ-

ees also desired to develop solution to benefit from the activity on their site. In this regard it seemed like an good idea to them to acquire information from visitors. The employees saw several business acquisitions with this dynamic e.g utilize it for direct marketing or for the survey purpose that would be useful for development of their "products". This idea then turned into an eminent requirement for future solution.

In this way they foresaw diverse options for interactive engagement with existing customer and towards visitors on the site. One such possibility was to provide customers an opportunity to find answers to many of the frequently asked question, and in this way take advantage of the existing knowledge in company to provide learning possibility for the customers. At that time, and according to my rough accounting for the services they had explained to us, possibly there existed eight (8) activities in Company in which employees were engaged with customer support.

> Employee Karl: ... What we are looking for is to connect customers to relevant information for them in the database ..., so the system must be able to communicate with the CRM solution that we would choose. And for the CRM solution, we are open toward choosing any systems, because the information that we, or the activity generated by customers on our site, that we want to be logged/captured in a CRM system. So later on when a customer logs in, and write help or seek some information, than we should have possibility to look in the in CRM. It is how we view to get DotNetNuke to communicate with a CRM system. There are modules that we want ...
>
> —source: translation of audio transcript (from meeting 29.11.06)

Based on the discussion and outcome in the "web workshop" at that time the participants decided on to use DotNetNuke and .Net environment for implementation of the web modules. Later on a test server to serve as platform was also configured for the occasion.

Company's Technical Design

Activity related to development of prototype was carried out mainly at Company's offices. In one of those session, when discussing the interrelation between modules and functionality, Company presented following diagram to the technical team. This diagram, Figure 6.9 on the next page portrays much of the activity that has been described for development of the prototype. I include it here to show an representation of employees perception and engagement in the development process.

6.3.3 Presentation of analysis

In a workshop *prepare status meeting*, researchers had through collective analysis work, reached to following four (4) topics categories of intermediate *findings*:

1. Development and upgrade of the product
2. Stream of information and how it will be processed within the company
3. Means of communication and channels of conveying message
4. Customer relationship

I had the responsibility to present results related to the category "stream of information ... internal information handling" (customer inquiry model). Considerations to several factors made the model appear to be complex. For this purpose I developed scenarios to represent the analysis. With help of pictures and a diagram, I developed a serie on two – three slides to address the effecting component in the model, i.e the relationship between Company and its customers. On one slide I presented the current practice, tagged "Today", and on the second slide I portrayed the scenario presenting implications occuring from the changes, tagged as "Tomorrow". See Figure 6.10 on page 105.

These scenarios referred to the design modeled in "design workshop". Therefore the topic of scenarios was the same as presented in that "design workshop". We expanded the focus and included the implications and relationship of Company's

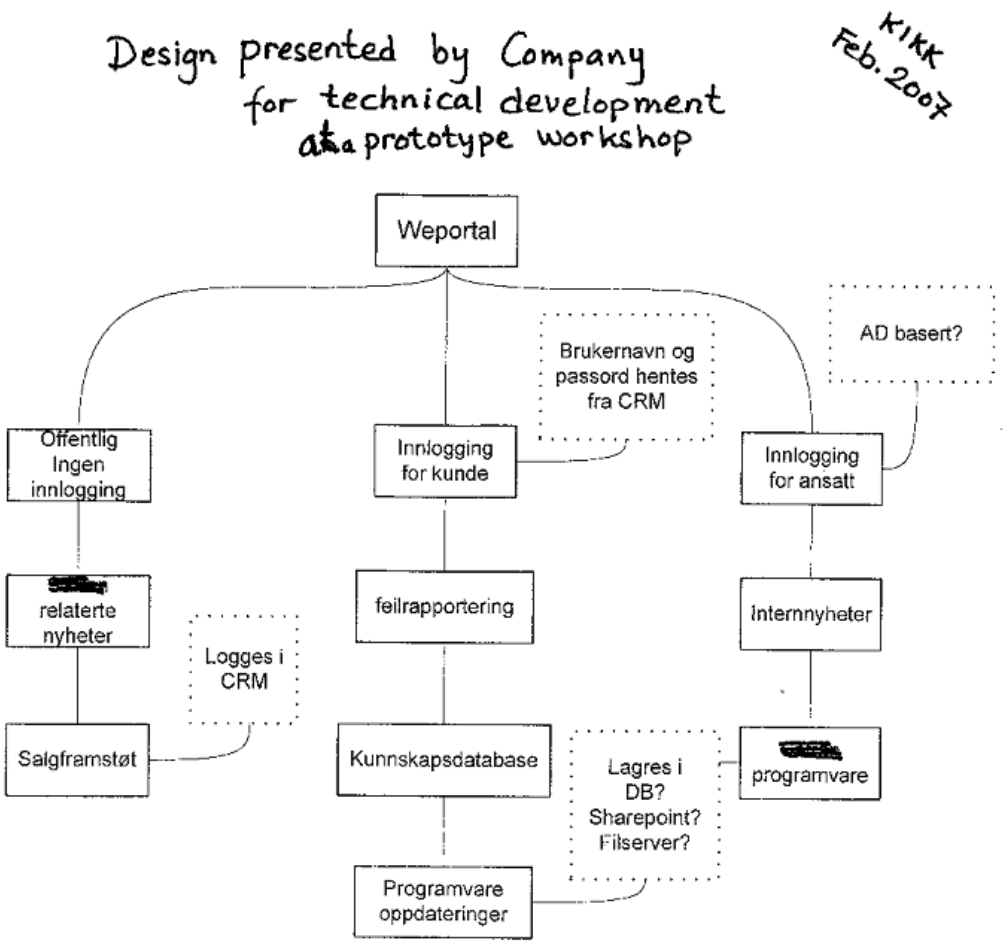
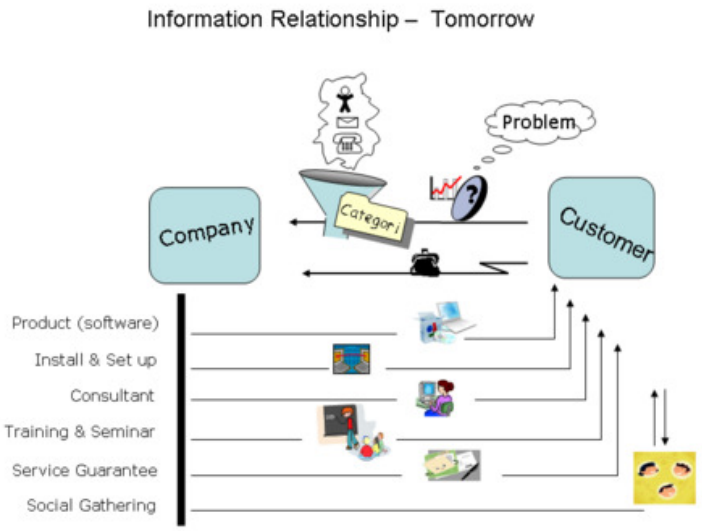


Figure 6.9: This diagram was made by Company and presented to technical team that wrote programming code for modules in the prototype, February 2007

other customer services. According to our understanding the web based customer support facility would come in addition to other services such as type of license agreements, facilities of application updates and maintenance, seminars and consultancy.

We emphasized the aspects that we found to create *discrepancy* in the design. Because they appeared to be contradicting with other aspects, which were expressed by the practitioners as to be of importance. Moreover those elements had been described as to have impact on the company's business strategy toward their customers. Therefore we considered them to represent critical part of the design.



(a) Tomorrow

Figure 6.10: Scenario illustrated with rich descriptions, presented as feedback on the model *customer inquiry* sketched in *Design Workshop*. It portrays the relationship between Company and its customers in the designed solution.

Chapter 7

Summary and Conclusion

7.1 Summary

> ” . . . computer users are not just information-processing devices but individuals striving to achieve their goals. Their interest, emotions, hopes, passions, fears, and frustrations are important and powerful factors in choosing, learning and using a technology ”
>
> —Kaptelinin and Nardi (ch.4.2.1, p. 78).

In this design case I have shown in several chapters the underlying constraints and rationale for defining the scope of the project. These are factors that had raised out of real life challenges to overcome workload and to find the way into a new work environment. I have tried to bring forward the inter-dependency among people's work with the help of employees issues (Table 6.3 on page 82) and (Table 6.4 on page 83). These are elements portraying that ideas were developed in response to solve dilemmas and tensions in the work environment.

From a designer's perspective it can be practical to have notion about what has triggered the idea and what rationale lies behind the project scope. Design is a continuous activity of thoughts, actions and interventions. This way things develop rapidly and one issue leads to the second. In our case these components

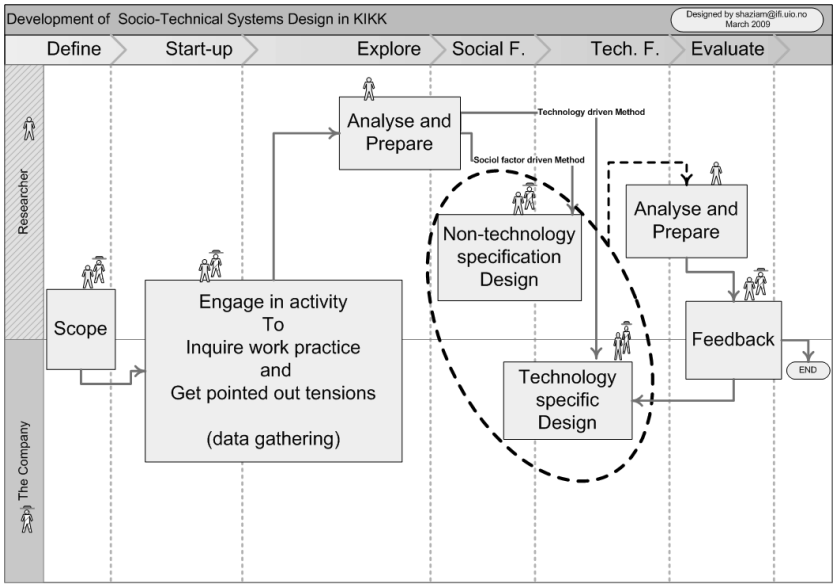


Figure 7.1: Main chuncks of design activities in design of scenarios and development of organizational & technical design.

have served a purposeful function and they have helped us move forward. Constant appearance of new clues, concerns and decision on the leads constructs a constellation of activities and actions. For KIKK it had been a demanding challenge to identify the elements constructing this constellation. The project was designed with manifolded research interests and included multiple research methods. This triangulation generated rich amount of data.

