

Work Analysis

Evaluation and further Development of The Work Analysis - an Approach within Information Systems Requirement Analysis

1: Project scope and problem statement

Project scope

I am working within the area of requirement analysis¹ in systems development. It concerns the phase from the initial recognition of a possible need for computer support in an organization, until this "need" has been analysed, described and discussed, and an overall functional design for the corresponding computer support has been made.

I use the term *designer*² - (for the person doing requirement analysis) instead of the more overall term *systems developer* (the one who is developing systems). This is to emphasize that I have a focus on the early stages of the systems development process in general, where the construction and implementation of a proposed system has not yet begun. You may compare this more explicit term with a corresponding differentiation within the area of construction: The *design* of buildings (made by *architects*) and the construction of the building (made by the engineers and craftsmen).

The *focus* of requirement analysis is on the application area, the work in question, and on the process of designing computer support for this work.

The *purpose* of requirement analysis 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, as well as development of the qualifications of people working in the organization.

The process 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.

When the process is considered *finished* is more vague to me. A rather ambiguous definition is when the organization is ready to sign a contract for constructing and implementing a computer based system, initiating organizational changes as well as a learning program³.

¹ In Danish the term is *forundersøgelse*, which could be translated to *pre-investigation*. In the English literature this scope (or part of it) is referred to as preliminary design, requirement engineering, -elicitation, -specification, -analysis, survey, feasibility study, pre-study, early systems design or the like.

² Here I will comment on a paper by Pentti Kerola (1982): he introduces in this paper the term *Information System Architect - IS-architect*.

³ Alternatively, the process could finish, when the organization realizes that it needs no new computer support after all. If this is the case, the result is likely to be identification of possibilities for re-designing work activities, e.g. by reorganizing the work, etc.

The *result* of a requirement analysis process may take the form of a report and - perhaps - some prototypes illustrating key ideas. The report will contain a system description, plans for developing the system, estimates about resources to be spend etc. In addition some people in the organization have to be carriers of the changes agreed up on. The latter part is not the least important. It has some severe consequences as to whom should take part in the process: who in the organization would be able to spare the energy as required. I do not consider the design of the system development process following the requirement analysis: this topic treated in detail in e.g. (Andersen et al., 90).

The *systems* I consider is information systems within an administrative context, i.e. where several people carries out complex administrative cooperative work.

Problem statement

The domain of developing computer based technology has changed. From automating routine tasks in the administration and mechanical operations in the production line and interfering with work processes of a delimited and well understood nature, modern technology is now integrated with complex work processes which often have a high degree of cooperation⁴. The reason for this change arises from⁵

- the possibilities offered by the new and emerging technology,
- a more general change in the nature of work, provoked by new demands to - and constraints on - modern business,
- an emerging but general awareness towards the object of the technology: the social structures and the work in question.

This change in domain entails severe consequences for the design process increasing both its volume and its qualitative substance. The application of modern technology deeply affects the need for organizational changes as well as the development of the qualifications of the users, i.e. these areas become part of the domain of requirement analysis.

The experience and domain of knowledge behind traditional approaches for systems development originates for the major part in the "old" domain. Most of their methods and techniques originates from specific approaches for construction and implementation of computer systems. This approach needs to be complemented with methods and techniques, based on the nature of the work in question, in order to keep up with the emerging domain (Schmidt and Carstensen, 90, p. 70).

In the literature, requirement analysis is claimed to be an activity within system development which is poorly understood, and very often information systems failures can be tracked back to this phase (Lyytinen, 87, p. 9).

I consider a major problem in current requirement analysis to be the gap between to-days practice and an approach needed for the emerging domain. This gap can lead to systems which might be technically perfect, but which do not meet the needs of the organization. The challenge in requirement analysis is not to develop the system right, in

⁴ One could claim, that the "change of domain" is merely a result of the science of information systems realizing that administrative work to be automated or supported, after all is quite complex processes (Suchman, 91; Wynn, 91).

