Designing Systems in an Organizational Context

An Explorative Study of Theoretical, Methodological, and Organizational Issues from Action Research in Three Design Projects

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PART I

Introduction and Research Approach

1. Introduction

This dissertation is concerned with the early part of systems design, the purpose of which is that users and their managers can decide which computer-based systems are needed and relevant, and how they can be provided, i.e. purchased, and/or developed, and implemented, in a specific organization. Systems design begins with a recognition of a possible need for computer support in a specific organization, continues until this need has been analysed, described, evaluated, and discussed, and ends with the description of an overall conceptual and functional design for the corresponding computer-based systems. The research objective behind this dissertation aims at developing theories of and approaches to systems design, which should provide a basis for designers to improve their work practices. In other words, this dissertation contributes to a clarification of what is going on in design, and how we, as designers, should deal with the process of designing for a specific organization.

The dissertation is based on exploratory empirical studies in one organization using action research as the research approach. The focus of

the action research project is on improving work practices for designers by developing methodological guidelines, heuristics, or "rules of thumb". This involves organizational issues comprising of social, political, and managerial/strategical aspects within the organization.

I have carried out action research over a period of 1 1/2 years in a public organization in Northern Europe, where I conducted three separate but interrelated design projects. Having a design approach inspired by and comprising of participatory design, ethnographically inspired, and systems approaches, I have done in depth analysis of current work practices, carried out unstructured interviews, observation, video recording, document analysis, and the like. Also I have set up participatory analysis and design workshops. One of the design projects was an experiment with a systems approach, Work Analysis, an approach that originates in an ESPRIT-project, FAOR (Functional Analysis of Office Requirements).

The goal and purpose of the dissertation are to contribute to current discussions, among researchers and practitioners, regarding how to do reliable systems design in small complex organizations - small in the sense that the design projects were conducted in an organization with approximately 50 employees, and complex in the sense that the employees had very different roles and relationships. The results in the dissertation are presented in a way where they can, hopefully, initiate and stimulate discussions among other researchers and engaged practitioners within the field of design. I present a number of examples from my empirical studies, which are based on my experiences using various participative techniques, ethnographically inspired approaches, and the conceptual framework and guidelines provided by Work Analysis.

1.1 Designing in an Organizational Context[1]

I use the term 'design' in the same way as architects do - focusing on the analysis of needs and the preliminary design of functionality and form - in contrast to what is common within computer science, where the design term is borrowed from engineering - focusing on construction and implementation. Also, the term 'designer' is used for the person in charge of the design, rather than the more general term 'systems developer'. This is to

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1 A main part of this section is based on Kensing, Bødker and Simonse (1994 A) and on earlier drafts of this paper.

emphasize that the dissertation has its focus on the early phases of the systems development process in general, where the purchase, development, and implementation of proposed systems may not yet have been decided upon[2]. The term 'approach' is used as something in between commodified methods and isolated techniques supporting one or more activities within design.

Designing in an organizational context *focuses* on the application area, complex administrative, managerial, and professional work within a specific organization, and the process of designing relevant computer support for this work. This is in contrast to design of generic products aimed for a (larger) market. For example, design in an organizational context includes scanning the market for available products, while designing generic products involves analysis of a potential market.

The *purpose* of design is to help an organization to find out whether computer support is needed and, if so, to sketch out relevant computer applications in terms of an overall functional design. The focus of the process should be (re-)design of computer systems, (re-)design of the organization, along with development of the qualifications of people working in the organization.

Designing might *start* from scratch, i.e. somebody in the organization wants some kind of change to take place and believes that computers might play a part, or it might start from a vague (or even a well stated) idea of new ways of applying computers in the organization.

The *result* of a design project includes representations of visions of computer support forming a basis for the organization to decide on and, subsequently, to purchase, construct, and implement computer-based systems. The results of a design project may include a conceptual design in terms of a written document, sketches, mock-ups, and/or prototypes illustrating key ideas. An evaluation of individual and organizational consequences of implementing the design, as well as a plan for the implementation, is considered to be part of the result too. Based upon a design proposal, it should be possible for the organization to say "go", "no go", or "more design is needed". In addition, the design project should include reflections regarding the competencies available and needed for the organization, in order to realize the visions and changes agreed upon. This is referred to as "anchoring the visions". Eventually the project may proceed to purchasing generic products and/or construction and imple-

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2 These terms are further discussed in section 1.5: Notes on the Concept *Design*.

mentation of the proposed systems. This latter part of systems development is outside the scope of this dissertation.

The *systems* I consider are information systems supporting complex administrative, managerial, and professional work, i.e. work involving cooperation of several people with a variety of backgrounds.

1.2 Personal Background and Motivation

My background is in computer science and communication. I graduated in 1989 with a Masters degree in Computer Science and Communication. My masters thesis focused on work practice and organizational changes within an experimental systems development project in the administration at Roskilde University (Andersen and Simonsen, 1989). After getting my M.Sc., I worked for two years as a systems designer in industry, participating in all stages of development projects including early design. Since 1991 I have been employed as a research fellow and Ph.D. student at the Department of Computer Science, Roskilde University.

From my work in the industry, I have experienced that early design is often faced with a great deal of uncertainty and only little time and effort is put into this activity. Designers plan and manage the process in an incidental way, and they tend to "jump to solutions" without having a thorough insight of the application area. Subsequently, the specification and development of those solutions (of computer systems) will guide them and carry the process to the end. There is nothing odd about this reaction: design in an organizational context is by nature a very open, chaotic, and uncertain process, and most designers - often with a background in (natural) science or engineering - face this situation with few and poor qualifications, techniques, tools, concepts, models, etc.

In short, my experience is the following:

- The designer starts by making some sort of analysis, trying to figure out, "what is going on": this involves some kind of introduction to the organization (which the designer most often does not know in advance), an introduction to what different people in the organization are doing (their work), and what they believe are the subject, needs, and problems to be analysed. I have experienced this as a very chaotic period, in which you get numerous different and conflicting impressions.

- After a (usually short) time, some kind of preliminary picture of the organization and the problem(s) and need(s) will crystallize and solutions to them, in terms of possible computer support, are suggested.
- This preliminary picture of the organization, its problem(s), need(s), and the solutions made possible through computer systems, arises from an interpretation of the various impressions designers get from the introduction to the organization. To test and correct this interpretation brings a need for regular confrontations of the designers' interpretations with the interpretations of various people in the organization. This is often not acknowledged. Instead, a decision regarding the suggested solutions is stressed.
- In order to discuss and create/harmonize concepts and notions from the different interpretations from the designers and the people in the organization, some kind of intersubjective "model" is needed. For this purpose, various kinds of descriptions could be used, both descriptions of the designers interpretation of the organization/need (analysis) and of the solutions made possible through computer systems (design). These descriptions may be based on texts, drawings, prototypes, etc., and they play an important role in the design process, as they are the tools which enable, develop, and confront the different knowledge of the designer and the people in the organization along with supporting them in communicating and understanding each other. I have experienced a low degree of creativity concerning such descriptions. Often a "standard" way of describing suggested systems is used. This is a description which forms the basis for a succeeding detailed system specification.

Designers, who feel that they are shaky and in lack of qualifications in such early design activities, and who, at the same time, are aware of the importance of handling this task in a qualified way, need support in order to obtain relevant experiences. They know that the only way to do their work in a more qualified way is through their own experiences. One way to facilitate designers, in order to achieve their own relevant experiences, is to provide them with guidelines that they can learn from (Dreyfus, 1988).

My motivation is thus to develop such guidelines based on my own experiences and further to test their applicability. A question then, that an approach to design must address, is: what kind of guidelines and at what level of detail might designers from industry find relevant and useful?

1.3 The MUST-Program[3]

During my Ph.D. study I have been part of a research program called MUST, the purpose of which is to develop *theories of and approaches to* systems design. The MUST-program is carried out by a research group at the Department of Computer Science, Roskilde University. The research group is led by associate professor Finn Kensing, and has as participants, besides me, associate professor Keld Bødker and research fellow/Ph.D. student Lars Bogetoft Pedersen. The research program comprises of design projects carried out by us, as well as by others using our (emerging) approach, and studies of designers working under industrial conditions. This dissertation is a part of the MUST-program.

Kensing, Bødker, and Simonsen (1994 A) presents a description of the MUST-program[4] and its current status. A shorter 5 page version of this description is presented in a position paper (Kensing, Bødker, and Simonsen, 1994 B). The main part of the description below of the MUST-program originates from these two references.

Our ambition is to develop a coherent approach for design in organizational contexts under industrial conditions. We advocate the importance of generalizing from our own work practice as designers and from studies of designers working under industrial conditions.

The MUST-program has as a basic assumption that the early design processes are an activity within systems development which is poorly understood, and that information systems failures often can be traced back to this phase (see e.g. Lyytinen, 1987, p. 9; Gougen and Linde, 1993, p. 152). Inappropriate approaches to design may lead to systems that are technically perfect but do not meet the needs of the organization. The motivation for studying this part of systems development is thus a hypothesis that the early design processes are important to consider in order to improve the overall process of systems design. In specific, we aim at avoiding a situation that individuals and organizations often experience: they don't get the computer support they (thought they) asked for (Lyytinen & Hirschheim, 1987; Bødker, 1989). We believe that in order to develop relevant visions of future computer support, it is necessary to achieve a thorough understanding of the specific organization and the

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3 A main part of this section is based on Kensing, Bødker, and Simonsen (1994 A).

4 A Danish description of the MUST-program is presented in Bødker, Kensing, Pedersen, and Simonsen (1991).

current work practices in question: this in order to find an appropriate balance in what Ehn (1988) refers to as the dialectics between tradition and transcendence in design.

Another motivation is that we agree with Kling (1993), in that many designers, academics, and practitioners need to broaden their perception of and approach to design of usable computer systems.

Current approaches used in industry (e.g. Structured Analysis and Design and Object Oriented Analysis and Design) tend to ignore design as being a political endeavour also. Furthermore, they tend to neglect the potentials in participatory design, and/or they tend to homogenize users not being sensitive towards individual needs. We see organizations as frameworks for cooperation as well as conflicts. Therefore groups and individuals participating in design should be expected to have common and conflicting goals. The role of designers is neither to cover up nor to solve political conflicts in design. Rather they should help the parties to each formulate their visions and leave it to themselves to solve conflicts in relevant forums.

We are developing our approach, and hence our experience, in projects, the aim of which, has been to investigate opportunities for computer support in a specific organization. In our design approach, we use a combination of *intervention* and *ethnographic* techniques. During the past six years, we have been engaged in nine projects related to the MUST-program. Seven projects were action research, one was a case study, and one was a pilot study. In all but one of our nine projects, we were brought in because somebody, employees or managers, thought that computers might be part of the solution to problems they had encountered. The initial problem definitions have been quite open. We have carried out detailed studies of the organization's needs and opportunities and have designed tailored applications in combination with (modified) standard products found feasible.

Most of the people we have worked with saw the main part of their jobs as problem solving and problem definition rather than routine work, and cooperation was considered a substantial part of their jobs. The list of jobs includes: radio journalists; university secretaries; operations people in an airport; managers, consultants, and secretaries in a multinational medical company; managers, editors, secretaries, and store-clerks in a film board; scientists in a research and development laboratory; and senior managers within the administration at a university.

A common objective of the projects has been to support the existing work force, which was considered overworked. Another has been that the

existing work force or management wanted to automate some of the routine tasks. In some projects, there was a request for computer support of activities, which had really never been done before in the organization. Sometimes the purpose was stated explicitly to improve quality of working life along with the product and service delivered by the organization. None had (explicitly stated) the purpose of head count reduction or downsizing.

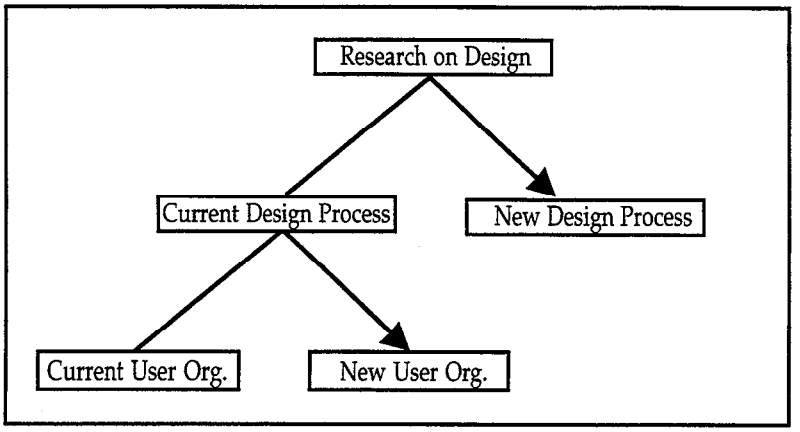

Figure 1: Focus of the MUST-program[5]

The focus of the MUST-program is outlined in figure 1. The application area is a specific user organization and a design process with the objective of changing the current user organization into a "new" user organization by the means of design and redesign of the organization and the information technologies (as indicated by the lower arrow). Our approach to design aims at guiding current design processes and practices, with an objective of changing and improving these into a "new" design process (as indicated by the upper arrow).

1.4 Outline of the Dissertation

The dissertation is divided in four parts.

Part I continues in the following chapter by presenting and discussing the research approach. Also, I argue for the form by which the results of the research are presented in this dissertation.

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5 This figure originates from a lecture given by Finn Kensing.

Part II covers three approaches and perspectives on design that I have been inspired from: the participatory design approach, the ethnographically inspired approach, and the systems approach. These approaches are described, discussed, and related, giving the basis for clarifying my own perspective in terms of my theoretical and practical relation to these approaches, along with what my research interest and starting point are.

Part III presents a thorough description of my empirical work: action research performed in three design projects. Part III thus gives three examples on what design is about and how to deal with this activity. The organization, the starting point, activities carried out, and the results obtained by the project establishment and by each of the three design projects are described. The lessons learned (described in Part IV) are closely related to this organizational and situated context, and the extent to which they are generalizable must be judged in this relation.

In Part IV, the lessons learned from the action research project (presented in Part III) are described, discussed, and related to my theoretical and methodological background (described in Part II). In order to stimulate discussions among researchers and practitioners within the field of design, I have structured this part as three discussions. All of these three discussions opens with a *claim* (one opens with two claims), followed by the arguments for this claim, mainly based on the experiences and results from the action research project.

- The first discussion reflects on my experiences from using *Work Analysis*, an example of a systems approach. This includes an aim to link early design considerations with the overall needs for organizational change and business strategy, i.e. *clarifying which work areas and functions are important to offer systems support.* One consequence of including the organization's environment and function in the design project, was a reconsideration of the organization's overall policy, hence shifting the focus from a system they were about to invest in, to computer support addressing other areas and needs.
- The second discussion is concerned with the effects and conditions from using a *ethnographically inspired approach.* This deals with *in-depth analysis of work practices, in areas where possible systems support has been given high priority.* Some effects from this analysis, in terms of adding to and changing the functionality of a preliminary design proposal, are presented.
- Aspects of the *participatory design* approach are dealt with in all three

discussions, though mainly in the third, where the task of anchoring visions of systems support to different competencies within the organization is covered. Thus this final discussion is concerned with *how to "end" a design project*: this is in terms of anchoring visions, with respect to making a decision about, and succeedingly realizing, the visions proposed as the results from a design project. A project management issue is thus addressed, which has not been directly dealt with in either of the three approaches described in Part II. The discussion ends up by giving examples for anchoring the design, from all three design projects.

1.5 Notes on the Concept *Design*

I have had some considerations regarding which term to chose for the central aspect of this dissertation. Within the MUST-program, we use the Danish term 'forundersøgelse', which can be directly translated to 'pre-investigation'. In the English literature this activity (or part of it) is referred to as requirement analysis, -capture, -determination, -elicitation, -engineering, -modeling, -specification, preliminary analysis and design, feasibility study, survey, pre-study, pilot-study, early systems design, or the like.

I have finally chosen the term *design*, which in Webster's Dictionary is given the following explanation:

> **design** (di zīn´), v.t. **1.** to prepare the preliminary sketch or plans for (a work to be executed), esp. to plan the form and structure of: *to design a new bridge.* **2.** to plan and fashion artistically or skillfully. [...] -v.i. **7.** to make drawings, preliminary sketches, or plans. **8.** to plan and fashion the form and structure of an object, work of art, decorative scheme, etc. -n. **9.** an outline, sketch, or plan, as of the form and structure of a work of art, an edifice, or a machine to be executed or constructed. **10.** organization or structure of formal elements in a work of art; composition. **11.** the combination of details or features of a picture, building, etc.; a pattern or motif of artistic work [...] (Webster's Encyclopedic Unabridged Dictionary of the English Language, 1989, p. 391).

The term 'design' is used for an activity focusing on analysis of needs and preliminary design of functionality and form. Thus, I include 'analysis' as a main part of design. Some readers may be confused by this, since much of the (traditional) literature within computer science clearly distinguishes between 'analysis', addressing the past and current (what's and why's), and 'design', addressing the future (how's).

The final choice of using the term 'design' was made by considering the main academic audience that I have tried to address so far, and who uses this term in a similar context: researchers in Scandinavia, especially those related to the Ph.D.-program on "Design and Management of Information Technology" and the IRIS-conferences (Information systems Research seminar In Scandinavia), the Participatory Design community (e.g. participants of the Participatory Design-conferences and the Design Studies Group at Xerox PARC), and a part of the community within Computer Supported Cooperative Work (CSCW).

The term 'design' is used in a context similar as in this dissertation by authors like Barrett et al. (1992); Bødker and Kensing (1994); Clausen (1993A, 1993B); Dahlbom and Mathiassen (1993); Ehn (1988); Greenbaum and Kyng (1991); Hughes et al. (1993); Hägerfors (1994); Madsen (1994); Minneman and Leifer (1993); Schön (1992); Schuler and Namioka (1993); Stolterman (1992); and Winograd and Flores (1986).

1.6 Acknowledgements

During my Ph.D. study, I have been employed at the Department of Computer Science, Roskilde University, as a research fellow. Funding, in relation to my stay at Stanford University, was provided by the Danish Research Academy.

Associate professor Finn Kensing and professor Arne Thing Mortensen have been my supervisors throughout the study. I thank them for their indefatigable support, comments, critiques, and advising.

My colleagues from the MUST-program, Finn Kensing, Keld Bødker, and Lars Bogetoft Pedersen, have provided me with a good, supportive, challenging, and intellectually stimulating working environment.

Thanks to all those in The Film Board, where the action research was done.

I am grateful to Professor Terry Winograd, who invited me to the Center for the Study of Language and Information (CSLI) at Stanford University, California, where I stayed 11 months during my study.

Also, I am grateful to Lucy Suchman who, during my stay in California, affiliated me with Xerox PARC where I, among others, enjoyed the weekly meetings and interesting presentations and discussions with the Design Studies Group including Steve Harrison, Lucy Suchman, Susan

Newman, Scott Minneman, Margot Brereton, David Bell and Randy Trigg as well as its visitors: Jeanette Blomberg, Catherine Marshall, Finn Kensing, and Rachel Hewson. Especially, I would like to thank Susan Newman for valuable comments and discussions regarding an early draft on this dissertation.

Thanks to Peter Carstensen and Kjeld Schmidt from Risø National Laboratory for discussions and comments regarding Work Analysis.

I have also received valuable comments and critiques from many people when presenting my work at different meetings, seminars, etc. Running the risk of forgetting someone (please forgive me, then), I acknowledge the comments received at: Systems Analysis Department at Risø National Laboratory; KISS'92, (Kilpisjärvi Information Systems Research Seminar 1992, April 23-30 1992) (especially I thank Liam Bannon and Pentti Kerola); IRIS'92, (15th Information systems Research seminar In Scandinavia, 9.-12. August 1992); EIS'92 (5. Erhvervs-økonomisk Informatik Seminar, 20-21 August 1992); my lecture held at the course "247 B, Human-Computer Interaction", Stanford University/CSLI in May 1993; three presentations at Design Studies Group at Xerox PARC held in July and November 1993; University of California Irvine/CORPS-seminar in July 1993 (especially I thank Trond Knudsen and Rob Kling); ICIS'93 Doctoral Consortium (Fourteenth Annual International Conference on Information Systems, Tallahassee, Florida, December 3 - 5, 1993); the "Sausage-Club" at our summer holiday in Løkken, June 1994 (My fellow students from Computer Science, Hans Jørgen Andersen, Karen Skov Andersen, and Randi Andersen); the summer course on "Design, Artifacts and Context" held in Dragør, August 1994, within the Ph. D. program on "Design and Management of Information Technology"; PDC'94 (Third Biennial Conference on Participatory Design, Chapel Hill, North Carolina, October 27-28, 1994) (also thanks for the comments from the reviewers).

Last but not least, I thank Kristen René Hershberger for helping me with my English in the final draft of this text.

2. Research Approach

How can we develop theories of and approaches to systems design? Or, in other words, how can we develop descriptions and concepts of what is going on in design and how can we develop guidelines for how to deal with this kind of activity?

In treating systems design scientifically, a major effort is to develop a specific terminology in dealing with and discussing design. This may be seen as an attempt to extend and develop an everyday language with a specialized terminology addressing relevant issues and experiences. Theories and approaches for design typically include both conceptual frameworks and guidelines.

- A conceptual framework must capture relevant issues within design. One way to evaluate a framework is to use it "as a pair of glasses" while doing design and then critically reflect on and evaluate the results: do the glasses leave critical "blind spots" where the framework has made an abstraction excluding relevant issues? In addition, one ought to be aware of the level of complexity of the framework: it should be "simple" in such a way as to give a practitioner the possibility to adopt and use the framework without using half of his[6] lifetime for this purpose.
- Approaches for design ought to be operational, i.e. they should provide help in the specific situation where the designer is developing the design. Just as for a conceptual framework, one can use an approach and its techniques and practical guidelines, as described, and point out where one needs additional help. But the relevance of this evaluation is limited, if the result only shows where it was insufficient. The aim must include reflections on *how* to compensate for these limi-

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6 Throughout the text I use male pronouns, instead of female or both, like e.g. he/she or his/her, though this is not to imply that women are excluded.

tations by expanding and changing the framework and/or the approach.

My research approach is described, in the following, as the process that I have arranged in order to achieve results relevant for discussing design practices. I relate this to other approaches[7] in the design area. I argue that my research has to be empirical, and that my results have to be presented in a way to stimulate discussions. This chain of arguments is depicted in figure 2.

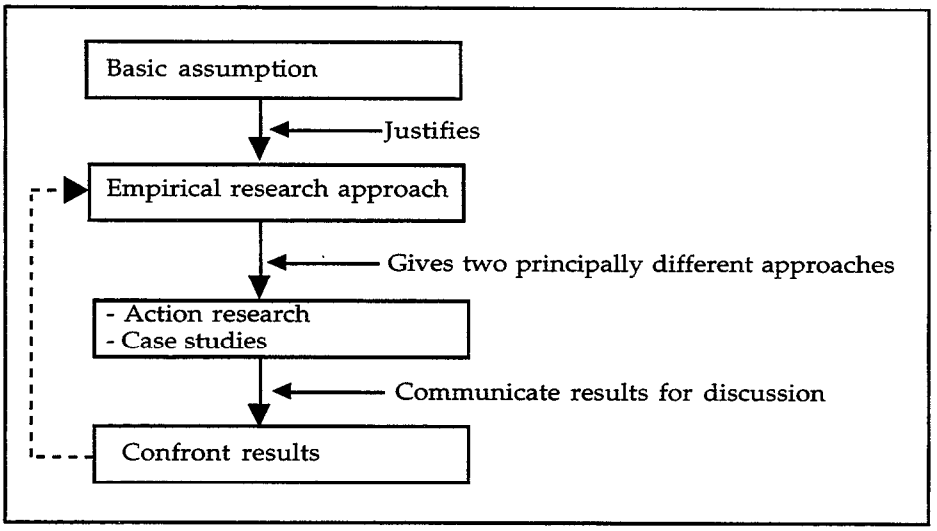

Figure 2: Research approach, chain of arguments

I take as a *basic assumption*, that the conceptualization of onc's experiences is developed and refined through discussions where they are confronted with others' experiences (Mortensen, 1992). To comprehend design is to give it a certain linguistic description and explanation (Mortensen, 1992). Theory and approaches for design should be based on and crystallized from the experiences of skilled and competent practitioners. Concepts within theory and guidelines within approaches should be developed through abstractions from discussions between competent practitioners, in which they describe, reason, and argue why some actions are important and right while others are wrong. Such discussions, in which the participants systematically argue and conceptualize their expe-

7 Three other approaches to design, that I have been inspired by, are described and discussed in the following chapters, in part II.

riences, will give the substance for theory and approaches.

Thus my research approach must be *empirical*[8] and my results have to be described and communicated in a way that allow others to discuss them. Basically, this empirical research approach can be conducted through two different kinds of activities:

- Doing design by oneself. This could be to conduct a design project yourself, taking the role of both a researcher and a practitioner, and/or to participate in a design project with other practitioners. Doing design by oneself in these terms, hence, serves a double purpose: a purpose with respect to the research and a purpose with respect to the organization where the design project is done. This I consider as *action research.*
- Observing others[9] doing design (*case-studies*) or interviewing others who have done design alternatively, through a literature study of such empirical projects.

So - one simple and preliminary answer to the initial question stated in the start of this chapter is: by empirical studies that provide additional substantial results to the current discussions among researchers and practitioners within the field of design.

Studies of others doing design was the main approach taken in two recent Ph.D. dissertations by Stolterman (1992) and Nørbjerg (1994). Stolterman conducted 20 interviews of designers in an attempt to clarify "their view on design skill, design methods, quality and the 'nature' of system design" and in this way to describe the "hidden rationality of practice" (Stolterman, 1992, p. 137). Nørbjerg carried out case studies of design projects (or 'system development projects' which is the concept Nørbjerg uses) in two organizations. Nørbjerg's Ph.D. dissertation focus on "the distribution of knowledge and skill, cooperation and communication in information systems development" (Nørbjerg, 1994, p. 214). A central characteristic of studies of *others* doing design is naturally a focus

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8 In general, an empirical approach is relevant within design and computer science. Computer science is a subject with a high degree of practical and craftmanslike dimensions. Research approaches within computer science have a tradition for taking a starting point in problems experienced from practice, and they aim at developing tools, that within a short or long-term view, improve practical situations.

9 'Others' could be practitioners within systems design, or it could be practitioners from other design fields, e.g. within architecture, a design field with a far more developed tradition than systems design.

and interest in clarifying and understanding (current) practices and conditions for design. Thus one main question to answer is *what* is going on in design.

Doing design by oneself, in *action research*, was the main approach taken in two other recent Ph.D. dissertations by Mogensen (1994) and Hägerfors (1994). Mogensen participated in two design projects where a number of researchers and practitioners participated in systems design. His dissertation focus on giving "ideas to, formulate concepts about, and provide practical examples from what could constitute a cooperative analysis in systems development" (Mogensen, 1994, p. 6). Hägerfors conducted a course for, and participated as a 'coach' in, a design project with practising systems designers. Her aim in this project was to "find out about how co-learning skills can be transferred to participants and utilized in participative systems design processes" (Hägerfors, 1994, p. 2).

In action research, the researcher takes an active role as an interventionist, whereby he uses his own experiences. Action research has a dual aim: to contribute to solving practical problems[10] in the organization with the participants in the action research project, along with specific research goals. The research aim is typically to experiment with and develop approaches and methods, concepts and conceptual frameworks, specific techniques, etc. As Hägerfors (1994, p. 18) points out: "Theory and practice, thought and action, science and common sense are brought together." As a result the situation on which an action research project is based is somewhat "ideal" and "laboratory-like," excluding certain kinds of business constraints that exist within consulting and design in a commercial practice. In action research, one main question to answer is *how* to deal with design. Action research has been a major approach within Scandinavia and England, especially within participatory design (see chapter 3) and Soft Systems Methodology (see chapter 5).

The knowledge potentially achieved from action research, as well as from studies of others doing design, is of vital importance in order to develop theories and approaches that reflect the practice of design, which may be adopted by practitioners in order to influence and change a design

10 Action research and consultancy within design are in some ways overlapping but yet different: As mentioned above, action research serves a double purpose. Another main difference between action research and consulting, is the motivation. An action researcher is not on the payroll of the organization. In consultancy, you are controlled by the organization and paid for a specific job of work. With action research you are going in as a learning experience (Checland, 1981), where the researcher must be open to continuous learning and changes within the framework.

practice. This is well in agreement with Galliers (1991), who in a paper on "Choosing Appropriate Information Systems Research Approaches" concludes: "[I]t is clear that - in my estimation - the survey, descriptive/interpretive and action research approaches appear to have the widest applicability in information systems research" (Galliers, 1991, p. 169). A central problem within such empirical approaches is, though, how to generalize the results. Theories of and approaches to design and design practices will always be based on experiences and thus have a heuristic character. They cannot be "proved" in a strict logical sense. On the other hand, they can be continuously improved by being confronted and tested against competing theories and approaches based on other experiences and contexts. Hence a theory, an approach, a guideline, a principle, or a heuristic may be viewed as sound and plausible until challenged by new experiences, e.g. in terms of disproving its applicability in a certain context.

For my dissertation, I have mainly worked with action research doing design in The Film Board, a public organization in Northern Europe.

The specific reason, though, why the research approach was chosen to be action research is to some respect a coincidence. Early in my study, the MUST-program, which this dissertation is part of, was planned to conduct case-studies of early design processes in an industrial context and, in a later phase, to conduct action research. Due to problems in establishing the case-studies, while at the same time two organizations in Northern Europe asked us to engage in design projects, we decided to start the action research[11]. This choice turned out to be very satisfying: action research is fun and exiting! Also this has given me the possibility to maintain and develop my practical skills.

The action research in The Film Board is comprised of three design projects all conducted as participative design:

- 1) Two postgraduate students (supervised by me) worked with two managers and seventeen employees in the Order Receiving and Shipping Departments to clarify how problems in managing a film stock and in the cooperation between the Shipping and the Order Receiving functions could be supported by an inventory control system. The

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11 Half-way into my Ph.D-project I did succeed, though, in establishing a complementary case-study in which I observed a large-scale early design study within the administration of a University in North America (Simonsen, 1993). This case-study is however, due to time constraints, *not* reported on in this thesis.

research goal was to test a variety of design techniques. The project lasted three months, with both students working full time.

- 2) Two researchers (myself and Finn Kensing) were engaged in the Editorial Board consisting of one production manager, three editors, three secretaries, one consultant, and one technician. We clarified needs for computer support for managing the overall production of films. The research goal was to understand the conditions for and effects of applying ethnographically inspired approaches to systems design. The project lasted one year and involved, in total, about four months of work from the researchers.
- 3) One researcher (myself) conducted a project with the Marketing and the Order Receiving Departments, with three managers and fourteen employees. I clarified needs for computer support of the Order Receiving and the Marketing functions, the integration with the overall production of films, and the organizational consequences of a parallel restructuring and merging of the two departments. The research goal was to experiment with Work Analysis. The project lasted five months and involved, in total, about two months of work by the researcher.

The action research project was a cooperative and mutual learning process between the researchers and the participants from the organization. As such, action research is exploratory and difficult to "control": the starting point is the specific organization and its problems and needs with respect to design, along with the specified research goals. The research goals, stated above, were chosen with respect to the situation at hand. This dissertation does not take its starting point in one narrow problem definition, stating the research question to answer. During an action research project, the situation and its possibilities, ideas, problems, etc., continuously develop and change. The researcher(s) need(s) to be flexible and constantly reflect and act on the current situation.

The research results are closely related to the organizational and situated context, and the extent to which they are generalizable must be judged in this relation. This is one reason why a thorough description of the action research project, i.e. the three design projects, is important. Also, this is a way to describe (as an example) what design is about and how to deal with this activity. In general, only a few descriptions of design projects exist in the literature (Nørbjerg, 1994).The organization, the starting point, activities carried out, and the results obtained for the

project establishment, along with the three design projects, are described in Part III. The description of the organization documents the kind of insight and part of the shared understanding developed during the design projects. Hence, this description serves as an example of what Kensing and Munk-Madsen (1993) refer to as relevant structures on users' present work.

The most important lessons learned from the action research are described in Part IV. In order to stimulate discussions among researchers and practitioners within the field of design, I have structured this part as three discussions. All of these three discussions open with a *claim* (one opens with two claims), followed by the arguments for this claim. The argumentation for the claims is mainly based on the experiences and results from the action research project, but also considers empirical, theoretical, and methodological contributions from the literature and my own former experiences as a designer. My ambition is that these claims may develop into what is referred to as 'principles' in the book "Professional Systems Development, Experiences, Ideas and Action" by Andersen et al. (1990). A similar book like this one, but focused on the early phases of systems development, is the planned and expected outcome of the MUST-program. It is important to note that the MUST-program has not yet achieved this goal. Results obtained so far on the MUST-program as a whole, are described by Kensing, Bødker, and Simonsen (1994 A).

The results of this dissertation are thus to be treated as preliminary results in relation to the MUST-program as a whole. Further research is needed before we can present a coherent (and industrially/commercially evaluated) approach and method to design in an organizational context.

Currently a new phase of the MUST-program is established. In this phase a preliminary version of our approach to design is planned to be tested by practitioners. The results of this dissertation are part of this preliminary version of our approach: e.g. the claims presented in Part IV provide some of the principles and guidelines in the approach. The research aim is to evaluate and further develop our approach, while being used by practitioners in industrial and commercial settings more constrained than in action research projects. This way, results from this dissertation may be challenged: a claim may be "falsified" e.g. in terms of disproving its applicability in a certain context. We plan to participate with the role of introducing and teaching our approach and, during the design projects, consult as 'coaches'. The MUST-program is estimated to reach its goal, in terms of a book describing an approach to design in an organizational context, in approximately three years.

