THE OBVIOUS & THE ESSENTIAL
INTERPRETING SOFTWARE DEVELOPMENT & ORGANIZATIONAL CHANGE

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Abstract

Examining how our basic values affect development processes is the overall theme of this thesis. In practice, the question is investigated in relation to software development and organizational change and in research, in relation to science and its relationship to common sense, specifically within the area of Human Computer Interaction. The thesis discusses how it might be possible to discover what is essential for development processes and why the essential may be interpreted as something other than the simply obvious. This thesis examines ways of studying and understanding our social environment and development processes, particularly those concerning people, organizations and software. The empirical examples deal with a software development project and a project that scrutinized the strategy for a governmental authority’s business and information technology.

Attitudes are discussed in terms of how they view the user, the customer, the software developers, the software, organizational and implementation processes, organizational management, aesthetic values, functionality and use, research, methods, paradigmatic approaches, ethical issues, psychological reactions, sociological prerequisites, categorizations of people and stress-related health consequences. One particular prerequisite for developing superior computer-supported office work has repeatedly presented itself: an open, questioning attitude towards the software development process, towards organizational change and towards the people working in the organizations. A similar attitude towards research and its design can be crucial to the development of new knowledge. This circumstance can be interpreted as an indication of how important it is that we be aware of and question our preconceived notions, in order to develop an autonomous behavior where we take responsibility for our actions. By doing so, we can avoid misinterpretations and not get trapped into making categorizations that are simply obvious. This is essential and must be emphasized in our search for the path to «healthy work».

Key Words: Human Computer Interaction, Usability, Work Environment, Organizational Change, Computer Ethics, Occupational Health, Software Development, Work Design, Organizational Culture

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SUMMARY

Examining how our basic values affect development processes is the overall theme of this thesis. In practice, the question is investigated in relation to software development and organizational change and in research, in relation to science and its relationship to common sense, specifically within the area of Human Computer Interaction (HCI). The intent is to discuss how it might be possible to discover what is essential for development processes and why the essential may be interpreted as something other than the simply obvious.

The ways of developing customized software differ, but problems seen in the altered computerized work environment can often be traced back to the development process. We need to take several aspects into consideration throughout the development process; aspects not just concerning the development of the specific software, but also the consequences it will have on the design of the actual work, on the work environment, on how people will act and react, on how organizations work, and not in the least, on how our basic values affect our understandings of what we see. This is why we need to become more adept at sorting out what actually is essential, and when the essential is something other than the simply obvious.

The multidisciplinary area of HCI – with its mixture of human, organizational and technological issues – is a great area to approach with the question of basic values. In the development processes of software for computer-supported work, several angles of approach to the issues of interest have been found. It is within these processes that the idea of, and search for, the relationship between basic values and the obvious and the essential has developed. Several studies have

The thesis follows an outline that leads off with a prologue, leaving the more thorough discussion of intent and motives to be presented in the main objective. A presentation of methods, followed by an explanation of the motives and choices of the methodological approach, is presented in the second part. The third part of this thesis encompasses the theoretical objective in where different lines of action are presented and discussed. The theoretical objective opens with a presentation of the field of HCI. Examples from practice then follow in the empirical objective, where the questions raised previously are discussed and presented in theoretical and empirical syntheses. The thesis then closes with conclusions from the observed, together with an epilogue, presenting more personal reflections.

The changes in workplaces that follow in the wake of new technology are not all positive; the changes can also be seen as a dominating factor in the loss of many of human values that were previously incorporated in the work. Rationalization has been predominant, producing effects such as loss of competence, increasing numbers of lonely work situations and poorer employee health. In this thesis, empirical examples and theoretical discussions, taken together, will help clarify how awareness of underlying values is essential in organizations, in businesses and their workings, as well as in software
development, if development strategies are going to have a chance to be implemented successfully. Within the theoretical sphere of this thesis, discourses from different disciplines are taken into consideration. Different ways of studying and understanding our social environment are examined, particularly different ways of understanding development processes, especially those concerning people, organizations and software. By presenting various lines of action, and by interpreting and discussing them from a basic values point of view, problems are illuminated that follow in the wake of unaware bias, of preconceived notions and of unconsciously emphasized ideas. From this perspective, the theoretical outline in the thesis is to be seen as both the framework and as an object of scrutiny. The empirical part of the thesis is used to further illuminate the main theme, by presenting examples from practice that are taken from the Swedish National Tax Agency. One of these examples is from a software development project concerning the national population registration in Sweden, and the other is from a project that scrutinizes the agency’s strategy for its business and the development of its information technology (IT).

A number of attitudes and approaches are discussed throughout the thesis, in terms of how they view the user, the customer, the software developers, the software development process, the organizational development process, the implementation process, organizational management, aesthetic values, functionality and use, research, methods, paradigmatic approaches, ethical issues, the self, psychological reactions, sociological prerequisites, categorizations of people and not in the least, stress-related health consequences. In the discussions about these issues, one particular prerequisite for developing a healthy computer-supported office work, repeatedly presented itself: an open, questioning attitude towards the software development process, towards the organizational change that the process is a part of, and towards the people working in the
organizations. A similar attitude towards research and its design can also be seen as crucial in the development of new knowledge. This circumstance can be interpreted as an indication of how important it is that we be aware of, and question our preconceived notions, in order to develop an autonomous behavior where we consciously take responsibility for our actions. By doing so, we can avoid misinterpretations and not get trapped into making categorizations that are simply obvious. This is essential and must be emphasized in our search for the path to »a healthy work«.