Based on experience with design work in KIKK, my perception is that to develop Socio-Technical Systems Design, it is necessary to start off by obtaining insight into employee's participation in their existing "community of practice" at the workplace. Then develop an overview of envisioned social work practice. Such overview encompasses technical solutions and organizational construction of the envisioned work practice. The envisioned system may be constructed through collaborative design activities between researcher and employees. The developers will gain better understanding through collaborative engagements e.g participate in joint design activities between researcher and employees. Design activities such as drawing organizational charts, information flow diagrams and building

prototypes may help to transform the envisioned system thoughts into an visual physical form. A simplified perspective on the design process is presented in the Figure 7.1 on the preceding page, projecting the phase for getting overview of the existing work practice, the part dotted circle refering to the process of developing the envisioned social practice.

Collaboration provided both employees and researchers a mutual playground. This serves to construct a secondary participative community. This sphere can be utilized to explore and test out ideas in support from other like-minded participants. The research group working with development of prototype (Nedic & Olsen 2007) has reported the positive development. Their observation was that employees acted with more confidence when they were engaged in discussion related to the modules components explored in the preceding "design workshop". They have also noted a significant positive change in the design environment between their first iteration of News module and development of Support module.

I have focused on developing *Socio-Technical Systems Design* for the systems development life-cycle in collaboration with employees in the case Company. Duration of the project has followed three predefined phases stretched over one year time. Design path in KIKK evolved from the project start and had developed as we moved on by following one lead to the next and at the same time the activities were anchored to milestones set for three phases. The object system was the information and the communication process, particularly customer-support activities related to their work practice. Company proposed to implement the solution with a web portal built on the content management system DotNetNuke (DNN).

Participatory Design approach was selected as motivation for our design process. Since focus is on active involvement of system users, it therefore requires work set which is user centered. Techniques and methods which we could use, needed to be in consistent with this approach. Agile software development is specified as cyclical model within software engineering approach and it has possibilities to be adjusted with end-user participation. Agile deveopment framed the work structure for development of prototype, and pair programming as a technique within extreme programming method was undertaken as method to conduct the technical

programming of the web portal.

I approached the empirical data from a *narrative* perspective. Much data comprised of stories that was accumulated in the various data sources collected in the fieldwork. The stories comprised of narrations on whole events with a beginning and an end. Equalently there was much information consisting of small snaps and bits of events narrated about certain work operations. In telling the story, the employees also incorporated their intentions and agenda with the narration. This information was available in form of research team's observations. Combined with theoretical and analytical understanding this provided me additional sources of information. This repository of information was especially valuable in evaluating the small pieces of stories and references to employees work practice. Even though I mostly utilized the stories that appear to be whole, at times it was necessary to join the small pieces of information that had occurred at various occasions.

This process provided me intermediate stories which I then analyzed further in *design stories*, and some were reused construct the storyboard in the socio-technical *scenarios*. These scenarios were developed as instruments to engage the participants with further development of the design. We made use of two types of scenarios. In first iteration I developed text based scenarios. They were composed with four events in the process of providing customer support. Second set of scenarios consisted of little text. I composed scenario with help of pictures. With them I presented scenario that was constructed on the outcome from first iteration of scenarios. With this I mean, that our feedback to practitioners on the diagram designed in design workshop, was presented by sketching a scenario on the new work practice. The impact on the new work practice was conveyed with help of pictures.

On basis of my subjective comparison between the output generated after applying these two different type of scenarios, my understandig is that scenarios written with text mediated with positive results. Where as scenarios conveyed with graphical layout of pictures demanded much explanation and clarification when it was presented to employees. This can be explained to be implication of several factors,

for example it is difficult to convey the elements concerning the organizational design at time of presenting the technical design, because a prototype of interface and functions are easy to relate to than drawings of pictures adressing the relationships. It can also be explained by focus of interest and meeting the mutual agenda. This thread will however remain open for further research. However, the result is that in KIKK I have demonstrated a process for development of scenarios adressing real practice, and this I have achieved by using design stories as analytical technique.

I have described the participatory design path that evloved in the KIKK project. More over I have presented how PD techniques had effect on structuring our work in process of developing socio-technical system, and then with help of empirical data I have shown the relevance of each activity, technique and influence of sequence in which the activities are arranged.

7.1.1 Role of Organizational Design and Technical Design

The factor that makes this process suitable as Socio-Technical Systems development, is the design operation which captures both the technological and organizational aspects of the envisioned future – which is *constructed by practitioners of the object system* i.e. employees. In these efforts we carried out two design techniques:

- visualize graphically the process for moving information in accordance to the envisioned solution. That outcome is labeled as *Organizational Design*.
- developed a prototype with the technology that was decided to be implemented in the envisioned object system. That prototype is labeled as q*Technical Design*.

Operation emerging the “Organizational Design”: The activity with drawing picture was carried out in a “design workshop” joined by both employees and researchers. The *Socio-Technical Systems scenarios* were presented to participants as instrument to set the stage for design work. Participants were first assigned

the task to list up information and actions which they believed were treasured by employees and their Customers. Participants were equipped with post-it notes and were free to write anything they considered relevant. Later on participants were given second assignment to organize those perspectives into one solution. The *Organizational Design* emerged as result of merging the information into a chart drawing organization of their various work operations (i.e their primary work) and the technical solutions (i.e the web portal) which they envisioned.

Operation emerging the *Technical Design*: The Prototype was developed over a period of approximately 10–12 sessions of workshops at the Company's office. Agile development approach was taken in practice and several modules were programmed in extreme programming style. The researchers took on the task to code the modules. Employees had the responsibility to decide the technological appliance they desired to implement. That also included the functionality, order of actions, layout of the interface, symbols and the information which they desired to include in the technical solution.

I relate the metaphor of construction work to three prominent elements; where this work is located, map for the architectural layout and placement of physical elements (i.e building, landscape, trees, monument, pathway etc.). Then the construction work carried out to implement those elements on the map into physical objects. We observed that such work brings changes into the physical environment.

Parallels can be drawn between metaphor and the Socio-Technical Systems design. The working environment at our case Company represents the place, the "organizational design" has resemblance with architectural placement of objects on the map, and the "technical design" carried out through development of the web prototype bears similarities with the construction work conducted to build the physical elements.

Hence the main challenge for development of information system lies in: (1) selecting the suitable approach for construction, i.e putting together social indicators with technical details, (2) programming of the code for system functionality with use context in mind etc, and (3) to decide which bricks (i.e operational units) will

make the fundamental for rest of the development. Change work tools (technology) that mediate in the work, make adjustment in the processes for carrying out tasks and selection of specific objects (for ICT it implies software application, hardware etc.) completes the design cycle.

7.2 Addressing the Research Question

Research Question : How do the following techniques contribute in development of organizational- and technical design:

- Scenarios
- Narratives and Design Stories

The KIKK project is unique in its user participation, methods for co-creation of collaborative environments through division of responsibility and the role undertaken by the stakeholders. The dialog in the focus group and workshop activities has shown to be necessary to sustain team work and has promoted the collaborative environment.

I have presented the design activities in KIKK as a successful example of developing a Socio-Technical System Design. The success of these activities in the design process has been primarily the result of engagements and responses (given by the employees). I measure success in practitioner's committed participation, development and continued improvement of the ideas during the design process. This was achieved by a careful composition of systems design activities that had been enriched with ethnomethodological methods i.e interviews and participatory observations. The overall guiding principle has been inquisitive exploitative approach and the reuse of practitioner's narrated experience. Reuse provides many advantages for user participation i.e participant's perspectives and interests are included in the design development and which in turn promotes sense of influence and ownership in the process.

The "customer inquiry flow diagram" as an outcome of the the "Design Workshop" demonstrates the effect of establishing a familiar platform for design ac-

tivities. An analytical comparison shows the similarities between STS scenarios presented at the design workshop and the components of the diagram. Indicating that our scenarios had positive impact on participant's motivation for design development. The participants involvement in the discussion prior to composition of the diagram illustrates the power in addressing actual socio-technical issues.

Results achieved supports the design of STS scenarios. Thus indicating that the scenarios can be based directly on narrations from the user. Otherwise a normal report or summary of a narrative tends to leave out emotional attributes and personal experiences. Such descriptions provide important details that are necessary for writing realistic reproduction of the issues. Another positive element is application of non-technological tools in the various design workshop. An example is post-it notes and whiteboard, which served as medium for meaning creation across teams (i.e researchers and employees). It permitted the participants to make their tacit knowledge explicit and thus creating information exchange and knowledge sharing to facilitate interdisciplinary communication (i.e design workshop, 'a usual day' workshop).

Therefore STS scenarios provide the opportunity to keep the designers focus on the practitioner's needs and the underlying rationale for design decision. By bringing shared stories and known actors in designing socio-technical systems, it establishes strong sense of involvement in the actual work environment and important design issues.

Development of STS scenarios effectively combines persons, daily work stories, practitioner's needs and possible improvements. While storyline is based on familiar and real incidents in the organization, the solutions by ICT tools represents a more or less random composition of future possibilities, and in this way the simulated system not only changes user habits but also the environment of use.

The results obtained from this thesis suggest significant promise for the approach of reusing employees daily work stories (i.e narrations) to compose realistic scenarios. Design stories are used as an analytical method to capture a clear view of user needs, expectations, capabilities, tasks, goals and the circumstances for the system. The concept of Design Stories was developed by Dagny Stuedahl in the

NEMLIG project, as reported in her doctoral thesis (see chapter 5 on page 45).

In application of Design Stories, my contribution has been towards empirical implementation of the method. Where as Design stories were not possible to apply in NEMLIG project, the method has produced fruitful results in the KIKK project. In this way I have provided the context for its utilization. The employees' spontaneous stories and the transition of stories into socio-technical scenarios illustrates real needs of practitioners at work.

7.3 My Contribution and Further Work

I have perceived the world through stories and narratives and brought it over to IS design. In my study I have explored this transition with help of design stories and future oriented scenarios construction. I have documented the whole process to the best of my possession. And in this way I hope to contribute with details on process as close to its first occurrence as an idea for design, as it has been possible to travel back in time.

With this master thesis, I hope to have added more experience and examples that will contribute for further researcher in IS design development generally, and as well documented example of Socio-Technical Systems Design process in particular.