PART II

Three Approaches to Design

This part of the dissertation describes three approaches and perspectives on design: the participatory design approach, the ethnographically inspired approach, and the systems approach.

In the following chapters, I start out by describing each of the three approaches. They are not described equally detailed and in the same form.

- The *participatory design approach* represents an approach where the future users of computer systems participate directly with the designers in the design process. Participatory design has a long (10-20 years) tradition within academia in Scandinavia, where it is widely known and appreciated. This approach has been an integrated part of my education in computer science. As such, the participatory design approach represents a "natural" and obvious approach to the design process to me. The focus is on how designers and employees (and to a growing degree also management) cooperate in design, which is viewed as a mutual learning process. Participatory design is described in a variety of aspects in several comprehensive literature sources[12]. This approach is therefore only briefly outlined in the following chapter, mainly by giving some historical background and by presenting a model indicating the current scope within participatory design viewed as a learning process. Examples of participatory design techniques are presented in Part III

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12 E.g. Greenbaum and Kyng (1991); Schuler and Namioka (1993); CACM (1993); PDC (1992, 1994) and the proceedings from the annual Information Systems Research Seminar (IRIS) conferences.

- The *ethnographically inspired approach* within systems design represents a small but growing area of interest. By having its starting point solidly anchored in the social sciences and the humanities (as opposed to the traditional technical, mathematical and engineering disciplines), it brings a radical, provoking, refreshing, and relevant perspective into design. The focus is on detailed analysis of current work practices, as viewed by the people who actually do the work. The ethnographically inspired approach is a relatively new but increasingly acknowledged approach that is reported on mainly in various conference papers. This approach is described in more detail in a collection of papers[13] that represent the main core of published papers from this approach. A general description of the approach is given and two examples from projects within this approach are outlined: a project at Xerox corporation and a project at Lancaster University.
- The *systems approach* represents an analytical, systematic, and more "logical" approach to systems design. Systems approaches offer conceptual frameworks within which organizations are interpreted as purposeful behaving systems. The focus is on concepts offering a certain level of abstraction. In contrast to the participatory design and the ethnographically inspired approaches, the systems approach aims at linking analysis and design to the overall needs for organizational change and business strategy. I present the systems approach in general by giving some background of Checklands Soft Systems Methodology, which I consider as one of the first and major contributions to this approach within systems design. Soft Systems Methodology, as an approach to systems design, is not described in detail, instead another example of a systems approach, Work Analysis, is described. The reason why I have chosen to describe this approach (and in greater detail) is twofold: First, Work Analysis has been one major source of inspiration for me. I used it in one of the design projects reported on in Part III. Second, I am able to describe Work Analysis in a concise, yet comprehensive form, part of which has not been presented and published before. The description given is based

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13 (Barret et al., 1992; Bentley et al., 1992; Bentley et al., 1993; Blomberg et al., 1993; Gougen and Linde, 1993; Heath and Luff, 1991; Heath and Luff, 1992; Hughes et al., 1991; Hughes et al., 1992; Hughes et al., 1993; Luff et al., 1993; Shapiro et al., 1991; Shapiro, 1993; Sommerville et al., 1993; Suchman 1983; Suchman and Wynn 1984; Suchman 1987; Suchman and Trigg 1991; Suchman, 1993; Wynn, 1991).

on (all) earlier and recent papers and reports about Work Analysis, along with the main background literature sources to the fields that Work Analysis has been inspired from. The description of Work Analysis is given in chapter 6, and is, besides from the literature, based on meetings and discussions with the authors of this approach.

After presenting the approaches, they are discussed and related, giving the basis then for my own professional standpoint: this is done by clarifying my perspective, in terms of my theoretical and practical relation to these approaches, and what my research interest and starting point are.

In Part IV, I return to the three approaches in reflecting on my experiences from my empirical work. In Part IV, the systems approach, represented by Work Analysis, is evaluated in chapter 13, experiences from using a ethnographically inspired approach is described in chapter 14, while aspects of the participatory design approach is dealt with in all three discussions, though mainly in chapter 15.

3. Participatory Design

Participatory design (PD) represents an approach where the future users of computer systems participate directly with the designers in the design process. The approach was pioneered in Scandinavia, is widely accepted throughout Europe, and is now beginning to get recognition in the United States (Schuler and Namioka, 1993 pp. vii-xiii). In Scandinavia, the primary scientific forum for PD is the Information Systems Research Seminar (IRIS) conferences. The recognition in the United States is mainly reflected in the Participatory Design Conferences (PDC). Also, the PD approach is demonstrated in other research fields, e.g. in the CSCW and the CHI conferences and the IFIP-WG 8.2 and WG 9.1.

PD may be viewed as an umbrella term covering a variety of different research projects and issues concerning design. PD embodies two principles, as stated by Miller (1993):

1) Workers - and customers - are intelligent, creative, and productive contributors to organizations if they are empowered to express their insights, apply their expertise, exercise their decision-making capabilities, and given responsibilities for the impact of their actions.

2) PD holds that, contrary to Taylorist belief, good ideas are likely (perhaps more likely) to come from the bottom up as from the top down. Front-line workers and customers know what works, what doesn't work, and have lots of ideas on how to improve things (Miller, 1993, p. 38).

Clement and Besselaar (1993) give a historical review of the PD-approach. The PD-approach originates in a number of Scandinavian research projects from the 1970s and 1980s, like NJMF, DEMOS, and DUE[14]. Common to all these projects is that an action research approach was adopted; the projects were made in cooperation with employees and their trade unions; the researchers provided the initiative for participative approaches; and the aim was to support a specific group of employees

[14] An introduction to these projects and further references are given by e.g. Bansler (1987) and Clement and Besselaar (1993).

often isolated from other organizational levels and management. Five common ingredients have been identified in the projects (Clement and Besselaar, 1993):

1) Access to relevant information
2) Independent voice in decision making
3) User-controlled development resources: time, facilities, expertise
4) Appropriate development methods: e.g. prototyping
5) Organizational and technical flexibility (room for alternative technical/organizational arrangements)

A central theme of these PD projects was their clear commitment to a political and ideological goal: empowerment of the workers (users) and their trade unions in their "fight" against technological solutions and changes from management. Bansler (1987 and 1989) refers to this as the 'critical tradition'. The aim was to develop the qualifications of workers and their trade unions, provide them with better possibilities in negotiations with management, and, in some cases, to suggest alternative technological solutions. This ideological stand included the aim for workplace democratization, enforcing the workers right to influence changes and matters that concern them in their work. Today this ideological purpose does not have the central focus anymore. In Kensing's words:

> While the main focus in the early work was on developing the qualifications of *workers/trade unionists* for the purpose of democratization of working life, and to some extent also on developing alternative technologies from the workers perspective, lately the main focus has been on methods for PD in an organizational setting involving *users*, systems designers, and management (Clement and Besselaar, 1993, p. 32).

Some reasons for this shift in focus were lack of engagement from the trade unions, especially the central unions, and maybe a general ideological shift (or vacuum) in Western Europe after the fall of the wall. PD, within the Scandinavian tradition, may be viewed as having developed through three generations of PD-projects. The first generation of projects (e.g. NJMF, DEMOS, DUE) was mainly focused towards critical technology assessment and on supporting the trade unions in clarifying and strengthening their position in negotiations with management. In the second generation of projects (mainly represented by the UTOPIA-

project[15]), the aim was on designing specific systems from the perspective of the employees actually doing the work. The objective was to design a technology that supported the employees qualifications. This is in contrast to a management perspective, which could e.g. imply designing systems with the aim of "deskilling" and/or automating the work in question. The third (and current) generation of projects focuses on developing techniques, methods, and theories for PD involving users, designers, and management, as stated by Kensing above. Examples of such projects are the MUST-program (see Part I, section 1.3), the Great Belt bridge/tunnel-project (Grønbæk et al., 1993), and the AT-project (Mogensen, 1994).

Greenbaum (1993) gives three reasons for the need for PD: from a pragmatic perspective, a theoretical perspective, and a political perspective. As the pragmatic perspective, she states that:

> [I]t is generally acknowledged that approximately 60- to 80% of all problems can be traced to poor or inadequate requirement specifications. Obviously, computer systems need to better suit people's working practices. Since those who do the work know how it is done, we need to involve the designers of the systems with day-to-day work experience early in the project, when the basic design choices are made (Greenbaum, 1993, p. 47).

From a theoretical perspective Greenbaum refers to the philosophers Wittgenstein and Heidegger and states:

> Since systems developers and people at workplaces do not experience the same things, this limits how well they can understand each other's experiences. One way of getting around this dilemma is to apply PD [...] (Greenbaum, 1993, p. 47).

Finally, as a political perspective, Greenbaum argues that:

> [W]e believe that in a democracy people have the right to influence their own workplace, including the use of computer technology. As system developers we have the obligation to provide people with the opportunity to influence their own lives. We believe it is our professional responsibility not only to build systems that are cost-effective but that also improve the quality of work life (Greenbaum, 1993, p. 47).

Participation in PD projects has manifested itself in a variety of ways, from the creation of technology criteria and guidelines, the creation of new organizational forms and infrastructure, the development of participatory techniques, to the design of specific computer systems (Clement and Besselaar, 1993).

Current work in PD focus on the mutual learning process between

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15 The UTOPIA-project is described by Ehn (1988).

designers and users, and on experimenting and developing methods and techniques supporting this (Greenbaum and Kyng, 1991; PDC'92; Schuler and Namioka, 1993; CACM, 1993).

Kensing and Munk-Madsen (1993) have suggested a model which could be used to "structure" the toolbox with available tools and techniques supporting this mutual learning process, by referring to the knowledge from the different areas required in PD (see figure 3).

	Users' present work	New system	Technological options
Abstract knowledge	Relevant structures on users' present work (2)	Visions and design proposals (5)	Overview of technological options (4)
Concrete experience	Concrete experience with users' present work (1)	Concrete experience with the new system (6)	Concrete experience with technological options (3)

Figure 3: Six areas of knowledge in user-developer communication (Kensing and Munk-Madsen, 1993). The rows represent two levels of knowledge, while the columns represent three domains of discourse.

> The figure illustrates the idea that design is bridge-building in the sense that a new computer system, and corresponding changes in the content and the organization of the users' work, is created based on two domains of discourse: users' present work and technological options. Technology incorporates not only hardware and software, but also work organization. This may seem strange but in this context it is useful and acceptable to group these matters since various organizational options, as well as several hardware and software options, should be considered and coordinated in order to fit together as well as possible.
>
> The three domains reflect both the users' and the designers' typical prerequisites in terms of knowledge and understanding prior to entering a design process. At the outset the users have knowledge of their present work and of organizational options. The designers have knowledge of the technological options with regard to hardware and software and maybe organization. At the outset these are the 'minimal' knowledge-prerequisites as a starting point for a design process. During the design process designers and users have to engage in a mutual learning process addressing these two domains and in an iterative way approach the third domain of discourse: a new (or changed) computer system and changes in the content and the organization of the users' work.
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> The second distinction expresses the fact that we need to distinguish two levels of knowledge. We need abstract knowledge to get an overview of a domain of discourse and we need concrete experience in order to understand the abstract knowledge. These levels too, should be dealt with in an iterative way (Bødker and Kensing, 1994).

Combining the two distinctions, Kensing and Munk-Madsen identify

six areas of knowledge which must be developed and integrated, in order for the design process to be successful. They suggest a list of tools and techniques to support PD. Comparing this list with a similar list by Muller et al. (1993) some typical PD techniques can be identified: Different kinds of prototyping techniques including mock-ups, sessions like future workshops, metaphors/card games, forum theatre, and ethnographic techniques like observations and analyses of video-recordings.

The PD literature describes many specific projects using various techniques with considerable improvisation, informed by a holistic understanding of local conditions. The PD process involves juggling many items, taking on various roles, balancing competing demands, and being confronted with ethical considerations.

4. Ethnographically Inspired Approaches

Ethnographically inspired approaches within systems design represent a growing interest for the study of work practices that computer systems and other information technologies aim at supporting. In the literature addressing this approach, reports and papers especially appear from England and USA[16].

Some of the pioneering work within this approach has been done by Suchman from Xerox Palo Alto Research Center (PARC) in California. In some of her earlier work, she investigated the relationship between procedures and practical action in office work (Suchman, 1983; Suchman and Wynn, 1984). The results of these studies argue for and recommend a new line of research into the practical problems of office work, regarding systems design supporting this work.

Suchman (1983) describes a case in an accounting office where procedures are "remarkably explicit and closely tied to the use of methodic procedures" (p. 322). The example given from the case study shows how problem solving and "judgmental practices" (p. 327) are embedded in the accomplishment of procedural tasks: "This preliminary observation indicates that the "smooth flow" of office procedures is an outcome to which practitioners orient their work - it is not the work itself" (p. 327). Descriptions of work, in terms of procedures, reflect a somewhat "ideal" work flow. This is not how the work is actually carried out. "Standard procedures are formulated in the interest of what things should come to, and not necessarily how they should arrive there" (p. 326). "The case suggests that the procedural structure of organizational activities is the *product* of the orderly work of the office, rather than the reflection of some enduring structure that stands behind that work" (p. 321).

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16 E.g. the CSCW-group at University of Lancaster, Centre for Requirements and Foundations at Oxford University, Department of Sociology at University of Surrey, Rank Xerox EuroPARC in Cambridge, Xerox PARC and Institute for Research and Learning (IRL) in California.

The question to Suchman is, "how the structure of these judgmental practices is important to the design of office information systems" (p. 327). She describes two alternative design-views:

1) The "traditional" view is where the designer treats the work as procedures executed in step by step instructions. Here the interpretative, problem-solving work is ignored, and the systems are limited to *quantitative* improvements and higher standardization of routine word and data processing.

2) "Alternatively, the designer can recognize the judgement required in the accomplishment of actions according to procedure" (p. 327), intending the design/system to "facilitate the work demanded by particulars of actual cases, and *qualitatively* enhance worker's methods of research and analysis. The goal of such a system is to serve as a tool for the work of accomplishing procedures" (p. 327).

This view is further elaborated in Suchman's book "Plans and Situated Actions" from 1987, a book which has been and still is often referred to. The main point is that we act in the situation and do not follow plans in any narrow sense. Plans should be considered as a resource rather as a procedure which we follow "in situ".

One major point in ethnographically inspired approaches is that work is a socially organized activity where the actual behavior differs from how it is described by those who do it. This is referred to as the "say-do" problem (Gougen and Linde, 1993) or the difference between "ideal" and "manifest" behavior (Blomberg et al., 1993). People do not express their actual behavior exactly and very detailed either because they would not think of mentioning details due to that it is an unremarkable routine or because it is inexpressible tacit knowledge. This implies that detailed studies of work must include observations besides asking what you are doing, e.g. in an interview. When asking, "you are likely to get little more than simplified generalizations of what the work involves" (Barret et al., 1992, p. 2). Gougen and Linde (1993) state it rather abruptly: "Don't ask people to describe activities that they do not normally describe, or if you do, then don't believe the answers" (p. 155).

Another major point is to deliberately avoid using any pre-defined conceptual framework in making the ethnographic analysis. "The idea is to find the categories that members themselves use to order their social world, rather than impose an analyst's order on it" (Gougen and Linde, 1993, p. 159). Thus, the concepts and categories used to describe obser-

vations should be based on the concepts and categories the people studied use themselves.

There are several reasons and arguments for the relevance of applying ethnographically inspired approaches to the design process. Detailed analyses of current work practices are considered to provide "an essential basis for innovative design and more well-integrated, effective technologies" (Barret et al., 1992, p. 1). Gougen and Linde (1993) argue that " it is necessary to consider the effect of a new system on social structures, as suggested by the following questions: will the new system reproduce the existing social order? Or will the order be altered in significant ways? Do the existing social structures suggest requirements that would negate the improvements expected from the new system?" (Gougen and Linde, 1993, p.162). Blomberg et al. (1993) argues that:

- Designers create artifacts for work settings they know little about. Some understanding of those settings is needed.
- Technologies help shape the work practices of their users, it is important to have an appropriate view on their world. Otherwise designers, to a larger degree must rely on their own experiences and imagination, running the risk of designing technologies better suiting their own needs rather than the actual users' needs.
- Designers need (thorough) insight in current work practices in order to participate in creating the context for discussions in a joint exploration of the relation between work and technology (envisioning how new technologies could support/change current work).

Bentley et al. (1993, pp. 6ff) argues that computerization, up untill now, has concentrated on corporate information systems automating existing manual systems and personal computers supporting individual work, all of which involve relatively simple applications with a large economic payoff. The next generation of information systems must have increased usability, in terms of fitting into existing work practices, if they are to be accepted because of this generation's lower improvement within productivity.

> Current application systems have been successful in spite of their usability problems because they offered so much. An inevitable consequence of the law of diminishing returns is that the next generation of application systems will offer a lower productivity improvement; users will be unwilling to change their working practices to adapt to these systems because the advantages from that change will not be obvious. Hence systems have to be more usable in order to be accepted.

> An essential characteristic of usability is conformance to existing working practice. Users will not change the way they work to adapt to a computer system if the benefits are not significant and obvious. We must therefore have a clear understanding of the workplace and the way in which humans interact with each other in that workplace. We must also understand how they actually use interactive systems and the ways in which they manage and process information (Bentley et al., 1993, p. 6).

Ethnography was originally never meant to be part of a design process. "Ethnography is a process which was originally developed by anthropologists to understand social mechanisms in 'primitive' societies. It involves an anthropologist spending an extended period of time (sometimes several years) living in a society and making detailed observations of its practices" (Sommerville et al., 1993, p. 165).

Also, you may discuss how ethnography is done at all, and what it implies:

> Although many books have been written about ethnography and ethnographic field methods, there is no agreed upon set of principles that guide anthropological field work, nor is there a cookbook of methods and techniques applicable in all situations (Blomberg et al., 1993, p. 125).

> There is no formal modeling of functions or requirements, no analysis of data flow, no tabulation of viewpoints, no separation between function, implementation and interface. There are only descriptive, interpretive, incomplete and seemingly quite subjective accounts of the accomplishments and the troubles involved in socially organized action (Hughes et al., 1992, p. 121).

Nevertheless, Blomberg et al. (1993) have taken the risk to outline four main principles of ethnography and some main techniques.

First of all, ethnography takes place in *natural settings*, which means that you are committed to study work practices and activities of people in their everyday settings. The focus should be on the naturally occurring, everyday talk and action. Second, it includes a principle of *holism*, which implies that particular behaviors must be understood in the everyday context in which they occur. The focus here should be on relationships between the parts studied[17]. Third, you should develop a *descriptive* understanding in contrast to prescriptive, and avoid judgements of the efficacy of the observed behaviors. Focus is on how people actually behave, not on how they ought to behave. Finally, your understanding should be grounded in a *member's point-of-view*, which means an effort to

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17 Shapiro (1993) refers to this as looking at the "big picture" and studying the overall functioning of an organization, implicitly acknowledging that this implies a rich and detailed knowledge of current work practices.

understand other people's behavior from their point of view, aiming at getting as close to the insider's view as possible.

The main techniques in ethnography are observation, interviews, and video analysis. Observation involves the range from unobtrusive "fly on the wall" observations to participative observation, being fully involved in the activities studied. Interviews are mainly conducted as informal, unstructured, and open-ended "in situ" interviews. The use of video-recording is a growing tendency within ethnography since the video is cheap, small, and portable. Video-recordings are used as a supplement to field notes, in teaching and reporting situations, and as a primary data source (Suchman and Trigg, 1991).

Ethnographic analysis may be *very* detailed, and it is impressing to experience the engagement that ethnographers may impose in concurrently analysing a fraction of the microcosms studied. Examples of analyses of video-recordings, that I have seen demonstrated, sometimes include several replays of a few seconds of a video-recording, e.g. analysing how a particular person lifts his finger to point at some text on a computer monitor[18]. Video or audio recordings are necessary if the ethnographic analysis is elaborated with interaction analysis. The use of interaction analysis (inspired from ethnomethodology[19]) in an ethnographic approach is described by Suchman and Trigg (1991) and Gougen and Linde (1993). "Interaction analysis is concerned with detailed investigation of the interaction of people with each other and with the material environment (Suchman and Trigg, 1991, p. 75). Interaction analysis is one way to analyse the concepts and categories that the people studied use. Interaction analysis includes detailed studies of transcripts of conversations, analysing turntaking (how someone takes over the conversation, takes the floor), adjacency pairs (utterances which belong in pairs like question-answer and greeting-greeting), and discourse units (the linguistic unit directly above the sentence, e.g.: the joke, the explanation, the spatial description, the plan, etc.) (Gougen and Linde, 1993, pp. 158ff).

Interaction analysis and analyses of video-recordings, in general, are

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18 This demonstration was made by Lucy Suchman in a presentation given at the University of Copenhagen in 1991.

19 Ethnomethodology represents a school within sociology. It originates in the work of Garfinkel (Harold Garfinkel: *Studies in Ethnomethodology,* Prentice-Hall, 1967). Some researchers within ethnographically inspired approaches are very inspired by ethnomethodology, e.g. Suchman (1987); Suchman and Trigg (1991); and Gougen and Linde (1993).

very labor intensive techniques. Therefore, Gougen and Linde (1993, p. 162) suggest a "zooming" method, which they currently only briefly are able to outline: Start with an ethnographic study to uncover basic aspects of social order, proceed with interviews and questionnaires to explore what problems members experience and find most important, and apply then the "labor-expensive/intensive" techniques to get a deeper understanding of selected problematic aspects.

Even though the potential and relevance of the basic ideas in ethnography are acknowledged to a still greater extent within systems design, at least within the academic community, the application of ethnographically inspired approaches to systems design is in a young and experimental stage.

> Although there is a growing recognition that an understanding of user's current work practices would be useful in the design of new technologies, the debate about what it would mean to acquire such an understanding and to link it to design is only beginning (Blomberg et al., 1993, p. 123).
>
> [I]f we are to take seriously the claim that more effective systems will result when their intervention 'resonates' with existing work practices, a method is required which both elaborates and explicates these practices. There is a *prima facie* case for considering ethnography to be particular appropriate for this purpose (Hughes et al., 1993, p. 125).
>
> [T]he [sociological] discipline may not in fact stand up very well to the test of having the perspectives and analyses that it proposes incorporated into designs for support systems in the real world, since they were hardly developed in the first place with such an end in view. That is, it may have some difficulty in delivering on the territory it has staked out. [...] [I]f this confrontation is to produce a change in paradigm for computer science, then why should sociology be immune? (Hughes et al., 1991, p. 321)

In the following two sections, two projects within ethnographic inspired approaches are outlined: a project at Xerox and a project at Lancaster University.

4.1 Work-Oriented Systems Design at Xerox

Work-Oriented Systems Design is a project at Xerox corporation where Lucy Suchman's group, from Work Practice and Technology Area at Xerox PARC collaborates with two other Xerox groups, User-Informed Design and Advanced Office Document Services. The project is described in Barret et al. (1992). The goal of the project is twofold: "The project's research goal is to explore innovative methods for work-oriented,

cooperative design of Xerox multifunction technologies, while its development goals are directed specifically at applications and user interface design for multifunctional machines[20]" (Barret et al., 1992, p. 1). The work practice research implies detailed ethnographic studies of work practices at a number of sites, in terms of other companies and institutions. These sites have been selected from a number of criterias (larger distributed organization, document-intensive work practices, willingness to being interviewed and videotaped, etc.). The sites have an interest in participating as they see an opportunity to reflect on current work practices, think about future possible information technologies, and support their image by collaborating with a high technology firm like Xerox.

One of the sites is a larger law firm where a typically moderate size "case" involves approximately 70,000 pages of documents, and some large cases run up to a million pages (Barret et al., 1992, p. 10). The ethnographic studies investigate the complex cooperative process of passing through these large amounts of documents and business files, and selecting those relevant for the attorneys considering the case. As pointed out when presenting the project at a workshop at PDC'92 (Blomberg and Suchman, 1992): The frightening situation for the attorney is if, in court, the counterpart (who has an exact copy of all documents) presents an argument based on a document that the attorney does not know about.

As mentioned above, the goal of the project is twofold. This means that the researchers not only make their detailed studies of current work practices, but also enter the organization with some technological prototypes "in the pocket" so to speak. So besides making the ethnographic studies uncovering a member's point of view, their own situated understanding of current work practices, etc., the researchers introduce prototypes of Xerox's multifunctional technologies into the sites. This may, of course, engage discussions of possible changes to the current work practices. This ambiguousness in the role of the ethnographers is different from their "traditional" role. They expressed some frustrations with this at the PDC'92 workshop.

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20 Some of Xerox' visions considering future multifunctional technologies are described by Weiser (1991) and Waldrop (1993).

4.2 The CSCW-group at Lancaster University

In the CSCW-group at Lancaster University researchers from the discipline of sociology cooperate with computer scientists from the software engineering discipline in design projects which they refer to as *ethnographically informed* design. The sociologists provide information which deepens the understanding of the application domain in question (air traffic control) (Hughes et al., 1991; Bentley et al., 1992; Hughes et al., 1992; Sommerville et al., 1993; Bentley et al., 1993; Shapiro, 1993; Hughes et al., 1993).

The ethnographic studies had the explicit objective "to inform the design of a user interface to a reactive data base system which provides the essential information for air traffic controllers to carry out their work" (Bentley et al., 1992, p. 123).

The ethnographically-informed design process involved two parallel activities: the sociologists made the ethnographic observations and the computer scientists did the software development (prototyping and system tailoring). The coordination took place in debriefing meetings.

> The central activity is the debriefing meeting, where ethnographers and system developers meet. System developers are doing prototyping and system tailoring in parallel to the ethnographers doing "informed" ethnography. During these meetings, the ethnographer discussed his findings and was questioned by other team members. The software developers' questions focused on systems requirements and, while it was rare to identify an explicit software requirement during the debriefing meeting, the developers gained an intuitive impression of the facilities required by the controllers. During the debriefing meetings, the system developers identified particular areas of interest and particular problems which should be investigated in the next phase of the ethnography. Thus, the ethnographer was informed of the system requirements and focused his observations to answer the questions posed by the system developers (Bentley et al., 1992, pp. 126f).

The ethnographers have, in some respects, played the role as a ('cheap') substitute for the users (the air traffic controllers) in the early stages of the design process:

> The ethnographer plays a key role [...] as he acts as a substitute for the air traffic controller, and represents his or her view of the system." (Bentley et al., 1992, p. 127).
>
> [...] our experience has shown that ethnographers can act as 'users' champions'

> in the early stages of the design process. Thus, initial inappropriate designs can be detected with very limited end-user involvement so that expensive user time is only used at later stages of the process where design details have to be resolved (Bentley et al., 1992, p. 129).

The cooperation between sociologists and computer scientists did have problems concerning differences in language, methodology, etc., but the general conclusion is that "software engineers and sociologists can work together effectively" (Sommerville et al., 1993, p. 172). Recently an attempt to make the cooperation more effective, through the use of a computer tool called "Designers Notepad", has been investigated (as proposed by the computer scientists, I suppose). The sociologists use the tool to enter unstructured information as their ethnographic records, while the system engineers use this information (and the same tool) to produce more structured descriptions for the requirement's specification, e.g. data-flow diagrams (Sommerville et al., 1993). To the sociologists, though, the role of having a purely informative 'service'-function, is considered problematic:

- "[I]t is hard to see why, other than financially, such a role should be of interest, since it would seem to involve just 'plugging in' existing knowledge and perspectives rather than originally intellectual work." (Hughes et al., 1991, p. 320).
- Design is not only about user interface, but also about the core functionality of the system. Social scientists may be unable to judge about the technical, etc. consequences of their analysis. "Equally, software engineers are not well placed to judge the effects on work processes of resolving incompatibilities and reaching compromises in particular ways" (Shapiro, 1993, p. 21).

5. Systems Approaches

Systems approaches offer conceptual frameworks, with the system concept in its core, within which organizations are interpreted as purposeful behaving systems.

One major contribution within systems approaches is from Checklands Soft Systems Methodology (SSM). SSM represents one of the first attempts to develop a systems approach into a methodology for handling situations like design in an organizational context. Below the background of SSM is briefly outlined as representing a general background for systems approaches, while the methodology of SSM as such is not described in detail[21]. Instead, another example of a systems approach, Work Analysis, is described.

SSM was developed in the 1970s by Peter Checkland and others at the Department of Systems, University of Lancaster (mainly through an action research approach), and is described in Checkland (1981) and Checkland and Scholes (1990). The SSM approach stems from the 'systems movement', which Checkland see as an attempt to give holistic approaches to problems, which the traditionally reductionistic approach within natural science has failed to solve. The systems movement can be located within such disciplines as Biology, Ecology, Economics, Geography, Demography, Management (Operational Research), Engineering, and Cybernetics.

Checkland distinguishes between 'hard' and 'soft' systems thinking within the attempt to use system concepts to solve problems.

Hard systems thinking is identified within Systems Engineering (as the traditional research strategy or design approach for engineers and technologists) and Systems Analysis (as the systematic appraisal of the costs and other implications of meeting a defined requirement in various

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21 Readers not familiar with SSM may read the introduction to SSM presented by Simonsen (1994 A) or the original literature (Checkland, 1981, 1984; Checkland and Scholes, 1990).

ways).

Hard systems thinking has the starting point in 'structured' problems and the assumption that the objectives of the systems concerned are well defined and consistent.

Soft systems thinking has the starting point in 'unstructured' problems within social activity systems in which there is felt to be an ill-defined problem situation.

> It became clear that the present research was to be concerned not with problems as such but with *problem situations* in which there are felt to be *unstructured* problems, ones in which the designation of objectives is itself problematic (Checkland, 1981, p. 155).

Checkland refers to hard systems thinking as the 'optimization paradigm' while soft systems thinking is referred to as the 'learning paradigm' (Checkland, 1981, p. 258).

The core of SSM is to use and apply systems ideas, developed within hard systems thinking, in "soft" situations: in problem solving in the typical situation where management in an organization wants to improve a situation and the problems and where the situation itself only can be stated in very general and vague terms. Hence, SSM is an approach which, in a systematic way, tries to establish and structure a debate concerning actions for improving the problem situation.

Checkland claims[22] that systems thinking, in general, relies on two pairs of ideas: 'emergence and hierarchy' and 'communication and control'.

Emergence and hierarchy refer to a general model of organized complexity describing the complexity as a hierarchy of levels, "each more complex than the one below, a level being characterized by emergent properties which do not exist at the lower level" (Checkland, 1981 p. 78). In an example from biology, the levels are: cell organelles, cells, organs, organisms, and ecosystems.

Maintenance or survival of the hierarchy entails "a set of processes in which there is *communication* of information for purposes of regulation or *control*" (Checkland, 1981, p. 83).

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22 In the paper: Atkinson, C. J. and P. B. Checkland: "Extending the Metaphor 'System'", *Human Relations*, 41 (10), 1988, pp. 709-725, Atkinson and Checkland examine a range of accounts of basic systems ideas from the literature. The conclusion in this paper is that "all authors draw on the same cluster of ideas and that the image underlying all accounts can be expressed in the two pairs of ideas: emergence and hierarchy, communication and control, as suggested by Checkland in 1981" (Checkland and Scholes, 1990, p. 19).

> The hierarchically organized whole, having emergent properties, may in principle be able to survive in a changing environment if it has processes of *communication* and *control* which would enable it to adapt in response to shocks from the environment (Checkland and Scholes, 1990, p. 19).

This makes the basic philosophy of SSM close to a functionalistic tradition in sociology. A traditional functionalistic position is that you, in principle, are able to study social structures by isolating or demarcating structures into systems, in which causal relations are dominating, forming some kind of boundary to the environments of the system. You can describe the function that the system has in proportion to its environments, as well as the function of the coherence within the system. The point of functionalism is that systems can be described as teleological or functional in a sense where they preserve themselves - they have a superior purpose. The superior principle of the system is its own maintenance, or survival, and events within the system can be described as having a function towards this principle.

SSM, as described by Checkland (1981), is commented and criticized by Kjeld Schmidt and Peter Carstensen (1990) in a paper describing Work Analysis. Work Analysis is, in many respects, influenced by SSM.

According to Schmidt and Carstensen, the system chosen in SSM is neither the social system nor a system distinct from this. It is both a perspective on the problematic situation, and the social system seen in the light of this perspective. To chose a "relevant system" in SSM, is to chose a perspective in changing the situation and the root definition[23]. This system is not a system "in the real world" but a notional system, in terms of a system changed from a specific perspective.

Schmidt and Carstensen (1990, pp. 31ff) claim that the central and critical points in SSM are 1) the choice of "relevant system", i.e. perspective, and 2) the investigation of the implications of this chosen perspective by a hypothetical construction.

1) Even though Checkland suggests that you test several "relevant systems" from different root definitions - possibly by many iterations - you finally *have to* chose one perspective[24]. This final choice could

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23 Both Checkland and Schmidt and Carstensen use the concept 'root definition' for an initial description of the system in question, see e.g. Checkland (1981, pp. 166ff).

24 This was a demand in the early SSM, but Checkland claims that it *is* possible to have several conflicting root definitions reflecting different "weltanschauungen" in the analysis (Checkland, 1981, pp. 251f). Though in the examples, given by Checkland (1981) and Checkland and Scholes (1990), the typical situation is an

introduce an inappropriate bias in the analysis. Also, this will intervene in the diverging interests and conflicts. It can, of course, be necessary to intervene in the existing constellations of alliances and conflicts, but Checkland totally underplays this issue.

Choosing one perspective eliminates other (relevant) perspectives. Instead, you should strive to develop one "united perspective": this should be developed by analysing the social system in a "bird's eye view".

2) The use of general system theory, common sense, and practical experiences, is far too inadequate in the development of the overall organizational change and business strategy, which Schmidt and Carstensen refer to as strategic conceptions. Such conceptions are domain-specific and must be developed and expressed in concepts from the domain in question, not by concepts from general systems theory. Systems theory can only serve a heuristic function. Also, you need knowledge about the means available, e.g. knowledge about possible information technologies.