⁵ This is e.g. expressed within the CSCW-community (Computer Supported Cooperative Work). See e.g. (CSCW'90; ECSCW'91; Simonsen, 92A; Schmidt and Carstensen, 90).

a technical sense (this is the challenge after the requirement analysis), but rather to design the right - or more correctly, a relevant - system, in respect to the work in question. In order to meet this challenge and change their existing working habits, designers need methods, techniques (perhaps even specialized tools) as means for developing their own experiences and skills within requirement analysis. These methods and techniques must give designers the possibility to:

- design computer support for the work in question with the starting point of analysing this work. This analysis must especially include the cooperative work in its focus.
- perceive the scope of the design process as involving 3 interrelated areas: the development of the computer systems, the change of the organization and the development of the qualifications of the users.
- consider the design process as problem setting, stressing relevance, rather than rational problem solving, stressing correctness.
- avoid reducing complexity too quickly. Designers should have the nerve to involve themselves in what often seems to be a chaotic situation for a while, to appreciate the richness of the organization.
- be aware not to rely solely on what agents in the organization *say* are the problems, and what they think might be proper solutions (e.g. initially stated problems, needs and goals). Often there is a gap between what people say they do, and what they observably⁶ do, and this might even differ from what they think they do (Suchman and Trigg, 91; Wynn, 91).
- naturally involve users in the change process, in cooperation with the designers.

One promising suggestion is the Work Analysis. This approach originates in an ESPRIT-project, FAOR (Functional Analysis of Office Requirements (Schmidt, 88)) and has further been developed by Kjeld Schmidt and Peter Carstensen (Schmidt and Carstensen, 90).

In (Schmidt and Carstensen, 90) the theoretical assumptions and practical problems of the work analysis are discussed. It is suggested that a analysis of work must be based upon a theory of *work*. This theory is outlined through a conceptual framework for the work analysis. Furthermore a method for doing the analysis is briefly outlined.

The Work Analysis suggests a distinction between 3 levels of analysis (Schmidt and Carstensen, 90, pp. 110ff):

- Strategical analysis. This analysis results in a strategic plan for the use of information systems in the system of work. Focus is the functional demands of the environment upon the system of work considered in general. This could e.g. be the overall purpose of an entire organization, as related to the demands of its environment. The result should define those domains of work, decision situations, and domains of tasks which would be appropriate to support the information systems.
- Functional analysis (or tactical analysis). This analysis results in a plan defining the overall functional requirements and demands. Focus is on the functions within the system of work, as defined in the strategical analysis. This could e.g. be one specific

⁶ When I say "observably" here, this means "what designers as outsiders observe and interpret them to be doing". This can also include how designers see them make sense of each others' actions, implicitly (e.g. in their responses) and explicitly, in their comments on specific situations.

department or task in the organization. The result should specify the functional division between the agents and the information systems.

- Operational analysis. This analysis results in the requirement specification. Focus is on the information system(s) in question, as specified in the functional analysis. The process of this analysis can be highly structured, as suggested in various methods (e.g. structured analysis etc.).

The scope of requirement 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.

The Work Analysis is still a fuzzy concept and there is only few practical guideline's and experiences concerning *how* it should be performed.

My study has its starting point in the overall problem statement: *how and to which extend does the Work Analysis solve the need for methods and techniques as described above?* This question includes:

- **how does the Work Analysis work in practice?**
- **How is the relationship between analysis and evaluation; analysis and design; comprehension and change? What is the role of the designer in charge of the Work Analysis and how does different participants/agents participate in the Work Analysis?**
- **how does it improve the requirement analysis?**
- **where is it problematic and/or "blind" in requirement analysis?**
- **where and *how* does it need additional suggestions/techniques and further development?**

Within this study my focus will be at *techniques for descriptions*. This comprises all kind of descriptions (and the process: how is it made) - of the work, suggestions for design etc. - which are relevant to produce during and concluding the Work Analysis. Such descriptions are used for evaluation of the current analysis, presenting design suggestions, describing and initiating changes etc. I find such descriptions very unveiling for an approach. The descriptions can be regarded as an important and visible *product* of the Work Analysis. Relevant questions considering techniques for descriptions includes:

- **How do they look?**
- **how are they produced and who is involved in the production of the descriptions?**
- **who should be involved in the presenting of the descriptions and in the decisions and following actions made in the light of the descriptions?**
- **who should be able to do what (e.g. make what kind of decisions) in the light of the descriptions?**

2: The significance/level of difficulty of the problem

As a systems developer I have experienced that designers face the requirement analysis with a great deal of uncertainty. They plan and manage the process in a quite random 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: The requirement analysis is by nature a very chaotic and

uncertain process, and most designers - often with a background in natural science or engineering - must face this situation with none or only few qualifications, techniques, tools, concepts, models, etc.