This thesis is an attempt to contribute to the body of knowledge that can be used in the development processes within different kinds of organizations, their work and workplaces, and especially in the development of customized software for computer-supported office work. The intent is also to raise questions that can be of concern in the discussion regarding methodology and methodological approaches within sciences such as HCI. By focusing on what makes sense instead of using more or less rigid methods and models that present results – which although obtained in a scientifically correct manner – are sometimes nothing more than nonsense. Furthermore, by illuminating different theoretical ideas, the possibilities may increase, in terms of developing the field of HCI into a field characterized by a fusion of the different approaches. The ability to portray computer-supported office work and work environments in a consummate manner and not just as a spectrum of fragmented snapshots, will thus increase. If taken into consideration, this ability will contribute to a greater awareness of the importance of better work environments and the impact that different development processes can have on these environments. Furthermore, this ability will facilitate an unprejudiced understanding of people and thereby, can increase the chances of really making a difference.
PROLOGUE

When I started my research work, I intended to limit the scope of the research to the issue of finding the keys to how to develop software for computer-supported work in a way that would result in a superior environment for the employees and generally more effective organizations. I tried, despite my own skepticism, to put forth hypotheses which were to be falsified or strengthened in order to assimilate to the idea of hypothetical-deductive approaches. But as time went on, I realized that this approach was hopelessly incompatible with my own belief in how knowledge, insights and interpretations about the social world must be coordinated. I realized that I constantly returned to one central issue that had been puzzling me for a long period of time: how are we affected by our basic values and how do our basic values affect development processes?

My interest in basic values has sprung from my experiences within organizations and with people who – although they try – fail to put to use their inherited resources, often in favor of sub-optimizations, based on various (more or less conscious) grounds. This can be seen in the consequences that are the results of often shortsighted economical interests, in the consequences based on assumptions of how people are, or in consequences that are the result of impulses based on shallow analyses or sometimes on gut feeling alone. When organizations fail to use their resources, the results can further be seen in the consequences that result from acting on motives of a personal or private nature. These kinds of interests and consequences are not only valid for organizational or software development, but also for research and development of knowledge and other situations as well. The development or
change in organizations – which lead to changes in people’s lives – that are the result of inferior design, development processes or decisions, is partly supported by our basic values – values we might not even be aware of, but certainly values which affect our understandings.

To develop knowledge and make decisions in a more sensitive and perceptive way we therefore need to interpret the social world holistically, taking different contextual matters into consideration. This does not mean that I propose eclecticism; rather I regard it as a consequence of the intertwined and interdependent relationships within the conditions of life. I propose that different ways of interpreting our environment must be taken into consideration and that the awareness of our »selves« must be raised as well in terms of how each one of us must reflect upon how we as observers affect or sometimes even constitute what is being observed. I believe that only by maintaining a humble attitude towards the fact that reality can be interpreted in different ways – as well as the fact that the reasons for people’s diverse behavior will differ – can lead to more thorough and hopefully more »true« interpretations, which in the end really can make a difference.

Thanks to its mixture of human, organizational and technological issues, the multidisciplinary area of Human Computer Interaction, HCI, is a fantastic area to approach with the question of how and when basic values influence the development processes. In the software development process for computer-supported work, I have found several angles from which to approach the issues that interest me, and it is through utilizing these angles that the idea of and search for the relationship between basic values on the one hand and the obvious and the essential on the other hand has developed. Albeit, the theme of this thesis has not just evolved during my work within the research area of HCI, it is also the result of reflections, discoveries and thoughts developed over time; experience gathered from theoretical and empirical studies in
research, as well as from my time as a performance auditor at the Swedish National Audit Office, NAO. The title of the thesis reflects the idea of sorting out the relationship between reality and the sense of reality, between narratives and interpretations of the studied and – last but not least – the relationship between the obvious and the essential.

The goal is to contribute to a deeper knowledge, which can be used in the development processes within different kinds of organizations, their work and workplaces, and especially within the development processes of customized software for office work. Furthermore, the aim of this thesis is to raise questions that can be of importance in discussions regarding methodology and methodological approaches within sciences such as HCI and by doing so, this work hopefully will contribute to a greater awareness of the importance of better work environments and a fair understanding of people, which in turn could result in making a real difference.

Where We Are Now

An attitude which demands efficiency and effectiveness in organizations based on rationality in decisions (and in life generally) is one of the more or less universal values in organizations of today. Rational decision making that is used to reach the goals of efficiency and effectiveness requires clear pictures built on obvious categorizations of different kinds. In most cases, these categories are furthermore supposed to be measurable. Measurability is especially important since calculable results, such as time and money will dominate in the interpretations and comparisons of different businesses’ success. But the comparisons are not only of concern in the benchmarking of organizations. The tendency to use comparisons based on categorizations are seen in interpretations and understandings concerning people, personalities, behavior or other possible characteristics. And these comparisons are seen not just as general speculations
among people in common, but as judgmental instruments within organizations as well.