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analysis with one root definition.

6. Work Analysis, an Example of a Systems Approach

Work Analysis is an approach to systems design still under development, mainly by Kjeld Schmidt and Peter Carstensen from the Systems Analysis Department at Risø National Laboratory.

Work Analysis makes an attempt to develop a theory of work, a conceptual framework, and a method for early design within information systems development. The scope of Work Analysis is primarily design within office work in (complex) administrative settings, with a reasonable content of problem solving, consideration, counselling, and decision making. Key elements of Work Analysis are inspired from the fields of function analysis, system thinking (Soft Systems Methodology, SSM), cognitive engineering, and ethnographic analysis of office work[25]. According to Schmidt and Carstensen, some of the main contributors to these fields have been Simon (1969, 1976); Checkland (1981); Mathiassen (1984); Roth and Woods (1989); Suchman (1983, 1987); and Suchman and Wynn (1984).

This chapter describes Work Analysis based on Schmidt (1986, 1988, 1989), Schmidt and Carstensen (1990), some confidential reports, and the main contributors to the fields that Work Analysis have been inspired from. Besides the literature, it is based on meetings and discussions with Kjeld Schmidt and Peter Carstensen.

The development of Work Analysis can be seen as encompassing three versions:

- In the first version, it was called Functional Analysis (Schmidt, 1986; Schmidt, 1988; Schmidt, 1989). A main part of its development originates from the ESPRIT-project FAOR (Functional Analysis of

25 A short introduction to some issues concerning the apparent contradiction in combining a phenomenological and a functionalistic approach, is outlined by Simonsen (1992 B, 1992 C).

Office Requirements). One of the instruments that this multiperspective approach describes is the Function Analysis Instrument (Schmidt, 1988).

- In the second version, its scope was broadened to include a functional analysis, a preceding strategical analysis, and a link to a succeeding operational analysis. Its conceptual framework was developed further as a preliminary theory of work, hence the name Work Analysis. The most recent description of Work Analysis is in a report describing this second version (Schmidt and Carstensen, 1990). In the foreword, it is stated that the purpose of the report is to discuss the theoretical basis and practical problems of Work Analysis (Schmidt and Carstensen, 1990, p. 5).
- Currently, a third version is under development. The effort is to use the experiences from Work Analysis in developing concepts of CSCW (Computer Supported Cooperative Work). This work is part of the ESPRIT-project COMIC (Computer-based Mechanisms of Interaction in Cooperative Work).

In the following, Work Analysis is described as it appears in the second version. Its perspective and conceptual framework is examined, the method is described, and the suggested techniques are outlined.

6.1 Perspective and Conceptual Framework

Basically, Work Analysis considers human work as a purposeful transformation (i.e. it is intentional) of an object into a product which satisfies a human need.

Work, thus comprises the elements: a need, an object, the transformation, and the product. A work domain is defined as comprising the transformation, its object, and its product; i.e. trade, line, industry, or profession.

Work Analysis does not elaborate much on these concepts in its second version: this is one effort currently being worked on. The concepts may be adequate in describing a material production where some input is transformed into some output[26]. Concerning services (medical

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26 Checkland uses a similar notion concerning root definitions and conceptual modeling in Soft Systems Methodology: "A root definition expresses the core purpose of

treatment, haircutting, acting, etc.) a more abstract use of the concepts is necessary: the object is, then, aspects of the condition of the customer; the transformation is happening when the service is consumed; when the transformation has ended, the need is satisfied. Within administrative work, the object is perceived as economic relations which the administrative work communicates and controls (Schmidt and Carstensen, 1990, pp. 71f).

The basic methodological approach in Work Analysis takes its starting point in the moral from Simons parable of the ant walking across a beach[27], where it leaves an irregular path across the wind and wave-molded sand.

> We can perceive the tremendous complexity in a work systems behavior analogously: 'The apparent complexity of its [the ant on the beach] behavior over time is largely a reflection of the complexity of the environment in which it finds itself.' Instead of trying to record and model the - changing - decision paths and patterns of cooperation displayed by the work system, it is more appropriate to record and model the - relatively stable - characteristics of the environment of the work system (Schmidt and Carstensen, 1990, p. 76, my translation).

The work system is defined as "a system of cooperating actors complete with technical equipment" (Schmidt and Carstensen, 1990, p. 74, my translation).

The decisive point in Work Analysis' perspective of work, is that work is purposive and intentional and hence, can be interpreted in functional terms.

> Human work is purposive transformation, i.e. it is intentional [...] By providing human beings with the necessary means for satisfying their needs, work is functional. As opposed to other human activities, a work process is essentially determined by its function (Schmidt, 1986)
>
> Human work must be understood as a system of which the tasks and activities performed by individuals and organizations are functional parts (Schmidt, 1988, p. 264).

Work Analysis uses Simon's description of a relation (an interface) between an inner and an outer environment (Simon, 1969). The inner

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a purposeful activity system. That core is always expressed as a transformation process in which some entity, the 'input', is changed, or transformed, into some new form of that same entity, the 'output'." (Checkland and Scholes, 1990 p. 33).

27 Simon (1969, pp. 63 f). The parable is referenced in Schmidt and Carstensen (1990, p. 76).

environment is the subject, the work in question that is defined as a work system, of the transformation. The outer environment - or just the environment - is that part of the world which imposes requirements and demands on the work system, and which imposes conditions and constraints on the work system concerning its effort to meet the requirements.

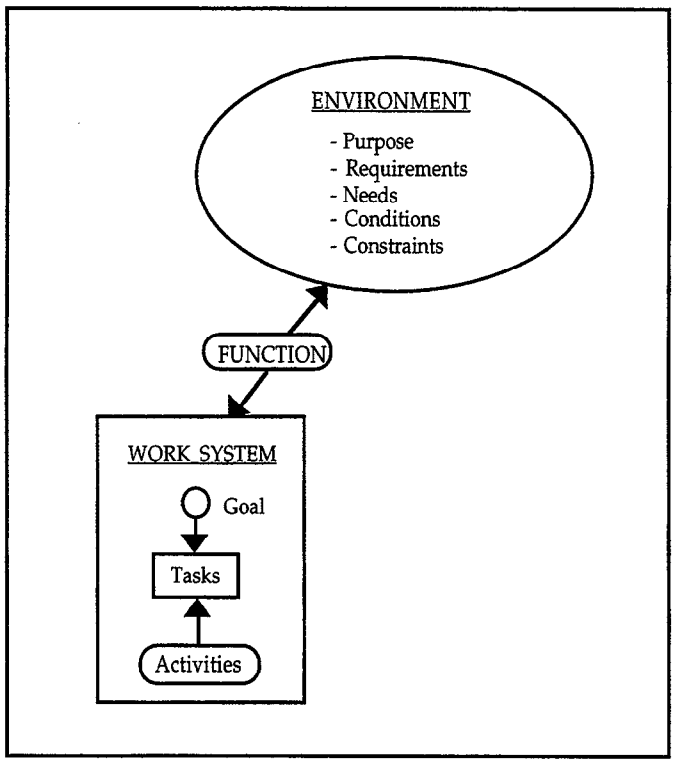

Figure 4: Basic conceptual framework, derived from Schmidt (1988, 1989) and Schmidt and Carstensen (1990)

The relation between work system and environment is defined as the function:

> The function is the relation of expediency, which links the systems configuration and mode of operation with its purpose and the specific conditions, in which the purpose must be met (Schmidt and Carstensen, 1990, p. 77, my translation).
>
> [A] function denotes the intention of the work. A function expresses the purposiveness of the processes, disregarding the method and the actual form of implementation of the processes (Schmidt, 1986, p. 5).
>
> The function of an element of a system is the relation of necessity of that element to the system at large (Schmidt, 1988, p. 264).

Thus, a function is a means-end relationship between the work system and its environment (Schmidt and Carstensen, 1990, p. 77).

The work system is perceived as a social or sociotechnical system. The work system may not (and most often it does not) correspond to an organizational structure (e.g. an agency, a department, or an economic unit). A work system is a cooperative ensemble that constitutes a coherent system, by performing interdependent activities.

> Being mutually dependent *in work* means that A relies positively on the quality and timeliness of B's work and vice versa and should primarily be conceived of as a positive, though by no means necessarily harmonious, interdependence (Schmidt and Bannon, 1992, p. 13).

The interdependent activities are, in some cases, interpreted as exchange transactions[28] (Schmidt, 1986, pp. 8f; Schmidt and Carstensen, 1990, pp. 78f).

As a social system, the work system is created and maintained through the activities performed by its agents. Its purpose is represented in a distributed and contradictory manner, as different individuals interpret the work system's purpose. The actors participate, and are guided by individual interests and motives. Hence, one task in doing Work Analysis is to develop a theory of the work systems purpose and conditions (Schmidt and Carstensen, 1990, pp. 78f).

When you observe a work system "in action", you will notice a lot of different things happening: A copies a letter for Mr. B; C drops a sheet of paper on the floor; D prepares a draft of a contract; E drinks his coffee; F negotiates with G concerning a loan; etc. What is observed, are processes. "The concept of process denotes the multiple facets of what is happening [...] accidental occurrences as well as the necessary" (Schmidt, 1988, p. 269). In order to abstract the essential processes from the accidental "background noise" (Schmidt, 1988, p. 269) Work Analysis provides the concepts: *process, operation, activity, task, set of tasks, goal,* and *function* (Schmidt, 1986, pp. 4-6; Schmidt, 1988, pp. 269-271; Schmidt and Carstensen, 1990, pp. 90-96)[29].

The significant content in the processes is the activities, which are related to tasks that are one (possible) implementation of a function. Doing Work Analysis, one must follow this chain from process to func-

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28 See e.g. Ciborra (1985) for a description of the concept 'exchange transactions'.

29 The definition of the concepts task, activity, and process are inspired from Andersen et al. (1990).

tion.

The concept *activity* highlights the substantial part in a process[30], with respect to the technical and other resources available. Hence, the form assumed by activities is strongly influenced by the currently available implements. Activities may be decomposed into *operations*.

A *task* abstracts from the resources at hand, and relates to a *goal,* in terms of a specific end state that you strive for. A task is an operational denotation of a function. Basically, a task appears as a problem, where the path from the current state to the desired state is not known in advance. The problem is solved by finding a path to the desired state.

There is an important difference between a function and a task. The function is a quality of the work system as a whole: its expediency in relation to its environment. It continues to serve a purpose. It is independent, concerning different possibilities of implementation. A task, on the contrary, has a goal and a definite end state: when the goal is reached the task is done. A task is an "operationalization", a way to realize and implement a function. "Functions exist while tasks come to an end."[31]

Typically, a function may be specified in a *set of tasks* indicating what is requested. A set of tasks operationalizing a function, is a manifestation of a specific problem solving method or heuristic. Sometimes, it is a bit of a quibble to try to distinguish between a function and a set of tasks.

An example of a function from The Film Board (the organization described in Part III), is *take care of film festivals*. A related task could be *to organize this specific festival next week*. Correspondingly, an activity could be *right now I'm preparing these leaflets for the festival next week.* Finally, an operation could be *to stamp the leaflets on the back page*.

The basic conceptual framework of Work Analysis is summarized in figure 4 and in the following figures 5 and 6.

The conceptual framework and perspective of Work Analysis are heavily influenced by the work of Herbert A. Simon (1969, 1973, 1976):

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30 Work Analysis does not elaborate much further on *what* is the substantial and *what* is the accidental and negligible background noise. An example is given though: Talking about photocopying as an activity you should ignore that you make a mess, drop the originals on the floor, and later collect yourself by drinking a cup of coffee while the photocopier is running (Schmidt and Carstensen, 1990, p. 91). Maybe this example is not the best one you could choose. A significant and very referred to study of people making a mess trying to photocopy, was made by Suchman (1987).

31 In Danish: "Funktioner består mens opgaver forgår".

Work Analysis has a rational theoretical background, and also a focus on decision processes.

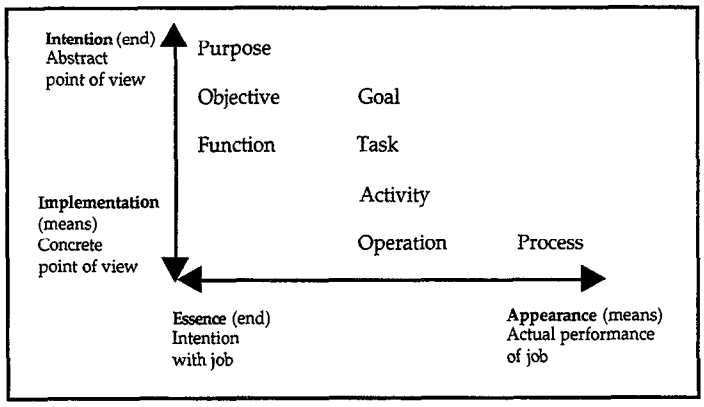

Figure 5: Basic concepts depicted in two means-end dimensions, derived from (Schmidt, 1986, p. 5 and Andersen et al., 1990, p. 42). The objective denotes the intended outcome of the function. Purpose denotes the intended outcome "sub specie" the wider system benefitting from the work (Schmidt, 1986, p. 5).

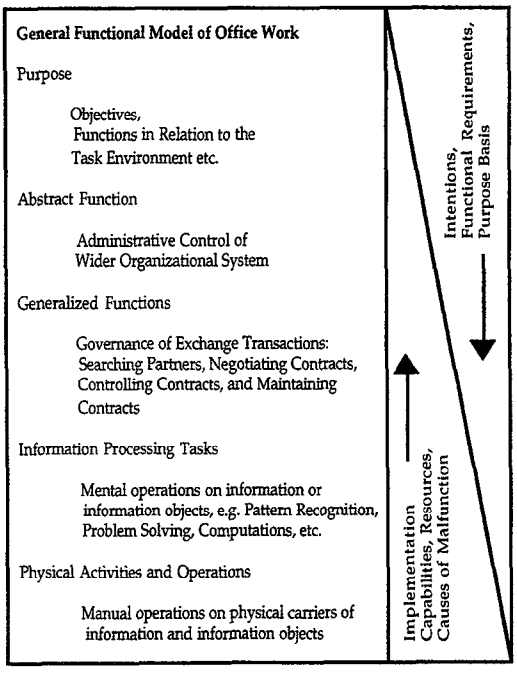

Figure 6: General functional model of office work (Schmidt, 1986, p.10)

Work Analysis claims that the interpretation of the results of the analysis, into this abstraction and conceptual framework, will provide relevant

recommendations regarding support from information systems: these systems must support the function that is the expediency of the work system towards its environment, "[...] so as to provide a rational basis for requirements specification" (Schmidt, 1988, p. 261). The requirements and conditions from the environment are viewed as the "field of force" in which the work system exists. The work system's functions correspond, to a large extent, to these requirements and conditions. If the work system cannot fulfill its purposes according to its environment, its resources will drain and finally, it will cease to exist: if it does not fulfil these demands in a reasonable way, it is "out of business".

When Work Analysis describes complex work, it often focuses on decision making and the conditions for decision making:

> Work Analysis is confronted with the challenge to investigate, describe, and interpret complex work. Within complex work, the actual approach in a decision process is not known in advance; different decision makers use different decision strategies, and one may often change strategy during the decision process (Schmidt and Carstensen, 1990, pp. 75f, my translation).

> Complex work is often characterized by comprising several target domains[32], and a significant part of the decision process is juxtaposition of information from several object domains (Schmidt and Carstensen, 1990, p. 83, my translation).

Often a function involves one or more "prototypic" decision situations. Work Analysis does not require, though, that a function always must involve a decision situation - often that is not the case. Within administrative work, for instance (especially in the financial sector), three superior processes are often observed: obtaining/gathering information, collocation/juxtaposition of the information, and decisions made on the basis of the juxtaposition. This often corresponds to three functions.

6.2 Method

A model describing the main components in systems development, emphasizes that system developers basically perform two types of creative

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32 A target domain (my translation of the Danish "genstandsområde") is a coherent accumulation of knowledge with vital importance for the work domain. It is the areas in the environment that the work system needs to know about. In an earlier paper (Schmidt, 1989) this was referred to as a problem domain (in Danish "problemdomæne").

activities (Andersen et al., 1990, pp. 42ff):

- A product-oriented activity creating a computer-based system, i.e. a computer system and making corresponding changes in the user organization. This performance-related activity includes design, analysis, and realization.
- A process-oriented activity creating a project resulting in the planned computer-based system. This management-related activity includes planning, evaluation, and regulation.

The description of the Work Analysis-method, given by Schmidt and Carstensen (1990), focuses on the product-oriented activity (in terms of the conceptualization of this activity) and basically ignores issues concerning management in the process of doing Work Analysis.

The method for Work Analysis cannot be more structured than the work system in question, i.e. the analyst must experiment and conduct the analysis with a pronouncedly iterative approach. Hence, the method consists of a collection of heuristics, guidelines, and principles, along with basic functions, tactical recommendations, and suggested techniques (Schmidt and Carstensen, 1990, p. 105).

In the following the method is described by presenting and discussing

- its general approach (this includes some general principles and heuristics);
- its three analytical levels (this includes the tactical recommendations, basic functions, and a number of guidelines);
- and finally, some suggested techniques.

6.2.1 General Approach

The general approach is to interpret the work system as having a purpose in terms of its function corresponding with the requirements and conditions from its environment.

Apparently, the starting point could be an analysis of the environment, leading to a "logic" model of the function of the work system, and finally, an investigation of the work system searching for tasks, etc., constituting its function. Work Analysis has, in its different versions, changed its view on whether the analysis should take its starting point by logic modeling based on an analysis of the environment, by a more "semantic" analysis of

processes (activities and tasks) observable in a work system, or by both:

> The workings of the inner environment of the target system are deliberately ignored in function analysis. [...] Function analysis does not address the inner environment, but rather addresses the interface between the target system and its task environment (Schmidt, 1988, pp. 269f).

> Concerning work, which is characterized by problem solving, it is [...] meaningless to try to record and model the path followed in the individual case (Schmidt and Carstensen, 1990, p. 96, my translation).

> An analysis of a specific decision situation must [...] comprise an analysis of the strategies, which are used in that kind of decision situation. The analysis must 1) expose which strategies are actually used [...] 2) identify strategies that are effective and reliable [...] 3) identify the information, mental models, and cognitive resources implied by the respectively alternative strategies (Schmidt and Carstensen, 1990, p. 98, my translation).

> [T]he dialectical approach to functional analysis unites the systems and the semantic approach. The systems approach identifies the functions of the given office by deriving them from its task environment, whereas the semantic approach identifies functions by deriving them from the *meaning* attributed to the activities actually carried out (Schmidt, 1986, p. 13).

A meeting with Kjeld Schmidt and Peter Carstensen, in September, 1992, clarified a general (and pragmatic) approach as the following:

A dialectical approach is recommended with a "main direction" from within the work system and out towards its environment: start within the work system in question and move from here, towards the environment. The actors within the work system are the central persons, having the work as one main part of their world. Then, talk with the persons in the nearest environment, e.g. other related departments, and get an understanding of this boundary of the work system. Finally, visit the more "distant" environment, e.g. the customers outside the organization. By then, you will have the best questions ready. The customers relation to the system is often only a very peripheral part of their world.

6.2.2 Three Levels of Analysis

Work Analysis suggests an ideal distinction between three levels of analysis, see figure 7:

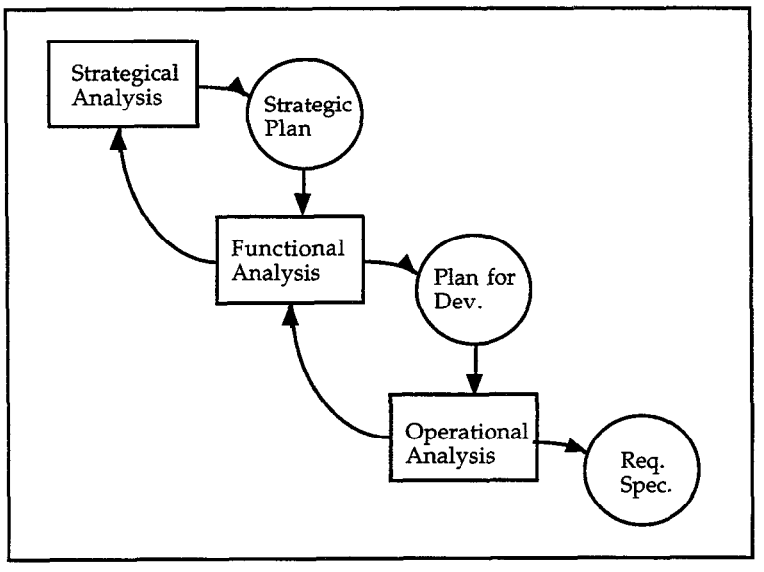

Figure 7: Three levels of analysis, (Schmidt and Carstensen, 1990, p. 110, my translation)

- Strategical analysis. This analysis results in a strategic plan for the use of information systems in a work system. The focus is on the functional requirements of the environment, upon the work system considered in general. This could, e.g., be the overall purpose of an entire organization, as related to the requirements of its environment. The result should define those domains of work, decision situations, and domains of tasks which are of crucial importance for the work system considered in general, and therefore would be appropriate to be supported by information systems. This leads to a "prototypic" decision situation with the decision of where it "hurts" - where to perform the functional analysis.
- Functional analysis. This analysis results in a plan defining the overall functional design. The focus is on the functions and the require-

ments that they are supposed to live up to - within the system of work, as defined in the strategical analysis. This could, e.g., be one specific department, a specific decision situation, or a domain of tasks in the organization. The result should specify the functional division between the employees and the information systems (what are the tasks managed by the employees and what kind of information and other support do they need). This leads to another "prototypic" decision situation, where the functional user/technology-division, and the priority of possible information systems, are discussed and decided upon.

- Operational analysis. This analysis results in the design specification. The focus is on the information system(s) in question, as specified in the functional analysis. As the purpose and the function of the information systems have been clarified from the strategical and the functional analysis, the operational analysis has a fairly clarified starting point from which to choose the succeeding method of analysis. The process of this analysis could, e.g., be highly structured, as suggested in various methods, e.g., structured analysis (Yourdon, 1982).

The scope of Work Analysis can be described as consisting of the strategic and functional analyses, while the major part of the operational analysis is out of the scope. The main focus is on the functional analysis, but with an effort to "reach" higher up into a strategic analysis if necessary, without loosing the relation to the final objective: suggestions of future information systems. Hence, Work Analysis is not designed to deal only with business strategies.

The distinction (and division) between the three levels of analysis is ideal, and does not mean that the analysis is conducted and divided into strictly separated phases. The levels reflect that the analyses roughly serve three different purposes, and *thus,* proceed in three different levels. On the other hand, the purpose of the preceding analysis serves the succeeding, and hence, the three levels reflect a main direction into the total analysis. For instance, it is a typical situation that Work Analysis starts as a functional analysis, and then during the analysis issues are revealed that force the current analysis to include a strategical analysis.

6.2.3 Strategical Analysis

The purpose of the strategical analysis is to develop an information technology strategy for a given work system, e.g. an entire organization or an

enterprise. The strategy should include a formulation of the overall objective of the work system, which in a condensed form states the purpose of the work system (what is this business all about). This objective should be expressed in a plan with a succession of related actions. The strategy should include an objective of the development of the work system, which corresponds to the requirements from the environment. Thus, the strategy should identify functions (work domains, decision situations, classifications of tasks, etc.) with a vital importance for the work system as a whole: which areas are of a strategic importance? Which areas are bottlenecks? Which areas "hurt", i.e. where do we need to give priority to computer support of some kind seen from a high organizational perspective, e.g. from the enterprise as a whole (Schmidt and Carstensen, 1990, pp. 110f).

The result of the strategical analysis serves as an ideal basis for the functional analysis: The overall functional requirements and the purpose regarding an information technology strategy are clarified, and the function(s) that need(s) support and hence, are the starting point for the functional analysis, are identified.

The strategical analysis includes (Schmidt and Carstensen, 1990, pp. 111-115):

- *Problem formulation.* This corresponds to stage 1 and 2 in SSM in its 1981-version (Checkland, 1981). Work Analysis recognizes that problems need to be realized and formulated - they are not "just there" as a starting point. Most likely the problematic situation is a complex one, many (usually interrelated) problems need to be identified. The work system is subject to diverse and contradictory requirements from the environment, and different actors have different perspectives on the situation in relation to their work, interests, and motives. The point in problem formulation is not to choose a certain interpretation of the problematic situation (as in SSM), but to try to identify aspects (problems, requirements, motives, etc.) that constitute the most dominating factors. The aim is to formulate a rather comprehensive and general interpretation of the problem situation, that serves as a criteria in succeeding questions of priorities.
- *Definition of work system.* This includes clarifying the basic requirements from the environment, clarifying the boundary between the work system and the environment, and, in this way, defining and describing the work system. The CATWOE-mnemonic from SSM (Checkland, 1981, pp. 224ff) is suggested as a guide to answer the

central questions. The system definition (root definition) serves as a guide for the further analysis and must thus be discussed and possibly approved by central actors in and interest groups of the work system - this does not necessarily mean managers.

- *Identification of central functions.* This includes the identification of functions (work domains, decision situations, classifications of tasks, etc.) with vital importance for the work system as a whole. Among these, the critical functions which need support and which are expected to benefit from support by information systems, should be pointed out: where does it "hurt", where should we perform the functional analysis.
- *Cost-benefit-analysis.* Finally, the expected effectiveness from support with information systems should be weighed, by pros and cons, with the expected costs.

6.2.4 Functional Analysis

The major part of this description of the functional analysis, is my interpretation, based on meetings and discussions with Kjeld Schmidt and Peter Carstensen.

While the strategical analysis focuses on the work system as a whole and the functional demands given by the environment, the functional analysis focuses on specific functions performed by the work system. The purpose is to characterize the functions and specify a future redesigned functional division between user and technology: what could be supported and/or automated by information systems, what should be taken care of by the actors in the work system, and how should a corresponding functional division be designed (Schmidt and Carstensen, 1990, pp. 116f).

The result of the functional analysis serves as an ideal basis for the operational analysis by specifying the information systems needed and the function they should support. Recommendations from the functional analysis should be able to outlive the lifetime of a specific information system.

The starting point for the functional analysis includes one or more (overall) function(s). For each overall function, and hence each analysis, a corresponding work system is defined and described in a root definition guided by the CATWOE mnemonic.

A general heuristic is to cover three levels of functions in the analysis, one level above and one below the function/work system in question. In order to define the work system for a function and its boundary to the environment the analysis starts by moving up one level to "see the map", i.e. all major functions and work systems in the organization or the part of the organization with relations to the work system in question. This is not, though, a very thorough analysis. When the root definition is made, and hence, the work system preliminary defined[33], the analysis moves "into" the work system: which basic functions does it perform? This analysis thus moves one level down and exposes the subfunctions that constitute the work systems overall function.

It is the problem situation which determines the starting point of the level for the functional analysis. The problematic situation is intended to mean the analysts' interpretation of the problematic situation as it is recognized by the actors from the work system (not necessarily the manager's perspective). This interpretation of the problem(s) may, during the analysis, appear to be wrong, e.g. it may be a symptom of one or more problems on another level. In that case, the analysis may shift its level, e.g. one level up and the functional analysis hence, may turn into a strategical analysis. This is referred to as an iterative and recursive approach for the analysis.

In decomposing[34] the function into subfunctions one level down, some guidelines/heuristics are given:

- Asking the actors in the work system *why* they accomplish certain tasks and activities, may lead to functions towards the environment which can reconstruct purposes and specific conditions.
- Asking actors in the environment what they expect, need, require, etc. may lead to a focus on the work system: where is this function performed?

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33 This preliminary definition may be redefined later, e.g. if certain activities cannot be identified or if assumptions, as interpreted by the analyst, appear to be wrong (Schmidt and Carstensen, 1990, p. 119).

34 To decompose a function into subfunctions, should be interpreted as describing it in more detail. "Decomposition of functions is meaningless. A function may be understood and defined in more or less detail, of course. However, enlargement or enrichment of a picture is not decomposition of it. In fact, decomposition of a function would be a description of a sequence of activities determined by a *specific* problem solving method or by the *current* implementation" (Schmidt, 1986, p. 6).

- An analysis of purpose and specific demands, requirements, and conditions in which the purpose must be met, often reveals specific functions. E.g., concerning a portfolio management agency (Schmidt and Carstensen, 1990, pp. 98-104; COMIC, 1993, pp. 75-78), the customers, often investing large amounts of capital, were nervous. This caused the consultants to thoroughly explain their recommendations for investments, and they organized their work according to this very important requirement. In that case, it was meaningful to refer to it as a function.
- A function may be decomposed into subfunctions for each decision situation. As a general heuristic, a coherent decision situation corresponds to a function; a one to one mapping between "prototypic" decision situations and functions is recommended; one decision situation may not be decomposed into two functions.
- Very often, different functions refer to different object domains, e.g. "make inquiries about this object domain".
- In case of several object domains, you will typically find functions that connect and link informations from each object domain (mediating functions).

Functions should only be decomposed into a level where they describe sociotechnical systems. The functional analysis clarifies the boundary between user and technology: which elements of the function (e.g. a decision situation) are supported by information systems and which by the user? Which data and information could an information system support appropriately? Functions in Work Analysis have nothing in common with functions in information systems - a function in an information system corresponds to an operation in Work Analysis. The lowest level the functional analysis may reach is a description of the kind of data, information, and functionality an information system should support, for a given function. It is the task of the operational analysis to systematize and structure this in more detail. In other words, when a specific information system is outlined, the functional analysis ends. The intermediate stage between the functional analysis and the operational analysis should be regarded as a milestone (a "prototypic" decision situation), where the functional allocation between user and technology is decided.

The final result of a functional analysis takes the form of a report with the following outline:

- A description of the environment and its requirements, needs, conditions, constraints, etc., along with a description of the main target domain in terms of the work system's target group (e.g. customers).
- A description of (other) target domains.
- A description of the functions performed by the work system.
- A discussion of problems and recommendations for information systems that could support the relevant functions.

In Work Analysis reports, Kjeld Schmidt and Peter Carstensen have not "translated" the concepts from the Work Analysis into concepts more known to the target group. By using (and explaining) these concepts, which the actors of the work systems in question have not known in advance, it is avoided that they are given other (wrong) interpretations. They have experienced that the target group could relate to, and criticize, such descriptions. Especially managers find that the functional descriptions describe their domain in very clear terms. From these descriptions it is possible to discuss specific elements (e.g. a specific function) separately. This way to outline the final report has thus been experienced as a basis for decisions providing discussions concerning "what should we aim at".

6.2.5 Operational Analysis

The purpose of the operational analysis is to realize an information technology strategy, by developing and implementing information systems. The result of the operational analysis is a design specification which forms the basis for the purchase, development, implementation, installation, etc. of information systems. The focus is on the information system(s), and the environment is the users and the tasks in which the information system should support (Schmidt and Carstensen, 1990, p. 118).

Ideally, the result of the strategical and functional analyses provides the operational analysis with a basis that permits a structured approach. The outcome from the strategical and functional analyses takes the form of a decision of a basic design, which corresponds to the rather well-defined starting point of e.g. structured or object oriented analyses.

Usually the operational analysis is performed by others than the ones performing the strategical and the functional analyses, e.g. employees

from an internal information technology department within the organization.

Hence, the scope of Work Analysis can be described as consisting of the strategic and functional analysis, while the major part of the operational analysis is out of the scope.

6.3 Techniques

Work Analysis suggests a number of techniques to support the inquiries and interpretations, respectively, in the strategical and functional analyses (Schmidt and Carstensen, 1990, pp. 119-130). The central technique supporting inquiries is the unstructured interview. The central technique supporting interpretations is the functional modeling.

6.3.1 Techniques Supporting Inquiries

The unstructured and qualitative interview (with employees, managers, customers, etc.) is the essential technique in eliciting the knowledge for the strategical and functional analyses (Schmidt and Carstensen, 1990, pp. 121-124).

The analyst should prepare himself by having an overview of the work system in question, and he must try to explain his hypothetical assumptions clearly. The focus in the interview is getting answers to "why"-questions (though not stated as direct why-questions), e.g. concerning how certain tasks and activities are accomplished. This may lead to functions towards the environment, which can reconstruct purposes and specific conditions. A successful unstructured interview takes the form as a dialogue, where the analyst and the interviewee intercommunicate and realize important aspects related to the work system.

Other suggested techniques are:

- Structured interview.
- Questionnaire and diaries (written by the actors in the work system).
- Document analysis.
- Observation. Observation is emphasized as a central technique concerning analysis of cooperative work. Observations may be supported

by audio and video recordings.

6.3.2 Techniques Supporting Interpretations

Functional modeling is a graphical diagramming technique to model the functions within the work system and between the work system and its environment. The technique is suggested as primarily a private tool for the analyst, though often functional models are presented in reports from Work Analyses. The diagramming syntax is quite simple. A function is represented by a box, and object domains by circles. Relations (i.e. transformation of information, logical dependencies, etc.) between functions and between functions and object domains, are represented by arrows.

Figures 29 and 30 in Part IV, chapter 13, are examples of functional models from the Editorial Board. Also, they illustrate two levels in a functional analysis. The third, and lowest level, was included in a description of each of the functions on the second level (see figure 31 in Part IV, chapter 13).

Other suggested techniques are:

- Root definitions. In Work Analysis, a root definition is a definition of a work system, as opposed to the root definition in SSM. Work Analysis claims that the root definition in SSM is a perspective on a hypothetical system.
- Rich pictures (Checkland and Scholes, 1990).
- Means-end hierarchies. These are illustrated in figures 5 and 6.