In short, my experience is the following:

- In requirement analysis the designer start 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 do not know in advance), and an introduction to what different agents in the organization are doing (their work), and what they believe is the subject, needs and problems to be analysed. I have experienced this as a very chaotic period, in which you get a lot of different and conflicting impressions.
- After some time, some kind of preliminary picture of the organization and the need(s) will crystallize, and I begin to see the frame of possible computer support. At this time the requirement analysis will be formed by parallel and interactive activities of analysis and design.
- My picture of the organization, its need(s), and the solutions made possible through computer systems, arises from my interpretation of the various impressions I get from dealing with the organization. So to test and correct this interpretation the requirement analysis will need regular confrontations of my interpretation with the interpretation of various agents in the organization.
- In order to discuss and create/harmonize concepts and notions from the different interpretations of the designers and the agents in the organization, some kind of intersubjective "model" is needed. For this purpose various kinds of descriptions can be used, both descriptions of the designers interpretation of the organization/need (analysis) and the solutions made possible through computer systems (design). These descriptions can be based on text, drawings, prototypes (maybe even video recordings), etc, and they play an important role in the requirement analysis, as they are the tools which enables, develops, and confronts the different knowledges - of the designer and the agents in the organization - and supports them in communicating and understanding each other.

The designers who feels that they are uncertain and in lack of qualifications in making requirement analysis, 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 own experiences. Relevant methods and techniques may guide designers in order to achieve own relevant experiences.

An approach - like the Work Analysis - and its methods and techniques, is an abstraction from skilled, experienced, and rational ways of behaviour in concrete situations.

The skilled, experienced, and rational behaviour in requirement analysis is characterized by getting the right (relevant) ideas (of computer support) in the concrete situation, and the ability to argue for this idea to some extent. This implies an openness to the concrete situation and some sort of conceptual framework, which supports you in your understanding of the organization, expression of this understanding, participating in discussions and in using other (similar) situations or experiences.

At the university I studied computer science and communications (a subject rooted in the humanities). I have experienced interdisciplinary work within design, and I believe that an interdisciplinary perspective, including methods and techniques from com-

munication⁷, can play an important role in increasing our understanding of - and ways of managing - requirement analysis.

Within the CSCW-community the interdisciplinary field of CSCW is acknowledged, as well as the need for combining traditional approaches from computer science with approaches from the social sciences and the humanities in order to design systems that support the way people observably cooperate in organizations.

The critique of the "traditional approaches" has been comprehended within my education, and I consider myself a "hybrid", or a "second generation designer", with an interdisciplinary background⁸. With this background, I expect the benefit of my work to be a thorough evaluation - and further development - of the Work Analysis.

3: Critical review of other research approaches and results related to the problem statement

The following outlines 3 (national) research projects and 3 research approaches related to the problem statement.

The MUST-project (Roskilde University)

The MUST-project is carried out by Finn Kensing and Keld Bødker, with me and Lars Bogetoft as research fellows and Ph.D. students. The project started in autumn 1991.

It is a project with an approach to the design of computer support for cooperative work guided by a combination of two perspectives - a language action and a cultural perspective. The purpose of the MUST-project is to examine and clarify requirement analysis as it is carried out by practitioners, and to develop and test a theory of - and a method for - requirement analysis, partly based upon the above mentioned perspectives. The "MUST-approach" is intended to support the process of designing computer support for cooperative work.

We are currently doing requirement analysis in two industrial settings, one funded by the government, the other privately. The two organizations wanted to investigate needs for computer support. Our purpose was to get realistic settings for developing and testing methods and techniques. The two cases begun in the autumn of 1991 and will continue for 1 - 1,5 year.