The fun part for research would start from here, like compare the study of design stories and the 'realistic' socio-technical scenarios with other comparative techniques such as design patterns, use-cases or personas. Another interesting thread would be to look into the narrated stories and study the employee's knowledge representation through the examples. If I had time, I would also follow up on the influence we have injected through intervention during this process. An interesting research for future would be to investigate IT professional employees committment to development of design adressing soft attributes. In KIKK my observation is that Company expected a structured and formalized design process. How can PD practitioners contribute in development of information system in an

structured or function oriented development culture.

Appendix A

Issues and Dilemmas Raised

1. **Infrastructure based on culture in Company:** The users brought forward the concern that current system is built up on culture for small company, with few employees, one office, information that is with the individuals and mostly in their memory, and the relationship with customers is based on personal networks. These factors are considered to be unfavorable for culture evolving with new developments in Company.

2. **Access to Information:** The employees sees the need to have some technology where Company's business related information can be saved for common use purpose. Further more they see it necessary that employees have access to information irrespective of which office they are working at or where they are stationed.

3. **Information is not lucid:** New employees find it difficult to grasp the structure of information. They have access to some kind of repository of documents, but they feel it is difficult to navigate and search for relevant sources in it. They often risk to come across documents which contain outdated facts or they find information that is irrelevant for their task. For them it appears as flow of information occurs randomly and therefore it is difficult to track something in it.

4. **Sense of belonging:** the employees expressed desire for an information structure which is simpler, kept up-to-date and which can help new employees to feel affiliation. It also includes the employees who are on move and seldom visit the office and therefore lack the sense of belonging.

5. **Ownership of information:** The management expressed concern for lack of a system which brings the know-how in to the organization. Today they run the risk of loosing it with the employee who decides to leave. Work practice and culture is organized around individuals and their expertise, therefore knowledge is also associated with these individuals.

6. **Learn from colleagues:** The users urged the need to establish a platform which can lead to a practice where knowledgeable employees can share their know-how with other employees, and in this way construct a system which promotes culture for learning, and in this way the organization can recover the risk that knowledge is only bound to individuals.

7. **Sharing of information:** the users pointed out policy for informing in Company which is dependent of personal choices and the routines that are based on informal procedures. The users felt they accidentally get to learn about things that might have happened at a office or in the organization.

8. **Channels for communication:** Most of the communication in Company is carried out on person-to-person, in personal email or through telephone conversations.

9. **Communication with customers:** Today there is established a culture between the customers and employees which allows the customers to call directly to any person they know, or the person whom they last were in touch with.

10. **Overload and redundancy of work:** The employees working with development of application products experiences increase in workload. They are constantly interrupted in work which is effecting the possibility to concentrate on the work they are supposed to conduct. One explanation is the factor of communication culture and secondly that inquiries for application support is directed towards them. Solving the inquiries often take too much of their time. They also see it unnecessary to receive questions similar to problems which they have solve previously.

11. **Information about updates and work status:** Employees not working in same office building as were development of software is carried out, experiences lack of routines. They feel much information is not forwarded to them, i.e report on software updates from development team, and that it is difficult to follow status of work in process.

12. **Need of feedback from customers:** it was described by the management that there was strong interrelationship between development of the application product and the feedback from the customers. They expressed special concern for the customers from their new niche in the market and emphasized the importance to establish a channel that can bring in the relevant customer feedback. They consider it vital to have the experience and knowledge about their customers. Therefore it was necessary to find a way to acquire customer's needs and requirements related to their application system. Company wants to maintain communication with their customers.

13. **Relationship with customers:** the management emphasized the importance of relationship with the customers as it gives Company the edge of knowing their needs, and in return Company has acquired high rate of customer satisfaction. At same time the participants also expressed concern for difficulties to reach same results with increasing number of customers.

14. **Providing customer services:** Users explained that over the years, Company has established a culture for first-come first-served strategy towards all their customers regardless of the formal contracts. Now they experience to fall short and therefore it is emerging need to develop new solutions to meet the inquiries from customers. Question they raised was how to solve the situation? What can they do to continue with support services for customers without such service agreements?

15. **Response to Customer inquiries:** The customer inquiries are characterized into two areas; urgent cases which needs to be solved immediately, and cases which are too complex and therefore require a consultant to visit the customer. Company needs to establish a setup which can deal with inquiries about more general and non critical problems. They explained that one way to meet the difference among customer's experience with using the application has been solved by introducing seminars and training programs tailored for application user's experience.

16. **Variety of applications:** during the discussion the users brought forward issue of unfamiliarity about the existing application system for registration of customer inquires. And that it is used only by a few people in the company. Moreover the users expressed this to be of general problem, that employees are not aware of various information systems that exists in Company.

Appendix B

Tentative Resolutions and Answers

1. **Module-based web technology:** By coincidence the development team had come across an open source application, DotNetNuke, which provided possibility to build the web pages with help of simpler modules. It was explained that Company saw it as interesting technology and needed to explore the technology as they wanted to check out possibilities with it.

2. **The resulting web:** As outcome of the project, it was desirable for Company to get a web portal that will be beneficial for communication for employees within the organization, external to the customers, and which also will helpful to improve communications with partners.

3. **New work practices:** Researchers suggested that it is possible to look into the work culture in Company and create new practices by i.e to redefine tasks by finding new ways of dealing with them.

4. **Software development:** Researchers expressed they will consider the possibility of involving someone who can work with HCI, .Net and component–based technology.

5. **Build knowledge bank:** to build up a knowledge bank that consultants can contribute to development (by entering information and experience) and that can be used by others to search for answers /consult solutions for similar requests from other customers.

6. **Common information repository:** raised questions about the need to build repository of information for common use, where anyone can search and get updated information?

7. **Electronic boards:** Bulletin board, mailing lists, forum for question and answer, FAQ on computer network as possible solution to the problem

8. **Active information system:** To look into the what triggers the need to keep the information updated and current. As there is differences in active and passive information systems. It is important to update information systems for to be in active use or they soon become a space for storage facility where the information is not used.

9. **Single medium for communication:** For Company it is preferable to use the same medium for both internal communication and customer care.

10. **Rank customer request:** For internal procedures to follow up customer services, there is a need to structure the customer inquiries and rank the case in terms of scope and type of request. There should be a channel that makes it easier to help the customer and provide services regardless of who were last in contact with the customer.

11. **Set criteria for customer service:** having fairly good notion of needs among customers, Company has possibility to arrange new services by providing training and seminars for the customers. An additional resolution would be to develop customer service by setting up criteria which are based up on license and support agreement signed by customers.

12. **Customers tracks their own request:** To build functionality in the web portal which allow customers to track their own request issues

13. **Customers register information about them self:** provide a solution in web portal that makes it possible for customers to register basic information about them. This information is then saved in a customer database and is reused to issue an electronic support request. Moreover the consultant receiving the details e.g on telephone also has possibility to add further information in the database. Such solution might save time that would be spent to enter basic information about the customer.

14. **Direct information towards customers:** approach customers with information structure on web inspired by business and marketing strategic communication, and its easy to navigate. It is important that communication is directed towards existing customers as well as it appears attractive for customers visiting first time.

15. **Ask customers for idea:** Ask the customers about ideas, suggestion and needs for information on the new web portal.

Appendix C

Extracts of Data Source

C.1 Minute of Meetings

Meeting 05.07.2006

> Møtet ble innledet av oslo-CEO med introduksjon om Company og problemstillinger de ønsket å drøfte (problemstillinger omkring informasjonsflyt).. . .
> . . . Det er planlagt fra Company side en webportal for å støtte sekundærarbeidet (opplæring, kunnskapsforvaltning, personalutvikling) for å støtte opp om de problemene som ble identifisert over. Dette arbeidet vil hovedsakelig foregå i regi av Company, men designet av de vil foregå sammen med research team [UiO]] . . .
> . . . Personer fra research team [UiO] vil ha rollen som observatører og ansvaret for innsamling og analyse av data og vil kunne bistå Company med rådgivning i forhold til eksisterende løsninger for samarbeidsverktøy og kunnskapsforvaltning.. . . . . Det overordnete perspektiver på prosessen er deltagende design ("participatory design").. . . . . kreves en del samlinger der aktører på forskjellig nivå i bedriften er involvert. I første omgang er det spesielt aktuelt med fokusgruppe (med utgangspunkt i brainstorming) og en design workshop.. . .
>
> — Source: an approved minute of meeting 05-07-06, written by researcher (and cross-checked with a work diary written in Compay)

Appendix D

Description of Methods

D.1 Sources of Data

D.1.1 Interviews

Six individual semi-structured interviews has been conducted with the employees at both offices. They all shared one thing in common; that they work daily and have their permanent offices.

D.1.2 Focus Group Meetings

We made four different arrangements of focus group meetings. I have defined two of them as exploratory focus group [ref. Silverman] and two of them as design focus group [ref. PD /Design at work book]. They were organized as discussion forums; introduction, presentation /demo, discussion, summary and suggestion for future step. At each such meeting the agenda was predefined and related to the issues at that current stage in the process. First three were organized during first phase, to acquire employees understanding. One focus group was arranged by the end to summarize our understating and to evaluate the development. In that meeting we researchers presented our understanding to acquire response from the

employees.

Silverman defines focus groups to be ”Group discussions usually based upon stimuli (topic, visual aids) provided by the researcher.

D.1.3 Brainstorming

This meeting was planned and prepared in cooperation with the ”contact person” in Company. We were four people engaged in preparation of the meeting.

The meeting was arranged at research center. I had the responsibility to write a minute of the meeting, which was later sent for approval to all participant's email address. In this way everyone had possibility to check the content from discussion, as they were informed about that content would be used for further work.

Data Material of the meeting consists of field notes, digital still pictures, copy of notes written on the whiteboard and paperboard, an accepted minute of the meeting.

At this meeting we did not make audio nor video recording. We asked the participants for their permission to make still pictures of the setting with digital camera.

Info. about participants, agenda and purpose is summarized in the tables. See 4.3 on page 29, 4.4 on page 34, 4.5 on page 35 and **??** on page ??.

More details are also provided in 6 on page 71.

D.1.4 Status Meeting - Evaluation by The Company

During the process with development of the prototype, it was decided to arrange status meeting for the project. Aim of this meeting was to present the current status of the work and to inform each other about the understanding that had evolved during the work developed so far. Included audio and video recording.