When interpreting different ways of understanding people, their behavior and the organizations that they work in, we can see fairly clearly how trends fluctuate, and the further back in time one goes, the easier it is to discover these trends. If we analyze the development of management ideas in the 20th century, we can see that the Tayloristic way of looking at people, in this case specifically factory workers in the beginning of the century, has once again become popular. All kinds of workplaces have been reorganized based on Taylor’s ideas and now it is office workers and the rationalization of office work that is the object of scrutiny. We can also see how psychological trends have dominated, especially within management theory, which has often sprung from different interpretations of Jung’s work on psychological archetypes. One of the most well-known management tools used today (and based on Jungian theory) seems to be the Myers-Briggs type indicator (MBTI)\(^1\) a test from which people are categorized according to different psychological types or archetypes using Jung’s terminology. The attempt to categorize people can be traced far back in time. We can see examples of this already in ancient Greece. For instance, people’s characters were discussed in the Hippocratic idea of dividing people into the four categories of constitutional types: phlegmatic, sanguine, choleric and melancholic, which were categories based on different temperaments. These categories are still sometimes used or at least referred to today. Other categorizations being used are religious, ethnic, gender, age, weight, length, etcetera, which often are completely irrelevant to the matter being discussed. The need for categorization can be seen as a need to bring order into one’s experiences, but it can also be seen as a way of underpinning the idea of

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\(^1\) The MBTI-tool is further described later in the thesis
rationalization. The dream of rational decision-making that is based on a clear picture of the situation, without too many «it depends», can be seen as at least one of the motivating forces in the process of categorization.

The development process for computer systems designed for computer-supported work, implies a rational way of understanding the work that the systems are built for. Development strategies are themselves more or less structured and developed, both in terms of the systems’ development processes and the organizations’ development processes. These strategies can be seen not only as an effect of the belief in rationality and efficiency, but they can also be seen as an effect of the fact that information technology is built solely for information processing. This might seem logical, but problems arise the moment we think that the understanding of an organization or of people in general, can be condensed into information processing alone.

The knowledge required for building faster and therefore better computer systems, is developing rapidly. However the knowledge about how different software solutions affect people is still not taken seriously into consideration. The same can be said about knowledge concerning how to choose technical solutions that can eliminate not only some of the increasing health problems seen today, but also could eliminate problems affecting the work environment in its entirety.

Occupational health issues, the effects of radical changes in our work environment and how work itself can affect us in a negative way, is currently getting a lot of attention. Stress and work-related symptoms, such as musculoskeletal disorders (particularly mouse-arm syndrome), eyestrain and stress-related mental and somatic symptoms are increasing at a disastrous rate. But stress-related mental and somatic symptoms and illnesses are not a new phenomenon. Similar diagnoses such as depression, burn out or chronic fatigue
syndrome have been traced back to the 17th century (Johannisson, K. 2001). At that time, some of the reasons behind the development of stress-related symptoms were already known, nevertheless this knowledge is rarely used in the development of organizations of today.

In the current development of organizations, different businesses use different development strategies for finding more efficient ways of running their operations. This thesis discusses some of the most common ways of analyzing organizational needs such as the use of time studies, flowcharts, process thinking, etcetera – all of them developed in order to bring structure and order to the understanding of the organizations and the organizations’ needs. Most of the ideas that are illuminated are sprung from an economic and a technologic perspective, as well as from the notion that rationality is always rational.

**Bringing Order into Reality**

It might be inevitable that people try to bring order into reality, and the possibilities for making rational decisions might increase, just as the possibilities for focusing on things other than understanding the surrounding environment might be a good thing. But the limits of order or structure must be taken into consideration since they exclude different values that are important in our lives, although not explicitly tangible or even clear to us. The structuring processes can in this sense be seen rather as an attempt to fit square pegs into round holes.

In our struggle to understand the world, we search for answers that can describe, in a rational way, how and why different conditions in our environment are related to one another. The need to bring order into reality reflects the dream of structure and understanding. But the structure and order we are looking for might not be there. Reality is dynamic and in a constant state of change. Although order may not be found in its absolute sense, the search for order persists. In different
parts of society, order has different appearances and the methods for finding order differ as well. In most cases the idea of order is based on belief in the idea that there has to be a causality relation; that there must be a purpose to all states and that everything must be caused by something – it couldn’t just simply »be«. The thought of reality as something without structure is too chaotic to live with. Our need of order is not primarily aimed at a true understanding of reality, but at a fair enough understanding, through which we can navigate our lives more easily. When we have a structured picture of the world, we can also direct our energy towards pursuits other than bringing order into reality.

In most religions, the explanations of how and why the world looks as it does are of a moralizing and fostering nature, with the purpose of teaching people how to behave. In these religious explanations, structure or order is in heaven, or at least within the rules that the particular religion adheres to. Within science, the religious ways of explaining reality are not considered to be adequate. In science, we aim to find observable proof for the order or structure that we see. Measures of different kinds are compared and used to prove hypotheses concerning relationships within reality. But in science as well as in religion, we have a tendency to build our knowledge on beliefs – especially when it comes to results that put our basic values into question. This behavior can be understood from the viewpoint of our need for order, in understanding our environment and its context. But when the discovery of alternative ways of understanding the world are clarified, we often have difficulties in accepting them, even though the results can be proven. It is at times like these, that we stand before a paradigm shift.