The activities and techniques that are considered and used in the two cases comprises:

- interview (open and unstructured),
- analysis of documents,
- observation (direct and participating, also including "thinking aloud experiments"),

⁷ Methods and techniques from communication are inspired from sociology. A particular interest has been in the work of Jürgen Habermas (e.g. The Theory of Communicative Action).

⁸ Which means that I am neither an expert in computer science or cognitive science, a sociologist, nor a psychologist or the like, but maybe a little bit of it all.

- video recordings analysed through the DOTS-system⁹,
- mockups and simple prototypes,
- various meetings and negotiations,
- free hand drawings of work situations, functions etc.,
- modelling of functions, working areas, and other diagramming techniques,
- various workshops and seminars.

The project was initiated by Finn Kensing and Keld Bødker. They carry their "own" theoretical perspective - the language action perspective and the cultural perspective respectively - into the project, and one objective of the MUST-project is to integrate the language action and cultural perspectives. Lars Bogetoft is interesting in decision making and especially how groups makes decisions within the requirement analysis. My focus is on the Work Analysis. As a member of the project team all my work will naturally be related to, and become a part of this project.

Rapid Systems Modelling (Aalborg University)

The project "Rapid Systems Modelling: The Soul of a New Methodology" is carried out by Lars Mathiassen, Andreas Munk-Madsen, Peter A. Nielsen, and Jan Stage, and is described in (Mathiassen et al., 91).

"Rapid Systems Modelling combines and adapts already established ideas and methodologies about analysis, design, modelling, documentation and management" (Mathiassen et al., 91, p. 9).

The already "established ideas and methodologies" concerns Soft Systems Methodology, object oriented thinking in combination with prototyping, and management of risk.

Rapid Systems Modelling addresses the same scope as requirement analysis does (Mathiassen et al., 91: see pp. 3, 9 + fig. 2). Early activities are approached by Checklands Soft Systems Methodology (learning approach) (Mathiassen et al., 91, p. 9). The applied techniques are modelling techniques based on prototypes and object-orientation from the methodologies of Jackson and Yourdon (Mathiassen et al., 91, pp. 7f, 11ff).

Compared to the MUST-project, Rapid Systems Modelling comprises the same scope and includes activities following requirement analysis. Rapid Systems Modelling uses already established ideas and methodologies (within requirement analysis mainly Checklands Soft Systems Methodology). While in the MUST-project we very carefully analyse the work in question the aim of Rapid Systems Modelling is rapidly to make a design proposal (e.g. as a prototype) and use this proposal as the starting point in the following analysis and design.

The DEVISE-project (Aarhus University)

The DEVISE-project is described under the heading: Tools and Techniques for Experimental System Development. A lot of people participate in this project. The following description of the project is based on a paper written by Kaj Grønbaek and Jørgen

⁹ Video recordings and -analysis trough DOTS (Data Organizing Tool for Systems developers) was presented at the COSCIS-conference in Helsinki, 1991 by Finn Kensing and Terry Winograd. See (Kensing and Winograd, 91).

Lindskov Knudsen in cooperation with Niels Damgaard Hansen, Kurt Jensen, Morten Kyng, and Ole Lehrmann Madsen (Grønbæk et al., 91).

"The project is bringing together three different approaches to experimental system development: Cooperative system design with users, object oriented development, and formal system description, simulation, and verification using Coloured Petri Nets." (Grønbæk et al., 91, p. 1).

The participants in the DEVISE-project comprises 3 research-groups at the university, the System Work Group, the Programming Language Group, and the Petri Nets Group.

"The goal of the project is to provide support for increasing the productivity and quality in development of large complex systems. This goal will be realized through design and implementation of integrated computer based tools, development of techniques and methods for the use of such tools, further development of the theoretical framework for experimental system development as well as testing of results together with relevant users." (Grønbæk et al., 91, p. 1)

The core of interest in the System Work Group which forms the relation to the MUST-project and my work is

"...the question of user influence on design and use of computer systems which is embodied in a Cooperative Design approach" (Grønbæk et al., 91, p. 2).