It was one of the the last activity that involved all participants.

Discussions and information we gained in this ”status” meeting in march 2007, lied the directions for further work. It was decided to proceed with further development of the prototype.

1. Bedre oppmerksomhet mot mindre kunder slik at de ikke forsvinner i forhold til store kunder
2. Det skal ytes service til kundene i henhold til avtalen, det som kunden har kjøpt av tjenester.

The prototype was presented to a focus group in an evaluation meeting. It was arranged with employees at office in Stavanger. It was the last joint design activity carried out in the project.

This meeting has a status for being a milestone in the project, as well as it is final milestone in duration for my research work. After this point activities were carried out separately by both actors, the company and researchers. The journey of collaborative design process ended with this meeting.

Content of the Meeting

We, the team of researchers, arranged two workshops where we collectively looked into data and made analyzes of the results we could anticipate. In the meeting we presented outcome of our analyzes to the employees.

Project team arranged workshops to analyze various finding and to reach an understanding through collaboration. This operation is described in separate section.

Scenarios were presented as problems resulting from analyzing the system design and consequences of suggested changes. The focus area for scenarios was the same as presented in the first design workshop, approximately 7 weeks ago. It was the relationship between the company and their customer when providing customer support. Web portal was included as the channel for communication in these scenarios.

Aspects which we found to problematic, because they appeared to be contradicting with other aspects which were expressed as to be of importance and also had

impact on the company's business strategy for their customers, were presented as critical part of the development.

D.1.5 Evaluation of prototype

An activity to evaluate the prototype was arranged by technical-group. The meeting was arranged in Stavanger. I have not participated in the meeting. I have used the audio recordings to acquire information relevant for my research.

D.1.6 Five workshops

D.1.7 Workshop 1: Technology Oriented

Workshop was arranged at the company's office in Oslo, and held in the meeting room. It was chaired by Company's employee. This meeting had been scheduled in cooperation with project administrator (researcher) and Oslo-CEO.

Prior to this meeting, the technical-team had previously met two representatives from the Oslo-office, including Oslo-CEO in an introductory meeting that was arranged at the research center.

The workshop integrated three parts; evaluation on suitable CMC and questions prepared by technical-team, followed by open discussion on issues of technical implementation, functionality and operational concern, and in the last a brief discussion to summarize issues at present and interrelate them to issues discussed in previous activities. However, First few minutes were dedicated to introduction of people present in the room, their role and affiliation with the project. Compared to acquaintance between participants in previous activities, at the meeting there were two new members of the research-team and an employee we met first time.

In the meeting, the technical-team presented their evaluation about platform that would be suitable for developing the web portal. To proceed with the work, they needed clarification on matters related to the task i.e system architecture in the

but tom, user access to data, import and export of existing data between systems, and control of logins. There was need to get answers to questions concerning operational and technical requirements, and to find out about user's expectations towards functionality that they acquire in the solution.

In the workshop, I had the responsibility to make both audio and video recording. A camera was placed in opposite corner of presentation board, and two microphones (one for video recording and one attached to the ipod) was placed on the meeting table in front of the users). (Unfortunately, at time of converting video tapes to digital format, I discovered there was no video recording of the workshop. I forgot to press the recording-button).

As researcher my role was to observe and to collect information about the technical aspect related to development of Socio-Technical Systems design.

D.1.8 Workshop 2: A Usual Day Today

It was first project meeting arranged in Stavanger, and involved only users of this office. An appointment was made for two days visit.

Information about a usual day was also gained by inviting users to present it on informal and unstructured way, occurring with spontaneous comments and descriptions.

Artifact used: Pen and colorful post-it notes were used as tool for the workshop. A blank whiteboard on the wall was used as workbench. Each user was given a place on it. Users could decide if they wanted to place the notes on the whiteboard one at a time or wait till they were finished with the work /writing.

Background and relevance of the activity had already been introduced in session where we presented plans for the day. So, at start of workshop, chair person described the task for users and provided practical guidance for the work. Users task was to write response to questions that were presented to them, and the users were asked to write only one thing on each note, or only thing which was closely connected to each other.

Pen and colorful post-it notes were used as tool for the workshop. Background and relevance of the activity had already been introduced in session where we presented plans for the day. So, at start of workshop, chair person described the task for users and provided practical guidance for the work.

Task was to write response to questions that were presented to them, and the users were asked to write only one thing on each note, or only thing which are closely connected to each other on the same note. A blank whiteboard on the wall was used as workbench. Each user was given a place on it. Users could decide if they wanted to place the notes on the whiteboard one at a time or wait till they were finished with the work /writing. Task was only conducted by user, while we contributed as facilitators.

In the workshop, the users conducted the activities, where as we participated in discussion and asking questions. We were seven person, three users and fours of us from the project team.

Members of the technical team did not participate in it. On the second day only two of us visited the office, since project administrator participated only in the joint work session during first half day, and one other after the workday another project team member also

During first half day we were accompanied by project administrator. Rest of the day, when we started with interview sessions, we split up the project team. Two team members conducted interviews, I looked into existing systems.

After first half day, the project administrator left for a conference,

Organization of Meeting

During the visit we stationed all the activities in the meeting room. Video camera was placed in one corner, and on the table we placed microphones for video recording and audio recording on ipod. At some points, specially in workshop, we used digital camera for photographing of visual expression; setting of the room, notes on the board and activities in the room.

Our two days were organized differently. Workshop about a usual day at office was carried out as warm up activity and the joint working environment continued several hours. During this part, the project administrator took on the role as chairperson, and I had the responsibility to make audio and video recording.

Schedule of the days comprised of several integrated activities, some were planned in beforehand, and some naturally occurring situations were adjusted into the schedule. An overview can be presented as such:

Activities First day:

Part 1 Duration from 10:00 - 12:00

- introduction (approx 10 min)
- users expectations and brainstorming (approx 20 min)
- discuss methods and planned activities for the day (approx 15 min)
- workshop; A usual day at office today? Use of tools? Interaction? Linking work relation and knowledge sharing (approx 45 min)
- discussion
- working lunch (approx 30 min)

Part 2 Joint work session: This part was not planned but due to flexibility in schedule and spontaneous suggestions created space for it. The new activity occur ed as result of discussion and mutual agreement among participants, and therefore integrated as natural activity based on the situation at hand.

- evaluate plans for the day and discuss activities. Plans for observation by following in users footstep was canceled in consent with users after evaluating the circumstances (approx 20 min)
- New plan: demo and discussion on existing information system as collaborative activity (approx 55 min)

Part 3 Duration from 14:00 - 17:00

- session with interviews
- presentation of existing IT systems

The second day was not planned to the details, and it was intended to supplement the work from the first day. Activities and interaction with users during this day occurred naturally. On this day we were given presentation about an existing information system used for registration of customer inquiries. However the system is not used by all users. We got invited to lunch, and were presented to two other users in the office.

D.1.9 Workshop 3: Construct Design

we arranged this workshop to design the envisioned solution. Departing from information we had acquired thus far, we created a scenario about users in company dealing with few selected aspects related to customer support service.

We applied some of the participatory design techniques to support work that had to be carried out in this meeting. This comprises of techniques such as scenarios, organizational games and using simple hands-on artifact such as post-it notes and whiteboard. Description of these design techniques are given in a separate section.

Design Workshop instantiated as first major activity that explicitly focused on constructing design as a 'product' in collaboration with employees.

researcher-team planned the content and setup for the workshop. Responsibility of allocating participants for the workshop was in hands of our contact person in Company.

We had also made arrangements for audio and video recording, and photographing with digital camera.

Setting

Design workshop was carried out in three units; we first introduced the scenarios and questions, immediately afterward the participants were divided in two groups

to look at perspectives for needs and requirements as seen from external (a customer's) and internal (from inside the company's) point of view. Points written on post-it notes during this organizational play was then presented on a whiteboard. Both groups presented their results. A final step in the process was to ask participants in the workshop to merge these two perspectives into a new joint perspective that would represent a system using web portal as medium for communication.

Both groups worked differently. The group focusing on internal perspective used the scenarios as starting point for the work, their conversation referred to elements pointed out in the scenario, the solutions presented in it and compared the design with aspects as they saw or had thought of. Conversation in the second group (viewing from external perspectives) was engaged about information and process seen from outside today, as things are perceived to be carried out and relevance of information on company's web for the customer's needs. After half hours simulation of roles, each group presented important point from their work and a rationale for how they consider the interrelation is between those points.

For the joint activity (in the last), the participants discussed various post-it notes, categorized them, and placed them in a order which sketched a flow of information, thereby resulting in a sequence diagram of envisioned system concerning the process for customer inquiries.

Purpose and Agenda

Intention was to reach for some common understanding on issues concerning work practice in the organization when dealing with customer support inquiries.

By creating an artificial setting, we hoped to allocate relations and mechanisms for knowledge sharing which will be acquired for work routines in future. Users were thus invited to take into consideration the situation prescribed through these scenarios and through putting themselves into someone else position discussion an view about the company. Target was to work out some concrete design /item.

D.1.10 Workshop 4: Prepare for Design Workshop

We arranged a workshop for participants of the project team. Here we explored into data and discussed issues that we had come across or observed during the work in previous phase of the project (analysis and data collection). It was then decided to focus on one relationship between the company and their customers, namely the situation in concern to customer-support process.

Scenarios for Design Workshop

The scenario was designed on basis of two ingredients; narratives and stories previously told by users, and it was incorporated with ideas given for new system as that had been described for us. Additionally we added adjustments for technological infrastructure that follow by implementing those components. Story in the scenario was presented by depicting one customer-support case and by setting up the related information flow in the company.

We arranged a design workshop. In this workshop participants, both on company's side and among researcher, worked on different tasks. This is described in section "Design Workshop" [ref. design activity sec. number and name]. The scenarios we had developed were presented at start of that workshop.

By presenting scenario to the participants, they were indirectly urged to continue to discuss factors which we thought would be helpful to understand their work practice. Secondly we hoped to get some kind of reaction from the employees which would help us clarify our understanding of their work. A third intention was to create awareness among employees about affects which are caused by changes.

For help in this process a list of questions were generated. And after presentation of scenarios these were listed on the whiteboard.

D.1.11 Workshop 5: Prepare Status Meeting

Collaborative data analyzing workshop. In this workshop the activities of project team revolved around data analysis, selection of focus area and made a presentation for the status meeting.