An example of how science and scientists, as well as religions and clergy cling to their beliefs, can be found in the heliocentric picture of the world discovered primarily by Copernicus and Galileo (Brody & Brody, 2001). The idea that the
earth was just one of many solar planets and that the sun was
the center of the solar system, threatened all the beliefs at the
time. If this theory was true, it would have consequences for
everything that comprised contemporary knowledge of the
universe, and paradigm would need to be reorganized.
Therefore it was easier to ignore the results and reject the idea
of the heliocentric picture of the world. Galileo was forced to
choose execution or denial of his discovery because of the
enormous threat that his theory represented.

The psychological tendency to draw general conclusions
from the results of experiments and apply them to the laws of
reality might be inevitable. This can be seen in the way we
develop hypotheses concerning order in the world by means of
inductive thinking, although the investigations can have a
more deductive undertone. This method of finding
explanations in and about our environment is not to be seen as
ultimately erroneous. But – we must increase our awareness of
how our own underlying values influence us when looking for
explanations.

**RATIONALITY IS NOT INEVITABLY RATIONAL**

I would like to put forth an empirical example as a means of
illustrating what I mean by the statement that rationality is not
inevitably rational. It is the sad story of a man named Phineas
Gage and his miraculous survival after a severe injury,
resulting form a bizarre accident. Gage’s story became the
platform for modern research about the brain (Damasio, 1994).

In the late 19th century, Phineas Gage worked on the railway
being built across the North American continent. One day,
Gage was involved in a bizarre accident. An explosion went off
and before he could move out of the way, a large piece of iron
(three feet, seven inches in length and one and a quarter inches
in diameter) shot up through his cheek, straight into his head,
through the front of the brain and finally out through his scull.
Miraculously he survived and when his brain functions, such
as memory, logical thinking and so on, were checked, no damage was found. However, in terms of his social behavior he was much changed. The balance between intellectual faculty and primitive propensities had been destroyed. At the time of the accident Gage was a twenty-five year-old construction foreman with an athletic build and social and intellectual skills. After the accident his personality changed radically. He had become a man who now had the patience and intellectual capacity of a child, while at the same time still possessing the passions of a grown man.

Phineas Gage had all his brain functions intact even after the injury, but the lack of appropriate social behavior that developed after the accident, forced him to quit his work. He was, as his doctor expressed, completely rational in his way of reasoning. But, his logical capacity, his memory and his knowledge could never compensate for the lack of the social skills he once had. Phineas Gage did still possessed his capability to calculate, to read, to speak, to remember etcetera; all that was necessary for rational decisions. But the capabilities concerning social behavior, such as understanding of other people’s feelings, ways of acting, reactions – in other words his empathic skills, no longer existed. It was due to the lack of these skills, often called soft skills that he had to quit his work. He ended up as a circus act, carrying around the fateful piece of iron pipe and never letting it out of his sight. The consequences from this single example illuminate the necessity of the (not always rational) soft skills and indicate that they might be as crucial as the rational skills and the rational way of thinking that we praise so highly today. I have chosen this extraordinary story of Phineas Gage’s transformation into a completely rational man as an indication that rationality is not inevitably rational.
The Obvious & The Essential

The Challenge

In this thesis I have given myself the challenge of drawing a nuanced picture of how to develop superior organizations, focusing on the essential issues, taking people’s needs into consideration and presenting this picture in an adequate academic manner. As I see it, this presentation needed to be done on different levels and from different points of view, which is why the theoretical framework is to be seen as part of the study and not simply as a background to the empirical matters discussed in the thesis. The methodological, the theoretical and the empirical parts of this thesis can in a sense, all be considered as objects of scrutiny, and therefore subject to interpretation. In that way, they become both parts of the research object and the background, as well as becoming parts of the final analysis in the discussion and conclusion chapters. I have deliberately chosen an analytical approach to the subject in that I have tried to follow a main theme in the discourse, while discussing different ideas in various scientific fields within HCI that are examined, and by a development of a line of reasoning aiming towards the final discussion and conclusions that are presented.
METHOD

Different methods, as well as different theoretical platforms, are being used within the multidisciplinary field of HCI. In a sense, HCI can still be seen as a rather young discipline, which is reflected in a methodological mix in which one can easily lose a clear frame of reference. The importance of presenting a methodological approach and making clear what theoretical framework different studies include and what ideas they are based on, is more thoroughly discussed in the following chapter.

In this doctoral thesis, there is a deliberate emphasis on the theoretical portion of the thesis as compared to the empirical portion. The area of HCI encompasses a wide set of influences from different disciplines and the theoretical framework in this thesis has a bias mainly towards research concerning behavioral sciences. Other theoretical angles of approach that have – or can have – an impact on the research field of HCI are also discussed.

I have chosen these particular approaches in order to give an idea of the discrepancies that exist within the field of HCI, as well as to give examples of the theoretical ground on which I stand, together with the results that follow from it.