Among their research and design ideals they mention:

"The design process highlights the issue of how computers are used in the context of work organization. Thus the users work-practice is taken as a fundamental starting point for the design process" (Grønbæk et al., 91, p. 2).

Historically this group participated in 3 research projects, DUE, UTOPIA and COOP. (Grønbæk et al., 91, pp. 2f).

In relation to DEVISE the System Work Group will participate in the development of techniques, methods, concepts, and theories, particular in the area of cooperative design.

"... we expect major results in the area of cooperative design, that is those aspects of design where cooperation between professional developers and users is primary...In particular development of techniques and theories for prototyping with active user involvement will be in focus" (Grønbæk et al., 91, p. 14).

Compared to the MUST-project, the System Work Group in the DEVISE-project addresses the same scope, with a focus on prototyping in requirement analysis. They focus on cooperative design tools, which I find very interesting, even though this is formulated in a short and vague statement:

"Cooperative design tools: In this area we focus on the development of cooperative design tool, based on hypermedia ideas (Conklin, 1987). Support for shared, distributed material and the support of several people working jointly on that material is the primary interest." (Grønbæk et al., 91, p. 5).

The Language Action Approach

This research approach is directly related to the MUST-project (and hence my work) through Finn Kensing.

His recent work (Kensing and Winograd, 91) explores a language action approach (as launched by Winograd and Flores (Winograd and Flores, 86)) with the "Scandinavian approach" to systems development. A case-study in the operations room of an American airport resulted among other things in a "check-list" with categories of questions to use in analysis of conversation structures as well as other related aspects. The structure of the analysis of this work also initiated the development of the first

prototype of the DOTS-system, which is used as a tool for organizing video recordings and annotations in related hyperstructures.

In his own words, the language action perspective can be described as follows:

"Inspired by *the language action approach* (Kensing and Winograd, 91) we conceive the organization as a setting for individual as well as for cooperative work, and as a framework for cooperation as well as for conflicts. Cooperative work is guided by the performance of language actions, in which parties strive to become mutually committed to the performance of future actions. They create social structures in which those acts are generated and interpreted.

In design we look for recurrent patterns of language acts which can be articulated as the basis for the organization of the activities. And we look for patterns which are triggered in recurrent ways by the declaration of "breakdowns" that represent points at which some action needs to be taken. Some of these patterns represent universally applicable structures such as a "Conversation for action," (Winograd and Flores, 86) which moves forwards towards satisfactory completion of mutually declared conditions.

In every organization there are specializations of these basic conversations, which can be described in a regular structure. These specializations identify particular participants, who work in or around the organisation in question, their actions (physical as well as linguistic) and alternative ways of doing the job.

By combining specialized and more basic conversation patterns in a uniform framework we have the ability to design systems that are efficient and "ready-to-hand" for the recurrent standardized activities and also provide support for unanticipated breakdown-initiated conversations. Systems can be designed to trigger, support or automate conversations in relation to work activities where breakdowns occur. Thus this design approach can serve as a guiding structure for designing computer-based support for cooperative work (Kensing and Winograd, 91)." (Bødker, Kensing and Simonsen, 91)

The language action approach certainly claims to capture recurrent patterns of language acts, and I believe that this is a very important aspect within requirement analysis. One could ask the questions: How "blind" is the approach? To which extent has this approach made an abstraction away from situations in which patterns of communication is not (yet) established and recurrent, and what consequences will the following analysis of such situations have?

With my background in computer science and communication it is quite natural that I have an interest in, and have been influenced by, the language action approach as one way of studying communication within work situations.

The Cultural Perspective

This research approach is directly related to the MUST-project through Keld Bødker.

Keld Bødker's recent work on this approach comprises his Ph.D.-thesis (Bødker, 89), and the approach is furthermore described in (Bødker and Pedersen, 91). In his own words the cultural perspective can be described as follows:

"From the cultural perspective the organization is seen as being a culture, i.e. a community with some integrity, some sense of its own identity, and some shared artifacts, symbols and work practices. Artifacts, symbols and work practices are seen as objects which synthesize and express meaning. However, meanings do not exist in artifacts, symbols and work practices. Meanings are assigned to artifacts, symbols and work practices by people interpreting and acting skilfully as members of the culture, implicitly using their social competence.