Methods for Analysis in Joint Workshop

Preparations for this in-house meeting encouraged for joint analytical work within our research group and contributed for the presentation of the 'findings'. We arranged two workshops with the purpose to jointly work through the selected data material. In order to make the work comprehensible, we restricted the focus to selected data material. The selected data material consisted of following three activities; a workshop on prior practice from phase I, design workshop from phase II and the development of web portal through phase II.

In the first workshop we presented "findings" from the selected activities. From the workshop of phase I, there were selected four video clips on informants perspective on the work and role in the company. From design workshop the findings consisted of a list of eight to twelve topics which were discussed/focused up on or there was raised questions about. From the work with web portal general issues about the development process, design perspective on the module which were implemented and prototypes made for the web portal were discussed.

This rich and wide selection of "findings", which were related to research perspectives, were then discussed and evaluated. Based up on the presentations and discussion in our focus workshop, we categorized the various aspects into four main focus areas. These focus areas were than used to set the framework for the presentation of our analysis at the status meeting.

Workout Preliminary Findings

The "findings" were used to define the framework for presentation. Following selected topics framed the content for the meeting. These topics poped up as

result of looking carefully on information we had collected.

1. Development and Upgrade of the Product
2. stream of Information and how it will be processed withing the company
3. means of communication and channels of conveying message
4. customer relationship

D.2 Method for Structure and Analyze Data

The technique of scenarios was used in analyzing data. I used it most in workshops and presentations especially in the last focus/status group meeting. Scenarios were developed to present my /our understanding of the situation. Therefore we focus one aspect namely "customer service and support for business" which is also reflected in the work of the cooperates Internet portal.

D.2.1 Socio-Technical Systems Scenario

A set of scenarios were developed based on the collected information. These scenarios were related to activities occurring in the company when a customer contacts the company requesting for help to solve a problem.

First stage - to Design Scenarios

At this stage, our information consisted of description of tasks and routines carried out in work, and it contained explanations and suggestions for how the participants foresee a future solution.

A set of scenarios were developed as instruments towards developing the system design in a future workshop. These scenarios were constructed by deriving information from the collected data; through meetings, group works, interviews

and presentations. Scenarios were formed as to represent existing work practice embedded with suggested technical changes.

Construction of Scenarios

First we selected the perspective which we understood to be of importance for the company. Therefore the focus was towards relationship between the company and their customers; about providing customer support services. In this regard, the activities carried out in company, the communication infrastructure used in the process and the flow of information in these situations was necessary factors to look into.

Information which employees had emphasized as important and expressed as to be challenging was extracted from the collected material. Along with problems, thought on improvements has also been mentioned. Therefore these suggestions were also included.

Four design scenarios were developed. They concerned about various aspect which occurred in the situation whenever customer support was provided as a service.

D.2.2 Design Stories

For presentation of the empirical data, I have selected to approach it by using ”Design Story” as a tool. With help of these design stories I hope to draw a picture of the task at hand. The presented design stories are narratives on occurrences of situations in the company that describes certain events or activities. With departure from these narrations, my attempt is to throw light on aspects which are present but not obvious. Each of these stories are described by supplementing them with information about underlying factors which are necessary to put tings in correlation, and this will be helpful to develop understanding of the perspective presented in the design story.

Appendix E

Presenting Design Stories

E.1 Design Story as Tool

Narratives presented earlier for describing the case, in chapter ”About the case and the company” will be elaborated and described in details and analysed.

E.2 Design Story 1 - from Narration 1

To achieve optimal utilization of knowledge and learning that occurs through interaction between employees, it demands to look into and treat those elements that generate these values/this property in the company.

The company consists of two main offices in Norway; the head office and a newly established office in Oslo. The office in Oslo has been assigned the responsibility for taking care of customer portfolio in eastern region. Employees appointed/ recruited to the office are new in the company. Many of them are recently graduated students and therefore have not sufficient work experience. The company’s experience and expertise lies with the head office. There are several miles of distance to travel between the two offices, because t he head office is located in west coast.

> We have the capability to work what would have looked like miracles in an earlier age. However, as in the parables of childhood, we ought to be careful about just which miracles we select
>
> — *James Martin, 1990 [ref.4]*

The experience exists in form of:

- knowledge among employees
- the history of cases
- experience with problem solving
- the ICT know-how
- information about the product development
- and the documents relevant for the cases

This sums up to be expertise on problem solving related to the product development. These properties are associated with developers of the product and senior employees at that office. Customer relationship features the support provided in response to inquires submitted by the customers. For the newly constituted office in Oslo this covers service to the established, new and the potential customers. The customer inquiries often necessitate /require insight into the customer's history and the specific knowledge of their product solution (the application implemented at their end). This is an additional requirement on the employees. They are supposed to have complete knowledge and potentials of their products.

While dealing with customer inquiries, the consultants working in Oslo s site faces several challenges. In case of insufficient knowledge regarding the customer inquiry they seek help from experienced colleagues. For this purpose they normally use telephone and/or email to discuss the case. In the company's culture it is customary for the colleagues to take part in informal and direct communication channel.

Telephone conversations are quick and to the point. In some cases it is even more convenient to use phone. Problem can be complicated and hard to explain for an inexperienced employee. For an experienced person it would be easier to obtain better understanding of the problem during a direct interaction. In this way, the

company's IP (intellectual property) is transferred from an expert to the single employee. Who can use this knowledge and solve the current customer inquiry. In future s/he can independently respond to the similar inquiries from the same or different customer. However there is a drawback with this. She or he may/might forget the details for rare cases and hence contact again/need assistance again. So this routine puts an extra load on experts who have to explain the same problem over and over again to each of the inquirers. Use of only email or combined with the telephone conversation can be helpful. Email can be saved and therefore information will be available. The inquirer can search in the mailbox and find solution if she/he forgets detail.

In general much important and useful information is shared among employees. Even though information in email is available, it has limitations. Emails are usually saved in personal accounts and not available to other persons seeking the same information. Each time a request for help is directed to the experts in the company, this very same procedure for interaction is carried out. Knowledge and experience gained from this communication process remains with respondent and the inquirer.

Vital insight regarding a problem (and also about the customer) is shared. Unfortunately it is not possible for others to benefit from it as the information is shared personally i.e. orally or in email. Those interested in the related know-how, they must first trace up the person who holds the information and secondly ask for it. Only then will s/he acquire the necessary information. One solution would be to make the information accessible for all employees. Openly available information would be utilized as reference source. This source would serve as a guide in resolving similar cases, or it may be of help for employees in their learning process, or it may be used to get information about customer's past inquiries. As a consequence employees would not always need to request information from the experienced employees. Changes of this character would lead towards lesser burden on the experts to attend to similar and once already answered request. In this way the frequency of questions towards the experts would be reduced, leaving them with fewer interrupts. The developers and experienced employees can focus on challenging tasks.

E.2.1 From a Socio-Cultural Perspective:

From a socio-cultural perspective /point of view we see example of procedures and routines that emphasizes:

1. the work practice in the company,
2. the work tools that are available for certain tasks,
3. the role and responsibility of the participants involved,
4. and the work environment for the employees.

It has been expressed benefits, disadvantages and limitations of the working procedures. First the focus has been on directed towards things which are experienced as problematic. This expression of frustration indicates the challenges for a system developer. As a conclusion, then attention is led towards suggestions, ideas for changes, and positive implications of those factors. A system developer can consider these elements as to be clues into the user s opinion about the situation. An understanding on what is working and which parts are needed to be fixed. It provides an idea of the desired working conditions. However, this simplified description serves merely as brief introduction to the company as an organization, its working environment, relation between employees and common tasks that are part of their work.

The point is that this design story contains elements that can provide information for the design purpose. Informant gives examples of existing practice and the need for change that is felt as necessary to it. The changes made by new suggested system are expressed along with expectations for future work practice.

E.2.2 From a Systems Developer's Point of View:

The way customer support is performed today, it is considered to be an insufficient work routine. A number of disadvantages with telephone usage are mentioned, and in additionally by putting heavy stress on the shortcoming of email usage, emphasizes is made on need for developing new system for dealing with

customer inquiry in such way that related information can be made valuable for the employees . To improve the condition, it is proposed to employ:

1. web based technology,
2. to build up a repository of recurring problems and problem solutions so that answers can be found by searching in it,
3. search can be presented to users by generating probable solutions for the inquiry.

The proposal is anticipated to resolve the challenges concerned with learning and sharing from the process of resolving customer inquiries. Further it is considered to be beneficial:

- especially for the experts as they can be released from the task to update and inform the employees,
- for the employees this repository can contribute in the learning process.

Today Web technology has advanced features, combined with repository of inquiries (problems and solutions) it can be employed to accomplish the goal. Further more by searching in the collection/database (on previously solved customer inquiries) the users can have the output presented as probable solution.

This narrative gives an impression of the routines and flow of information in the company. It is a good illustration of activities concerned with customer related tasks as they are carried out by the employees today. For a system developer, this description presents parts of a user environment. The situation provides information about the scope for the desired computer system.

E.2.3 Further Analysis

[From Here start outline of ideas relevant for further development of the design story number 1]

Second Feature - Geographical Distance

The interaction between customers and the company illustrates a second feature at the organization/company. Customers are divided between the two office units accordingly to geographically location of their business. This division is considered to be practical. This is partially also done because the two units focuses on different customer segments.

The administration staff at office in Oslo consists mainly of a managing director and new employees who reside the office during their training time in the beginning. Much of their time is occupied with participating in an education program to learn about the tools and work methods related to the company's project management applications. They receive training on consultancy task and will later be assigned to projects. As consultants they are engaged in activities at the customer s site, and which later on often become their work place. A close working relation is often established between the customer and the consultant. This establishes one-to-one interaction, and then customer prefers to consult with these contacts (the consultants that has worked with them) first. Only when the person is not available for help, they place inquiry with people at the office.

Third Feature - Flow of Information

Flow of information is third significant issue emanated from the design story / narration /in the company. Employees at office in Oslo express their dependency on colleagues at head office. Access to information is dependent on the availability of the person. Documentation of the history /information is a subject to personal assessment.

Forth Feature - Upgrade of ICT Park

A forth feature which is indirect and hidden, could be the expression for upgrade of the ICT infrastructure. With the new technology of web 2.0 it can seems fashioned and as the company is lagging in the technology development since work

procedures are dependent of telephone and email infrastructure.