7. Discussion

In this chapter, the three approaches presented above are discussed and related, giving the basis for clarifying my own "approach" and perspective, in terms of my theoretical and practical relationship to these approaches, and what my research interest and starting point are.

In order to discuss the approaches and to review Work Analysis in particular, I start by describing the concepts *structures* and *actions,* based on Mortensen (1992)[35]. I do not intend to - and do not have the necessary background to be able to - give any thorough philosophical explanation of the dualistic distinction addressed by these concepts. Rather, my point is to use these concepts as instruments or metaphors in discussing some relevant issues in the three approaches. In the following a brief outline of the concepts' structures and actions is given, in order to review some aspects of Work Analysis and relate the three approaches.

Descriptions of structures and actions are considered as fundamental, theoretically dualistic and contrasting dimensions.

Descriptions of structures are reproductions of the rationale, the rules, the coherence, and the whole of an activity, e.g. the grammar of a language or the rationale of an action. Descriptions of structures are the result of the sense-making that a person reconstructs when he is asked questions like "what are you doing?" and "why are you doing this?". Thus, structures are reconstructions of the logic, rationale, sense, or meaningfulness one makes of his practice, his actions, and hence, a way to answer such questions.

To Mortensen, the reconstruction of the meaningfulness of one's practice is to give it a certain linguistic description and explanation. This is also a precondition in order to comprehend one's practice. As an example

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35 Mortensen (1992) presents a collection of papers, all addressing linguistic and philosophical aspects of descriptions of structures and actions. The main part of my own understanding and use of these concepts in this chapter, has been developed through meetings and discussions with Mortensen.

from psychotherapy, consider a person who recognizes a particular and recurrent behavior with himself, which he cannot understand and cannot accept. One possibility for him is to consult a therapist. Through conversations with the therapist, the person may conceptualize and describe his behavior. In this way, an explanation behind the behavior is reconstructed as a means to comprehend it, and possibly accept or change it.

It is a basic assumption (an axiom) that you are always able to give a systematic reconstruction of the meaningfulness of an action. This axiom implies that humans try to act in a rational way. Otherwise, you may admit to commit an error or mistake, or you will seek some explanation justifying the rationale in your action.

The action dimension represents the concrete actions in a certain practice. Descriptions of actions are descriptions of a concrete practice, either in terms of what actually happens (e.g. a certain definition or characterization of an actual action/event) or what should, or is supposed to, happen (e.g. an instruction, a procedure, or a plan).

A structure can be described in terms of a system. Consider a system within natural science. It defines the actions available through its parameters. The system does not exist, as such, independent from humans: It is the humans that define the system and the actions available, by stating the questions and reading the output of the variables defined by the system.

The existence of structures is connected to, and bound up with, their realization and materialization in practice. They are embedded in the actions carried out in practice. This practice may be characterized as a precondition for structures. The conversations in practice are the medium which reconstruct the structures. Structures, thus, do not have an existence "on their own", but are constantly reconstructed through conversations between people where they reflect on and describe their actions. On the other hand, a description of an action implies a certain structure: you need to have a certain meaning in order to be able to interpret a concrete action. E.g., a person standing in a bank making a loan would be interpreted and described differently if you implied a systems description, including different bank operations such as the structure, than if you implied, say, a psychological structure.

The structure dimension implies the axiom (that you are always able to give a systematic reconstruction of the meaningfulness of an action) and the reconstructed rationale, while the action dimension implies the conversation between humans, resulting in the structures.

The distinction must be considered an analytic one, which we do not explicitly make in our everyday life and in the activities we carry out. In

Mortensen's words:

> "If I am an ordinary Danish user of language, I talk and discuss regularly with my children about if it [e.g. a certain thing] should be described as this or that. In this way, I am conducting an activity which could be described as a description of action, and through this activity I use a language, which could be described in a grammar, a description of language. I do not myself distinguish between these two kinds of descriptions while I am doing the activity, this is what the linguist will do when he is doing his research. It is the problem for the observer, the linguist, and the designer to make the distinction between the descriptions of systems and actions. I do it in an activity dealing with the language, about the language, i.e. a meta-language. I make both descriptions but do not have a distinction between them, that is the problem for the researcher or designer."[36]

Mortensen's main point is that every meaningful activity needs to be described in these two dimensions, structures and actions: as a realization of a meaning/structure on the one hand, and as a practice/action where this meaning is realized on the other. Actions are described in our everyday language. Everyday language implies several different structures. There are, in principal, an indefinite number of ways to interpret and understand actions. When several, say 10, people have to cooperate in a job at work, it is absolutely unlikely that they have the same understanding of what they are doing. This situation, with an indefinite number of possible interpretations, is solved through certain procedures, among which always is the procedure to choose something very concrete to coordinate the conservation's around: e.g. a concrete example, a certain drawing, etc., i.e. a certain description or object. This allows the involved actors to combine their descriptions of actions and structures through the chosen object as the center, thus giving a possibility to focus the conversation on a certain aspect. Descriptions having the role of such an object, therefore, play a major role in design.

Within design, descriptions of structures, in the terms of a system, may imply the work, the rationale and meaning with this, and the tools involved, including information systems, while descriptions of actions involves people doing their work and conversing, which reconstruct the system. The system, thus involves both the information system and the work it supports, as well as, the rationale and idea behind it, as conceived by the people using it. If one, as a designer, forgets about or underplays the action dimension, one may end up with information systems without considering the users perception of the ideas and rationale behind it. This

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36 Transcription from a meeting with Arne Thing Mortensen, my translation.

may result in a situation where the system is not used as intended. Orlikowski (1992) gives a good example on such a situation. On the other hand, if one forgets or underplays the system dimension, one may end up with a bunch of (possibly very interesting) observations of activities carried out and how people interpret them, but no information system. Many ethnographic studies within systems design, like e.g., the ones conducted by Heath and Luff (1991, 1992), give such examples[37] of this.

Design, when taking the structure/action dimensions into account, may be viewed as a process, where two things need to be taken into consideration: the development of a system (the information system and the work it should support) and the people using the system (how is this system and the rationale and the ideas behind it reconstructed by the users and others, who need to be considered with this?)

7.1 The Systems Approach Represented by Work Analysis

Work Analysis deliberately excludes the action dimension in its framework. It does so in its definition of a work system and its basic methodological approach.

The work system is defined as "a system of cooperating actors complete with technical equipment" (Schmidt and Carstensen, 1990, p. 74, my translation). Thus, the people doing the work are considered to be part of the system. Systems in Work Analysis are inspired from the systems concept in biology and economy, rather than in natural science: they are teleological rather than deterministic. The function that the work system maintains in achieving the purpose as a response to the requirements and constraints from its environment, is the focus. The people within the work system are then reduced to the functions they perform or take part in. Central decisions often correspond with central functions. The designer (or the analyst, which is the concept used by Work Analysis) is standing above the work system observing it, like you were studying an anthill[38].

The designer models the work system in a high level of abstraction,

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37 It was probably not their intention either, to design any information systems.

38 A metaphor of the basic methodological approach in Work Analysis as described with reference to Simons (1981) parable of the ant walking across a beach by Schmidt and Carstensen (1990, p. 76).

with regard to its environment and purpose, in a root definition representing a "shared" perspective and a "birds-eye" perspective on the system (Schmidt and Carstensen, 1990, p. 33). There must be some consensus, at least in terms that the people who ordered the analysis want to investigate the work system from this perspective. Within Work Analysis, the designer is above the work system while the people are in it. Those "outside" the system would, besides the analyst, typically be representatives of management (that may share this view of a work system). Through its level of abstraction in its conceptual framework, Work Analysis thus addresses an organizational level in a relatively high position, within an organizational hierarchy where strategical issues are discussed.

During the analysis, the work system (including the people in it) is reduced and decomposed into subfunctions, on a lower level, using the concepts in the framework, functions, tasks, operations, activities, etc., until a level is achieved where the analysis identifies solutions, in terms of identified information systems and the human/machine interface. The final "output" of Work Analysis is, thus, descriptions of information systems within a work system, where the means-end logic embedded in the analysis argues for the relevance of those systems pointing "back" to the overall purpose of the work system.

Work Analysis does not require that the people in the work system reconstruct their own rationale with their work within the same logic, but they must, of course, verify the results. Work Analysis suggests that this is done in three "prototypic" decision situations corresponding to three levels in the analysis, the strategic, the functional, and the operational levels. Work Analysis recognizes the existence of a practice, which is a number of conversations that constantly reconstruct and maintain the system (Schmidt and Carstensen, 1990, p. 78). But, the resulting descriptions from the analysis may be considered complete, without this practice as part of the description. As such, the descriptions from Work Analysis focus on the work system and may be considered as descriptions of structures (in Mortensen's terms). The action dimension is out of its scope, even though its descriptions are intended to structure those conversations as a basis for making decisions. But besides identifying these decision "points", Work Analysis is "blind" with regard to the action dimension.

Reviewing Work Analysis in the Mortensen's structure/action-perspective raises three questions:

1) Does it "invite" the designer to perform some sort of encroachment on

the people in the work system by reducing them to the functions they perform or take part in? This is an ideological question, the answer to which depends on who and how Work Analysis is used. One could claim that if the people in the work system should be taken seriously, they should be defined as standing outside the work system and, with the designer, participate in stating the questions to be answered. Defining the people as part of the work system introduces a complexity of individual interests, motivations, interpretations of goals, etc., which may appear to be system "defects": "The Purpose and working conditions of the work system are not only represented in a distributed manner but also in a contradictory manner " (Schmidt and Carstensen, 1990, p. 79, my translation). In order to cope with this complexity the work system concept tends to be widened and expanded with the possibility of breaking down as a teleological systems concept. The designer could, of course, use Work Analysis' framework and guidelines in his own personal reflections in developing a theory of the purpose and working conditions of the work system (as Work Analysis recommends), and still focus on the human interaction, social conditions, etc., as the participatory design and the ethnographically inspired approaches invite him to. But, Work Analysis does not explicitly support this part of the design process.

2) Is the means/end logic and the functional descriptions in Work Analysis representable and/or usable to the people involved in the work system? The means/end logic, inspired from Herbert Simon (1976), represents, which Simon also points out, an ideal model of rational behavior, worth aiming at but never fully achievable. I believe that the long tradition for using this rationality in western cultures makes the logic plausible for most people. This is, though, an empirical question. Even though you seldom think of your work in means/end logic and functional terms, it may be very appropriate to reflect on it using this level of abstraction. According to Schmidt, the experiences in using Work Analysis are positive: those presented for the results (i.e. mainly managers) and descriptions using this framework often acknowledge the kind of overview that it provides. Schmidt even recommends not to try to "translate" terms from Work Analysis into concepts more familiar to the domain studied, as this would involve that they could be interpreted inappropriately. My own experiences from using Work Analysis show that management is quite familiar with the "language" provided, while other employees tend not to

respond to the descriptions. Since a main purpose of Work Analysis is to link the proposed information systems to a strategical business level, and hence to a managerial concern, I do not consider this a major problem.

3) Are the resulting descriptions of the work system and the recommended future visions regarding information systems anchored in the organization? Excluding the action dimension within its framework, Work Analysis does not explicitly address this question. In fact, Work Analysis does not describe how to manage the process of the analysis in particular, besides pointing out what the designer should be aware of. Suggesting the three prototypic decision situations, the question is left as a problem for the organization. This decision situation may typically be faced by management and other representatives of the work system. Thus, Work Analysis could be viewed as having a "top-down" approach, at least with regard to the decisions of change. This is in contrast to the "bottom-up" approach the participative design and the ethnographically inspired approaches may claim to take. I do not, though, consider this to be a contradiction. You could view Work Analysis as the tool supporting the strategic and managerial part of a design process, which is not directly supported by the other approaches.

7.2 Ethnographically Inspired Approaches

Ethnographically inspired approaches within design are traditionally more critical than constructive. They question and point at difficulties and issues that have not been taken into consideration within existing system designs or design projects. And they make little effort to provide recommendations on how to make a good design or how to perform a good design project.

By nature and from its historical background, ethnographically inspired approaches tend to be preserving rather than creating and changing, which is the purpose of designing. For an ethnographer, changing his work practice from traditional ethnographic studies to using ethnography in design, must be very challenging: Using ethnography in an intervention process, which characterizes design, raises some contradictions and paradoxes - for the ethnographer. The job of the designer is to intervene

and initiate and conduct changes in work practices and organization - in participation with the people involved. This includes (participating in) judging which current practices are problematic in some ways and "worth" changing at all - an aspect that the traditional ethnographer deliberately tries to avoid. Also, an ethnographic approach tries to avoid using any "pre-defined" concepts and categories in describing observations: they should be based on the concepts and categories the people studied use themselves. This implies analysing and using "members categories" rather than imposing your own. Though this may seem as an appropriate aim, I believe it must be quite difficult in practice. As an observer, you will always interpret and make sense of your observations through your own experiences. And this naturally implies using concepts that you had beforehand. It is simply impossible to interpret any observations with a "clear mind" and without using pre-existing concepts and categories. As Mortensen points out, descriptions of actions are made on the basis of some kind of structures.

As a designer, I do acknowledge the basic point of the ethnographic approach: that it is very important to achieve a deep knowledge of existing practices if you are to change them. But, as a designer, I also recognize that my purpose and legitimacy is to participate in changing these practices. Ethnographically inspired approaches are thus interesting as a supplement that may be included and adapted to a design process: a design process cannot be conducted alone using ethnographically inspired approaches.

Considering research experimenting with an ethnographic inspired approach, the Xerox project (described in section 4.1) differs from the MUST-program, which I participate in, in two major ways:

- In the Xerox project, the development goal is to develop generic products for a large market. In the MUST-program, the view is "from a fraction of that market", i.e. a specific organization, where the design process involves "scanning" the market of products (including e.g. Xerox-products) in search for products appropriate for the specific needs in the organization.
- In the Xerox project, professional ethnographers cooperate with designers of technological products. In the MUST-program, researchers with a background, mainly within computer science, play the role of "quasi-ethnographers" and designers trying to study, adopt, and experiment with ethnographic techniques.

A difference between the project at Lancaster (described in section 4.2) and the MUST-program is (similar to the latter difference from the Xerox project noted above) the cooperation between sociologists and software engineers. Also, we have not taken any role as 'substitute' for users; in our studies, user participation was considered crucial from the very beginning of the design process.

Within the MUST-program, the ethnographic study of work practice and the intervention and design-oriented approach of systems designers, are combined into one process carried out by the same group of people. Being computer scientists with an interest in work practice studies (but clearly, we are not sociologists or ethnographers) has been exciting and challenging. Whether it is possible for designers in general - as lay persons - to apply such ethnographic techniques from social science and the humanities in a qualified way, is a relevant question. Readers must judge my success from trying this, by the description of the empirical project in Part III and IV.

7.3 Participatory Design

Participatory design (PD), as a basic approach to design, has been a natural part of my educational and professional background and as such, I consider myself a designer within PD, as it is known from Scandinavia. I fully acknowledge one of its basic points: that if you want to learn and change current work practices and organization through a design process, you need to establish a situation where designers cooperate with users and their managers.

Even though the current generation of PD-projects includes the participation of management, I will claim that the main experiences from the participatory design approach[39], so far, aim at participation with employees rather than management. Biased by its historical development process, PD and the main core of its techniques and experiences direct its primary legitimacy to the situation where designers and users cooperate in designing systems that support the work the users are doing. This implies that a decision regarding e.g. where to invest in design or redesign of an

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39 I here refer to the Participatory Design Approach as described in part II. Other approaches, like e.g. the sociotechnical design approach (Mumford, Land, and Hawgood, 1978), directly include and address management.

information system has already been made. Hence, PD does not particularily focus on more management related issues, like e.g. information systems strategies.

PD is needed not only for analytical reasons, but also in order to intervene and initiate changes as a means to establish mutual learning experiences. Thus, I agree with Greenbaum's (1993) pragmatic and theoretical reasons for PD.

I have some reservations towards the ideological/political perspective embedded in PD, especially where it places the aim for increasing democracy in the workplace on the agenda for design. I will claim that parts of these ideological stands could be viewed as rather naive: Studies by Højrup (1989), of how large scaled plans for reforms concerning economic democracy in Denmark in the seventies and eighties, and why they failed, support this claim. Højrup describes (commercial) organizations as a temporary rendezvous involving three different "ways of living" or life styles: the investor, the worker, and the careerist: the expert/academic, scientist, and the manager. Højrup argues that democratization, if it leads to a higher responsibility for the workers considering the overall management and responsibility for the survival of the workplace and firm, is not in their own interest. Also, it will not lead to higher productivity (Højrup, 1989, especially pp. 94-111). This may be the view from an academic life style, which was the one proposing these reforms, and which also was the lifestyle of the researchers initiating the early Scandinavian PD-projects. Højrup argues that the reason for this lies in that the different lifestyles have different views on 'responsibility', 'freedom', and 'work'. The worker's responsibility is to carry out or administrate certain tasks within certain conditions, considering tools, machines, materials, division of work, procedures, etc. It is the manager's responsibility to secure that the conditions in question provide an overall production that is profitable, and that the organization as a whole is competitive. Freedom for the worker means the ability to "sell" his working hours for a certain wage and only to have responsibility for his tasks within his working hours. As opposed to the careerist, who has more of a "one-track" interest in his work and is relatively ignorant considering other values in his life, the worker has spare time which is separate from his work: his spare time is important because it includes important life values like the home and the family.

As Højrup points out regarding reforms concerning economic democracy, the democratic ideals in PD (especially in the initial projects in Scandinavia) may be viewed in a similar way: the researchers aim,

through the PD-projects, to enable the workers to undertake some of the responsibility the researchers themselves were familiar with from their own engagement in work. Democratization in the workplace should enable the workers to participate in the responsibility for the overall management, profitability, and competitiveness of the organization in which they work. But for the worker, a responsibility for the management work is in contradiction with having a clear cut separation between work and spare time, which is essential for the worker's life style.

Thus, I have a rather pragmatic perspective on PD, emphazising its productive element rather than its ideological element. Greenbaum (1993) points out, in her description of the political perspective within PD, that "We believe it is our professional responsibility not only to build systems that are cost-effective but that also improve the quality of work life" (Greenbaum, 1993, p. 47). Of course it is important to improve the quality of work life. But it is to me even more important to improve the competitiveness of the organization in question. In some cases, this may lead to changes and reductions in certain work functions, which, for the worker in question, will not be perceived as an improvement in his quality of work life. This may, nevertheless, be the price you need to pay in order to improve the competitiveness of the organization.

7.4 My Perspective and Research Interest

Design should involve both the structural and the action dimension, as pointed out by Mortensen. Within design, the structural dimension envelops the development of a rational system concept linked to a strategic level and the overall purpose of the work that the proposed informations systems aim at supporting. The action dimension envelops the people involved in the decision process, as well as, the users of the information systems: the reconstruction of the meaning and rationale, in using the systems, formed and developed through conversations between the engaged participants.

Comparing the three approaches, it may be claimed that Work Analysis omits or underplays the action dimension, which the ethnographic approach tends to focus on in its study, and that the participatory design approach tends to interact with.

I acknowledge the basic point in the ethnographically inspired approach, that a thorough understanding of current work practices, as per-

ceived by the people actually doing the work in question, is important within systems design. This is in order to develop a realistic, rather than a idealistic, vision of a future information system. A realistic design proposal is based on how work is actually and observably carried out, rather than how one describe one's own work practices, or how others think you ought to work. In general, though, I am critical towards to what extent an ethnographically inspired approach can support design. Ethnographic techniques may be very time consuming, and they are not designed for making changes, which is the purpose of designing. Also, they do not address abstract descriptions and strategies that cannot be observed in current work practices, but which nevertheless may be a guiding factor for an overall design effort in an organization, e.g. as a rationale for investing in some kind of systems support at all.

Within participatory design, I fully acknowledge its pragmatic potentials. I am critical towards having democratic ideals as a sort of "standard" agenda within design, which some researchers within PD support. To me, one general and overall objective of a design project must be to improve the organizations ability to fulfill its purpose and goals and strengthen its competitiveness. This may not correspond to, e.g., a higher level of democratization within decision processes. PD has an important and substantial point when emphasizing the participation of the users as a prerequisite to the design of systems that actually and efficiently support their work. But PD needs to acknowledge (and it does to a growing extent) that the participants come from many different target groups and include management. Good systems are not solely developed from the "bottom". To conduct changes through systems design also requires support from (strong), competent, and committed management.

A design project should relate its goals to the overall business strategy within the organization. This does not necessarily imply that a design project always needs to include an analysis at a strategic level: a competent business strategy and a corresponding strategy for the design of information systems may already have been established as the starting point for the design project. Nevertheless, a general design approach needs to include guidelines supporting designers in this task. Often, a design project may face a lack of policies or contradictions, in relation to a strategic business level, that require clarification. An example on this follows in Part IV, chapter 13.

Work Analysis support the designer in this task, and at the same time, Work Analysis focuses on a managerial perspective and reduces the employees (users) to the functions they perform. Figure 8 outlines this

effect and compares it to the perspective of the ethnographic and participatory approaches.

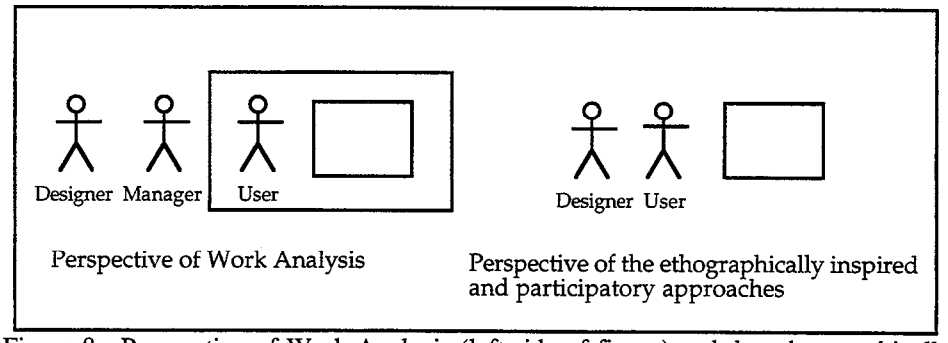

Figure 8: Perspective of Work Analysis (left side of figure) and the ethnographically inspired and participatory approaches (right side of figure). The box indicates the structure dimension (representing the system in question) while the outline of a man indicates the action dimension. The figure is inspired from Mortensen (1992, p. 132).

In general, designers need to be able to address and involve different target groups with different issues and through different descriptions involving different levels of abstractions, relating to both observable processes and work practices and to more abstract strategic issues. In Part III and IV, I give several examples with a multitude of descriptions, from "cartoon-like" rich pictures to highly abstract functional diagrams.

In summary, and stated in a very simplistic way, the three approaches to design could be characterized and related, with respect to my perspective and research interest, as follows:

- The participative design approach, in its pragmatic and recent form, recognizes that systems may fail if the action dimension is not properly handled, and that it is both necessary and efficient to involve users in the design process. The approach offers a variety of techniques and experiences supporting user-participation, while a strategic and management related level is on the boundary of its current scope. This needs to be addressed, and I am here interested in Work Analysis as a means to link PD with a strategic and management related level. The result and outcome of such a broadened approach to design (in the form of a vision of a future design proposal) needs to be "anchored" in the organization, in order to secure that the ideas and rationale in the vision will be reflected in the final implementation of the vision. This issue is further described in Part IV, chapter 15.
- The ethnographically inspired approach explicitly focuses on the

action dimension and offers an increasing number of important observations and experiences in this respect. The approach is, currently, mainly descriptive and has only a few experiences in combining with intervention and change. This places it in a critical and informative role in the overall design process. My interest, besides experimenting with ethnographic techniques, is in investigating the effects an ethnographically inspired approach has on the design, and reflecting on how it can be applied to design and the conditions in which (commercial) design is conducted. This is discussed in Part IV, chapter 14.

- The systems approach focuses on the structural dimension and explicitly address a strategic and management related level. SSM aims at using system concepts in establishing discussions regarding future changes but offers a very general framework and methodology. Work Analysis offers a more specific framework and rather detailed guidelines but tend to ignore the action dimension. The conceptual framework and the guidelines provide the designer with tools to adjust his interpretations, but gives little or no help to cope with the cooperation of the involved participants in the design process. It does, though, provide you with a schema for important "milestones" in the design process, in terms of which abstract structures you need to develop, describe, and communicate to the organization. I return to my experiences from using Work Analysis in Part IV, chapter 13.

PART III

Action Research - 3 Design Projects

The action-oriented research study was performed from September 1991 to January 1993 in a public organization in Northern Europe. The organization has been given the name "The Film Board".

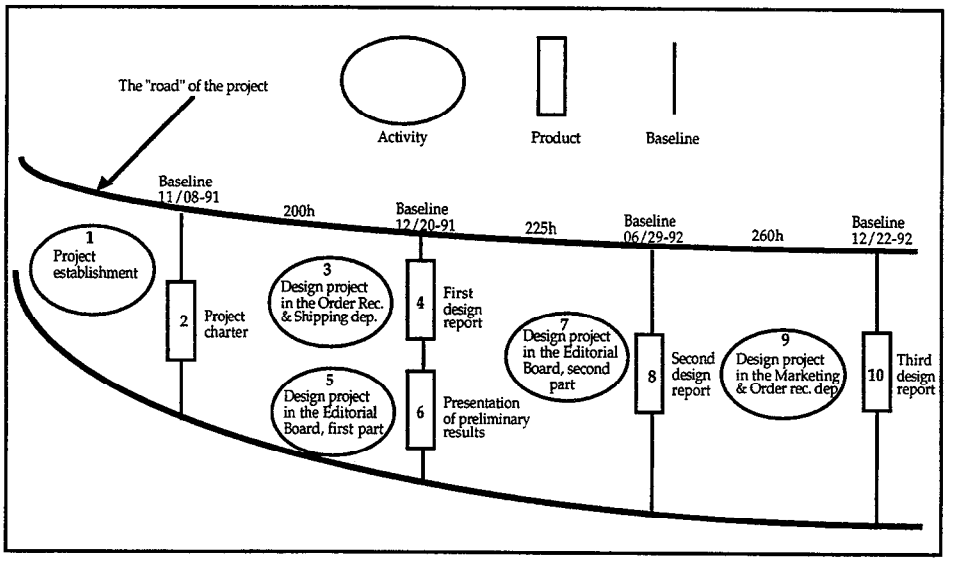

Figure 9: A visual presentation of an "after the fact" baseline plan (Andersen et al., 1990), giving an overview of all three design projects performed in The Film Board.

The research study encompasses project establishment and three design projects involving four departments in The Film Board. This part thus gives three examples characterizing design, in terms of what design is about, what you as a designer might be involved with, and how to approach and conduct design projects. It is demonstrated that design, apart

from technical considerations, also involves organizational issues comprising of social, political, and managerial/strategical aspects within the organization. An overview of the total research study is given in figure 9.

In the figure, the circles (or "lying eggs") represent the activities carried out. The squares indicate products made and presented at the date given by the baseline. The time spent on the activities is indicated by the number of hours between the baselines. Until the baseline on 12/20-91, I had spent approximately 200 hours on the project. In this part of the project Finn Kensing and two postgraduate students participated, and the time indicated only counts for my part of the work. From the baseline on 12/20-91 until the baseline on 06/29-92, I spent approximately 225 hours. In this part, Finn Kensing also participated. The last design project, from the baseline on 06/29-92 until the final baseline on 12/22-92, was conducted by me alone, where I spent approximately 260 hours.

This part of the dissertation is structured the following way (see figure 9):

- First the organization, The Film Board, is presented.
- Then, the establishment of the project is described. This involves activity 1 and product 2.
- The three design projects are then described, one by one. The first design project, in the Order Receiving and Shipping Departments, involves the activity and product 3 and 4. The second design project, in the Editorial Board, is described in two parts, the first involve 5 and 6 while the second involve 7 and 8. Finally, the third design project, in the Marketing and Order Receiving Departments, is described involving 9 and 10. Each design project describes the starting point and situation for the project, the activities carried out, and the results obtained. The results in an action oriented research project are by nature twofold: results for the given organization participating in the project; and results concerning the research project. Both are described, with the emphasis on the results for the organization, as the research results are treated in depth in Part IV: Discussions.

8. The Organization

This chapter describes the organization. The description of the organization represents parts of the shared understanding of it that was developed through the design projects.

The Film Board is a public organization in Northern Europe under a Ministry of Cultural Affairs. The organization has approximately 50 employees and a budget of approximately $7.5 million a year. The Film Board has two main functions as specified by law:

- To promote information, education, and artistic and cultural activities by producing[40] films and videos and by buying films and videos.
- To promote information, education, and artistic and cultural activities by lending (on request from consumers) such films and videos for educational institutions, associations, and individuals.

The Film Board produces films and videos, along with distributing films and videos, thus mediating the needs of both producers and consumers (their customers).

The Film Board has a governing body consisting of representatives of both consumers and producers.

The film and video-categories of The Film Board include:

- Cultural and social conditions, such as documentaries, portraits, and debate films and videos.
- Educational films and videos.
- Art, e.g. experimental video art.

The various departments of The Film Board are arranged spatially, as depicted in figure 10.

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40 Producing film means funding and supporting directors and producers and, to some extent, managing the production.

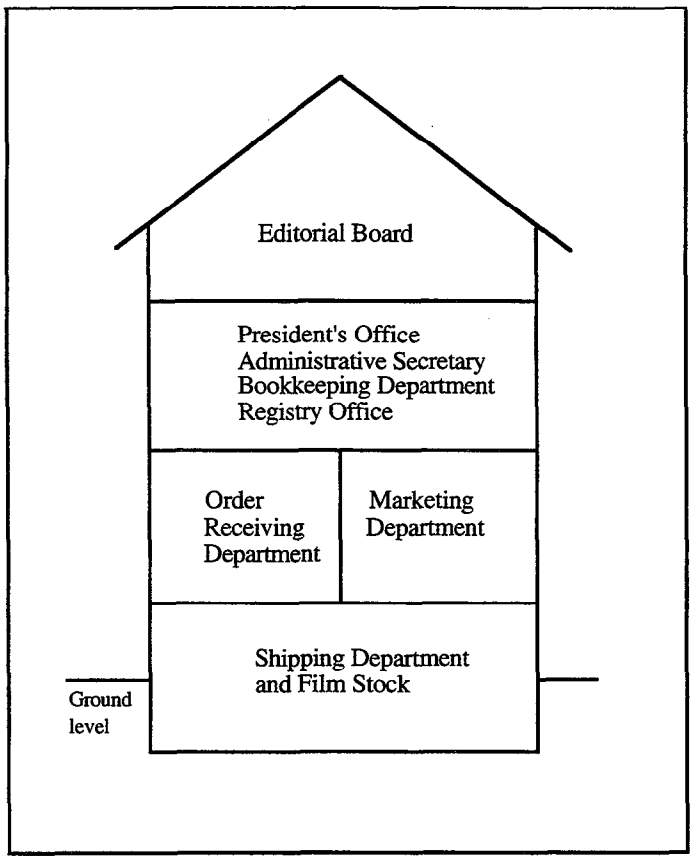

Figure 10: The house of The Film Board

The Editorial Board is located at the very top of the house. Nine people work here: three editors who consider applications (approximately 700 per year) and decide which productions should be funded (approximately 80 per year), one production manager who is in charge of the financing of all productions, three secretaries, a consultant specialized in buying and managing the translation of foreign films and videos, and one technician.

Located on the second floor are the president, secretary, bookkeeping, and registry. A total of twelve people work here.

The first floor houses the Order Receiving Department, which receives orders, books 250,000 films and videos per year out of a catalogue of 1,700 titles, and counsels borrowers, along with the Marketing Department, which takes care of marketing, press, festivals, premieres, etc. These two departments have a total of sixteen employees.

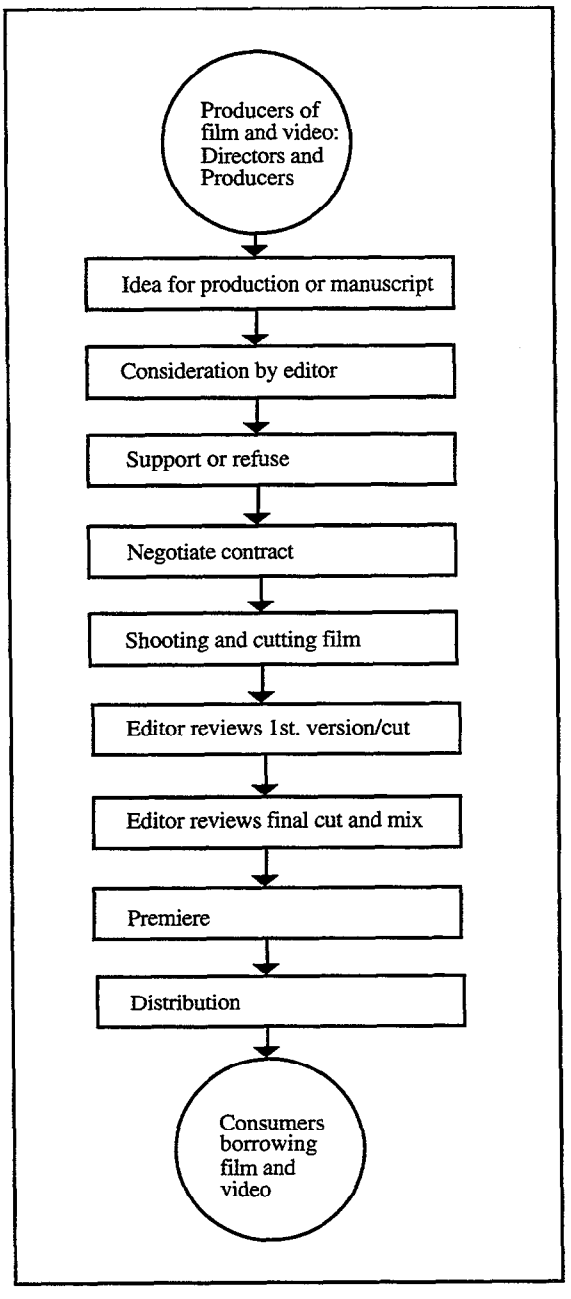

Figure 11: The production, from idea to distribution

In the basement, half below ground level, are the Shipping Depart-

ment and a large film and video stock for distribution, where nine people are working.