RESEARCH QUESTION

The combination of IT-development and organizational development is of vast interest. The increasing number of people developing health problems in poorly designed, computer-supported work environments, is a problem of great concern. Negative effects from inferior software and poor organization management are consequently the focus for
discussion in this thesis, and the overall goal is to move towards achieving efficient and effective organizations built on ideas that will contribute to a superior and satisfying life for people at work.

In my licentiate thesis I divided the research questions into a theoretical issue and an empirical issue, however in this thesis, I have chosen to organize my research questions in a somewhat different way. This change is based on my belief that studies and interpretations of social life risk drawing incorrect conclusions if the division between theory and practice is too sharply emphasized. In this thesis, I have instead preferred to see the main issues as questions concerning the problems and ideas of values and their effect on development processes. In contrast, the empirical parts of this thesis are to be seen not only as the environment in which we discover examples of the issues being discussed, but also as the target environment which could be positively affected based on the outcome of this research.

In this thesis there is one main theme: how basic values affect development processes. In addition, I have chosen two complementary issues associated with the main theme: the relationship between science and common sense and perhaps most importantly, the question of what is obvious and what is essential. In the parts of the thesis that discuss methodological, theoretical and empirical objectives, the three main issues as listed above will be illuminated in terms of how they affect various situations in practice and in research.

**Basic Values**

The first issue of concern is the question of basic values. This has been a persistent theme in my work, my thoughts and my research during the past 15 years. Our basic values affect us in different ways. Some of them are known to us, while others are unknown, though they still affect our ways of responding to different situations. Our basic values are a matter of course to
us, seemingly as completely natural as the knowledge that helps us to make the right decisions and choose goals. And, since they are values of our time, they are much influenced by the dominating trends. The challenge is to increase our awareness of our basic values, in order to be able to question them – and as a consequence, be able to make more conscious moves toward our goals. The main question of concern in this thesis is thus:

*How do our basic values affect development processes?*

This question is to be considered as the overall query which might have no answer, but from which stem the major research questions that will be focused on in various ways, in the different segments of the study. The development processes focused on in this work are mainly organizational and software development processes.

**Science and Common Sense**

As previously noted, two complementary issues will be explored as well. The first of these issues concerns the relationship between science and common sense. Science needs to have systematic ways of gathering information about the objects being studied; information from which suggestions and interpretations can be made in systematic ways. But science also needs to include a good portion of common sense in order to be able to stay on track and not get bogged down in narrow-sighted, introvert studies built on models that are too strict and methods that have not been sufficiently thought through in terms of the object or the circumstances being studied. The main question here is:

*How is science related to common sense?*
By discussing the relationship between science and common sense, some essential issues can be raised, e.g. how investigations are conducted and the impact of methodological choices and their relation to practice.

The Obvious and the Essential

This second issue is essential to the theme of this thesis; it will discuss the differences between that which is essential and that which is simply obvious. The main point of this question is to investigate if what we see – the obvious – can also be considered that which is essential. Or is it possible that what is essential gets lost in the dominating picture of the obvious? This issue is formulated in the question:

What is essential – and can it be discerned from what is simply obvious?

By putting forth this question I want to focus on problems that arise due to the lack of awareness about when, and how, our basic values or the values of our time, affect our ways of handling decisions, as for instance in development processes. By doing this, I also want to find out if it is possible to develop strategies for managing our preconceived notions and to further develop an ability to see what is essential and when the essential issues are separated from the obvious ones.

Affecting Practice

Beyond investigating the three main issues above two additional aims will be targeted. Based on the results of this research one aim is to focus on a discussion concerning how research is conducted and what values it constitutes; the other aim is to focus on the practitioners. Discussions about how development processes within organizations are affected by the values that currently dominate, create more possibilities of finding superior development strategies by taking different
views into consideration. And in turn, this could lead to the development of healthier organizations with healthier and more satisfied employees.

RESEARCH PROJECTS
A small number of projects and parts of projects have dominated my objects of research. In this thesis, the presentation of the research projects is limited to two main projects within one Swedish governmental authority. These are described more thoroughly in the chapter on empirical objectives. In this part of the thesis, a brief overview is given presenting the projects that provide the main basis for the analyses that are made.

THE VERKA PROJECT
A major research project called VERKA\(^2\) comprising several different sub-projects made up my research between the years 2000-2004. The aim of the project was to find out what areas to focus on in the software development process that could facilitate the work process as well as improve the work environment for the users. In the end, the goal was to make the user’s work »a healthy work«. Some factors were already well-known, while others were, and still are, more difficult to discover and therefore more difficult to acquire knowledge about. Knowledge and experience gleaned from earlier research was systematically considered during the development process, particularly knowledge about aspects of health in office work using visual displays. Some of the theoretical aims, together with the results seen in the empirical studies, illuminated the question and problem of maintaining the balance between organizational development and software development. The research project included two of the most

\(\)VERKA is a Swedish acronym for Verksamhetsutveckling och Arbetsmiljö (in English: Business Development and Work Environment), VERKA means to work, act.
important governmental authorities in Sweden, the National Social Insurance Board and the National Tax Board (renamed the National Tax Agency in 2004).

The Folke Project

My particular part of the VERKA research project examines the grounds on which strategic decisions of importance were made for – and within – the development projects, especially within the »Folke« project which was established to develop software for case-handling of the national population registration. The software project was an in-house development project, conducted with the aim of becoming a model project that focused from the outset on usability and work environment aspects and which would then remain in focus throughout the software development process.