Communication Tools - Telephone

During last half of the century telephone has developed to become necessity of life. Development in use of phone has brought about changes in the daily life for individuals in the society. Rich Ling writes:

> Ětheway we keep in touch with each other, the information that we communicate, shopping and the practical aspects of life, the things that we can hide from others and interaction between individuals have all been changed by the telephone.
>
> *— Rich Ling, 1994 (Chapter 1 Introduction)*

There are social factors attached to the use of telephone. First of all because it functions as medium for communication
Rich Ling describes it to be;

> Ěculture of telephony Ěthe role of the communication mediumĚthe medium has much to say about how one collects and sends stimuli. Ě.the character of the interaction varies depending on the medium through which the interaction passesĚ
>
> *— Rich Ling, 1994, (chapter 2.3 the role of the medium)*

Secondly telephone have played mediating role in bringing changes into the ways thing are carried out (compared to how they were conducted previously); change in technology, change in behavior and change in need.

Culture of Workplace

Interaction between people plays important part in composing the culture of the environment. In light of socio-cultural perspective learning is understood to be product of the environment.

Relationship

The design story briefly sheds light on the co-relation that involves three actors /participants. (a triangular relation between employees at the two office units and

the company's customers). The learning process for employees occurs as result by solving customer related cases. Focus on sharing know-how is directed towards the interaction between the employees (internal communication challenges). Flow of information defines the interaction between the company and its customers.

Introduction of new work tool propagates new ways of doing things, which bring changes in the environment. (Introduction of a work tool propagates the way things will be done). By suggesting new system the company indicates openness towards new work structure. Every new tool will not necessarily bring expected changes.

The suggested new system is based up on web 2.0. With trend towards collaboration across geographical places, it is a technology aimed at making the communication infrastructure adoptable to it.

Categorizing the Information

- present a Table with listing of elements A goal oriented approach to make things explicit, prominent and visible

E.3 Design Story 2 - from Narration 2

A meeting on titled Brainstorming was called in the beginning of the KIKK project. It was aimed at to get to know each other, and had two main purposes; a face-to-face meeting between participants and to think aloud on issues which are considered good and problematic in the company. We were urged to concentrate on challenges and not to focus on solutions. For further details about the meeting, refer to chapter XXX for presentation of project.

While discussing the topic about communication culture in the company, the company's representative participants provided information on the matter as they considered it. As they see it, the structure of information comprises of a number of

historical and social factors; the following three aspects seemed to be main reasons (1) small office culture with fewer people in office than today, (2) a practice where information was kept in their memory, (3) personal network and social relations lay the basis for development of company.

Participant MA narrates an event from his own experience to illustrate communication practices in the organization. In response to a customer inquiry s /he seeks help from a senior. While discussing the problem, MA assumed that senior will respond to the customer and detaches from the responsibility of the case. As a result the customer was not informed of the outcome. After some time the customer made contact with MA again and asked about his inquiry.

In this example we see a situation where employee is dealing with a customer request. We see two communication relations that are established; one internal between colleagues and second external towards a customer. Further we see a novice who makes some interpretation of this situation and disconnects him self from the case. Consequently a customer awaits answer and calls back to same person to whom he was in contact. From a business point of view this might effect the company's reputation. As for the internal part, we get to know that employee in the company work together to solve customer issues. And the company has a system that could have been used when dealing with customer inquiry but back then it was unknown for MA.

According to MA, this example projects some aspect of the collaboration process when solving customer inquiries. Therefore MA expressed a need to look into the routines and messages that are required to be established between colleagues in the company. A closer look into the content gives indication on flow of information related to activities dealing with customer inquiry. More over it reflects how an employee may involve himself with inquiries from a customer. For a novice there is possibility to find an experienced colleague whenever a query is not understandable or if it s a complicated issue. We see that an experienced colleague some time help; by providing some clarification or contribute in solving the case. Such situations provide an arena for interaction between a novice and an expert in the company. However the experience from this leads to discussion on the feeling

for ownership and responsibility for work conducted in collaboration.

In sum, the participants suggested that it would be preferable to use an information system which can provide communication both for internal use and for customer support function. Some technological advancement to ease the exchange of documents between colleagues across the offices /sites was also regarded as necessary initiatives.

E.3.1 From a Socio-Cultural Perspective:

From a socio-cultural perspective, the narrated design story stages a couple of factors related to the working environment at the company. Following is a brief overview of what I can see:

1. 1. there is a culture for cooperation in the company. Colleagues help each other to resolve a case.

2. 2. an acceptance for novices to learn from experts in the company.

3. 3. Cooperation and interaction among employees promote learning situations, and in some way these facilitate processes of knowledge transfer.

4. 4. Inquiries submitted by customers are immediately (or soonest possible) attended to. Implying that a customer is highly valued and their requests are given priority.

5. 5. Work routines seem to be embedded in the tasks /activities. As illustrated in this story; new know-how is learned while dealing with issues i.e. an application for entering customer inquiries was learned as part of discussing this event, unspoken culture on who respond to customer, and the understanding on division of work. the way activities are carried out shows that there is little formalism present in the company. This may indicate a flexibility and nonrigid structure of work practices; in the way a customer approach employee with its inquiry, and a novice has possibility to get expert help.

6. 6. some kind of generation gap; a novice consider work finished when it has been brought into account /attention for an expert, this compared to anticipation from an expert believing to be providing assistance to novice.

7. 7. There is an established work culture /environment which is not transparent for an outsider.

E.3.2 From Systems Developer's Point of View:

From a systems developer s point of view this design story points toward a number of shortcomings and potentials.

Shortcomings:

1. It seems to be missing some common or centralized system to provide interaction between employees. A system of importance so it will be known from very early on for a new comer.
2. The infrastructure of communication is invisible. It seems know-how of system is dependent on who uses it.
3. Lacking a system that can provide possibility to track customer request in the process. A setup to detect pending task and to ease the process for following up the cases.
4. The employee seems to lack insight on area of responsibility and structure on delegation of work.

Potentials:

1. Some formalization of standard routines and procedures can help to make the unspoken culture explicit.
2. The process of implementing a new system for communication, can contribute to revise existing way of work and establish new work practice to cover the gaps of cultures and to include new work tasks.
3. A medium that can be used to share information and to communicate with those working together.
4. An atomized system which can help the new comers to get acquaintance with work routines.

A system development approach is to focus on some kind of improvement request /work flow to deal with issues pointed out earlier (refer to chapter XXX on details about improvement process). Considering then information related to this design story, it can be categorized as listed in the table. This can help to draw a picture of state for desired situation and actual practice today. Analyses of it can contribute to find elements which need to be attended to.

E.3.3 Categorizing the Information

- present a Table with listing of elements A goal oriented approach to make things explicit, prominent and visible

E.3.4 Theoretical Aspects

- Novice Expert difference in problem solving (Richard E. Mayer, 1997) [Mayer is COGNITIVE oriented] Alternative:
- Sosio cultural perspective: vertical and horizontal dimensions i. Vertikal: Situated Learning by Lave og Wenger (om praksisfellesskap basert på skredderlæring i afrika) ii. Horizontal: Appropriation (Säljö) + Externalization (Säljö og Engeström) iii. Mesterlære by Kvale
- Underuse and overuse (Grudin and Markus 1997)
- Implication of IT on org. (Grudin and Markus 1997)
- Improvement process on goal driven approach (Hohman + +)

E.3.5 Technological Aspects

- - Ticketing applications commonly used for customer support services
- - Share pool
- - Mailinglist

- - Bulletin board
- - Web 2.0 technology
- - Forum
- - Experience db ala the one Oracle has

E.4 Design Story 3 - from Narration 3

This narration has been expressed by employees participating in the meeting titled brainstorming , it come forth during the third session at that time the focus was turned towards issues and concerns experienced as problematic. This phrase problematic was used by us researchers in order to encourage the participants to speak openly about any matter which they regarded as necessary to be changed or improved. At that point participants were urged to leave aside ideas for possible solutions and only look at matters as they are today. Among several more concerns this selected story describes one concrete process related to the communication and sharing activity. It refers to the way colleagues inform each other and keep themselves up-to-date with activities happening in the company.

The narration depicts the customary approach for spreading information to employees. For those in office the conventional way of sharing updates is by telling it orally. Email is used when someone finds it necessary to inform some other, and usually in case when a person is not present physically in same office. What information is conveyed and to whom it is given to, is in any case (and mostly) dependent up on the teller. Email is used for communication purpose. The employees presume this practice need attention as it has some drawbacks. Moreover they expressed concern for establishing contact with colleagues working out on assignments, who are usually hired by customers on short or long term contracts.

With this, the participant draws a picture of their practice for conveying the news in the company. It sketches a procedure the employees apply and participate in for passing on information among them. They have developed practice for use

of email system as channel for informing. This describes the tools and mediums adopted for communication and broadcasting information in the company. It appears to be an ad hoc and arbitrary approach. By referring to the needs for belonging and inclusion of colleagues working at the company's customer sites, apparently they have uncovered the shortcomings of their existing practice.

From introduction to the company, we have learned the culture in company is based up on personal ties and work within close networks. These relations have been explained to be of vital importance for expansion of the company's business. As an organization the company considers it to be vulnerable since most of the operation is grounded in knowledge and information kept with each employee working in it. This was one of the driving forces for initiating this KIKK project. The have therefore expressed preference for making the work related information available in such manner so it is accessible and traceable for future use.

The custom for sharing information either orally or via email, can be understood as the culture for sharing and communication at the work place. As described by the employees, in another design story, the work culture has evolved with the development of the organization; it has grown from being a workplace where persons knows of each other and therefore work in close relations, to now encompass young and fresh graduate colleagues.

E.5 Design Story 4 - from Narration 4

The design story brought forward is about one of the company's consultant who is assigned to a project. The consultant will be working at the customer s site. In this case the customer is located in Oslo. Duration for this assignment is agreed to last for two (2) years. The story briefly describes responsibility and tasks to be carried out by the consultant.

In order to understand the activities and relations that are present in this design story, it is important to look into the aspects which are under concern. Three main issues /concerns are prominent; employee consultant, products and services, and

the customer.

IT Product for Linking

The company's main business focus is on concept for running project management and it has in-house development of software application based up on it.