The house reflects the status of each department, with the Editorial Board above even the president. It also reflects the top-down flow of a production, which the organization itself has outlined, according to figure 11.

Directors, producers, or manuscript writers send applications for a production or just a manuscript which later can be turned into a production. The application is considered by one of the editors who decides to support or refuse it. If support is given, a contract is negotiated and the film or video is subsequently shot and cut. The editor may review the production at certain phases, when the first cutting is done, when the final cut is near, and when the images and sounds are mixed. Then, the Marketing Department takes over and manages the premiere of the film or video. Afterwards, the premiere distribution is handled by the Order Receiving Department. The Order Receiving Department receives orders from the consumers requesting copies of films and videos. The consumers are public and private institutions (e.g. schools and libraries) and private individuals. Films and videos are typically booked by the consumers for a specific period of time, e.g. a certain date or week. Also, the department issues invoices, etc. from the fee paid for borrowing a film or a video. The physical shipping and the receiving of copies of the films and the videos (to and from the consumers) are managed by the Shipping Department.

As a whole, the production "cycle" starts at the "top" of the house and ends at the "bottom", involving nearly all employees.

Purpose, constraints	Public information, film culture, demand for income
Abstract function	Mediating function (coupling) between producers and consumers
Generalized function	Production, purchase, fund-raising, marketing, administration, consulting, order receiving, shipping
Physical function, Physical form	Departments and physical arrangement, e.g. as given in figure 10

Figure 12: The Film Board described as a means-end hierarchy (Rasmussen, 1986)

The organization of the production process was mainly paperbased. The two top floors of the house were only supported by terminals for

word processing[41]. The Marketing Department had its own network with Macintosh equipment, supporting the production of text and layout. The Order Receiving Department had a central booking system, but handled the booking to the Shipping Department by paper forms, as the Shipping Department had no computer support at all.

The overall organization was going through four major changes:

- The organization had traditionally been managed in a strongly hierarchical way and had troubles in keeping the budget. A few years ago, the old president had retired, and a new one was employed for the purpose of organizational and managerial restructuring and refreshing of the entire organization. He did that by redefining most of the jobs, thereby replacing half of the employees.
- At the same time the organization was trying to achieve a change in its image:
  - From "the old dusty house with films for schools," or "a public library for films and videos," which is the way they believe most of their customers see them,
  - To "the house for film and video art" (as a dynamic and cultural center for film and video art).
- The organization faced a demand for income from the government: it must earn (back) about one fifth of its overall budget. This comes from the charges of lending films and videos. At the same, time it experienced a decrease in the number of requests for films and videos, among other things, due to a competition in the market for distributing films and videos.
- During the past few years, the organization experienced the introduction of video as an additional medium, besides the traditional 16 mm film. This has raised the number of productions from about 25 productions a year to nearly 100. The whole organization was not geared for this.

The introduction of videos into the film concept puts a large burden on the secretaries in the Editorial Board. The video media is less costly and less complicated to handle than the traditional 16 mm film, and it is a

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41 The Bookkeeping Department has a terminal connected to a Central Account System outside the organization.

very popular and widespread technology. In just a few years, the organization experienced a drastic increase in the number of applications along with the number of productions. The secretaries in the Editorial Board carry out most of the administrative and paperbased work for each production. From having an idea of and feeling for each production, their job was focused on only dealing with the paperwork. They started to discuss the possibilities of changing and simplifying the paperwork by adopting some kind of computer-based production-management system for recording all the information on a production and for supporting the financial management.

9. Establishment of the Project

The project was established by using the technique "Project Establishment" (Andersen et al., 1990). This technique deals with activities aimed at clarifying, defining, and establishing what the whole project is about. It consists of a clarification and definition of the assignment and objective, organization of the project, level of ambition, resources, interest groups, critical conditions, etc., and it includes a social establishment of the project group as well. The result is a project charter.

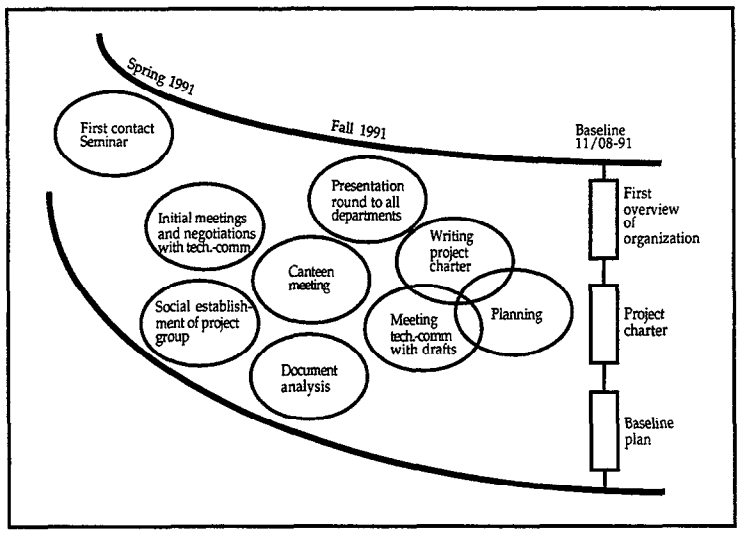

Figure 13: Overview of the activities and products involved in the project establishment

An overview of the activities and products involved in the project establishment is given in figure 13.

9.1 Starting Point

As I believe many projects of this kind are born, this one was initiated by quite a coincidental event. An acquaintance of mine was hired as the production manager's secretary in the Editorial Board. He was engaged in the organizations discussions concerning technology, as he was experienced with this from his former workplace. In the spring 1991, when I was employed as a designer in the computer industry, he called me asking for my advice concerning which word-processing system they should choose. He introduced me to their current ideas and discussions in the Editorial Board, concerning computer support for production management and financial management.

As they did not know how to proceed with their ideas, I was invited for a seminar some weeks later in order to consult them in what to do. At the seminar, I proposed three different approaches for them to proceed - one was to buy and implement a standard system (a well-known system within the public organizations) right away; another was to start up a prototyping approach in a more careful way, but still resulting in small running prototypes in a relatively short time; and finally, another approach was to make a broad-scaled design project.

Management, who was struggling with the overall changes mentioned above (in chapter 8), liked the idea of a broad-scaled design project which could provide the basis for deciding what to implement and how to do it. At this time, I knew that I, some months later, would return to the university to start my Ph.D. study and I was open for the possibility to be involved with this organization as an empirical part of my Ph.D. thesis. This initiated the action oriented research project as a joint project between the research group (see Part I, section 1.3) at the university and The Film Board.

9.2 Activities

From the start, it was an open question as to how many and which parts of the organization should be involved in the design project. Our goal for the project establishment was to first establish an overview of the entire

organization, along with making the project charter and a plan[42] for the design project. In order to reach this goal, we carried out the following activities:

- Initial meetings and negotiations with the technology committee of The Film Board. The committee consists of the president and representatives from various departments, and it served as a steering committee for the design project. Here we had the first presentation of the organization and its possible needs for information systems. On the other hand, we informed them about the MUST-program and our intentions in participating with the organization.
- Canteen meeting informing all employees what this project was about.
- A presentation round, visiting all the departments and the employees in the organization. Each department was visited, we presented ourselves briefly to each employee, and talked with them about what they were doing. The presentation round was carried out within a week.
- Social establishment of the project group. The project group is here considered as our own research group from Roskilde University. As "techniques", we used having dinners, drinking wine, and making a trip with a sailboat.
- Document analysis. Various documents (leaflets and booklets, production plans, minutes from various meetings, the wording of the Act for the institution, etc.) were collected and read, to gain information about The Film Board.
- Writing the project charter, along with planning and having meetings with the technology committee presenting drafts of the charter.

The project was finally agreed on in a meeting with the technology committee on 11/08-1991.

9.3 Results

The results of the project establishment included an initial overview of the entire organization, the project charter, and a baseline plan for the project

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42 Planning was made using the technique "Project Management with Baselines" (Andersen et al., 1990).

for the rest of the fall 1991.

The 10 pages project charter is outlined in figure 14, by showing its table of contents.

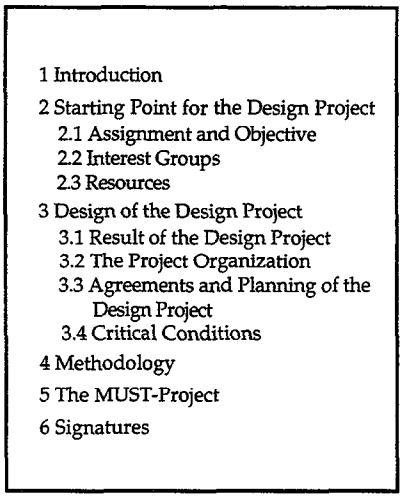

Figure 14: Project charter, table of contents

The project charter introduces the project as a design project, with the overall aim of clarifying appropriate applications of information systems, including organizational and qualificational issues within The Film Board.

As an assignment and objective of the project, the charter stated that we should answer questions like the following:

- How is the work organized?
- What is working satisfactorily and where are there problems?
- Where does double work appear and how can it be avoided?
- What are the needs for new information systems, and what are the needs for organizational and qualificational development?
- And finally, which technological solutions are available, which have to be developed, and how do they fit in with existing and future systems? What should a long term information system strategy include?

It was emphasized, in particular, that the project would not lead to any reductions among the employees. If certain tasks and functions would be rationalized or removed, the affected employees would be given other tasks and functions.

The main priority was that the design project should take place within the Order Receiving and Shipping Departments, the Editorial Board, and the Bookkeeping Department.

It was estimated that I would spend 2-3 days a week on the project, Finn Kensing 1-2 days a week, and the two students 2-3 days a week. From the organization, the members of the steering committee should be prepared to use half a day a week in coordinating, etc. with us and the other employees in The Film Board. Other employees from The Film Board should participate to the degree the steering committee found relevant.

As the result of the design project the charter stated that we could end up with:

- A map of the existing work organization.
- A map of the existing technology.
- Recommendations for changes in work practices and organization, in addition to recommendations for design and redesign of information systems.
- A description of the consequences of the implementation of proposed information systems.
- A plan of action describing discussions and activities required to implement our recommendations, and elements for an information systems strategy.

This was to be stated in a report, and possibly demonstrated with prototypes.

The project was to be conducted by me, Finn Kensing, and two post-graduate students as a project organized within the technology committee which the president was in charge of. Employees from all involved departments should participate as needed.

As a (rather symbolic) fee, The Film Board paid $7.500 to the MUST-program to cover its expenses.

Section 3.4, "Critical Conditions", stated that it was assumed that the management and cooperation board within The Film Board would demonstrate a positive and cooperative attitude towards the project, and that possible misunderstandings, disagreements, and conflicts should be made open and discussed in the proper forum.

Section 4, "Methodology", outlined how we would perform the design project, mentioned that we would analyse and "follow" a productions

"flow" throughout the organization, and showed that we would use techniques such as document analysis, observation (including video recording), interviews, and thinking aloud experiences.

Section 5 described the research program, MUST. The project charter described the research dimension of the project, in brief terms, indicating what we wanted to learn and experience from this project.

The project charter was finally negotiated and signed by the project group and the technology committee. We consider this to be an important ritual: its purpose is to seek and make a commitment to the participation, objectives, and intended results of the project.

10. The Order Receiving and Shipping Departments

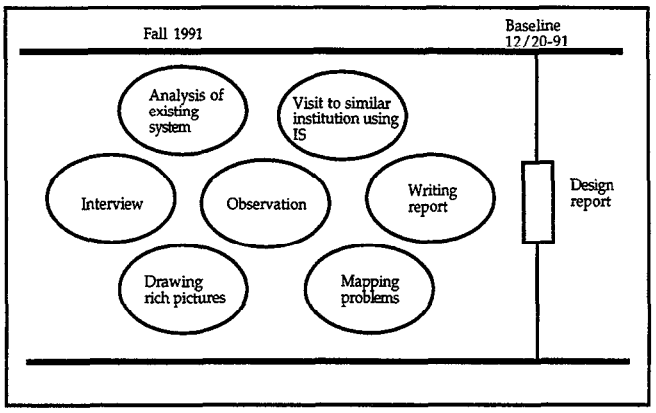

Figure 15: The design project in the Order Receiving and Shipping Departments

10.1 Starting Point

The Order Receiving and Shipping Departments were organized as two separate, yet very interdependent, departments. The Order Receiving Department receives orders for films and videos, and records the orders in a central booking system. During the day, these orders are printed out on forms that are brought downstairs to the Shipping Department. With these forms, the Shipping Department finds the ordered films and videos and ships them to the customers. When the Shipping Department receives the returned films and videos from the customers, return forms are brought upstairs to the Order Receiving Department where they are entered into the booking system, indicating that the films and videos now are back in stock. The two departments thus handled two stocks, the physical

stock in the Shipping Department where the actual films and videos were and the "logical" stock in the booking system indicating which films and videos ought to be in the physical stock downstairs and which ought to be with various customers.

In the Shipping Department, they had for some time recognized a problem with handling their stock: due to the introduction of the video into the film concept, the amount of films and videos in stock had increased significantly during the past years. This had lead to a situation where the Shipping Department, for some years, did not have the time to make the usual yearly update of the entire stock, and thus the current physical and logical stock did not tally. Problems with the manual handling of forms back and forth between the departments (returned films and videos with missing return-forms, errors on forms, etc.), were not new, but the increased number of transactions made this cumbersome work more time-consuming. The work involved in updating the booking system with homecoming films and videos and in handling lists of "missing" films and videos (e.g. due to customers that did not return their films and videos in time as recorded in the booking system) was a full time job for one employee. Often times, films and videos ordered for shipment (and available according to the logical stock in the booking system) did not appear in the physical stock.

For some months, the two departments had been discussing a technological solution to these problems, in form of an inventory control system in the Shipping Department connected to the central booking system in the Order Receiving Department. This would support them in controlling the physical location of a film and a video, as well as, in the logical booking of the film and the video. The problem was urgent, and therefore of high priority.

The problem situation was fairly limited, and a technical solution rather obvious. We organized a design project, in order to quickly analyse the situation and recommend a solution. This design project was carried out by two postgraduate students (as the empirical part of their master thesis) under my supervision. They worked on the design project for about two months during which they cooperated with a group of four people, the two managers from each department and two employees.

For the students, this was an opportunity to carry out a "real" design project and to experience different techniques. We also had an interest in giving the organization some quick results, in the form of an intense design project from which they quickly could make a decision and get a system implemented. This would demonstrate the kind of benefits that

the organization could get from our cooperation, hence strengthening the confidence in our cooperation. Also, the design project was a possibility to experience the potentials of Work Analysis, which was studied and used by the students and reflected on in their masters thesis (Jensen and Kullberg, 1992).

10.2 Activities

The activities performed in the design project are outlined in figure 15.

Since the Order Receiving Department was using their central booking system and the new inventory control system in question should interact with this system (or ultimately be a part of a replacement of the booking system with a new system), it was a necessary and obvious task to analyse this system, its functions, and database. This analysis proved that it would be possible to implement an inventory control system as an "add-on" to the existing system and its database, without altering its current functions. Thus, this opened the choice to invest in an inventory control system now, and later replace the booking system with a new one (which was under consideration since the booking system was rather old).

Interviews were conducted as unstructured interviews with a range of employees, though mainly with the manager of the Shipping Department: he had the responsibility for the problematic situation, had taken the original initiative doing some inquiries regarding possibilities with an inventory control system, and was the carrier of the vision of how such a system could support the work handling the stock.

The students' interpretation of the current work practices was described in rich pictures[43]. These rich pictures were succeedingly presented to the persons interviewed, as a tool for discussing their understanding of the work practices. Hence, interviewing and the drawing of rich pictures were used in a participative and iterative way.

When the students ran out of questions to ask, they did some days of participatory observation (Eneroth, 1984), searching for relevant issues that were "forgotten", i.e. not addressed in the interviews.

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43 In Checklands broad interpretation of this technique, they are informal "cartoon-like" drawings. "There is no formal technique or classic form for this [drawing rich pictures], and skill in drawing is by no means essential (though it's not a hindrance!) in the production of pictures which are found to be very helpful." (Checkland and Scholes, 1990, p. 45).

Problem	Causes	Consequences	Alternatives
System and physical stock do not tally	Because of stress and work load, homecoming films are sometimes updated in the system in "bunches", and non-returned films are mistakenly updated as returned Yearly update of the entire stock has not been made No standard for how to record a returned film within one of the special booking arrangements	Non-existing films booked to customers No of copies of a specific film are erroneous Difficult to apply numbers for copies	Update system with physical stock. Two ways to do this: a) by a new inventory control system. b) manual updating (as usual)
Too much work in updating, with regard to homecoming films, both in the Shipping and in the Order Receiving Department	A large number of returned films Return form missing, causing missing relation between customer and no. of film-copy List of missing films has errors and is difficult to interpret Cumbersome to find return form when unpacking returned films Time consuming to make list of missing films	One person less in Order Receiving: uses all working time to update homecoming films and handling lists of "missing" films It is not possible to make overdue notices before return forms and list of missing films have been handled Ineffective receiving of films Customer does not get film	New inventory control system Send overdue notices even though film may have been returned
Ordered films are not in stock	System and physical stock do not tally Customer did not return film as expected Employees within The Film Board borrow films without updating the system "Forced" bookings	Too much work with urgent overdue notices Too much work negotiating with customer to get another film (which implies new urgent booking) Too much work in finding films Shipping Department gets bad image in the Film Board Customer does not get film	New inventory control system No. of copy is recorded in system No employees may borrow a film without updating the system Supply stock with additional of the critical films Prohibit "forced" bookings Customer gets film only if on stock Effort to get customer trained

Figure 16: Diagnostic problem map (Jensen and Kullberg, 1992)

As the various employees in the two departments had quite different interpretations of what the problems were, and as most of them believed that "if they just could get this system all the problems would be solved", the students made two sessions mapping the problems using the technique diagnostic mapping (Andersen et al., 1990). These two sessions brought about an agreement on what the central problems were and how they should be given priority, and also it supported a clarification regarding which problems would not be solved with an inventory control system. The final diagnostic problem map is outlined in figure 16.

Two institutions were visited, a library using an inventory control system, offered as a standard product, and a film board in a neighbour country using an inventory control system that this organization had developed and implemented by itself.

Finally a design report (Kullberg and Jensen, 1991) was written and presented to the technology committee on 12/22-1991.

10.3 Results

To The Film Board the main results were:

- Harmonising different interpretations/views on - and making a priority of - "what are the problems".
- Bringing expectations *down* (this system will not solve all our problems and will give you new potential problems).
- Mapping the shipping of films and videos when problems arise. The interviews gave insight in how the work procedure should be like in the normal routine situation of handling the booking and shipping of a film or video. The participatory observations highlighted what is done when problems occur[44] and the routine breaks down. This insight was important to later design proposals, e.g. it added a new search function to the system ("What are the possibilities of having this film back tomorrow, just in time for shipping it out to the next customer?").
- Finally, the design report, which made the reasons for and the potentials of the implementation clear, made the technology committee make a decision to realize the system right away, and formed the basis for the succeeding competitive bid.

Figure 17: The design report for the Order Receiving and Shipping Departments, table of contents

The 15 page design report is outlined by its table of contents in figure

44 E.g. when a copy of a film should be shipped but it has not yet been returned from the former borrower.

17. The report was enclosed with descriptions of the problem maps (see figure 16) and drawings of the current and future work processes, as it would be viewed from both the Order Receiving Department and the Shipping Department (see figure 18).

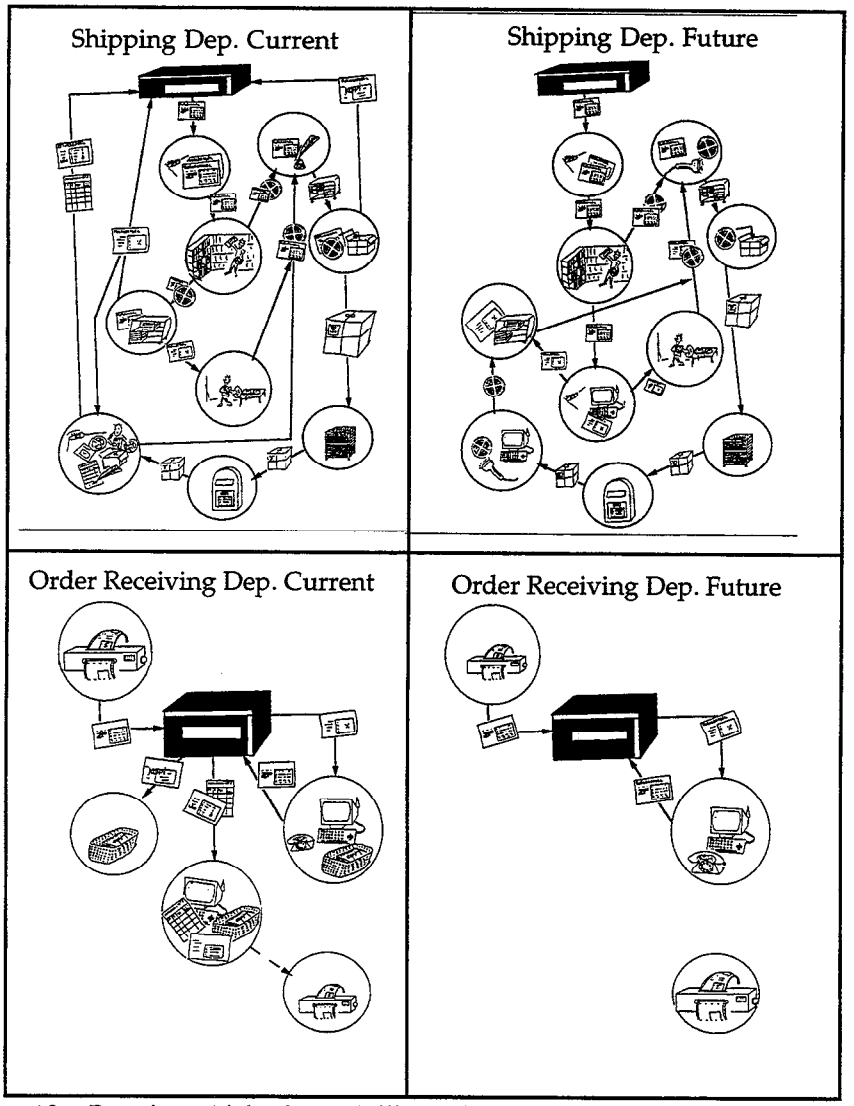

Figure 18: Drawings (rich pictures) illustrating the Shipping and Order Receiving Departments' current and future work process of handling the distribution of films and videos. Above, the process in the Shipping Department, where the Order Receiving Department is viewed as a "black box". Below, the processes in the Order Receiving Department, where the Shipping Department is viewed as a "black box" (Jensen and Kullberg, 1992).

The students were succeedingly hired by The Film Board to write the material needed for the competitive bid and to support the negotiations with the chosen supplier offering the new system. The design project took place in November and December of 1991, and the competitive bid and final implementation of the system was made the following 6 months.

The design project represented what could be characterized as a kind of problem solving situation (Andersen et al., 1990), where the assignment or problem was known and fairly well-defined, the uncertainty was small or intermediate, while the way to conduct the design project (the working practice of the designers) was not fully known in advance. In contrast, the following two design projects can be characterized as problem setting situations where the assignment or problem is rather unknown as the starting point. The design project in the Order Receiving and Shipping Departments, hence distends the level or situation for the three design projects in the research project as a whole. Also, the design project provided some more specific results for our research project:

- Experiences using different techniques (observation, mapping, drawing rich pictures, etc.)
- Initial experiences with the conceptual framework of Work Analysis.
- A concrete example of developing and anchoring a vision, until its final implementation.
- Confidence of the mutual benefits in the succeeding cooperation with the organization within the action research project.

11. The Editorial Board

As the secretaries from the Editorial Board initiated the whole project, it was natural to make a design project here. The design project in the Editorial Board is described in two parts. The first part was performed in the fall, 1991, in parallel with the design project in the Order Receiving and Shipping Departments described above. The second part was performed in the spring, 1992.

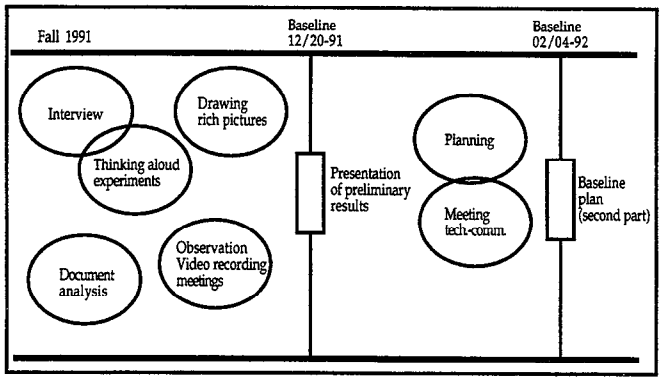

Figure 19: The design project in the Editorial Board, first part

11.1 Starting Point

The Editorial Board handles all applications for productions of films and videos, decides which ones to support, negotiates contracts, and supports and manages the actual production of films and videos. Three editors (hired only for 2-4 years, in order to secure a broad selection of productions) are in charge of this task. They have the responsibility of four different areas of productions (16 mm. film; video; film and video for children; foreign film and video), each of which has its own budget. Also,

the Editorial Board buys films and videos and handles the translation of foreign films and videos. A consultant (on the permanent staff), specialized in purchasing and managing the translation of foreign films and videos, supports the editors in this rather complicated process. The editors are supported by a production manager, who has the responsibility of the overall economy, and three secretaries. The decision of which productions to support and the coordination of the different productions with other departments in The Film Board, is done at the weekly production-meeting. At this meeting, where all employees from the Editorial Board, along with the president, and the managers from the Order Receiving and Marketing Departments, participate, information regarding applications, status, and actions for each production "in the air" are exchanged and the necessary decisions and coordination are made.

The editors mainly take care of the applications and production, in regard to content, while their secretaries handle most administrative follow up: fielding calls, informing relevant parties, receiving and filing applications and all succeeding data that concerns the productions (budget, funds, expenditures, technical data, correspondence, etc.).

All information needed for the weekly production-meeting, the administrative work on the productions, as well as all the coordination with the other departments in The Film Board, was paperbased and the only technology available was word processing running on a central computer and accessed by terminals. Especially the secretaries in the Editorial Board felt that the increased number of applications and productions was an overwhelming and cumbersome administrative burden, and the paperwork and manual updating of all the paper files in each office engrossed most of their time. This left only a little time for the skilled and qualitative support, given to the editors, producers, and directors of films and videos, that the secretaries were qualified for and used to doing.

The secretaries knew that their paperbased working practice could be radically changed and supported by computer technology. They wanted computer support for recording all the information on each production, and for the financial management of the productions. One key issue was to get rid of double work within the department and in relation to other departments too. Another issue was to keep track of the current status of the productions for cooperative purposes between the departments.

This situation, characterized as problem setting rather than problem solving (Andersen et al., 1990), was a unique possibility to experiment with and explore different design approaches. One of our goals was to

develop an understanding of the conditions for and effects of applying ethnographically inspired approaches to such a design project. Would it, for example, be possible to trace knowledge developed by such an approach to specific consequences on the design proposals?

The design project was conducted by Finn Kensing and myself, in participation with the employees of the Editorial Board.

11.2 Activities, First Part

To get the first overview of the work in the Editorial Board, we interviewed all 8 employees one by one, i.e. in their respective offices. Each interview lasted 1-2 hours. We used unstructured interviews organized as a dialogue around questions like "What are you doing?", "What do you like/dislike about your job?", "Have you encountered problems?", "Do you have ideas for improvements?", from the answers of these, the rest of the interview followed. In parallel with this activity, we did thorough document analyses of all the written materials (leaflets, booklets, production plans, minutes from various meetings, the wording of the Act for the institution, etc.), along with studying the different paper-forms in use.

A second interview round was then performed with the secretaries. These interviews were all "in situ" and were conducted as dialogues, where the secretary often showed how he carried out specific tasks. Some of these interviews initiated thinking-aloud experiments, where we observed and asked them to think aloud while working. Often specific design ideas emerged during these interviews.

For example, one situation had the following progress: one of the secretaries supports the production manager in charge of keeping a financial overview of all the productions "in the air". While sitting with the secretary at his workplace, he explained how he made his different postings, tables, and accounts by showing and referring to the files, documents, and papers, etc. available for this task. This quickly turned into a dialogue clarifying our understanding of the task and the problems of gathering information from the Bookkeeping Department, the editors, and the other secretaries from the Editorial Board. Soon, design ideas of how he could arrange different amounts and sums for productions on a spreadsheet-type form emerged, along with how some of this data could be transferred directly from a project management system, which was under consideration, and the central account system in the Bookkeeping

Department. Thus the interview established a mutual learning situation where relevant structures of the secretary's current work were developed on the basis of his concrete experiences. The outcome was a drawing that captured a design vision to support the tasks in question.

We observed and video-recorded three of the weekly production meetings in an attempt to capture the multitudinously coordination taking place here. The fact that we observed and video-recorded these meetings gave the employees in the department an occasion to reflect on and do some restructuring of this meeting. This was apparently only due to our presence (we may have given somebody a short comment on some of the things we observed). As one of the editors later (a bit irritated) stated: "I have asked for these changes in the productions meetings for months, but nothing happened. And now they were implemented just like that because you showed up."

As part of our reflections and discussions, we draw rich pictures capturing design-ideas. One design idea concerning financial support was drawn as a mock-up at a flip-over used for a presentation of our preliminary results at the meeting with the technology committee in December, 1991. This presentation resulted in further planning of the second part of the design project. A final plan was confirmed in a meeting with the technology committee in February, 1992.

In negotiating the plan, we were asked to include the Bookkeeping Department in the design project. We argued for, and the steering committee agreed, not including this department. Several reasons were presented. A new manager was about to be hired for this department and this person should be given time to be introduced to the department before participating in a design project. Also, we found it more relevant to concentrate our time and effort experimenting with ethnographic techniques in the Editorial Board (which was part of the agreed project charter)[45].

11.3 Results, First Part

We had identified and sketched out two systems:

- A production-management system, supporting that all data on a production was recorded only once in a central database. This system is

45 Another unspoken reason was that we did not find the work performed in the Bookkeeping Department very interesting!

technically quite straightforward, but to them, having all records on paper and each office and employee having his or her own private paper files, this was a radical change which would involve serious discussions of re-designing the work practices and division of labor.

- A financial part of the production-management system, supporting a general view of the budget and money spent on all productions "in the air".

We could have started refining and prototyping those two design ideas, but we had one concern: they primarily supported the secretaries, the production manager, and the consultant. The functions of the secretaries, the production manager, and the consultant are to support the editors. The editors themselves had no idea of their needs besides word processors - they saw no relation between their problems and computers. Were our design proposals also supporting the editors? Was our design only about to "sub-optimise" the internal quantitative work in the Editorial Board, and in turn, neglect the overall function of the department: the qualitative work of the editors towards the producers of films and videos? In order to investigate this, we claimed that we had to get a thorough understanding of the editors work. This lead to the second part of the design project, which turned out to have important consequences on the final design.

11.4 Activities, Second Part

To obtain a thorough understanding of the editors work, we observed them in their daily work. This was done simply by "following" them for several days at their office observing them doing their daily routines, having meetings with applicants, while negotiating new productions with directors and producers, and when reviewing a version/cut and final cut/mix with the directors, producers, and sometimes the photographer and the cutter. The editors themselves helped by suggesting days and times where we should be with them. This assured that we observed the variety of different tasks in their job. At some of our observations, especially when they were "out of the house", e.g. reviewing a version of a production, the reason for our being there could seem peculiar in the eyes of the directors, producers, photographers, etc. We were introduced as designers from the university that observed the editors daily work in order

to design appropriate computer technology - the relevance of this "following them at their work" did not seem to be very obvious in these situations. To be honest, I was not very confident about the relevance either, and emphasised that this was a "scientific" experiment that I did not yet know the result of myself. They did not resist our being there, even in cases of negotiating contracts and funding[46]. In fact, they were all very kind and confident by this situation, perhaps because the editors are in charge of the funding for the production! We video-recorded some of our observations at The Film Board[47]. This was mainly the meetings where the editors participated in when negotiating with directors and producers, and when meeting with the production manager, etc.

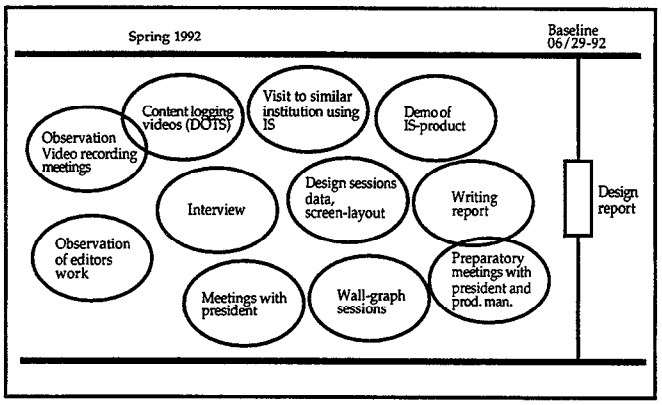

Figure 20: The design project in the Editorial Board, second part

With parts of the videos, we did content logging by using a HyperCard-tool developed at our department at Roskilde University: DOTS (Data Organizing Tool for Systems design). This tool is described by Kensing and Winograd (1991). The DOTS-system was under development at the time we used it, which made the content logging rather cumbersome because we often experienced insufficient functions and ran into errors in the tool. The main use of the video-recordings was thus to replay them and discuss what happened on the tapes. This was done at our lab at the university, and the employees from the Editorial Board did not

46 Only once a director and a producer asked me to turn off the video, as they had a rather confident matter to discuss concerning the need for further funding.