As part of the Folke project, a specific study called Visuwork was conducted focusing on overview and visualization of work and work load (Boivie, I., Blomkvist, S., Persson, J., Åborg, C. 2003). Visuwork was conducted in two phases. In the first phase a number of case-handling officers at the national population registration were interviewed about their routines, and using the results of the interviews a prototype of an inbox was designed and briefly evaluated. In the second phase of the study, the ideas arising from the problems with the inbox created in the first phase were analyzed and developed and a new way of visualizing and sorting the inbox was proposed in a paper called »From Piles to Tiles« (Blomkvist, S., Boivie, I., Masoodian, M., Persson, J. 2004).

The IT-Strategy project

A second research project (outside of VERKA) was conducted with the purpose of making a thorough review of the IT-strategy at the National Tax Agency with the issues of usability
and work environment as its focus. This project was a joint project between the HCI-department at Uppsala University and the Royal Institute of Technology in Stockholm. Originally, the purpose of the project was merely to ensure that the issues of usability and work environment were properly addressed in the strategy, but in fact the project took on a much wider perspective concerning structural issues and basic values affecting the strategic work in the organization. Although initially the project was a rather small undertaking, the data gathered during the study became of great interest and importance for this thesis.

Research Objects

The nature of the research objects vary greatly – from which level of a particular organization is studied, to the level of detail that is studied. These studies have been conducted mainly within the Swedish National Tax Agency and they are all focused on issues concerning the development of computer-supported work and development strategies for this kind of work within the authority. The other kind of research object can be seen in the theoretical framework – which is not just a framework, but an object of scrutiny as well – where the different approaches (human, organizational and software development) are illuminated and discussed in the theoretical part of the thesis.

Empirical Objects

The empirical objects of scrutiny are, for the most part, found in the Swedish National Tax Agency which handles the major part of the tax administration in Sweden. The »Folke« project, which is the subject of this research, is the development project dealing with a new software system for the national population registration in Sweden. The project was set up as a model project with the idea of creating superior
work situations for people carrying out computer-supported work. By taking certain issues (usability, health, ethics and work environment) into consideration in the software development process the project is provided with important knowledge early in the development process. Having this goal as the project’s central idea, we hoped to increase the chances of developing systems characterized by superior usability for computer-supported work.

The other research project is an investigation of the formal IT-strategy developed within the National Swedish Tax Agency. This research project focused on the basic values reflected in the IT-strategy, which from the National Tax Agency’s point of view ought to comprise strategies for IT-development, computer-supported work as well as work environment within the authority.

Nineteen interviews (each approximately one hour long) were conducted, recorded and transcribed in order to gain a complete understanding of the IT-strategy. In the interview situations we were usually two people interviewing one respondent.

**The Swedish National Tax Agency**

During 2003, the Swedish Tax Administration comprised one central authority called the National Tax Board, and ten regional tax authorities. The Swedish Tax Administration manages the entire Swedish tax system with the exception of customs matters. The National Tax Agency (Skatteverket – SKV), formerly called the National Tax Board (Riksskatteverket – RSV), is responsible for the activities of the National Tax Administration and the Debt Enforcement Agency, as well as for national election administration. The National Tax Agency reports to the government through the Ministry of Finance, although as an authority, it is independent of the government. Consequently, the National Tax Agency, in line with other administrative authorities, works independently and is only
subject to laws, ordinances, general instructions and allocation of funds. The Tax Administration handles individual tax matters and is responsible since 1991 for handling the national population registration. The head of the National Tax Agency is the Director General, who is also the chairman of the agency’s governing council. The head office of National Tax Agency currently has approximately 1000 employees, of which 350 works within a separate organization referred to as the IT department. The Tax Authority management is made up of a Regional Tax Director and a governing council. In 1998 the Tax Authorities had approximately 9,500 employees of which ca 700 work with national registration.

**Population Registration in Sweden**

The National Tax Agency's population registration changed its way of working in 1991 when the registration organization moved from the state church to the former National Tax Bureau. The second phase of this overall change began in the year 2000 when a new software system was developed to facilitate the registration work and make it more efficient. The new system was called »Folke« and it was chosen to be one of the objects of study within the research project VERKA. The purpose of the Folke project was to take issues such as work environment and health aspects into consideration, which in turn would result in a new software system characterized by superior usability, in particular for the case-handling work at the national population registration.

The study of the software development project called Folke encompasses different kinds of methods. The development of Folke is one part of the overall research project VERKA. The main part of my empirical data has been collected from the Folke project. In my role as a researcher, I have been attending meetings within the Folke project throughout the development process, mostly as an observer, but in some cases also as an active participant. In the course of the project I have
interviewed both the developers and the users. I have also read and analyzed data from previous work concerning strategic decisions, development projects and follow-ups that were made within the National Tax Agency. Users were observed when testing demos or prototypes of the system, as well as during their normal workday when they were using their regular software.

Researchers have been involved in various activities in the early phases of the Folke development project and at our suggestion a usability designer was added to the project. This usability designer worked together with some users as well as with one researcher who is an expert on this particular work process. The aim was to produce a proposal early on in the development project as to how the graphical user interface (GUI) could be presented. The proposed GUI was to be taken into consideration throughout the system development process. Interviews were then conducted with both users and developers at various intervals, taking up issues as the meaning of usability, the importance of healthy work and the importance of keeping in mind the well-being of the users.