The company develops three (3) types of project management applications; one is categorized as add-on for advanced reporting facilities with Microsoft Project (product is named: Company module as add-on in Microsoft Project), and two complete stand-alone systems. Among these two, one covers advanced features for professional and complicated project management (product is named: Company Project) and the second one is directed towards managing simpler and smaller projects (product is named: Company Planner). Oslo office holds special focus in Microsoft related products, thus their competence lies in running project management with Microsoft Project tools combined with Company add-on module for advanced reporting. Which at a time is relatively fresh product introduced in the market.

The company specializes in customizing these applications for their customers. In additionally the products are market /promoted with feasibility to communicate with customer's own project database and database from their subcontractors.

Work as consultant in the company

A consultant carries out several roles; as a representative for the company's products, a person with best know-how on project management software, a person with IT skills to find technical solution on problem and as the one with best and advanced experience in using the company's project management tools. As referred to in another design story, the employees recruited in the company are mostly people with experience with company's software product and has worked together in some previous projects. In the case for fresh graduate employees, prior to their individual assignments (sent as consultants out to customers) they have during their first working period undertaken training at office. There they receive training by participating in activities with experienced consultants and additionally supplement it with intensive theoretical classes in project management concepts. The

company mainly uses its own courses for providing education and where necessary additional external short curses are also provided. Consultants can also choose to specialize in selected areas. New consultants get gradually introduced to take responsibility of independent assignments.

Consultants often play role of middle-man between the company and the customer they are working for. During this contract work usually the consultant takes on role to report errors, to submit inquiries and discuss problems on behalf of the customer, and on other hand, to some extent, they implement solutions and solve problems on behalf of their own company. Customers tend to tie relation to consultants who was hired. As a consequence consultants experience that old customers call them directly when ever a need arises or they want to direct an inquiry.

Consultants working on long-term assignments feel to be caught between sense of belonging to both the company and the customer. Their everyday work is at the customer s site, they socialize with customer's employees as colleagues, where as their actual status is temporarily and actually are representing their company.

Facilities offered to customers The company facilitates various services for customers. Customers can attain these services either as part of delivery product or as additional service independently of the product they have purchased. For instance a customer can buy product which include get started consultancy help or they can inquire for assistance from a consultant as an assignment based project.

Further more, the company also arranges classes for customers interested in their project management software. It is arranged by assigning consultants among the staff to give lectures for classes. This arrangement also provides with establishing relation between customers and the consultants.

[noen tanker: tvilsom argumentĚ finn ut om datamaterialet dekker dette???]

A customer in the company

In the company the customers are spoken about in many ways, more than 10 terms has been frequently used to describe them. This rich spectrum of labeling of customers identifies the relationship to the customer. Reference to relationship with

the customer is usually categorized in terms of business agreements. Example on these categorizations are labeled /named; golden customers,license customer, USP customer with maintenance agreement, big customer, small customer, old customer, new customer, potential customer, friendship customer, customers attending classes, customers hiring consultants, customers from well-known business segments, customers from new line of business, non USP agreement customers, big customers with user licenses but with dedicated contact persons, advanced users etc.

Division of customers between two offices, as described in another design story, is organized according to geographical locations, expect for that old customers are linked with office in Stavanger. At the start when office in Oslo was established, a number of experienced consultants from head-office (office in Stavanger) were transferred over to the new office and gradually the staff at new office has been increased with employment of fresh graduates.

Social relationship and network building in the company

Every year all employees are invited on trip to some place far away, and mostly it is arranged to be out of country. For instance in year 2006 the trip went to Italy.

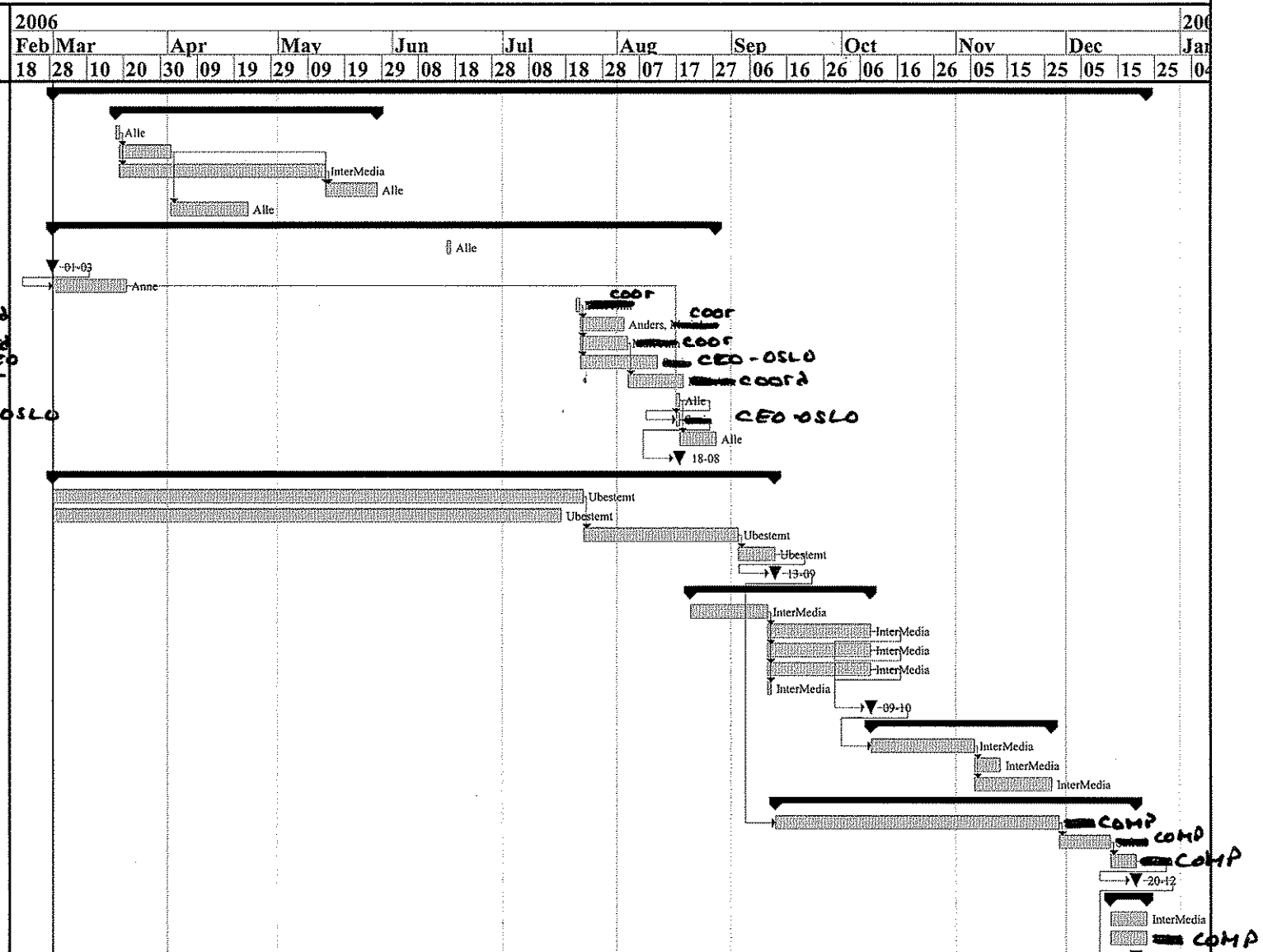
Appendix F

Preliminary Project Schedule

Forskningsprosjekt "KIKK"

InterMedia

Description	Early Start	Early Finish	Dura	Ansvarlig
Forskningsprosjekt	01-03	22-12	297 d	
Planleggingsfase	18-03	27-05	71 d	
Infomasjonsmøte, InterMedi	18-03	18-03	1 d	Alle
Bekrefte videre arbeid	19-03	01-04	2 w	
Innvolvere akutuelle prosjekt	19-03	13-05	8 w	InterMedia
Utarbeide mål med prosjektet	14-05	27-05	2 w	Alle
Avdekke behov og problem	02-04	22-04	3 w	Alle
Forprosjekt	01-03	27-08	180 d	
Fellesmøte, [redacted]	16-06	16-06	1 d	Alle
Forskningsspørsmål satt	01-03	28-02	0	
Lage utkast av kontrakt	01-03	20-03	20 d	Anne
Møte [redacted]	21-07	21-07	1 d	[redacted]
Spørre kunde om involvering	22-07	02-08	12 d	Anders, [redacted]
Utarbeide prosjektplan	22-07	03-08	13 d	[redacted]
Inkludere ansatte i Stavanger	22-07	11-08	21	[redacted]
Utarbeide synopsis	04-08	18-08	15 d	[redacted]
Brainstormingsmøte	17-08	17-08	1	Alle
Signere avtale med InterMedi	17-08	17-08	1	[redacted]
Design av mock-ups	18-08	27-08	10	Alle
Forprosjekt ferdig	18-08	17-08	0	
Verktøyvalg	01-03	12-09	197 d	
Undersøke alternativ platform	01-03	22-07	144	Ubestemt
Undersøke alternativ utviklin	01-03	16-07	138	Ubestemt
Teste platform	23-07	02-09	6 w	Ubestemt
Avgjøre utviklingsverktøy	03-09	12-09	10	Ubestemt
Verktøy avgjort	13-09	12-09	0	
Datainnsamlingfase	21-08	08-10	50 d	
Plalegge datainnsamling	21-08	10-09	3 w	InterMedia
Observasjon	11-09	08-10	4 w	InterMedia
Intervjuer	11-09	08-10	4 w	InterMedia
Spørreundersøkelse	11-09	08-10	4 w	InterMedia
Observasjon hos [redacted]	11-09	11-09	1	InterMedia
Datainnsalingsfase avsluttet	09-10	08-10	0	
Analysefase	09-10	26-11	49 d	
Ansalysere data	09-10	05-11	4 w	InterMedia
Evt. gjøre mer innsaling av d	06-11	12-11	1 w	InterMedia
Transkribere	06-11	26-11	3 w	InterMedia
Utviklingsfase	13-09	19-12	99 d	
Utvikling av portal	13-09	28-11	11 w	[redacted]
Testing	29-11	12-12	2 w	[redacted]
Dokumentering	13-12	19-12	1 w	[redacted]
Portal ferdig	20-12	19-12	0	
Avluttingsfase	13-12	22-12	10 d	
Presentere forskningsresultat	13-12	22-12	10	InterMedia
Presentasjon	13-12	22-12	10	[redacted]
Avslutte forskningsprosjekt	20-12	19-12	0	



Appendix G

Appendix Interview Questions

Intervjuguide for KIKK- prosjektet (Final version)

(Innledningen er worksopen)

2. Personens bakgrunn (10)

1 Om mulig: ref til skjema m bakgrunnsopplysninger, dersom dette er fylt ut snakker man om det.
   - Navn
   - Alder
   - Stilling/antall år /mnd.
   - Utdanning/bakgrunn
   - Tidligere arbeidserfaring

3. Bakgrunnsinformasjon om bedriften (5)

2 Historisk informasjon:
   - Oppstart
   - Antall ansatte
   - Personlig forståelse av bedriftens utvikling

3 Hva er din oppfatning av Company sin visjon?
   - kjenner du til den –
   - hvilket forhold har du til den?

4. Organisasjonsstruktur (5-10)

4 Oppfatning av organisasjonsstruktur (tegn og forklar)

5. Beskrivelse av arbeidsoppgaver(10)

5 Beskriv dine arbeidsoppgaver raskt
6 Finnes det noen skriftlige retningslinjer for arbeide ditt?
7 Opplever du at det er samsvar mellom den og arbeidsoppgavene dine?
8 Hvordan ser en god dag på jobb ut – beskriv
9 Hvordan ser en dårlig dag ut – Beskriv
10 Hvilke type utfordringer møter du på?
11 Hvordan prøver du å løse disse? – utdyp

HALVVEIS!