47 Some of the video-recordings had to be discarded, since the house was under reconstruction and at that time the roof was being replaced, which was a rather noisy process (Yes, it's cumbersome to be a quasi-ethnographer).

participate in this[48].

The observations and reviews of the videos opened a lot of questions that we subsequently followed up by interviews with all employees in the Editorial Board. The focus was on the cooperative aspects of the work, both internally in The Film Board and externally with applicants, directors, and producers from the film and video industry. Most of these interviews were audio-recorded. The audio-recording had the function of "note-memory", which allowed us to concentrate in participating in the dialogue during the interview without taking written notes. We then made our notes from these tapes without transcribing everything recorded. We have not made detailed transcriptions e.g. using special transcription notations (like e.g. the notation presented in Suchman, 1987, pp. 96f), which appear in some literature when presenting the data analysed.

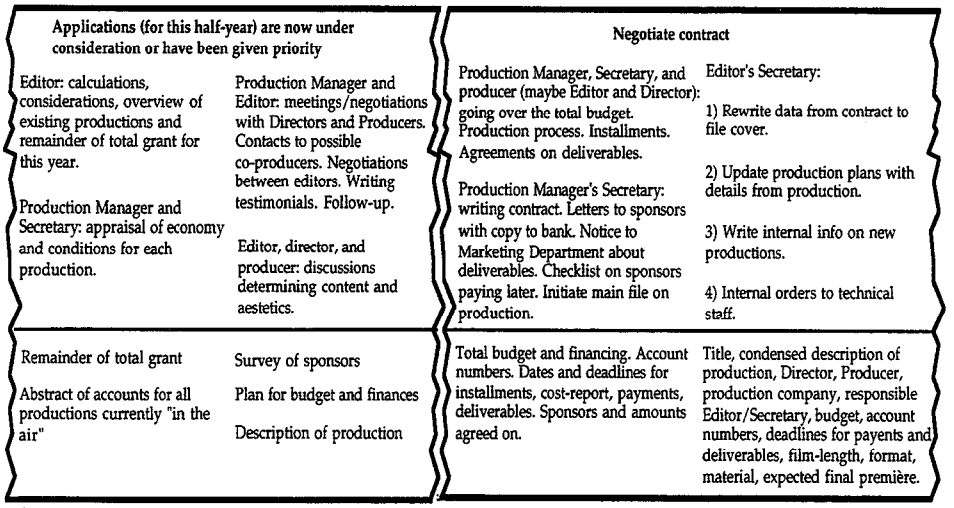

Figure 21: Outline of two pieces of a wallgraph, each approximately one meter wide. This figure only roughly outlines their real form, which was much more "free-style", hand-written, and with the text written in different colors and handwritings.

The observations revealed a complex cooperative pattern in the life cycle of a production, involving all employees in the Editorial Board. In order to obtain a coherent picture of the production life cycle, we orga-

48 Looking back at the project, I now regret that we did not spend more time analysing and using the video recordings. Our experiences are, for that reason, rather sparse. It could e.g. have been very interesting to confront employees from the Editorial Board with parts from the video recordings, as a way to establish discussions about what is going on.

nized a series of what we call "wall-graph sessions". Wall-graphs[49] are large pieces of paper where work involving various people and competencies, is described in a coherent way. Coherent in the sense that it described the "flow" of a production: from idea to production and premiere, distribution, and finally, until the film or video is discharged and removed from the film and video-stock. At the wall-graph sessions we gathered different participants in the life cycle of the production of a film or video (the secretaries, the consultant, the editors, and the production manager). We asked them to write down all activities and functions and who was in charge of them (on the upper part of the wall-graph), and the data and information needed and/or recorded through the life cycle of a production (on the lower part of the wall-graph). Everything was written on one piece of paper (1x10 m) with the start of the production on one end (an application is received), and the end of the production on the other (the film or video is discharged and taken out of distribution). Each participant used his or her own color writing on the wall-graph. The wall-graph sessions were important for all to realize the complex cooperative work involved in the life span of a production. And it formed a coherent picture of the cooperative aspects of their work. The wall-graph formed the basis for a later presentation of how the design of a production management system could support the work with productions, and for discussions among all future users involved, about "who is responsible for what" in an envisioned future work organization. The wall-graph hence served as a reference in the succeeding discussions concerning possible computer support, thus playing an important role in anchoring the vision of the design.

As the design was now revised and refined, I conducted two design sessions with the secretaries discussing functions and data in the system, screen-layout, etc. This was followed up by a visit to an institution using a standard system supporting registering and file/project management. The employees at this institution had rather positive experiences with this system, and since it seemed that it could offer much of the functionality the Editorial Board needed, this visit was followed up by a demonstration and discussion at the computer company which offered the system.

The president had, during the spring, 1992, asked for several meetings with us where he, in quite confident ways, wanted to discuss several

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49 Within the organization, wallgraphs were soon given the nickname 'the Dead Sea Scrolls'.

organizational matters, many of which did not relate to our specific design project. At these meetings, we found ourselves acting in the role as a kind of organizational "therapist", where the president needed someone to discuss issues concerning ideas for changes in the organization.

Finally, we wrote a design report (Kensing and Simonsen, 1992) and had preparatory meetings with the president and the production manager before we presented the final report to the Editorial Board and the technology committee at a meeting in June, 1992.

11.5 Results, Second Part

The results to The Film Board were described in a 30 page design report, the content of which is indicated in its table of contents in figure 22. The report was enclosed with a diagram outlining the proposed design, the computer-based communication within the Editorial Board and between the Editorial Board and other departments in The Film Board (see figure 23).

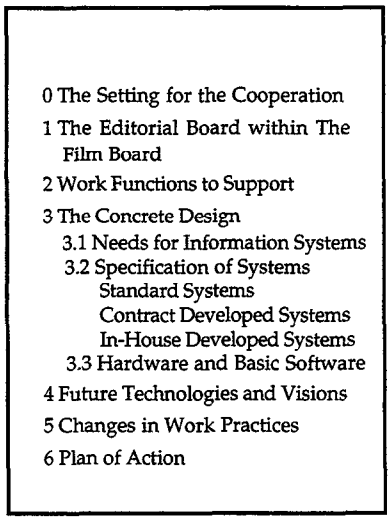

Figure 22: The design report for the Editorial Board, table of contents

Section 0 outlines the setting for the project as a joint project between our research group and the organization. It also describes the current status of the project. Section 1 describes the main function of the Editorial Board within The Film Board, and points out the general areas where

computer support is relevant. Section 2 describes the different work functions within the Editorial Board, grouped by the employees with the responsibility for these functions, and argues for their respective needs for computer support. In section 3, the design proposal is described. Section 4 outlines some possible visions for the future succeeding the concrete design in the report. A scenario (Clausen, 1993A, 1993B) describing how a future work practice for a production cycle, is supported by the design, is given in section 5. Finally, a plan of action for the further development and implementation of the proposed design is given in section 6.

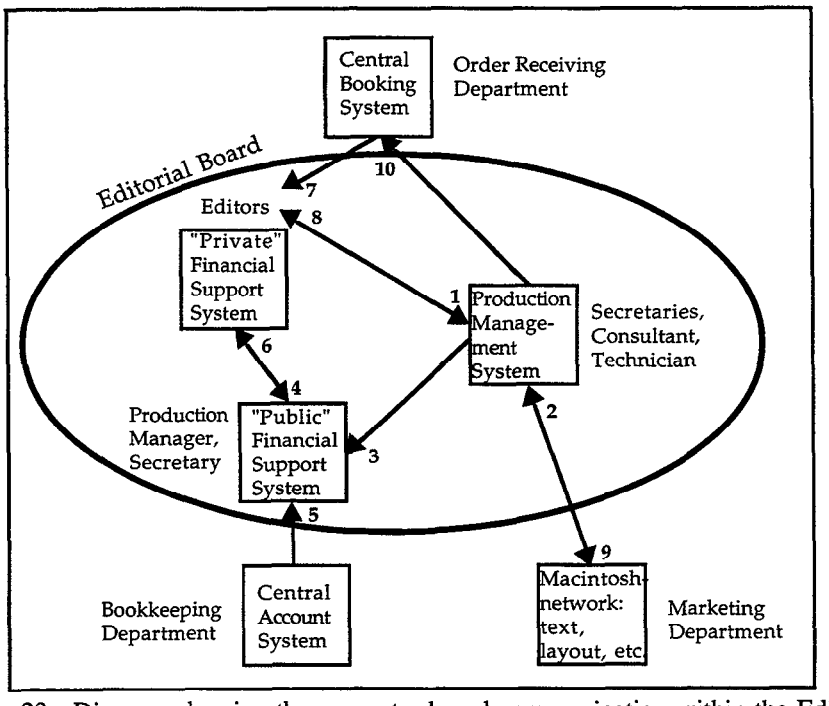

Figure 23: Diagram showing the computer-based communication within the Editorial Board and with other departments in The Film Board. The numbers on the arrows refer to the following:

1: The production management system receives data from the editors.
2: The production management system receives data from the Marketing Department.
3: The public part of the financial support system receives data from the production management system. This is e.g. all single financial transactions for one production, payments from sponsors, expenditures when receiving invoices, etc.
4: The public part of the financial support system receives data from the editors private financial support system when the amounts are committed to a production.
5: The public part of the financial support system receives data from the central account system. These booked amounts are checked off with the corresponding committed amounts from the production management system.
6: The editor's private financial support system receives data from the public part of

the financial support system (e.g. the remainder of the block grant).
7: The editors can query information from the films in the central booking system.
8: The editors can receive information from the production management system.
9: The Macintosh system in the Marketing Department can read data from the production management system.
10: The booking system in the Order Receiving Department can read data from the production management system.

The technical design recommendations from the report are described as follows:

- A revised version of the originally suggested production-management system (a specific standard system).
- A revised version of the financial part of the production-management system (this was to be done by in-house development with contract-developed[50] relations to the Central Account System in the Bookkeeping Department).
- Systems for communication (this included standard e-mail, contract-developed "triggers," and in-house-developed lists in a standard system).
- Portable computers for the editors.
- A specified upgrading of the central server.

Our insight into the editors' work made two impacts on these design recommendations:

1) We realized that there was a difference in how a production was viewed between the secretaries and the editors:

- To the secretaries, a production starts when the editor decides to fund it (from "negotiate contract", see figure 11 in chapter 8). Besides correspondence, they mainly take care of a production from the point where the contract was made. That was how we originally were presented with the problem of managing productions.
- To the editors, the main considerations and decisions occur before it reaches this status. One editor often did not pay much attention to the productions after they had been funded, a contract had been made, and the secretaries "took over" the administrative follow up on, and management of, the production. The revised production-management

50 For a discussion of contract and in-house development, see Grudin (1991).

system also supports the very early phases, providing direct support for the editors.

Support for the early phases of a production under consideration changed the design to:

- Support the three "top" activities ("idea for production or manuscript"; "consideration by editor"; "support or refuse", see figure 11 in chapter 8), where our first design only supported from the activity "negotiate contract" and down.
- Involve the Registry Office (the place where The Film Board receives mail and files paperwork), allowing the production (or application, as is its status at this time) to be recorded when the first mail is received. The first design did not involve the Registry Office.
- Allow more applications to be recorded with important information about their early lifetime. This provided direct support for the editors, e.g. allowing a new editor to check if a similar application had been considered by his or her predecessor. The first design did not consider applications refused by the editors.
- Require the design to be portable, as the editors are frequently "out of the house." The first design, mainly supporting the secretaries, did not take this issue into account.

2) Support of the financial side of productions, as considered by the editors, turned out to be strictly confidential.

None of the editors' personal calculations - about which productions they were considering to fund and with how much - should be public unless made so by the editor managing the production. If this important "feature" had not been included in the design, the editors simply would not have used the system for this complex task, and the financial part of the production would then only be supported by the system, after the final decision to fund it had been taken. The "private" and "public" part of the financial support system was illustrated with two system sketches/mock-ups, as shown in figures 24 and 25.

Why was it important to keep the financial side confidential? The answer to this has to do with a power-struggle existing between the production manager and the editors:

- The editors are responsible for deciding which projects to fund and with how much. But, the production manager is responsible for the

overall budget - including considerations about whether the total budget for a production looks sound and realistic.

- The editors are usually not very interested or skilled in the economic details of a production. They want as many as possible of their preferred applications to become productions.
- The production manager is concerned about the financing of each production and about how many productions the organization can handle. The production manager wants fewer productions to be funded with more money.

Title	Budget	Funding, committed	Funding, booked	Expenditure, committed	Expenditure, booked	Available
Title or other ID on the production in question	Total budget for that production	Latest balance including all commitments on incoming fundings	Latest booked balance on incoming fundings	Latest balance including all commitments on expenditures	Latest booked balance on expenditures	Amount available for a production
Registry Office	*Production Manager, Secretary*	*Production Manager, Editor, Secretary*	*Bookkeeping Department*	*Editor, Secretary*	*Bookkeeping Department*	*Calculated*

Figure 24: The "public" financial support system. The lower text in italics refers to the employees/departments responsible for recording and updating these data.

Additional windows giving an outline on each production considered by the Editor

Window giving an outline on all productions considered by the Editor

Title	Funding, Editor	Funding, Editor	Funding, Sponsor	Funding, Sponsor	Budget	Still missing
Title or other ID on the production in question	Funding assured from editor	Additional funding considered from editor	Total amount of funding assured from sponsors	Total amount of funding considered or applied for from sponsors	Total minimum budget estimated for that production	Amount still missing in relation to total estimated budget

Figure 25: The "private" financial support system

We believe that we could not avoid playing a part in this conflict

when designing the system supporting the financial part: either the system is open to all (and that means supporting the production manager, as in our first design) or it allows the editors to work with their budget, in confidence.

As a research project, we were given an example of how our ethnographic approach or, to put it more simply, how our "taking a closer look" in the second part of the design project had specific consequences for our preliminary design proposal. The example demonstrates how multiple viewpoints on the work practices may be harmonic or problematic in terms of consequences for different design options. In addition, we gathered experiences in our experimental use of different techniques (observations, video-recording, wall-graph sessions, etc.)

12. The Marketing and Order Receiving Departments

The design project in the Marketing and Order Receiving Departments was made after the final report for the design project in the Editorial Board was made and had been presented. As the design project in the Editorial Board had focused on the overall function toward the producers of film and video, the president now had a desire for a design project focusing on the other overall function toward the consumers.

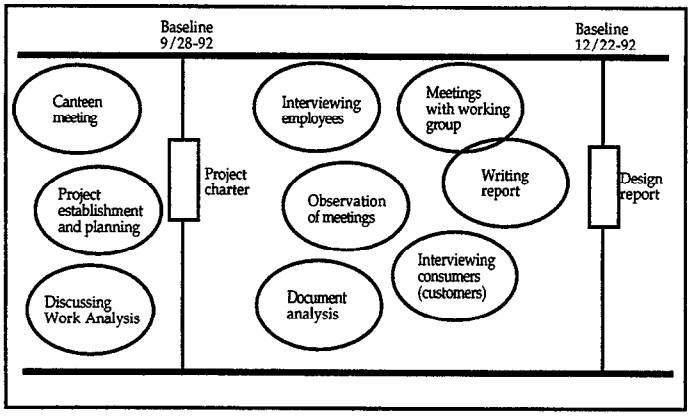

Figure 26: The design project in the Marketing and Order Receiving Departments

12.1 Starting Point

Compared to the overall situation in the two former design projects, the design project in the Marketing and Order Receiving Departments was not as harmonious:

- The recent demand for income from government, involved that The

Film Board should earn (back) about one fifth of its overall budget (about $1.5 million out of $7.5 million). This demand for income was automatically raised by $30,000 every year. The purpose of this demand was to force the organization to change from a non-commercial public organization to a more business-oriented organization, having greater attention towards its earnings, expenditures, and productivity. In the past two years since this demand was forced upon The Film Board, the organization did not succeed in earning the demanded sum and had to cover the remainder with its operating budget. The only source of income was from the distribution of films and videos. In the past two years, The Film Board had experienced a decrease in the number of films and videos distributed.

- It had been decided to join the two departments into one. The explicit rationale behind this decision was that the Marketing Department could benefit from a more close cooperation due to the direct contact with the customers that employees in the Order Receiving Department had. The employees in both departments did not get that point, as they saw the functions performed in the two departments as rather different. An implicit reason for the decision, which emerged during the design project, was what I would characterize as a "structural" attempt to change the hierarchy of management in the two departments, by having a newly hired manager in between the manager of the Order Receiving Department and the President.
- It was known that the President had criticized the management of the Order Receiving Department. The manager of this department had been hired a few years earlier with the purpose of changing the department to do more active "reaching out" fieldwork, profiling the new image of the organization, and "getting new customers". To the president, the Order Receiving Department did not take care of the field work they were supposed to - the manager claimed that they needed more resources in order to do it. The President didn't trust that and wanted me to conduct a broad design project analysing the work in the department: is it true that they need more resources or do they also have a problem in changing and simplifying their work (e.g. by the use of new technology). To him it was a possibility to "get a foot in the door" and to use my recommendations to force changes into the department.

The starting situation was clearly a complex mixture of needs for

organizational, managerial, and technological changes.

The more official stated reasons for the need of a design project were:

- The bookingsystem in the Order Receiving Department was rather old, and they faced a situation in the near future where they would have to replace it with a new system.
- The libraries had, during the last few years, become one of their largest customers. Their orders (and many orders from the educational sector too) were very straightforward, and they experienced that about 50% of all orders by phone were such kind of "automatic" orders where the customer knew exactly what film or video he wanted and did not need any consulting. If their customers had the ability to order their films and videos on-line with a library-system[51], The Film Board expected a significant drop in the booking-task done in the Order Receiving Department. They had decided to invest in this kind of system as their highest priority, after the systems for the Editorial Board.
- To release resources, especially in the Order Receiving Department, would support their fieldwork taking care of existing borrowers, and cultivate new markets for their films and videos. Even though this was a task of a very high priority to the organization, the Order Receiving Department did not take much care about it, claiming they needed more resources.

As a research project, I was interested in experimenting with Work Analysis as an approach to systems design. The situation would serve as an example for the strategic and functional levels of analysis within Work Analysis. The design project was managed by me, performed within 3 months, and involved 260 hours of work.

12.2 Activities

The project was initiated by the president at a canteen meeting where the results of the former two design projects were presented and discussed. As the project charter from 11/08-1991 had been fulfilled, a new project

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51 As library-systems provide this functionality for on-line "booking" functionality, this solution was known to the organization as "the library-system".

establishment and planning activity were performed. In parallel I, discussed Work Analysis, and how to perform the design project with this approach, with the authors of this approach from the Systems Analysis Department at Risø National Laboratory, as this approach is only sparsely described and still under development (see Part II for a description of Work Analysis).

The project charter was agreed to on 9/28-1992. Its structure and main content was very alike the charter from 11/08-1991. The charter made clear, though, that the approach of the design project would include a functional analysis as prescribed by Work Analysis. This analysis would include the "environment" of the two departments, including qualitative interviews with some of their main customers.

The design project was mainly to be conducted by me and organized by regular meetings with a working group, this included the participation of both the managers from the two departments and a representative from the employees.

The main data gathering method used was unstructured interviews. I interviewed all the employees in both departments. The focus in the interviews was on (answers to) "why"-questions, in order to reveal functions performed. Each interview was performed "in situ", mainly as a dialogue, lasted for about 1/2-2 hours, and most of them were audio-recorded. As in the design project in the Editorial Board, these recordings had the function of "note-memory": having done an interview, I listened through the tapes and made my notes only transcribing those parts which could be needed as citations for the design report. The manager from the Marketing Department was, from the very start, engaged in the project and became my main discussion partner throughout the project. The interviews provided the basis for describing which functions the two departments performed. Some of the employees interviewed (not all due to time constraints) commented on the drafts of this part of the report after the interviews.

In order to get a feeling of the different "cultures" and management-styles in the two departments, I observed their weekly departmental meetings, where ideas, problems, tasks, and projects were discussed and coordinated.

A thorough document analysis was performed, as both departments produce a lot of written material (status-report from the Order Receiving Department on the efforts doing fieldwork, statistics, booklets, leaflets, etc.) Also the entire organization had performed a future workshop (Jungk and Müllert, 1984; Kensing and Madsen, 1991), from which a report was

made.

Work Analysis recommends that a design project includes getting insight into the environment, or "outer world", of the work system in question in order to clarify how the function of the work system corresponds to the equivalent requirements, needs, conditions, constraints, and purpose from the environment. The environment includes what are called target or problem domains, i.e. areas which the work system needs to know about. In this case, this means to get an insight into the customers of The Film Board (the consumers borrowing their films and videos) in order to clarify how the overall function of the two departments corresponded with the customers needs, conditions, etc. I achieved this insight by interviewing some of their main customers. The purpose and result of these interviews should be interpreted as an inspiring and qualitative test, in contrast to a more quantitative and representative measuring. On a meeting with the working group we went through statistics on all their customers and picked up five main customers from the libraries and the educational sector. Each of the five customers was visited and interviewed for 1-2 hours as an activity in the latter part of the design project. The focus was on the trend and prospects for their use of films and videos, and also their response to the assumptions that the Film Board, and the two departments in particular, had towards their customers. The results of these interviews seriously challenged the idea of the library system under consideration, and developed new ideas for systems support not yet considered.

Finally, the design report (Simonsen, 1992 D) was written and drafts were discussed with the working group, before the presentation of the final report at a meeting with the technology committee on 12/22-92.

12.3 Results

The main result presented to The Film Board was a 52 page report enclosed with a functional diagram of The Film Board. The content of the report is indicated by figure 27, outlining its table of contents. The Film Board decided to reconsider the overall image and policy of the organization and initiated discussions within the governing body and the management-group. The design report was chosen as the basis for those discussions.

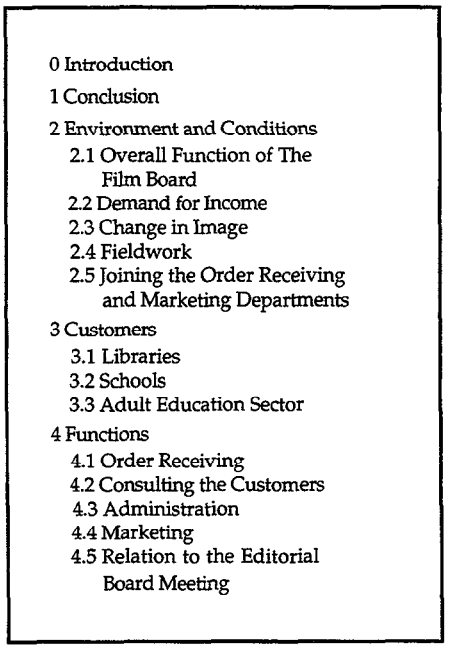

Figure 27: The design report for the Order Receiving and Marketing Departments, table of contents

Section 0 summarizes the main point from the project charter and introduces the report, while section 1 presents an executive summary and conclusions from section 2-4. Sections 2 -4 outline the "standard" framework of Work Analysis: section 2 describes the environment and conditions that the two departments are subject to, section 3 describes their target domain - the customers, while section 4 examines the functions performed by the departments.

Visiting and interviewing the customers resulted in a drastic change of focus on which systems they needed. The library system turned out not to be relevant, and the need for technological innovation found a focus in another area:

- The organization could forget about their plans of investing most of their budget on a library system for the next 3-4 years, as they were ready for. It would simply not be used (or even bought) by their customers. The Film Board needed it, but their customers did not have an equivalent need. All their routine requests for booking films and videos (50%) came from a corresponding high number of customers. One library I visited was one of their largest single customers. They had 1 or 2 requests for films and videos per day. In this situation, the

telephone is the relevant technology for the customer in ordering films and videos. They would resist paying for any on-line possibility and training their staff to use a library system. Instead, a future possibility (on a longer view) for receiving requests for booking by e-mail was presented and discussed. This possibility, though, had to await when their customers would start to use e-mail.

- They urgently and very quickly needed to hand over their catalogue (which was currently in paper form) in an electronic way in less than 1-2 years. Their two main customers (to whom more than 50% of all films and videos were distributed) are the educational sector (mainly schools) and libraries. All libraries have, or are about to convert, their paper files into electronic databases. Schools have the same trend, as the education gets more and more organized into projects, where many subjects are studied in an interdisciplinary form. This creates a need for queries across traditional dictionaries (divided by subject). The trend is to bar-code and record all educational materials into databases, creating the possibility to search by key-words and query for all different materials available at the same time: books, class-sets, videos, tapes, maps, laboratory-equipment, etc. The Film Board has to provide all these local databases with the possibility of being supplied with their electronic catalogue as well (see figure 28).

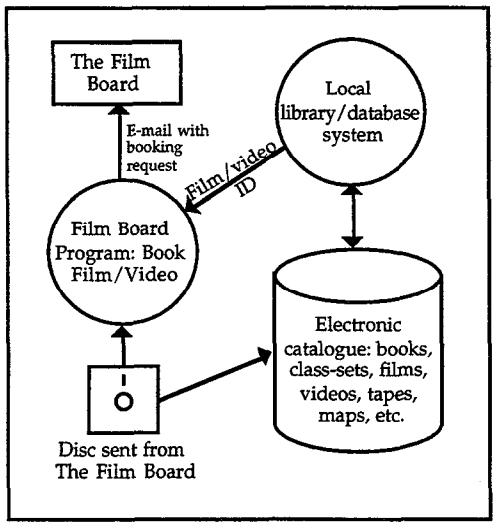

Figure 28: Diagram from the presentation of the final design report showing how customers could be supplied with an electronic catalogue of films and videos. The diagram outlines how The Film Board could supply schools with a disc, containing their catalogue of films and videos, to add to the school's local database. Also, on a longer view,

it should contain a program that e.g. could send an e-mail to The Film Board with a booking request. This program could receive an ID of the requested film/video from the local library/database system through a simple cut/paste-function.

Though this design project had its apparent starting point in the need for information systems (in terms of a library system), its focus on the environment caused the results to be on a more strategic organizational and management-related level, which again pointed at needed areas for systems support, not known before the design project.

On the organizational level, the design project concluded that the overall image ("the house for film and video art") and the demand for income contradicts each other: the demand for income pushes the organization into a radical change: *from* a non-commercial public organization *to* an awareness about where do we spend our resources and where do we earn them. They could neglect this and wait for changes in the overall policy from the government (which meant a new government) or try to fulfil this demand and even aim for a profit. These two possibilities reflected two camps in the organization (where the manager of the Order Receiving Department was in favor of the former and the manager of the Marketing Department of the latter). A design recommendation had to take part in this conflict. My conclusion was that their work practice and mentality were not geared to manage their expenditure compared to their income: no one knows if a specific way of distributing films and videos is profitable. Management has no information about the income made by the Order Receiving Department - and no one is considering to change this situation. On the technological level, they needed systems supporting information like:

- How much money have we currently earned?
- From where? Which kind of films and videos? Which way of distributing? From which customers?
- Statistics showing where do we loose shares of market - where do we win shares of market? Where should we make a specific market campaign? What was the result of our market campaign?

This conclusion broke a taboo in the organization: they had just recently ended the power struggle, when they formulated and committed themselves to their new image which could be argued to neglect or contradict this point.

Considering the qualifications within management, the design project

ended up stating: "The Film Board must seriously consider whether the necessary qualifications to change this situation are available". Though this is a rather formal and diplomatic statement, everybody in the organization knows what that means: get rid of the manager of the Order Receiving Department if you want any changes to take place.

To the research project, the design project gave valuable experiences concerning Work Analysis. Questioning the organization's view and perspective of itself (self-image), by analysing its environment and function, moved the focus of the design project: from designing the library system they apparently needed, to issues on organizational levels that needed clarification in order to point out where investments in computer support would be relevant. Compared to the two former design projects, the design project in the Marketing and Order Receiving Departments was an example that distended the level of design into a strategic, organizational, and management-related level.

PART IV

Lessons Learned: Four Claims

This part discusses results from the action research project (described in Part III) and relates them to my theoretical and methodological background (described in Part II). In order to stimulate discussions among researchers and practitioners within the field of design, I have structured the results as three discussions. All three discussions open with a *claim*, followed by the arguments for this claim, mainly based on the experiences and results from the action research project.

- *Including the Organization's Environment and Function.* The first discussion reflects on my experiences from using *Work Analysis*, a systems approach. This includes an aim to link early design considerations to the overall needs for organizational change and business strategy, i.e. *clarifying which work areas and functions are important to offer systems support.* One consequence of including the organization's environment and function in the design project, was a reconsideration of the organization's overall policy, hence shifting the focus from a system they were about to invest in, to computer support addressing other areas and needs.
- *Taking a Closer Look: Applying Ethnographically Inspired Approaches.* The second discussion concerns effects and conditions from using a *ethnographically inspired approach.* This deals with *in-depth analysis of work practices, in areas where possible systems support has been given high priority.* Some effects from this analysis, in terms of adding to and changing the functionality of a preliminary design proposal, are presented.

- *Anchoring the Visions.* Aspects of the *participatory design approach* are dealt with in all three discussions, though mainly in the third, where the task of anchoring visions of systems support to different competencies within the organization. Thus, this final discussion is concerned with *how to "end" a design project*: this is in terms of anchoring visions, with respect to making a decision about and succeedingly realizing the visions proposed, as results from a design project. A project management issue is thus addressed, which has not been directly dealt with in either of the three approaches described in Part II. Examples on anchoring the design from all the three design projects are given.

13. Including the Organization's Environment and Function

Claim no. 1: In conducting a design project, you might realize contradictions, or a lack of policies, in relation to a strategic business level. Clarification at this level might be crucial, in order to ensure that systems sketched at a functional level appropriately support the organization.

It has, for many years, been accepted that systems design must be considered closely related to organizational issues (Simon, 1973), and that organizational analysis is (or should be) part of the design practice (Mathiassen, 1981; Andersen et al., 1990; Kling, 1993). The overall business strategy should form the context within which systems design is considered (Parker et al., 1989). A more radical trend from the US, known under the banner "business process reengineering" (Hammer, 1990), currently argues that the technological innovation and possibilities should enable, or even determine, organizational changes.

One approach which offers a conceptual framework and guidelines for integrating strategic business analysis with systems design, is Work Analysis, described in Part II. Work Analysis was used in the design project in the Marketing and Order Receiving Departments. In the following, the results from this design project are discussed.

The starting point in the design project in the Marketing and Order Receiving Departments was a need for a specific system: a system providing customers with an on-line booking functionality, thus reducing resources doing the booking task. Using Work Analysis, the design project was given a focus on environmental requirements and constraints that the organization does not have the power to affect (at least within a short/mid-term time perspective). This led to a focus towards the equivalent organizational functions. The point was not whether this functional perspective provides a "correct and true" description. Rather, the point was whether this kind of description, as a basis for the design project, could reflect a relevant self-image that the organization wanted to achieve.

Hence, one result of the analysis was to point out where the organization failed to achieve its function and which kind of consequences this implied. In this respect, the basis for Work Analysis in the design project was similar to some basic ideas in the Soft Systems Methodology approach, where a conceptual model is analysed and compared to the problem situation (Checkland, 1981; Checkland and Scholes, 1990). Including strategical issues in a design project using a functional framework is clearly addressing a management related target group. Experiences from using Work Analysis (from the authors of this approach as well as from this project) find this "language" as an appropriate level of abstraction in communicating with management, while non-managerial staff may have difficulties in relating to it. This has been experienced especially when concerning discussions and decisions regarding *where* to apply computer support, in terms of which business functions should be considered as candidates for support.

The overall picture, or self-image, of the organization, which formed the basis for the design project, is The Film Board functioning as a mediator. The Film Board produces films and videos along with distributing films and videos, thus mediating the needs of both producers and consumers (their customers), as outlined in figure 29.

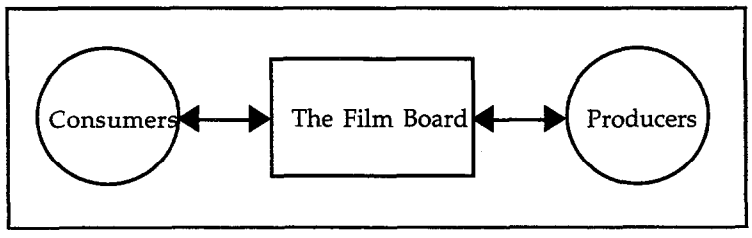

Figure 29: Overall function of The Film Board, outlining the root definition of the work system. The function in focus was the function towards the consumers

This overall function was taken as the basis for the analysis (as a 'root definition' of the work system). The analysis then investigated its complications and consequences relating it to the environment and its equivalent requirements and constraints. The overall function was decomposed further into two levels, the second level, as indicated in figure 30, and the third (and lowest) level as indicated by the subsections in section 4 of the final report (figure 31).