The researchers also had a prominent role in the implementation phase of the system. Full-day seminars were held, where in my role as a researcher I was engaged to speak in particular about the consequences of, and reactions to, changing work situations and changing work environments. During the remainder of the seminar I observed and gathered information on the users’ reactions to, as well as expectations about the new system. As a complement to the observations, a survey was carried out and answered by a majority of all the case-handling people working with population registration at nine of the ten districts in Sweden.

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3 The role of a usability designer is to emphasize usability matters in a software development process.
IT-Strategy

The strategy in focus is a strategy primarily drawn up for the development and maintenance of IT and its information systems within the National Tax Agency in Sweden. It comprises not only the development of IT as such, but also development strategies for the agency’s work, for the employees affected, along with the strategies for development and use of the e-service offered by the organization.

The original project was an assignment from the National Tax Agency in Sweden, to assist in the work dealing with the structure of their strategy, and in particular to act as a watchdog on issues of usability and work environment, making sure they were being addressed and when necessary, making sure these issues were implemented into the strategy. A number of strategic documents were put at our disposal as a basis for analysis, and these documents were analyzed together with the nineteen interviews that had been conducted with people from different parts and different levels of the tax organization, most of whom had been involved in the work with the IT-strategy in one way or another. These people also answered a short questionnaire about the organizational culture. The questionnaire is based on a work presenting and offering a validated instrument for diagnosing organizational culture and management competency (Cameron & Quinn, 1999). In this thesis the results are only used as a basis for discussion and not as validated results.

Theoretical Objects

I have chosen a number of approaches as theoretical objects of scrutiny. They are mainly chosen to articulate and discuss the issue of how basic values affect the development processes that are mainly reflected in theories used within or in association with the area of HCI. These development processes, which include not only software and organizational development, but
research development and methodological matters as well, are central parts of the investigation.

The design of work and tools for work is in focus. Health aspects such as the stress related effects of poor usability in the design of tailor-made software are the center of attention, as seen from a perspective that reflects the consequences for the organization, its efficiency and the work satisfaction of its employees. On a generalized level the theoretical part of this thesis can be seen as comprising three main areas. the field of HCI particularly some of the theoretical bases for its approaches, the design of the work situation as well as design for the work situation, and finally the psychological aspects of people’s more or less conscious strategies in their work life and in life in general. The three areas are not exhaustive, but they give a fairly good picture of discrepancies within the fields – discrepancies which will serve as telling examples of problems that must be dealt with in the development processes of software and organizational change as well as in the development processes of research and how research is conducted.

**Data Collection**

Although the emphasis in this piece of work has its focus on theoretical discussions and interpretations, the work comprises data from empirical observations gathered in traditional scientific ways. The majority of the empirical data is collected by a survey, in interviews, in observations and in strategic documents of importance in the organization. As a complement, the theoretical bases can also be seen as data collected in order to scrutinize, interpret, discuss and evaluate the targeted questions.
Observations

An explorative, ethnographic approach was carried out primarily by attending weekly meetings, having informal discussions and being in the environment of the development project.

An integrated analysis has also been made at one of the local tax offices. Here, we have looked at how the employees work with the current system, which is a system that is being replaced with the Folke system that was focused on in the VERKA research project. The purpose of this observation was to get a more complete picture of how specifically chosen work tasks were carried out. This was done to get an idea about how our different perspectives as researchers colored the observations. To do this, several researchers studied similar situations simultaneously. The different observations were then compared in order to produce a more nuanced picture of the tools of work that were studied.

Documents

As a part of the research work, the IT-strategy as well as several other documents of strategic impact on the National Tax Agency have been gathered and analyzed. In addition to the IT-strategy, the documents include evaluations of previous projects, an internal analysis of views on the future work within the organization, an internal inquiry into the authority’s administration organization and an internal application of the choice of methods for software development in the organization.

In addition to these documents, there are several documents concerning health status and perceived well-being within the organization that have been taken into consideration as part of the analysis. As part of the analysis there are as well the formal instructions to the projects of Folke and the IT-strategy.
A Survey

A survey was conducted, comprising a majority of the 700 case-handling employees who worked with national population registration at nine out of the ten regions of the Swedish National Tax Agency. The questionnaire was put together based on well-known theories on »healthy work« and the stress related consequences that arise in a poor work environment. Karasek’s and Theorell’s theory on support, demand and control (described in the section on stress), was of key importance. In addition, the questionnaire addressed issues concerning computer support and physical and psychosocial reactions related to the work environment. Finally there are some questions on ethics and how they apply to development processes and to the work situation.

Interviews

As part of the VERKA-project, several sets of interviews have been made, and most of the subjects were people working with the national population registration in the Swedish cities Falun and Stockholm. These interviews dealt mainly with questions concerning visualization, usability and health issues in computer-supported office work.

Within the IT-strategy project, nineteen interviews were conducted, focusing primarily on usability and work environment, and each interview took approximately one hour. The interviewees were mainly people who had worked with the IT-strategy in one way or another. The interviews were semi-structured, recorded and transcribed.