Knowledge about cultural aspects at the workplace, e.g. insight into the meaning behind the specific forms of work-organization, coordination etc. is highly relevant in relation to the design activities. It can be used to challenge the assumptions behind a design proposal or an idea for computer support, e.g. regarding how coordination is carried out. Or knowledge of cultural aspects may also be used to judge if the organization is mature for a proposed change. By stressing elements of the culture regarding its potentials for change designers are able to judge if a proposed change has a

realistic magnitude. As an example of directly using knowledge of aspects of the culture, consider a design proposal highlighting support for cooperation of work activities, hereby stressing that cooperation is important and need to be supported. However, at some workplaces where we have experienced such proposals, very strong and dominant elements of the workplace culture emphasize individual work habits. Thus one has to consider if the workplace members actually are prepared and able to change its culture, and thus e.g. work habits accordingly, in relation to the individual versus cooperative element. If the answer is no, the designer must be prepared to change the design proposal radically.

Thus, while the language/action perspective, based on a philosophy of language, offers a design rationale as described above [quoted above as the Language Action approach], the cultural perspective offers an empirical analysis of the organisation in question, which challenges that rationale in order for the design to be based on a realistic vision." (Bødker, Kensing and Simonsen, 91)

I regard an attention to cultural dimensions as relevant and important. Especially I find - and have experienced - this relevance connected with how mature an organization is according to changes i.e. caused by the development of information systems. My "cultural perspective" is primary based on (Christensen and Molin, 83).

The Soft Systems Methodology

This section remains to be written.

4: Identification of the contribution(s) of my thesis

The contribution(s) of my thesis must be seen in the light of the goal of the MUST-project in which I participate: the purpose of the MUST-project is to examine and clarify requirement analysis as it is carried out by practitioners, and to develop and test a theory of - and a method for - requirement analysis.

The results of the MUST-project may span different levels:

- a theory of - and a conceptual framework for - requirement analysis,
- a method (or guidance) i.e. coherent description of requirement analysis,
- (methods) and techniques, i.e. guide-lines for activities as parts of a method (or guidance), e.g. interview, observation, various techniques for descriptions etc.,
- tools, mainly computer based tools, e.g. DOTS.

With my practical attitude my contribution will "spring up from below". My contribution to the Work Analysis (and by this to requirement analysis) will thus be a thorough and systematic test and evaluation of this approach where it is confronted with reality¹⁰: the questions to be investigated is *how* to do it in contrast to *what* this approach promise to solve. In the light of the MUST-project the Work Analysis will be compared to - and criticised from - competitive perspectives: the language action and cultural perspectives as well as a study of how it handles decision making. This will e.g. contribute to the clarification of important "blind spots" in the approach: which relevant issues has its conceptual framework made an abstraction from. My experiences from using the Work Analysis I intent to confront and discuss with other researchers having experiences from other comparative approaches. This I plan to do by staying at a

¹⁰ By using it (myself) at a larger case-study and by interviewing practitioners, who use it in scientific and commercial settings, see section 5: The preferred research approach.

foreign university (for half a year) and by visiting the Rapid Systems Modelling project at Aalborg University.

The result will be a thesis where the conclusions of my evaluation of the Work Analysis are presented. The thesis will clarify the powerful and the weak points of the Work Analysis and where it needs further development. I intent to make some of this further development and to suggest additional techniques and guideline's useful for the practical performance of the approach. In addition I plan to make a contribution (a paper) concerning my research approach and how to develop methods, techniques, and practical guideline's within requirement analysis.

5: The preferred research approach

It is a basic assumption of mine that social structures mainly are constituted and expressed through the spoken or written language. Of course social structures and human practice are constituted and expressed in many other ways too (e.g. in psychological or cultural ways), but the decisive way is through the language, e.g. through writing, speech, conversation, and discussion. The primary way to study social structures is consequently the study of the communication within the application area¹¹.

The Work Analysis (and requirement analysis in general) deals with social structures and human practice. The Work Analysis comprises a theoretical and conceptual framework and a method for doing the analysis including techniques and practical guideline's.