The result of the *functional analysis*, in terms of the description indicated in figure 31, provided a map of all functions in the two departments towards the consumers. Each function was described, along with problems and recommended computer support, stated as briefly outlined ideas

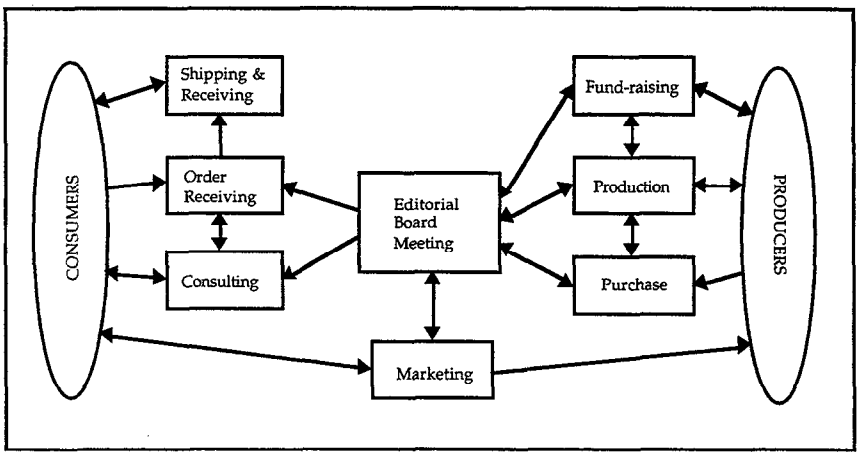

Figure 30: The overall function decomposed to a second level

Functions
- Order Receiving
  - The Booking System
  - Booking by Phone
  - Booking by Written Forms and Letters
  - Issuing Direct to Customer at the Counter
  - Special Arrangement for Libraries
  - Special Arrangement for Schools
  - Special Arrangement for Long-Term Issues
  - Disposing
  - Booking and Disposing for Foreign Countries
- Consulting the Customers
- Administration
  - Updating of the Film and Video Stock
  - Maintaining Customer Files
  - Overdue Notice and Indemnification
  - Systems Administration
  - Relation to Bookkeeping
- Marketing
  - The Catalogue
  - Field Work and Market Campaigns
  - Follow-Up on Market Campaigns
- Relation to the Editorial Board Meeting
  - Transferring Productions to the Order Receiving Department
  - Communication from Marketing to the Editorial Board Meeting

Figure 31: Third level of functions, as indicated by the subsections of section 4 in the final design report

and suggestions. It was subsequently used by the managers in these departments as basis for deciding where computer support was relevant. Also, the overview of functions, especially within Order Receiving, raised a discussion regarding how to reduce and simplify their (many) different arrangements and procedures for booking and lending films and videos. During a number of years, different arrangements had been added, and management did not have an overview of these[52]. This discussion was, of course, important before a decision, regarding which functions (and how) to apply computer support to, was made.

The descriptions of functions did not explicitly address the employees involved (see the discussion in Part II, chapter 7). Instead, they were formulated with reference to job-categories and number of employees involved. The managers in the two departments acknowledged this form, as it provided an overview of the department's functions in terms known from e.g. more formal job-descriptions. A few employees commented and corrected parts of the description, where a function was conducted solely by themselves and thus acted as (a part of) their job-description. The employee participating in the working group, though, had difficulties in relating to drafts on the overall report, except for the few paragraphs related to his own work. Thus the "language" within Work Analysis provided an appropriate level of abstraction in communicating with management, while non-managerial staff had difficulties in relating to it.

The analysis of the organization's environment, in relation to the overall function towards the consumers, led the focus into a *strategical analysis*. The result of this analysis was remarkable: the overall policy of the organization was challenged, and it was revealed that the system they believed they needed (providing customers with an on-line booking functionality) was irrelevant, while they needed other systems nobody had thought of beforehand: systems providing and monitoring information about income, spending, consumer market, etc., along with a system to provide main customers with an electronic version of their catalogue of available films and videos.

The starting point of the design project was stated as a functional analysis of the two departments (perceived as a work system). They voiced a need for a new booking system which could provide their customers with an on-line booking functionality. This could reduce resources

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52 Neither had the employees, partly because the responsibility for administrating these arrangements was delegated to different individual employees.

used in doing the booking task, and could provide resources to consolidate efforts in profiling a new image of the organization and "getting new customers".

Two environmental requirements and constraints were relevant to involve in this context:

- The new image that the organization had decided to achieve, resulting in a present policy focusing on a production of artistic film and video. The organization was following a policy decided on by the governing body: "a house for film and video art" instead of the former policy: "a public library for films and videos".
- Government's demand for an (increasing) income. The purpose of this demand was to force the organization to change from a non-commercial public organization to a more business-oriented organization, having greater attention placed on its earnings, expenditures, and productivity.

The new image, decided by the organization itself, of course had great attention. The demand for income was forced on the organization from "outside". Its purpose was to force quite radical changes into public organizations, having no tradition in balancing earnings with expenditures. This environmental requirement was more complicated to handle, and the organization was reluctant in paying serious attention to it. The main responsibility for acting on both of these requirements was assigned to the two departments, and it was decided then to join them into one department. Here the responsibility for the requirements "ends", resulting in a situation where a need for more resources are regarded as the main problem. Thus the attention is focused on a technological solution with a demand for a new on-line booking system as a means for releasing resources.

In the design project, expectations and assumptions of the departments towards a new booking system, and the "chain of events" leading to this solution, were analysed and compared with an analysis of the target domain of their function: their customers borrowing films and videos from The Film Board. The preliminary results "moved" the analysis from a functional level to a strategic level.

On the strategic level, I claimed that the demand for an income contradicts the organization's overall policy. The present policy, focusing on a production of artistic films and videos, neglects the needs and requirements from the consumer market. The overall organization, management,

and current work practices were not geared for the changes that the demand for income entailed. Neither the governing body, the president, nor the management group had realized the contradiction as to the overall economic situation in trying to follow the policy: "a house for film and video art" instead of the former policy: "a public library for short films and videos." The governing body had even stated that it did not see a contradiction between these two metaphors. Taking the demand for earning money into account, this contradiction was even more apparent. This led to the conclusion that The Film Board needed computer support for this function: they had to consider what kind of information is needed in order to monitor their income, spending, consumer market, etc.

The design report could not avoid highlighting the lack of economical, as well as managerial competence in one of the departments. By reading the report and being a member of the organization, it was easy to trace this evaluation back to a certain middle manager. This middle manager, though, had been loyal to the stated policy of the organization, and had within marketing explicitly chosen the "house for film and video art" metaphor. As mentioned above, this was the real problem if the organization should earn money. This was in the design report pointed out as failures within the responsibility of the president and the governing board[53].

Involving the environment, by an analysis of the customers, into the design project revealed other remarkable results: the need for on-line booking, expressed by the organization, did not correspond to an equivalent need for their customers. Instead, innovation from the customers focused on a need for electronic catalogues, which was not identified by The Film Board beforehand. Even though The Film Board felt they "knew" their customers, they did not know them from such a design perspective. On the functional level, I claimed that the planned new booking system would not have the expected effect (reducing resources doing the booking task), and that they consequently should reject the plans for this system. Instead they needed to respond to changes by their customers' general handling of catalogues by providing their own catalogue in an

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53 When the design report was discussed at a meeting attended by the president and the technology committee, I was forced to play down the latter type of failures in a final version of the report. The employees in the departments were denied a copy of the report in the succeeding couple of months, while the governing body, the president, and the management group considered how to respond and act on its content and recommendations.

electronic way.

If the design project had not taken environmental issues into consideration, it could have resulted in a design-solution recommending an investment in an irrelevant system. The involvement of environmental issues moved the perspective from design of a specific system into an analysis at a strategic business level, challenging the overall purpose of the organization. Work Analysis, its conceptual framework, and guidelines proved to be very efficient in this task. Also, it was not problematic to change what was originally conceived as a functional analysis into a strategic analysis, and subsequently suggesting different systems than those anticipated by the organization. Such a change in levels of analysis has been experienced as a typical situation (see Part II, section 6.2.2). Work Analysis did fully live up to the results I expected from it. In fact this design project did provide some of the most remarkable (and relevant) results I have experienced so far.

A strategic analysis requires thorough knowledge of the organization and its environment. A large part of the basic knowledge of the organization, though, was achieved in the two former design projects in The Film Board conducted the year before.

14. Taking a Closer Look: Applying Ethnographically Inspired Approaches[54]

Claim no. 2: Designers may have to observe users while they are involved in their everyday activities. Observations may be necessary in establishing a mutual learning process with users, aiming towards a shared understanding of the current work practice, along with developing realistic visions of future use of computers.

Claim no. 3: Taking a closer look may unveil users' multiple viewpoints on the current work, as well as on future use of computers. Multiple viewpoints might be harmonious or problematic, in terms of the possibilities of integrating them in a coherent system. In case of conflicting viewpoints, leading to different design solutions, designers should bring up the conflict and its consequences in terms of different design proposals.

In the design project for the Editorial Board, one of our goals was to develop an understanding of the conditions and effects of applying ethnographically inspired approaches. Since we have a background in computer science but try to study, adopt, and use ethnographic approaches in our own design practice, we use the terms *taking a closer look* and *ethnographically inspired* approach. Also, we did not only use ethnographic techniques like interview, observation, and video-recording and -analysis. In parallel, we conducted activities as design sessions, wall-graph sessions, and visited other institutions in order to investigate changes of current work practices. Hence, the overall approach may be described as an *intervention and ethnographically inspired approach,* though the use of ethnographic techniques are in focus in this chapter.

One way to describe the potentials of applying an ethnographically inspired design approach to the design project, is by referring to the

54 A main part of this chapter has been published in Simonsen and Kensing (1994 B). An earlier version of the chapter is published in Simonsen and Kensing (1994 A).

knowledge from the different areas required in participatory design (see figure 3 in Part II, chapter 3). Referring to this figure, the basis for our investigation was to pay special attention to the development of knowledge in areas 1 (concrete experience with user's present work) and 2 (relevant structures on user's present work). Since our research agenda was to investigate possible effects on the design due to our approach, we paid special attention to knowledge developed about their current work practices, the techniques we had used to develop that knowledge, and the effect it had on our visions and design proposals.

The relevance of applying an ethnographic approach to systems design has been argued by ethnographers and sociologists especially (see Part II, chapter 4). Even though an ethnographic approach to systems design has proved valuable, especially within highly specialized product development and research oriented design settings, reports on concrete consequences on a specific design due to such an approach seem scarce.

In the following, I report on what seem to be some concrete consequences from the design project in the Editorial Board, due to the attempt of being inspired from such an approach. Finally, I discuss the effects and conditions from using this approach.

14.1 Taking a Closer Look in the Editorial Board

The first design proposal[55] was a result of gathering knowledge about the current work practices, mainly from interviews and document analyses, even though we, as designers, had only few experiences of the users performing their jobs. Hence, we had few possibilities of evaluating the relevance of the design from the more or less structured presentations of the current situation that we obtained from the users and the written documents (Kensing and Munk-Madsen, 1993).

Through a detailed insight into their work, we wanted to test whether (also if and how) this would affect our preliminary design proposal. It was done mainly by observing the editors working and by observing and video-recording various meetings that the editors attended. Questions and situations which arose from the observations were further investigated in a second interview round.

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55 As described in part III, the design project in the Editorial Board was divided in two parts, and the first part resulted in a preliminary design proposal referred to here.

Our insight into the editors work unveiled different views of the life cycle of a production, from the secretaries and the production manager. To the secretaries, a production becomes relevant (in terms of being cumbersome/problematic and therefore considered a candidate for computer support) after an editor has decided to fund it. On the contrary, the editors spend more time and energy on productions while still considering them for support. The main concern of the production manager, who holds a permanent job, was the total amount of productions that the organization could handle simultaneously, as well as ensuring that each production was sufficiently funded from the very beginning. Instead, the editors, hired for just 2 or 4 years, tend to be more interested in getting as many productions through the system as possible, even to the point of becoming quite active in raising external funding. Since they are recruited from the film milieu to which they usually return, they also had to take into account their reputation in that milieu, thus preferring to give many producers and directors a possibility to produce films. In informal talks, this was referred to in terms like "unavoidable incestuous relations," unavoidable due to the size of the film and video industry in question.

Our observations told us that the editors, too, would benefit from computer support. This may be even more important: they agreed when we presented our ideas. The ideas were aimed at facilitating communication, establishing and maintaining an overview of the economy and the progress of ongoing projects, and supporting fund-raising. We also suggested portable computers that would free them from rewriting a lot of material, if for instance while away from their office they reviewed suggestions for films.

The difference in viewpoint between the secretaries and the editors was *harmonious* in the sense that the functionality needed for the editors could easily be added to those functions needed by the secretaries. Referring to figure 11 in Part III, chapter 8, the editors mainly needed support in the beginning of a production (from the application of an idea for a production is received to the contract being negotiated). The secretaries mainly needed support later in the production (from the negotiation of a contract to the final premiere of a production).

On the other hand, the difference between the production manager and the editors was more *problematic* and challenged our role as neutral experts. It was not possible to allow the editors to keep to themselves the current amount of funding for productions under consideration, and, at the same time, to allow the production manager, who had the responsibility for the total budget, to have access to the same data. Through interviews,

thinking-aloud experiments, and observing the editors and the production manager (especially, when together they negotiated contracts with directors and producers), we realized that this contradiction was crucial. E.g., one of our video tapes shows the production manager, while trying to ensure that a production in question was sufficiently funded, eager to increase the support, while the editor was reluctant to do so, because it would make it problematic for the editor to support other projects currently under consideration.

The design of the financial part of the system could either provide public data and thus support the interest of the production manager, or support the interest of the editors by allowing them to keep this data private until they deliberately wanted it to be public. We brought up this conflict by proposing a redesigned system of the latter type. The rules given by Parliament support this, since they state that it is the responsibility of the editors, based upon artistic evaluation, to suggest to the governing body which films to support and with how much. In our earlier design, sketched before our detailed analysis of their work, the financial data was considered public. The situation was tricky since few of the editors, now and in the past, had been good at estimating production costs. The job of production manager was created for that reason. The current editors agreed to the need for such a job, however they expressed concerns that the production manager implicitly would take over part of their responsibility.

The system we finally proposed intended to support the editors in budgeting the productions under consideration and provided the editors with the power of deciding when their personal calculations - about which productions they were considering to fund and with how much - should be public. Therefore, this would potentially reduce the production manager's influence. The production manager ended up agreeing to this proposal. It was, however, "a hot potato" for some time, which at one point led the production manager to suggest to the president that our detailed analysis of their work should be brought to an end.

We are not suggesting that designers should bring up and play a part in all types of conflicts that manifest during a project. At a meeting with the president, when he had become so used to discussing various matters with us, he "invited" us to engage in a conflict he had with a middle manager. Since, in our interpretation, this conflict was related to different opinions on management style rather than to technical and related organizational matters (which was our commission in the design study), we chose to stay out of the actual conflict. Instead, we chose the role of

"therapist", challenging the way the president dealt with the conflict and discussed alternative ways of handling it. The point is not to take the stand of those you like best or those you, in some sense, are dependent upon. The point is to make explicit the conflicts you see when it involves your responsibilities, i.e. in the case that the design of a system either supports one side of the involved interests, or the other. To bring up a conflict and make it explicit, involves describing to the parties how the conflicts influence the design choices under consideration. Thus, bringing up a conflict and playing a part is not equivalent to supporting one side.

14.2 Effects and Conditions from Taking a Closer Look

The immediate learning experience from this research project was that our "taking a closer look" resulted in specific changes of our first design proposal. This was to some extent a surprising result, as both we and the users found the first design proposal very appropriate. Thus, it serves as a concrete example of how developing knowledge by observation may challenge an immediate knowledge achieved mainly through interviewing users. The first design proposal, mainly based on the secretaries descriptions of their present work, did not directly support the editors: and the editors did not have any ideas as to which kind of systems support they needed. Also, the public access to the financial data in the first design proposal could have led to a situation where parts of the system would not have been used as intended, as the editors would have kept their personal calculations private during initial considerations and negotiations. A similar kind of result, discussing realistic versus idealistic ideas for systems support, and considering public access to data, has been reported by Bødker and Kensing (1994).

Though we have learned that applying ethnographic techniques contributed to this result, it is impossible to specify more precisely which techniques gave which kind of insight. For instance, we believed for some time that we became aware of the importance of keeping financial data confident for the editors, when analysing a video-recording from a meeting. Later, though, we found that this issue had also been touched upon and discussed during interviews performed before we analysed this video.

The overall insight into the editors work was developed by a combination of observations and interviews. Time was also an issue. Observa-

tions, in general, had the effect of generating immediate questions for later interviews and provided us with an experience of their work, which formed a qualitative input to succeeding interviews. The point is to be present when things happen and not only to have it referred. The observations unveiled and illuminated the amount and complexity of the work performed by the editors, i.e. before an idea for a production reaches the process of negotiating the contract and their struggles with fund-raising. Such concrete experiences with their work provided a substance and richness which developed the interviews from a rather questioning form into mutual dialogues and discussions. It was through such additional and substantial discussions that e.g. the conflict with the production manager was conceptualized. The fact that the second part of the design project was performed during a period of approximately three months is also significant: this gave time for developing the insight into the editors' work, thinking through different design possibilities, and discussing and reflecting on design proposals related to current work practices.

Since the design was conducted as part of an action research project, a relevant question is what the conditions are considering applying ethnographic techniques in commercial design projects in similar contexts. Would a consultant in a similar context, but in a commercial situation, be provided with the possibility, time, and resources to conduct such types of studies and analyses? Ethnographic approaches are rather unknown within systems design in industrial settings. For an organization to invest a relatively large amount of time and resources doing observations of current work practices, requires preconditions like:

- The designers and the user organization must have a positive *attitude* towards investing needed resources, and these resources must be available. When using ethnographic techniques, you may not know in advance what effects these will have on the final design. Investing resources in such an approach, thus requires that the organization has their own positive experiences with this, is provided with experiences from others, e.g. in the form of convincing examples, and/or has the resources to do it as an experiment.
- The designers must have the *competencies*[56] to conduct such an

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56 In addition to competence designers should have some patience and enthusiasm using ethnographic techniques. To me, especially analysing video-recordings may be *very* boring. To be honest, I was often struck by an overwhelming tiredness during some of our video-analyses.

approach and to handle the situations that such an approach may imply. Alternatively, external help is needed.

- The designers and the user organization must be able to *identify potential domains* in terms of work practices, where applying "expensive" ethnographic techniques seems appropriate in relation to systems design.

The latter, of the above stated preconditions, raises the question whether it is possible to "economize" the use of ethnographic techniques. This is what Gougen and Linde (1993) refer to as "zooming", i.e. pointing out specific parts of the overall work context as candidates for "taking a closer look".

We did in fact use zooming. Taking a closer look at the editors work was to test whether our first design, mainly supporting the administrative staff, in fact supported the editors work. In this way, we tested our results from the first part of the design project by asking the question (inspired by Work Analysis) "what is the overall intention (or purpose) of the Editorial Board?". Hence, taking a closer look at the editors work was argued for by the need to test that our first design supported the overall function of the Editorial Board, thus avoiding "sub-optimization".

15. Anchoring the Visions

Claim no. 4: As a designer, you are responsible for the development of a vision of a computer-based system. A main concern must be anchoring the vision to those people and competencies that are to act on the vision and its recommendations.

A design project results in one or more visions for future computer-based systems. A computer-based system includes the technical system, the organizational change affecting working practices, and social and technological issues Andersen et al., 1990). In other words a vision means a mental picture of the proposed information system(s) and the technical, organizational, qualificational, and social work context it involves, i.e. a coherent idea and image of how this is all going to work.

In this chapter, I focus on a managerial aspect within participatory design: what Andersen et al. (1990) refer to as management and the relation between performance and management. I introduce the concept *anchoring* to address the concern of taking care of communicating or assigning visions to those actors that have the competence to decide upon and, further, to realize[57] visions into implemented computer-based systems.

Those who decide if a proposed vision should be implemented (having competence in regard to decision) and those who actually implement a vision (having the competence in regard to realization) are not necessarily the same as the main participants in the design project who developed the vision.

Participatory design (as described in Part II) mainly focus on anchoring (to use this term) within a design project, i.e. between designers and current/future users, focusing on learning processes and what Andersen et al. (1990) refer to as performance. In this chapter, I focus on the problem

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57 In the following, 'realize' refers to making the vision a reality as opposed to referring only to grasping or understanding it clearly.

of anchoring visions to those having the competence in decision-making and in realization.

I have experienced that those having competence in decision-making often participate in a design project only in its start (project establishment) and when its results are presented. Those having competence in realization are sometimes not involved until after a design project has been presented and decided upon. Presenting the results of a design project involves that a large amount of information is communicated, usually in a very short time. Descriptions play a major role in this communication, though they cannot stand alone: e.g. when presenting the results of a design project, this may typically involve descriptions in the form of a design report along with different diagrams and sketches of systems, mock-ups, prototypes, etc. But those descriptions are usually given along with an oral presentation and a succeeding discussion. In this chapter, though, the needed descriptions and the questions those descriptions ought to address, are the focus.

Even when using a participatory design approach, such an approach usually requires designers with a competence that enables them to take the responsibility of conducting, managing, and carrying out the process of developing visions. Competent designers have the required experience, skill, knowledge and qualification to act not only in the role as facilitators (Viller, 1991), but also as experts who have the legitimacy in participating in the design process, because of their ability to be responsible for developing the visions.

One abstract and very abridged way to describe how a vision is gradually developed is by looking at the knowledge from the different areas required to do so (see figure 3 in Part II, chapter 3).

At the starting point for the design projects in The Film Board, and hence for the situation from which the development of a vision takes place, we had a basic knowledge covering areas 3 (concrete experience with technological options) and 4 (overview of technological options), while the users covered area 1 (concrete experience with users' present work) and partly areas 3 and 5 (visions and design proposals). Through the different activities carried out in the design projects we achieved knowledge in areas 1 and 2 (relevant structures on users' present work), as well as enhancing knowledge in areas 3 and 4, providing a basis for developing visions (area 5). We organized activities for users to achieve knowledge in areas 2 and 4 (as well as enhancing a common knowledge of area 1) giving them a basis for developing coherent visions. The participation that each of the engaged users contributes is somewhat like

pieces of a puzzle through which the picture of a vision gradually takes form. By participating in the different activities, they experienced that their knowledge within each of their specific jobs contributed to a vision more coherent than was possible for each of them to describe beforehand. The context and complexity of their cooperative work in e.g. handling the productions, were clarified and a vision was gradually developed. A final vision was build upon elicited pieces of relevant structures from area 2 and the more or less shared knowledge from areas 3 and 4, and it was evaluated towards area 1 knowledge.

In the following, I will argue for the assumption that you need specific competencies in order to be responsible for:

1) The *design* project developing the visions. Persons responsible for this are referred to as the designers.

2) Making the *decision* regarding this vision and its recommendations. Responsible for making the decision are the users, i.e. management and employees in the user organization in question.

3) The further *realization* (purchase/development and implementation) and maintenance of the vision. This includes the following:

   - system developers in a vendor organization, offering hardware and software products, or, alternatively, in an internal information technology department (IT-department) within the user organization,
   - a project manager and "technicians" (often referred to as a system administrator) usually within the user organization, and
   - people taking care of training and education.

As a consequence, the designers in charge of 1) needs to hand over, communicate, assign, or *anchor* the vision in the organization, with respect to the competencies responsible for 2) and 3). This implies involving people with these competencies and making descriptions of both the vision of a computer-based system, as well as the plan for the process of further realizing the vision.

1)-3) are, in the following, referred to as three different levels of competencies. I characterize the level of competence with regard to design (1) by describing what is needed, with respect to making the decision upon and to further realize visions. *First*, the level of competence responsible for the decision (2) is described. *Second*, the level of competence responsible for the realization (3) is discussed. The designer, responsible for anchoring the vision to the competencies with regard to

decision and realization, needs to develop and produce descriptions for this task. Consequently, and *thirdly*, a discussion will follow, where the focus will be on the descriptions needed in anchoring visions: which questions should these descriptions address? Hence, the general focus in this discussion is on descriptions needed to structure the communication, and discussions among the participants rather than the participative process itself. *Finally*, I will describe the result of the anchoring in the three design projects in The Film Board.

15.1 Competence with Regard to Decision

Clearly, the visions and their recommendations from a design project have to be decided upon by the organization, and most often designers only have a consulting role in this decision. The main actors are the future users, involved in the vision, and the management, who decide whether or not to realize a vision.

Ideally, this decision implies (and should be made on the basis of) four types of arguments:

- First, an overall *priority* of investment into the domain addressed by the vision is needed. It is mainly a managerial concern to make this priority and it requires some kind of overview e.g. of all major business functions. In all three design projects in The Film Board, the interest parts: users, along with managers, were concerned about this issue: would they get a desired system after all, or would "others" (e.g. another department) be given first priority, leaving their vision in an unpredictable future.
- Second, a coherent *picture* of the vision is needed. This picture needs to be detailed enough for users to recognize the affect on their own work practice, while management (at least) should feel confident with the outcome. In the design projects[58], both users and managers were reluctant to make decisions if they felt they were unclear about the vision and "what it was all about". They sought some confidence in how their work would be affected and supported, and what they would

[58] This was especially apparent in the design project in the Order Receiving and Shipping Departments and in the design project in the Editorial Board. In the design project in the Marketing and Order Receiving Departments, overall organizational concerns "took over", leaving visions as only roughly sketched ideas.

achieve from such a system.

- Third, users and management should be convinced that the vision is relevant, i.e. actually supports or solves problems without imposing new major side effects, in other words, that it is *worth it.* The picture of the vision has to imply that you believe in its potentials and in the benefit you will achieve from it: otherwise the problems in changing and adapting current work to fit the system will not be considered worth doing. Especially to the users, this is not always the case (Lyytinen, 1987; Bullen and Bennett, 1990; Orlikowski, 1992).
- Finally, the vision must be regarded as *possible* and realistic to realize, with respect to the financial and organizational concerns, as well as the qualifications available. This is a rather pragmatic point of view: if a vision is unrealistic, it will not be realized. To management, this e.g. implies that the financial resources are available. The users should feel confident that they would be provided with the possibility to be trained and educated in using a new system. Also, the degree of organizational change embedded in the vision should "fit" the organization's potential of being dynamic (Christensen and Molin, 1983).

Hence, the users should (ideally) be able to argue for statements like:

- I understand what the vision is about and how it will affect and change my work practice.
- I am convinced that it is worth investing the time and effort to learn and "convert" to this vision - that this effort will be paid back by what I achieve by the vision.
- I am convinced that it is possible for me to accomplish this change and that I have or will be provided with the necessary qualifications needed - that I have or will be provided with the time and training/education needed.

Similarly, management should be able to argue for statements like:

- I give priority to an investment in this function/work area/groups of employees, compared to other alternative and possible investments in the organization or within my area of responsibility.
- I have a sufficient understanding of this vision to the extent where I am confident with what it is all about.
- I am convinced that an investment in this particular vision would be

preferable when compared to other possible alternative improvements.

- I regard the costs foreseeable to be worth the investment, and I am able to raise the financial means, manage the reorganization of work practices and other organizational changes, obtain needed qualifications, etc.

15.2 Competence with Regard to Realization

From my practice[59] as a systems developer in industry, I have experienced a division of labor between designers and systems developers, due to both individual and institutional reasons. I worked with tailoring generic software products (standard systems) and developing new information systems for specific customers. In order to keep updated and skilled in using the various technologies (database management systems, 4th generation languages, CASE-tools, client-server technology, etc.), I experienced that I needed to spend most of my time in front of the computer. In a sophisticated development environment (in this case the Oracle-environment), most tools are upgraded with new extended and improved versions, at least once every second year. This rapid change in the technical development environment resulted in a specialization among *individuals* and a division of labor into groups, mainly taking care of customer related issues (at least in the initial parts of a project where the bid, negotiation, and contract are made) and the succeeding tailoring and/or development of an information system.

Also, I experienced a separation between designers and system developers due to more *institutional* forces. Most customers had engaged designers analysing their needs and recommending solutions (building visions), before applying a vendor organization. One reason for this has to do with confidence. A vendor organization will naturally engage a potential customer with its repertoire of solutions and know-how in mind, and thus tend to "find problems suited to existing solutions". Hence, the user organization needs a designer in terms of a consultant advocating the interests of the user organization itself, rather than the vendor. This could also be the situation in larger organizations within the relation between a

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59 Before I started my Ph.D. work, I worked for two years as a designer in a Danish computer firm.

"user"-department and the internal IT-department, as pointed out by e.g. Bødker and Kensing (1994).

In a recent paper by Bansler and Havn (1994), a growing tendency for companies to rely on alternative approaches in developing computer-based information systems is recognized. This is referred to as the process of industrializing software production: a trend to purchase generic software[60] products rather than relying on in-house development. This leads to an approach to the development of information systems referred to as configuration development, "putting generic components together" in building an information system. Configuration development comprises of:

- Feasibility study and requirement analysis, which I refer to as a design project,
- Selection and purchase of a generic system. I consider the selection of a generic system as part of a design project,
- Implementation of generic component configurations. This implies a technical implementation customising individual modules and integrating them into a working system, and an organizational implementation training users and adapting the existing work organization to fit the new computer-based system. This I do not consider as part of a design project,
- And finally, operation and maintenance of the system (which I also do not consider as part of a design project).

Bansler and Havn identify three competencies needed in an organization practising configuration development:

- The analyst, analysing local work practice in order to establish systems requirements. He needs skills in organizational analysis, a basic technical knowledge, and insights into the market of generic software and hardware and evolving industry standards. This competence is what I refer to by the designers in 1), and the project manager

60 Generic systems differ from one another to the extent that they can be tailored or customised to specific applications. Generic software spans from packages "off the shelf" with no tailoring, packages with pre-specified options for tailoring of features and selection of procedures by the customer, packages installed with custom tailoring by customer or vendor, to sophisticated development tools, including a dedicated programming language for use within a limited and specialized domain.

in 3), above.

- The systems programmer with advanced technical knowledge about machine architecture, operating systems, networks, etc., takes care of the integration of generic products into the existing systems, along with its daily operation and maintenance. This competence is what I refer to by the technician or system administrator in 3), above.
- Even though vendors of generic software offer training sessions and courses for users, the modification of the generic products and their integration in existing systems brings about a need for a staff within the user organization with technical insight, taking care of training/education and daily support. This competence is equal to what I refer to as "people taking care of training and education" in 3), above.

I agree to the trend (or industrialisation), as pointed out by Bansler and Havn, and its consequential configuration development approach and needed competencies: this corresponds to my own experiences. The configuration development approach is perhaps especially relevant in smaller organizations, like The Film Board, where there is no capacity to have an internal IT-department. In this case, development of specialized systems, which does not exist on the market as generic systems, may be obtained by contract-development by a vendor or software-house.

15.3 Descriptions Needed in Anchoring

If you agree with the above stated assumption that several different competencies are involved within design, decision, and realization of a vision[61], the consequence is that you have to face the situation that the vision must be *anchored* to the levels of competencies responsible for the decisions regarding the vision and the realization and maintenance of the vision. Since designers are responsible for the development of the vision, this should include the responsibility for the anchoring of the vision as well.

Anchoring the visions brings a need for a participation from people with these competencies. I regard descriptions as an important means in

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61 To make the assumption complete, you, in addition, have to agree that you rarely find neither an omniscient nor an omnipotent superman or superwoman who can bridge all three levels of competence.

this participation: viewed as an object through which a main part of the needed communication is established and structured.

Descriptions alone, e.g. in the form of a written document do not guarantee that the vision will be successfully anchored. Any document is written in a certain context to a certain target group and is always open to different interpretations. A description may be interpreted in ways not intended to or anticipated by the author. An example on this, from the design project in the Editorial Board was the manager from the Bookkeeping Department who was newly hired and had not participated in the project and the presentation of its results. He read the final design report and interpreted the description of the financial support system and its function as an attempt to take over some of his departments responsibilities (which made him rather upset). It was not intended to do so and we were called to a meeting with him to clarify its intended function.

A vendor organization often has as a starting point only a design project-document made by consultants, who might not even be present, since their part of the project has ended. The system developers, facing this document without much additional context, are left with a wide range of questions to which the answers may only be found through activities similar to those already carried out once in the design project.

	Description of the vision of a computer-based system (product)	Plan for the further realization of the vision (process)
Decision	What do we get (A) - system - work org. /qualifications - cost/benefit	(B) Which activities and resources are required
Realization and maintenance	- system (C) - relations between system, work organization, and needed qualifications	(D) - how to develop and achieve those relations

Figure 32: Questions that descriptions of both product and process should address in order to anchor the vision in the organization

Descriptions may serve as the basic documentation and reference in making a final decision and as a starting point in realizing the vision. They have a function as the result and basic reference of a design project: hence they serve as an instrument in communicating the result. Those people who have made the descriptions, and others who have participated in the design project, must be present in order to clarify the context and

discuss different interpretations of the descriptions. This ought to be taken into account regarding both the decision and the realization of the vision.

Descriptions of the visions should include descriptions of both the product and the process, i.e. both the vision of a computer-based system and the plan for the process of further realizing the vision. The questions these descriptions should address, in order to anchor the vision to the levels of competence responsible for decision and realization, are outlined in figure 32.

Below, each of the boxes, A-D, are described and provided with some examples from the design project in the Editorial Board.

A: In order to make decisions on the recommendations from the design project you need a description of the system - that's trivial. You need to know what kinds of organizational changes, changes in work practices, and qualifications are embedded in the computer-based system. For this purpose, the report from the design project in the Editorial Board described a scenario of the future computer supported work practices and the organization of that work handling the flow of a production. Finally, you would like some estimated costs and benefits.

B: In order to make appropriate decisions, you need to know which activities and resources are required to further realize the vision and how this could be organized and conducted. Here, we recommended activities like workshops, where the organization developed the changes in work organization due to the changing of their paperbased administration. The required education and training were described, and we recommended that they hired a new employee with the competence of being the project manager.

C: In order to take responsibility for the realization and maintenance of the vision, you need a description of the system - that's trivial. The need to be aware of what qualifications are required to operate and maintain the system, is also often acknowledged (e.g. most vendors offer courses in the systems they offer, for this purpose). The need to know how the work should be organized in order to make sure that the computer-based system is actually used in the intended way is less acknowledged. In the case of a generic system, the responsibility of adapting the existing work organizations to fit the new system, is often left to the organization.