6. Kundecase

Tenk deg at en kunde ringer inn og ønsker en oppdatering eller tilleggsfunksjon i en verktøyeme (project, safran planner..). Du tar i mot tlf, hvordan går du fram? Hvordan kan andre kollegaer finne ut om denne tillegsfunksjonen/oppdateringen? (internt og eksternt) Hvordan kan andre kolleager følge kundeoppfølgingen?(få fram oslo kontor og stvg kontor samspil)

7. Kundebehandling (5)

12 Har du noen kundekontakt og evt hvor ofte er du i kontakt med kunder?
- Hvor stor del av arbeidsdagen din / uka består av kundekontakt?

13 Hvordan beskriver du kundene du er i kontakt med? Erfarne, gamle, olje/ byggebransjen? – hyppighet?
- (østland / vestland)

14 Hvor mye kunnskap har kundene om produktene? Har dette noen sammenheng med bransjen?

- kan du fortelle om hvordan den beste testeren av kundene blir kåret, bakgrunnen for det?
- Hvordan anvender dere tilbakemeldinger fra kunder når det gjelder produkter? (- i hvilken grad er kundene på denne måten er med på å utvikle produktene?).

15 Har du en oppfatning om at kundemassen har forandret seg?
- Og i tilfelle hvordan?

16 Hvilke krav stiller kundene til dere som bedrift?
- Opplever du at kravene er forskjellige ut fra ulike kundemasser?
- Utfordringer m intern kommunikasjon og kundebehandling? (muligens fjernes)

8. Design av webportal (5-7) kartlegge dagens situasjon på webportalen

17 Når og hvordan fikk du kjennskap til dette?
18 Hvilket forhold har du til den nye webportalen som kommer?
19 Hva ønsker du at denne skal inneholde?
- Kan denne gjøre arbeidet ditt enklere? Gi et eks
- Ønsker du å være direkte involvert i uviklingen? Hvorfor?
  - hvem vil webportalen være nyttig for? (kundene, oslo kontoret).
  - Hvilken innflytelse har du på utviklingen av webportalen?

MAX 45 min,

Intervjuguide for KIKK- prosjektet

1. Innledning.

1 Presentasjon ; kan du vennligst si navnet ditt slik at vi får det bånd, da blir det enklere å gjenkjenne deg. eller så kan jeg si navnet
2 Vi opplyser om at vi bruker båndoppdager, kan du underskrive dette samtykkeskjemaet?

2. Personens bakgrunn (10)

1 Om mulig: ref til skjema m bakgrunnsopplysninger, dersom dette er fylt ut snakker man om det.
2
- **Stillingstittel/antall år /mnd**
  - Alder
  - Utdanning/bakgrunn
  - Tidligere arbeidserfaring
  - Utfordringer m intern kommunikasjon og kundebehandling?
  - Forventninger til den nye webportalen

5. Beskrivelse av arbeidsoppgaver(10)

1 Beskriv dine arbeidsoppgaver
2 Hvordan ser en god dag på jobb ut – beskriv
3 Finnes det noen skriftlige retningslinjer for arbeide ditt?
4 Opplever du at det er samsvar mellom den og arbeidsoppgavene dine?
5 Hvordan ser en dårlig dag ut – Beskriv
6 Hvor ofte møter du på et problem du ikke umiddelbart kan løse?
7 **i hvilke situasjoner oppstår det ofte problemer?
8 Hvilke type utfordringer er det snakk om?
Hvordan prøver du å løse disse? – utdyp

4. Organisasjonsstruktur (5-10)

1 Oppfatning av organisasjonsstruktur (tegn og forklar)
Evt. Sammenligne m ledelsen sin offisielle versjon
3 - Har Company en visjon –
- kjenner du til den –
- hvilket forhold har du til den?

3. Bakgrunnsinformasjon om bedriften (5)

2 Historisk informasjon:
- Oppstart
- Antall ansatte
- Personlig forståelse av bedriftens utvikling

HALVVEIS!

9. Kundebehandling (5) -eksterne forhold

1 Hvor ofte er du i kontakt med kunder?
   - Hvor stor del av arbeidsdagen din / uka består av kundekontakt?
2 Hva består denne kontakten i?
   - Hvem tar kontakt?
   - Hvordan kommuniserer du med kunder? –beskriv
3 Hvilken kundemasse er du i kontakt med? – hyppighet?
   - (østland / vestland)
4 Forholder du deg mest til kunder på lokalt nivå, eller har dette mindre å si?
5 Har du en oppfatning om at kundemassen har forandret seg?
   - Og i tilfelle hvordan?
6 Hvilke krav stiller kundene til dere som bedrift?
7 - Opplever du at kravene er forskjellige ut fra ulike kundemasser?

6. Kommunikasjonsrutiner (5-10) lokalt?/interne forhold

- hvor mye kontakt har du med kollegaene dine i løpet av en arbeidsdag? om hva? hvem? er det noen spesielle kollegaer du henvender du deg oftere til?

- i hvilke situasjoner tar du kontakt med dine kolleager?? og hvem? hvorfor? hyppigst med hvem? (jobbrelatert, sosiale situasjoner)

3 Hvordan kommuniserer du med andre ansatte?
4 Hvilke informasjonssystemer finnes?
5 kommunikasjon mellom oslo kontoret og stavanger kontoret?

7. Teknologiske verktøy (3)

2 - hva bruker dere datasystemet til? hva slags oppgaver?
3 Hvem har ansvar for de ulike systemene (databaser, informasjonsystem, mail)? (spss, oracle..)
4 hvem avgjør hvilke systemer som skal taes i bruk, **hvilke** bruker du, og hva bruker du det til?
5 Hvem har tilgang til hva? Hva slags policy er det på tilgangsrettigheter?
-*hvem er superbrukere
-*hvem drifter
-*Navn på kundebehandlingssystem

8. Design av webportal (5-7)

1 Kjenner du til at en ny webportal er under utvikling?
2 Når og hvordan fikk du kjennskap til dette?
3 Hva synes du om det – er det et behov?

4 Hva ønsker du at denne skal inneholde?
   - Kan denne gjøre arbeidet ditt enklere?
   - Ønsker du å være direkte involvert i uviklingen?

5 Er det planlagt intern opplæring i forbindelse med innføring av den nye webportalen.
   - Har du behov for opplæring i det nye verktøyet

Max 1 t.

Intervjumetode:
- fra boka til faulkner;

"semistrukturerte spørsmål"
*hva gjør du?
*hvorfor gjør du dette?
*hvordan gjør du dette? spør om dette for hver delspm
*hva får deg til å gjøre dette?
*hva blir resultatet?
*hva slags feil/problemer oppstår?
*hvordan retter du opp i disse feilene/problemene?

"spørsmål for å utdype arbeidsoppgave detaljer (s 45 i faulkner)
*hva gjør du? -finne bruker sitt mål
*hvorfor gjør du det? -metode
*hvordan? - for å finne del oppg, gjentas for hver delspm.
*hva er forutsetningene for å gjøre dette? -ytre faktorer som påvirker
*hva er resultatet når du gjør dette? - produkt og hensikt
*hvilke feil oppstår? -fange opp problemer
*hvordan retter du dem? - feilretting

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UNIVERSITY OF OSLO
Department of Informatics

The errata of: Socio-Technical Systems Design as Collaboration with Employees in an IT Company in Norway

Master Thesis

Shazia Mushtaq

June 5, 2009

Erata Sheet

0.1 Acknowledgements

Corrected misspelling, name is Profeesor Jens Kaasbøll.

Corrected misspelling, name is Karin Heiene.

0.2 Introduction

1. definition of *object system* in section *Research Interest*: " With object system I mean as it is defined by Hirschheim et al. "the part of organization that is targeted for change through an IS development project" (Hirschheim & Lyytinen 1995, p:10)."
2. corrected typography from Socio-Cultural Learning (non italic) to *Socio-Cultural Learning*
3. correct phrase is not *Socio-Culture learning*, but *Socio-Cultural Learning*
4. missing the phrase: *mediating artefact* in text: "Information system or other technical *artifacts* are from a Socio-Cultural learning perspective considered to be tools, *mediating artefacts*, which people use to carry out some task."
5. misphrased sentence: " That is because I consider design does not occur at a specific point in timeline." to the intended correct sentance: "That has supported my understanding – design does not occur at a specific point in timeline."

6. missing references to literature for development of understanding about use of technology, learning and Socio-Cultural Learning perspective: is (Wasson, Ludvigsen & Hoppe 2003),(Stevenson 2002), (Mørch, Engen & Åsand 2004).

0.3 Research Method

In section “Research Collaboration”, second last paragraph, missing reference to literature with socio-technical approach which makes extensive use of fieldnotes as part of the method and in that way combines data material with analysis, as described by Herrmann et. al in (Herrmann, Kunau, Loser & Menold 2004).

0.4 Literature on Systems Design

In subsection ”Definition of Design Story” replaced Figure.

0.5 Summary and Conclusion

Added the reference point to the Figure in the elaboration.

0.6 References

- change the title ”Bibliography”
- included missing references - see 0.6 on the facing page

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