The theoretical and conceptual framework of the Work Analysis must capture the relevant issues within requirement analysis and the analysis of *work*. To evaluate the framework one must use it "as a pair of glasses" doing the analysis and critical reflect on and evaluate the results: does the glasses provide you with critical "blind spots" where the framework has made an abstraction excluding relevant issues? In addition one must be aware of the level of complexity of the framework: it must be "simple" in a way as to give a practitioner the possibility to adopt and use the framework without using half of his lifetime for this purpose.

The method for doing the Work Analysis including techniques and practical guideline's must be operational i.e. provide help in the current specific situation where the designer is doing the analysis. As for the theoretical and conceptual framework one can simply use the method and its techniques and guideline's as described and point out, where one needed additional help. But the relevance of this approach is quite limited if the result is reduced to statements claiming *where* the guidance of the method was insufficient. The interesting point is *how* to complement for this limitation.

Any guidance within a method must be based on and crystallized from the experiences of skilled and competent practitioners. The foundation of such guidance is build up by repeatedly "getting the right ideas in the right moment". It must be developed through abstractions from discussions between competent practitioners, in which they reason and argue why some actions are important and right and others wrong. As a start it could be "rules of thumbs", good advices and ideas (to use in future similar situations) primarily formulated through discussions, in which somebody did something "wrong" and others acted "right". Such discussions, in which the participants

¹¹ A very short introduction to some philosophical issues concerning this approach is outlined in (Simonsen, 92B).

systematically argue and conceptualize their experiences, will give the substance for such guidance and hence the method.

As indicated above my research method is bound to be *empirical*.

Basically this empirical research approach can be performed by two different levels of activities:

- the activity to do Work Analysis (myself), and
- the activity to look at and observe others doing Work Analysis or interviewing others who have done Work Analysis (alternatively through a literature study of such empirical projects).

The activity that I mainly use is doing Work Analysis myself, an approach I consider as action research. This is done within the MUST-project where I am in charge of one of the case-studies: Requirement analysis in The National Film Board of Denmark. This case-study is planned to continue for 1 or 1,5 year. I work closely with Finn Kensing in this case-study and I am supervising two senior students who are participating in the case-study graduating their M.Sc. by a special subject within requirement analysis.

Although action research has unique benefits - own experiences, the possibility to test even more radical methods and techniques etc. - there are complications if this is the only research approach used: even though my case-study takes place in "real" industrial settings, there will be differences compared to Work Analysis carried out in reality due to the fact that part of my cooperation with the industrial setting is based on a contract, allowing research to be (a main) part of the activities carried out. This makes the situation in the case-studies somewhat "ideal" and "laboratory-like", excluding different kinds of business-like constraints. To meet this complication I plan to discuss my results with Kjeld Schmidt and Peter Carstensen and to interview designers in a large Danish bank where the Work Analysis has been used for about 2 years.

How to provide evidence for the generalizability of the results?

This question is extremely relevant and at the same time very difficult to answer.

In practice the action research-approach will result in various relevant and exciting observations. These observations must be related to - and reflected through - the Work Analysis and the underlying theoretical and conceptual framework. The point is to argue for the relations - or the lack of the relations - in a convincing way and to render relevant connections probable.

Concerning my further development, improvement, and suggestions of additional techniques and guideline's useful for the practical performance of the approach the problem of generalizability must be considered in relation to the relevance for the practitioner: what level of abstraction should this guidance address. A too abstract (and general) level is not very interesting: this will not help you in any concrete situations; the interesting answers are "how"-answers in contrast to "what"-answers. The level of abstraction must be operational in one way or another. Some advices can doubtlessly be expressed in very general terms, others are bound to be related to specific situations which e.g. could be described through typical examples or scenarios. The latter type will dominate due to the very nature of Work Analysis (and requirement analysis), which is very dependent on the specific situation. In any case, one must decide very carefully which pretension you will claim in your generalization.

In general the way to provide evidence for possible generalizabilities is to confront and discuss the results and experiences with other researchers and practitioners: through such discussions and argumentations the evidence will arise.

References¹²

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¹² This reference list contains only the references needed for this research proposal and should not be considered as my reference base.

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