D: The realization of the vision requires knowledge of how to achieve the

relations between the system and the work organization and qualifications. A vendor cannot, e.g., install a generic system in a proper way, without knowing how to customise various parameters and functions to the work the system should support. In the Editorial Board, the customising of the generic system was recommended to be integrated in the workshops mentioned under B. In addition, some parts of the system supporting the financial management should be developed using an experimental prototyping approach. Also, it was described how to achieve the needed qualifications by local system administrators and a central project manager/system administrator.

The anchoring of a vision requires a thorough understanding of both the product (what do we want) and the process (how might we get it). A successful design project should result in a final document describing a vision and a plan for the further realization, thus providing the necessary basis for making the decisions that the recommendations provide. But such a document cannot, by itself, guarantee that the necessary understanding of the vision and the competence for managing the further process are provided - the organization does not necessarily have the competence or qualifications to realize the decisions. Hence, designers ought to take the role of designing the vision as well as the process to carry it out.

15.4 Anchoring the Visions in The Film Board

The experiences from The Film Board point out that anchoring the visions with regard to decision, was successful, while anchoring with regard to realization was more problematic. To understand and declare oneself in agreement with a vision, does not mean that you necessarily are able to realize the vision. Anchoring the visions with regard to realization brings a need for the competence described as the project manager in 3), above. In an ideal situation the designer and the project manager are the same person. When this is not possible it seems appropriate (and perhaps necessary) to plan a situation where designers and the project manager can meet throughout a period of time.

The result of project establishment (used in all three design projects) constituted the initial basis for a decision, concerning the vision and recommendations expected as results from the design projects. Establishing the design projects created expectations in the organization that

"something" was to be done. Hence, any satisfying solution generated from the design projects was expected to be treated seriously, and decided and acted upon. In general, we found that project establishment, planning the process succeeding the design project, and appropriate follow-up and attention to the anchoring of the vision through a participatory approach, to be useful techniques and activities to accomplish the task of anchoring.

The result of the *first design project*, in the Order Receiving and Shipping Departments, specified the required computer-based system, in a quite detailed manner. The starting point encompassed a rather narrow scope and problem situation, and the final report, did with a few changes, serve as a basis for the succeeding competitive bid.

As a basis for the decision, the outcome from three activities seemed important:

- The drawing of rich pictures (Checkland and Scholes, 1990) resulted in four cartoon-like drawings, outlining the current and future work process viewed from both the Order Receiving Department and the Shipping Department (see figure 18 in Part III, chapter 10). In a simple and clear way, these pictures highlighted how the computer-based system would work and how the current work practice would be simplified and supported.
- Which current problems the system would solve, which it would not change, and new problems which could arise due to the system, were identified by the problem mapping (see figure 16 in Part III, chapter 10).
- The visit to two institutions, one having an in-house developed inventory control system and another using a generic system, made two things clear: The Film Board did not have the competence available for in-house development, and the generic system provided the functionality they needed.

The results from the design project were presented at a meeting with the steering committee and participants from both involved departments. At this meeting, the decision to realize the vision by a competitive bid was made.

The students, who took part in the design project, were later hired by The Film Board to write the material needed for the competitive bid, and to support the negotiations with the chosen vendor offering the new system. In this situation, they provided the anchoring of the vision to the vendor implementing the system.

The result of the *second design project* in the Editorial Board was a vision that included generic systems, in-house developed systems, and contract developed systems, along with a comprehensive reorganization (involving other departments) from mainly paper based to computer supported work practices.

As a basis for decision, the overall picture of the vision was given by the wall-graph sessions (providing a picture of current work practice), combined with the described scenario of the future computer supported work practices and the organization handling the flow of a production. The visit to an institution using a generic project management system, and a succeeding demonstration and discussion of that system by the vendor, clarified that it provided the needed functionality. Also, an estimated price was calculated.

The major argumentation for the benefits was stated, in the report, in more qualitative terms or goals: in order for the editors to have more time to consider applications, take care of their network within the film milieu, do fund-raising, etc., some specified tasks could be supported by the editors themselves using the system. Other specified tasks, done by the editors, could be handed over to the secretaries. This provided that *their* administrative work was rationalized and supported, and it was specified how the system could provide this[62].

The recommended process needed in order to realize the vision included purchase, installation, and tailoring of a generic project management system; experimental prototyping with a financial support system; workshops developing new work organizations; education; an incremental strategy for the overall realization of the system; and that the organization hired a project manager to be in charge of the overall realization process.

When the results from the design project were presented at a meeting with the steering committee and the employees from the Editorial Board, the recommendations and the proposed plan of action were agreed to. It was decided to give the realization of the vision highest priority for the coming years. We were asked to present the results at a canteen meeting with all employees from The Film Board, and provide this presentation with an estimate of the costs. After the canteen meeting, the steering committee decided to realize the vision.

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62 I am aware that benefits, in terms of reducing and shifting time spent on various tasks, could be considered measured in a quantitative way. However, we did not make any attempt to do this.

The realization of the vision required a competence of a project manager which the organization did not have. We had recommended that the organization hire a person with this competence, and that we cooperated with this person through some months, providing him/her with the necessary background to take over the vision, and to develop a strategy and a plan for the overall process of realizing the vision.

The person the organization hired, failed to accomplish this task, and was fired within 3 months (for reasons not relevant to this discussion). The organization then faced a problematic situation: though they had a quite clear idea of what they wanted, they did not have the competence to manage the process of how to get it. Our cooperation with the organization had ended, and we were no longer present (actually we left the country) to hand over the vision to a new employee with the needed competence, which we again recommended for them to hire. Several months later, a new employee was then hired as a project manager. He has managed to create the necessary infrastructure, including a local area network, a connection to the organization's central database, workstations for all employees in the Editorial Board, and portable computers for the editors and the production manager. He has bought standard systems for electronic mail, word-processing, and spreadsheet systems. The development of the rest of the visions and design proposals from our design report (the production-management system and its financial part) has only just begun, two years after the design project ended, since other systems in the meantime, were given higher priority.

The result of the *third design project* in the Marketing and Order Receiving Departments, unveiled problems more related to a strategic organizational and management-related level. Overall conditions on this level had to be clarified, in order to decide which kind of computer support the organization should give priority. The different alternative suggestions for computer support were, consequently, only briefly outlined, while the design project-report focused on the problems related to a strategic organizational and management-related level. In this situation, the organization had both the relevant forums (management-group and governing body), competencies, and traditions to handle the following discussions and decisions. Competence in realization was not needed until this clarification was made. The outlined visions for computer support had primarily the character of pointing out *where* (which functions) to support, and secondarily *how* this support could be obtained.

Conclusion

This dissertation has presented an exploratory endeavour into the early processes of systems design in an organizational context, focusing on how designers should deal with this kind of activity.

Early design processes are an activity within systems development that is poorly understood, and information systems failures can often be traced back to this phase. There is a need for systematic reflections and discussions about what design in an organizational context is about, and how designers should approach and conduct the activity of designing. The purpose of the research that has formed the basis for this dissertation, has been to develop qualified input into the current discussions among researchers and practitioners within the field of systems design. This input has been developed through an empirical study performed by an action research approach. The action research enveloped project establishment and three design projects in a small organization. As a consequence of the relatively uncultivated status of the research in this field, action research has been chosen as the approach for an exploratory study, where no single model or method have been found feasible as *the* guideline: a multitude of approaches, techniques, and descriptions have been applied in an experimental form within the action research project, and the experiences from this have been reported systematically and reflected upon. The results are drawn from my own former experiences as a designer, the experiences achieved through the action research, and a wide range of empirical, theoretical, and methodological contributions from the literature.

The empirical, theoretical, and methodological contributions from the literature have been focused on three approaches: the participatory design approach, the ethnographically inspired approaches, and the systems approaches, in form of Work Analysis. These three approaches have been described in Part II. The description of Work Analysis, in chapter 6, represents a concise, yet comprehensive form, part of which has not been

presented and published before.

The results from the research are presented in chapters 7 through 15.

Chapter 7 discusses and relates the three approaches by introducing the concepts' structures and actions. This leads to a clarification of my own perspective and research interest, and hence, the status of my professional standpoint.

Part III, chapters 8 through 12, presents a detailed description of the empirical work: three design projects. The participatory design approach was used in all three design projects, while an ethnographically inspired approach and Work Analysis were used, in particular, in two design projects. The organization, starting point, activities carried out, and the results obtained by the project establishment and by each of the three design projects, are described. Part III, thus, gives three examples characterizing design, in terms of what design is about, what you as a designer might be involved with, and how to approach and conduct design projects. The description of the organization represents parts of the shared understanding of it, that was developed through the design projects. Part III demonstrates that design, apart from technical considerations, also involves organizational issues comprising of social, political, and managerial/strategical aspects within the organization.

The techniques applied and activities performed include:

- project establishment,
- planning with baselines,
- meetings with technology committee, president, working group, and canteen meetings,
- presentation rounds to various departments,
- interview, interview "in situ",
- observation,
- video-recording and video-analyses, content logging of video-recording,
- thinking aloud experiment,
- document analyses,
- analysis of existing systems,
- drawing rich pictures,
- mapping problems,
- wall-graph sessions,
- design sessions clarifying data, screen-layout, etc.,
- visits to other institutions using information systems,
- demonstration of information system products, and

- writing reports and presenting the results.

The descriptions applied and represented with figures include:

- baseline plans,
- the spatial arrangements within the organization,
- the "flow" of a production, from idea to distribution,
- the organization as a means-end hierarchy,
- the project charter and the three design reports,
- rich pictures of present and future work processes,
- diagnostic problem map,
- wall-graphs,
- system sketch/diagram showing the computer-based communication within one department and between this department and other departments in the organization,
- system sketch/diagram showing how customers could be supplied with an electronic catalogue,
- system sketches/mock-ups of the "private" and "public" part of a financial support system, and
- functional diagrams.

In Part IV, chapters 13 through 15, three aspects from the action research project have been chosen and further elaborated into three lessons learned. This part of the dissertation is structured as to stimulate discussions among researchers and practitioners within the field of design. Part IV is divided into three chapters, each presenting a lesson learned and formatted into a discussion. The discussions open with a claim (one discussion opens with two claims) followed by the arguments for this claim. The four claims represent an attempt to generalize aspects from the action research into more general design guidelines or principles, with respect to their relation to the organizational and situated context from which they have been developed. The argumentation for the claims is mainly based on the experiences and results from the action research project, but considers also empirical, theoretical, and methodological contributions from the literature and my own former experiences as a designer.

The three chapters focus on, respectively, each of the three approaches to design presented in Part II. Also, the three chapters focus on, respectively, an early phase, a "middle" phase, and a final phase within a design project:

- Chapter 13 focuses on Work Analysis and how to link early design considerations to the overall needs for organizational change and

business strategy, i.e. clarifying which work areas and functions are important to offer systems support.

- Chapter 14 focuses on an ethnographically inspired approach, dealing with in-depth analysis of work practices in areas where possible systems support has been given high priority.
- Chapter 15 focuses on a managerial aspect within the participatory design approach. This concerns how to "end" a design project, in terms of anchoring visions, with respect to making a decision about, and succeedingly to realize, the visions proposed as results from a design project.

Chapter 13, "Including the Organizations Environment and Function", opens with claim no 1:

- In conducting a design project, you might realize contradictions, or a lack of policies, in relation to a strategic business level. Clarification at this level might be crucial, in order to ensure that systems sketched at a functional level appropriately support the organization.

The effects of applying Work Analysis to a design project, and conducting a functional and a strategical analysis, are demonstrated. The point was not whether applying a functional perspective provided a "correct and true" description of the organization. Rather the point was whether this kind of description, as a basis for the design project, could reflect a relevant self-image that the organization wanted to achieve. Hence one result of the analysis was to point out where the organization fails to achieve its function and which kind of consequences this implies.

The results of this analysis were remarkable: the overall policy of the organization was challenged, and it was revealed that the system they believed they needed (a system providing customers with an on-line booking functionality) was irrelevant, while they needed other systems nobody had thought of beforehand: systems providing and monitoring information about income, spending, consumer market, etc., and a system to provide main customers with an electronic version of their catalogue of available films and videos.

If the design project had not taken environmental issues into concern, as prescribed by Work Analysis, it could have resulted in a design-solution recommending an investment in an irrelevant system. Involving environmental issues, moved the perspective from design of a specific system into an analysis at a strategic business level, challenging the

overall purpose of the organization. As a result of this, The Film Board decided to reconsider the overall image and policy of the organization, and initiated discussions, based on the design report, within the governing body and the management-group.

Work Analysis, its conceptual framework, and guidelines proved to be very efficient in this design project. The "language" within Work Analysis provided an appropriate level of abstraction in communicating with management, while non-managerial staff had difficulties in relating to it.

Chapter 14, "Taking a Closer Look: Applying Ethnographically Inspired Approaches", opens with claims no. 2 and 3:

- Designers may have to observe users while they are involved in their everyday activities. Observations may be necessary in establishing a mutual learning process with users, aiming towards a shared understanding of the current work practice, along with developing realistic visions of future use of computers.

- Taking a closer look may unveil users' multiple viewpoints on the current work, as well as on future use of computers. Multiple viewpoints might be harmonious or problematic, in terms of the possibilities of integrating them in a coherent system. In case of conflicting viewpoints, leading to different design solutions, designers should bring up the conflict and its consequences in terms of different design proposals.

The effects of applying an ethnographically inspired approach to a design project, are demonstrated by pointing out some concrete consequences this approach had on a preliminary design proposal. The relevance of applying an ethnographic approach to systems design has been argued in a number of recent research papers, but reports on concrete consequences on a specific design due to such an approach seem scarce, if not non-existent.

In the design project, an immediate knowledge was achieved, mainly through interviewing all employees in one department. This lead to the development of a preliminary design. This design proposal did not directly support all employees: some did not have any ideas as to which kind of systems support they needed.

An ethnographically inspired approach was then applied to test if, and how, this would affect the preliminary design proposal. A detailed insight into the employees work was then developed, mainly by observing them while working, and by observing and video-recording various meetings.

Questions and situations which arose from the observations, were further investigated in a second interview round.

A deeper insight into the work unveiled that a system could be designed that directly supported all the employees. This deeper look into their work unveiled a different view on the life cycle of a production when compared to different occupational groups within the department. This also resulted in a specified redesign of the former proposed system.

The difference in viewpoint between two occupational groups was harmonious in the sense that the functionality needed for one group, could easily be added to those functions needed by the other. Another difference in viewpoint was more problematic, and lead to a choice between two possible design proposals. The design could either support the interests of one group, or the other.

Besides the effects that the ethnographically inspired approach had on the design, some preconditions for using such an approach in systems design, in industrial settings, are suggested: the designers and the user organization must have a positive attitude towards investing needed resources, and these resources must be available, since when using ethnographic techniques, you may not know in advance what effects this will have on the final design. Also, it must be possible to identify potential domains in terms of work practices, where applying ethnographic techniques seems appropriate, since these techniques require quite an amount of resources. Finally, the designers must have the competencies to conduct such an approach and to handle the situations that may arise.

Chapter 15, "Anchoring the Visions", opens with claim no. 4:

- As a designer, you are responsible for the development of a vision of a computer-based system. A main concern must be anchoring the vision to those people and competencies that are to act on the vision and its recommendations.

Chapter 15 focuses on a managerial aspect within participatory design. I introduce the concept 'anchoring', addressing the concern of taking care of communicating or assigning visions to those actors that have the competence to decide upon and further to realize the visions into implemented computer-based systems.

Participatory design mainly focuses on anchoring within a design group, i.e. between designers and current/future users, concentrating on the learning processes and performance. In this discussion, I seek to establish a concept of anchoring in a broader organizational and managerial context, by addressing the three levels of competence: the designer,

the decision maker, and the system developer/project manager.

Those who decide if a proposed vision should be implemented (having competence in regard to decision-making) and those who actually implement a vision (having the competence in regard to realization), are not necessarily the same as the main participants in the design project who develop the vision.

I argue for the assumption that you need three specific levels of competencies in order to be responsible for: the design project developing the visions; making the decision regarding this vision and its recommendations; the further realization (purchase/development and implementation) and maintenance of the vision.

As a consequence, designers need to anchor the vision in the organization with respect to the competencies responsible for, respectively, decision-making and realization.

The different levels of competencies are described and characterized, and the descriptions needed in anchoring visions are discussed. For this purpose, a model is developed, presenting some important questions that these descriptions should address.

Finally, the results of the anchoring in the three design projects in The Film Board are described.

The four claims, presented in Part IV, represent some general guidelines or principles, and are thus a very concrete contribution to the development of an approach to early systems design. Before they can be integrated into a coherent approach to design, they need to be further empirically tested. This may be done by practitioners in industrial settings. This way, results from this dissertation may be challenged: a claim may be "falsified", e.g. in terms of disproving its applicability in a certain context. Also, by publishing research papers and by presentations given at various seminars, etc., for both the researchers and the practitioners, discussions among researchers and practitioners within the field of design could be initiated, through which a coherent approach to design in an organizational context can be developed.

Sammenfatning (Conclusion in Danish)

Denne afhandling præsenterer et udforskende studie i edb-forundersøgelser udført i en organisatorisk sammenhæng. Der fokuseres på edb-konsulenternes arbejdsformer ifm. forundersøgelse.

Forundersøgelse er en af de dårligst forståede aktiviteter i systemudvikling: Udvalget af metoder til forundersøgelse er mangelfuldt, forundersøgelse er en af de aktiviteter, der er mest disponerede for fejl, og disse fejl er de dyreste at rette. Der er således et behov for systematiske refleksioner og diskussioner omkring hvad forundersøgelser indebærer og hvordan konsulenter skal foretage dem, kort sagt teori om - og metode til - forundersøgelse.

Formålet med denne afhandling er at give et kvalificeret bidrag til diskussioner om forundersøgelse, blandt såvel forskere som praktiserende konsulenter.

Afhandlingen er baseret på et empirisk studie baseret på aktionsforskning. Studiet omfatter tre forundersøgelser foretaget i en mindre offentlig virksomhed. Forskningens status på området må vurderes som relativt uopdyrket og studiet har en udforskende karakter: Der eksisterer i øjeblikket ikke kvalificerede metoder til forundersøgelse. Dette studie har derfor afprøvet og eksperimenteret med en række potentielle metodebidrag i form af forskellige tilgange, begrebsapparater, teknikker og beskrivelser. Erfaringerne fra aktionsforskningen er blevet rapporteret systematisk, og der er reflekteret over resultaterne. Disse resultater inkluderer både erfaringerne fra det konkrete aktionsforskningsprojekt, mine egne erhvervserfaringer som systemudvikler og konsulent samt en bred række af empiriske, teoretiske og metodiske bidrag fra litteraturen.

De empiriske, teoretiske og metodiske bidrag fra litteraturen har koncentreret sig om 3 tilgange eller "skoler": Systemudvikling med brugere (participatory design), etnografisk inspirerede teknikker (ethnographically inspired approaches), og systemtilgange (systems approaches), sidstnævnte i form af den såkaldte Arbejdsanalyse. Disse 3

tilgange er beskrevet i afhandlingens del II. Arbejdsanalysen er i kapitel 6 beskrevet i en kortfattet men præcis form, hvoraf flere dele ikke har været publiceret før.

Forskningens resultater er præsenteret i kapitlerne 7 til 15.

I kapitel 7 relateres og diskuteres de tre tilgange vha. begreberne struktur og handling. Dette leder frem til en afklaring af mit eget perspektiv, forskningsinteresse og professionelle "ståsted".

Del III omfatter kapitel 8 til 12, og præsenterer en detaljeret beskrivelse af det empiriske arbejde udført som tre forundersøgelser. I alle tre forundersøgelser var brugerne inddraget. To af forundersøgelserne fokuserede specielt på henholdsvis etnografisk inspirerede teknikker og Arbejdsanalysen. Organisationen, udgangspunktet, udførte aktiviteter og opnåede resultater beskrives for dels projektetableringen, dels for hver af de tre forundersøgelser. Del III giver således tre eksempler på hvad der karakteriserer forundersøgelser, og hvordan konsulenter kan gribe forundersøgelser an og gennemføre dem. Beskrivelsen af organisationen demonstrerer tillige karakteren af den forståelse af den, som blev opnået ved forundersøgelserne. Det vil af del III klart fremgå, at man i forundersøgelse, ud over tekniske aspekter, må inddrage sociale, politiske, ledelsesmæssige og strategiske aspekter i den pågældende organisation.

Blandt de teknikker og aktiviteter, der blev gennemført kan nævnes:

- projektetablering,
- referencelinieplanlægning,
- møder med teknologiudvalg, direktør, arbejdsgrupper samt kantinemøder,
- præsentationsrunder til de forskellige afdelinger,
- interviews og interviews "in situ",
- observation,
- videooptagelser og videoanalyser inkl. kategorisering af videooptagelser vha. edb,
- tænke højt forsøg,
- dokumentanalyse,
- analyse af eksisterende systemer,
- tegning af "rige billeder",
- kortlægning af problemer,
- workshops med "væggrafer",
- design workshops, med fokus på dataanalyse, skærmbilled-layout, m.m.,
- besøg til andre institutioner for at se deres edb-løsninger,

- demonstration af edb-systemer hos leverandører og
- udformning og præsentation af forundersøgelsernes resultater.

Blandt de beskrivelser, der blev anvendt, og som præsenteres ved forskellige figurer i afhandlingen, kan nævnes:

- referencelinieplaner,
- organisationsdiagram med angivelse af afdelingernes fysiske placering,
- produktionens vej fra ide til distribution,
- organisationen afbildet i et mål-middel hierarki,
- projektgrundlag og de tre forundersøgelsesrapporter,
- "rige billeder" af nuværende og fremtidige arbejdsprocesser,
- diagnostiske problem kort,
- "væggrafer",
- systemdiagram der viser den edb-baserede kommunikation inden for en afdeling og mellem denne afdeling og andre afdelinger,
- systemdiagram der viser hvordan virksomhedens kunder kunne tildeles elektronisk baserede kataloger,
- systemdiagrammer (mock-ups) demonstrerende den "private" og den "offentlige" del af et økonomisystem, samt
- funktionsdiagrammer.

Del IV rummer kapitlerne 13 til 15, og her er der udvalgt tre elementer fra forundersøgelserne, som analyseres særligt dybtgående. Denne del af afhandlingen er udformet som oplæg til diskussion blandt forskere og praktikere. De tre kapitler indledes hver med en påstand (et af kapitlerne indledes med to påstande) som der efterfølgende argumenteres for. Disse i alt fire påstande repræsenterer afhandlingens forsøg på at generalisere nogle aspekter fra forundersøgelserne og udforme dem som generelle retningslinier, heuristikker eller principper. Dette gøres med baggrund i den organisatoriske og situationsbundne kontekst som de er opstået fra. Argumentationen for disse påstande tager sit hovedudgangspunkt i de opnåede erfaringer fra hele aktionsforskningsprojektet, men der trækkes også på empiriske, teoretiske og metodiske bidrag fra litteraturen samt på mine egne erhvervserfaringer som systemudvikler og konsulent.

De tre kapitler fokuserer på henholdsvis hver af de tre skoler, der blev præsenteret i del II. Derudover fokuserer de henholdsvis på tre forskellige faser inden for forundersøgelser: en initierende og tidlig fase, en midterfase samt en afrundingsfase:

- Kapitel 13 fokuserer på Arbejdsanalysen og på hvordan man kobler en

forundersøgelse til organisationens overordnede formål, udvikling og forretnings- og edb-udviklingsstrategi. Dette indebærer en kortlægning af, hvilke arbejdsområder og funktioner der er vigtige at overveje mht. ny teknologi.

- Kapitel 14 fokuserer på brugen af etnografiske teknikker og omhandler detaljerede studier af nuværende arbejdsgange inden for områder, som det er blevet prioriteret at edb-understøtte.
- Kapitel 15 omhandler et ledelsesaspekt i forbindelse med systemudvikling med brugere. Der fokuseres på hvordan en forundersøgelse afsluttes og forankres i organisationen mht. beslutning om - og realisering af - forundersøgelsens anbefalinger.

Kapitel 13, med titlen "Including the Organization's Environment and Function", indledes med påstand nr. 1:

- Ved forundersøgelser, kan man komme ud for at indse, at der mangler eller er modstridende overordnede strategiske overvejelser. Det er i dette tilfælde vigtigt at få afklaret en overordnet strategi for at sikre, at de påtænkte edb-systemer understøtter organisationens funktioner.

Kapitlet demonstrerer effekten af at benytte Arbejdsanalysen i en forundersøgelse som middel til at gennemføre både en funktionsanalyse og en strategisk analyse. Analysen kortlægger organisationens omgivelser og funktion og konsekvenserne af, at organisationen ville forsøge at efterleve en bestemt forretningsstrategi og profil. Det blev påpeget, hvor der var problemer, og hvad konsekvenserne ville være, hvis målene for forretningsstrategien skulle opnås.

Forundersøgelsen gav nogle overraskende resultater: Den udfordrede organisationens overordnede forretningsstrategi og profil og det blev påvist, at den edb-løsning (on-line bestilling af film direkte fra kunden), som organisationen mente de havde behov for, var perspektivløs, og at de derimod havde behov for to andre systemer, som ingen havde overvejet før: Et system til monitering af økonomi ifm. kundetransaktioner og markedsfremstød, samt et system, der kunne tildele deres kunder elektroniske versioner af deres filmkatalog.

Hvis forundersøgelsen ikke havde omfattet en analyse af organisationens omgivelser og funktion, kunne den være endt med at anbefale en investering i et edb-system, der ikke ville være blevet anvendt af de kunder, som systemet skulle betjene. Forundersøgelsen var som udgangspunkt defineret som en funktionsanalyse, men skiftede fokus og

blev suppleret med en strategisk analyse, som kritiserede organisationens overordnede forretningsstrategi og profil. Resultatet var, at organisationens ledelsesgruppe og bestyrelse besluttede at genoverveje sin forretningsstrategi og profil med udgangspunkt i forundersøgelsens rapport og anbefalinger.

Arbejdsanalysen og dens begrebsapparat og metode viste sig at være ganske anvendelige i denne forundersøgelse. Dens begrebsapparat gav et abstraktionsniveau, der var passende for ledelsesrepræsentanter, mens medarbejderrepræsentanterne havde problemer med at forholde sig til forundersøgelsens indhold.

Kapitel 14, med titlen "Taking a Closer Look: Applying Ethnographically Inspired Approaches", indledes med påstandene nr. 2 og 3:

- Konsulenter kan drage fordel af at observere brugere, mens de udfører deres daglige arbejde. Observationer kan give et nødvendigt indblik som grundlag for en gensidig læreproces med brugerne: Dette kan lede til en fælles forståelse af nuværende arbejdsgange og et fælles udgangspunkt for udvikling af visioner om fremtidige edb-baserede systemer.

- En dybere forståelse af nuværende arbejdsgange kan afsløre forskellige opfattelser af - og holdninger til - både nuværende arbejdsgange, og ideer til forandringer ifm. indførelse af nye edb-systemer. Disse forskellige opfattelser og holdninger kan være i harmoni med hinanden, men de kan også være udtryk for konflikter. I tilfælde af konflikter, der påvirker forundersøgelsens systemforslag, skal konsulenten bringe konflikten, og dens konsekvenser i forhold til forskellige systemmuligheder, åbent frem i de relevante fora.

I kapitlet demonstreres effekten ved brugen af etnografisk inspirerede teknikker ved at påpege de konkrete konsekvenser, som dette fik for et forslag til et edb-system. Der findes i litteraturen en række bidrag, som argumenterer for det relevante i at benytte etnografisk inspirerede teknikker i forundersøgelser. Dog har det hidtil knebet med rapporter (hvis sådanne overhovedet findes), der påviser konkrete edb-tekniske konsekvenser, som en anvendelse af sådanne teknikker har resulteret i.

I den forundersøgelse, hvor de etnografisk inspirerede teknikker blev anvendt, var der i forvejen foretaget interviews af alle medarbejdere i den berørte afdeling. Disse interviews dannede baggrund for et forslag til et edb-system. Ikke alle medarbejdere kunne direkte drage fordel af dette system. Nogle medarbejdere havde ingen ideer til, hvordan deres arbejde

kunne understøttes af ny teknologi.

De etnografisk inspirerede teknikker blev herefter anvendt for at undersøge, om de kunne give en dybere indsigt i arbejdsgange på en måde, der ville resultere i ændringer til det foreslåede system. Der blev foretaget observationer af medarbejdere, mens de udførte deres daglige arbejde. Derudover blev en række møder observeret og videooptaget og efterfølgende analyseret. Spørgsmål, som dukkede op under observationerne, blev forfulgt i opfølgende interviews.

Den viden om arbejdsgange, som opnåedes herved, afslørede, at alle medarbejdere kunne opnå en hensigtsmæssig understøttelse af deres arbejdsfunktioner vha. edb. Det blev også klart, at der eksisterede forskellige holdninger til de nuværende arbejdsgange: Forskellige faggrupper havde forskellige opfattelser af, hvad der var væsentligt i et produktionsforløb, og hvordan det skulle gribes an. Dette blev væsentligt for udformningen af det fremtidige edb-system.

De forskellige opfattelser mellem to faggrupper, af det væsentlige i produktionsforløbet, var harmonisk i den forstand, at begge faggruppers behov kunne imødekommes i forslaget til edb-systemet. Derimod var to andre faggruppers forskellige holdninger til, hvordan et produktionsforløb skulle gribes an, konfliktfyldt, og ledte til et valg mellem to forskellige udformninger af edb-systemet. Systemet kunne kun udformes, så det støttede enten den ene eller den anden faggruppes interesser.

Ud over at påvise de ændringsforslag til edb-systemet, som anvendelsen af de etnografiske teknikker resulterede i, angives nogle forudsætninger, som anses for væsentlige, hvis sådanne teknikker skal benyttes i en industriel og kommerciel sammenhæng: Organisationen skal både have de fornødne ressourcer og samtidig acceptere, at resultatet af brugen af sådanne teknikker ikke kan forudsiges. Derudover skal det på forhånd kunne afklares, hvilke arbejdsdomæner, som disse teknikker bør anvendes på, da de er meget ressourcekrævende. Endelig skal konsulenterne have de fornødne kvalifikationer til at udføre etnografiske analyser og kunne håndtere de situationer, som kan opstå ved deres brug.

Kapitel 15, med titlen "Anchoring the Visions", indledes med påstand nr. 4:

- Konsulenter, der udfører forundersøgelser, er ansvarlige for at udvikle en vision i form af et tænkt fremtidigt edb-baseret system. En hovedopgave er at forankre denne vision til de personer, der er ansvarlige for - og kompetente til - at føre visionen og dens anbefalinger ud i livet.

Kapitel 15 omhandler et ledelsesaspekt i forbindelse med systemudvikling med brugere. Begrebet "forankring" introduceres, som et middel til at fokusere på problemet med at overdrage visioner til de personer, der har kompetencen til at beslutte og efterfølgende realisere visionerne i form af implementerede edb-baserede systemer.

Systemudvikling med brugere har traditionelt fokuseret på forankring inden for den gruppe, der udfører forundersøgelser og systemudvikling, dvs. mellem konsulenterne/systemudviklerne og brugerne. Fokus har været på gensidige læreprocesser og selve udførelsen frem for ledelsen af projektet. I kapitel 15 diskuteres forankring i en bredere organisatorisk og ledelsesmæssig sammenhæng, hvor tre niveauer af kompetence er involveret: Konsulenten der udfører forundersøgelsen, beslutningstageren og systemudvikleren/projektlederen der realiserer systemerne.

De personer, der tager beslutning omkring en forundersøgelses visioner og de, der ender med at realisere (indkøbe/udvikle, implementere og vedligeholde) visionerne, er ikke nødvendigvis blandt de personer, der udfører selve forundersøgelsen.

Jeg argumenterer for det udgangspunkt, at der reelt findes tre forskellige niveauer af kompetence, der hver især er ansvarlige for: 1) at gennemføre forundersøgelsen og udvikle visioner, 2) at tage beslutning omkring visionen og dens anbefalinger, samt 3) at realisere og vedligeholde visionen i form af edb-baserede systemer.

Dette får som en konsekvens, at forundersøgelsens konsulenter har til opgave at forankre visionen i organisationen med hensyn til de kompetencer, der er ansvarlige for henholdsvis beslutning og realisering.

De forskellige niveauer af kompetencer bliver herefter beskrevet og karakteriseret og de beskrivelser, der er nødvendige i forbindelse med forankring bliver diskuteret. Til dette formål præsenteres en model, som angiver vigtige spørgsmål som beskrivelserne bør søge at besvare.

Til sidst gennemgås resultatet af den forankring, som blev foretaget i de tre forundersøgelsesprojekter.

De fire påstande, der præsenteres i del IV, repræsenterer nogle generelle retningslinier og principper, og udgør dermed et meget konkret bidrag til en metode til forundersøgelser. Før de kan indgå som en integreret del af en mere omfattende metode er der dog behov for, at de bliver yderligere empirisk afprøvet. Dette kan fx gøres ved, at de benyttes af praktiserende konsulenter i kommercielle forundersøgelser. Dette kan lede frem til, at resultater fra denne afhandling udfordres: Fx kan en påstand blive kritiseret ved at vise sig unyttig, eller ligefrem umulig at følge i nogle situationer. Derudover kan resultaterne indgå i diskussioner mellem

forskere og praktikere ved, at de bliver publiceret i diverse artikler og præsenteret ved seminarer og andre lejligheder. På denne måde kan afhandlingens resultater tjene som oplæg til de diskussioner, som et kvalificeret bud på en metode til forundersøgelser i organisatoriske sammenhænge, bør udvikles i kraft af.

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