User Interfaces

Different images from the Folke project are part of the analysis, although not in particular focus. As one part of the project, a minor study was conducted concerning problems with overview that were the result of the transformation of case-
Method

handling work from being paper-based to becoming completely electronic. This project was limited to the inbox and the problems associated with the inbox, and it was conducted (in part) to investigate the possibility of using the ideas and knowledge that we as HCI researchers have acquired.

Theoretical Lines of Action

Finally, the theoretical part of the thesis can be seen not only as a background but as an integral part of the data collection. By highlighting different lines of action within the theoretical framework of HCI and in its surroundings, the theoretical part of the thesis becomes a part of the research object; and as such it can be regarded as the focus of the investigation, as well as part of the theoretical background.
METHODOLOGICAL OBJECTIVES

The question of method is a rather complex issue requiring a thorough discussion that clarifies not only a choice of method or methods but the background for the choices as well. The choice of method reflects not only the ways in which research has been made. It also reflects the underlying values in terms of what is important to the researcher or the researcher’s domain. The choice of method is expected to follow often tacit rules constituting the framework of the specific scientific domain, in order to be able to present results that can be accepted within the domain. This is why I needed to go deeply into the question of method when I took this thesis to task over issues such as the questions of the obvious and essential, and of how our basic values affect development processes. This was particularly important since it became more and more difficult for me to accept the classical hypothetical-deductive ways of conducting research. In this chapter I will try to clarify the reasons for my preferences and standpoints concerning method and methodological choices. I will thus begin with a presentation and discussion of different views on methods and I will position myself by pointing out the ways in which I deal with these methodological issues.

A HISTORICAL OUTLINE

Scientific ideas were first formalized in ancient Greece. The difference between magical or religious forms of explanations and explanations of a scientific nature began to be outlined. Very early on, the idea of rationality was developed. The logical, conceptual way of thinking, was seen at the time as the most important and superior source of knowledge. Later, there
were other thinkers who argued for the opposite point of view. These were the empiricists who claimed that knowledge was gained from experience, and that our conceptions were thereby reflections of our observations. Traditionally, the rationalists and the empiricists have different methodological ideals, and while the rationalists’ methodological ideals were deduction, the empiricists’ methodological ideal was induction.

By outlining different methodological approaches, it will be possible to better clarify the methodological foundation on which I stand. My aim is to outline the development of the methodological approaches that have dominated over time and how these approaches differ from one another. My point of departure is the modern era, which began in the 17th century, when Descartes, Spinoza and Leibnitz were the most influential rationalists. While they were active on the continent, Locke, Berkley and Hume were the most influential thinkers in Great Britain. These geographical differences between the rationalists and the empiricists are reflected in the later controversy between the continental and the Anglo-Saxon ways of thinking. (Ahlberg, 1953. Russell, B. 1992. Mårtensson, B. & Nilstun, T. 1988. Lewis, R. 2002).

René Descartes (1596-1650) investigated the question of doubt in his famous work on method in year 1637. In this investigation Descartes decided that nothing was true as long as it could be subject to doubt. He came to the conclusion that the only thing he did not doubt was the fact that he was thinking, and since he was thinking he also had to exist. He had finally discovered a truth that he did not doubt. Based on this conclusion, he suggested a common rule saying: what we very clearly perceive is true is simply what the mind intuit. The difficulty is to accurately comprehend what we clearly perceive. This logical discovery was the foundation on which he developed his theory about our universe; a theory which has influenced scientific thinking ever since.
The deductive way of reasoning in the rationalistic sense was highly criticized by David Hume (1711-1776), who felt that all deductive reasoning is hypothetical according to reality; that deductive methods only will clarify that which follows certain premises, and that the methods would give no answers about the actual conditions of humanity. But when Hume scrutinized the inductive way of thinking with the same skepticism, he came to the conclusion that one cannot, through induction itself, prove the existence of a relationship in the real world.

Hume’s work affected Immanuel Kant (1724-1804) in so far as Kant focused his work on the mission to save science and to give it solid ground to stand on. Kant’s idea was that the ego will form its own reality and that we must experience the world within two forms of time and space, as well as in a number of categories. One of these categories incorporates the idea of causality, which according to Kant, is a human way of understanding reality, not a quality of reality itself. He meant that we simply see these causality relations in our environment because we have to, because we are shaped in that way.

During the same period of time, the positivistic ways of regarding the world were beginning to develop. Francis Bacon (1561-1626) is often mentioned as the forefather of the positivistic tradition, but it wasn’t until about 200 years later that the conceptualization of positivism, through Auguste Comte (1798-1857), was established. The positivistic scientific ideal emphasized the idea of neutral observations and objectivity. From this time on, the positivistic tradition has continued to evolve. The main positivistic ideas were based on the idea that science is built on raw data from observations; it is the idea that science produces knowledge about causalities; it is the idea that scientific freedom from values is needed in order to maintain objectivity; it is the idea that science is the opposite of non-verifiable speculations; it is the idea that
science prefers quantitative methods; and finally it is the idea that the values of science lie in its technical and social practices.

One school of thought that developed from this tradition was logical positivism. A group of philosophers in the 1920s and -30s called the Vienna Circle, went further than Comte. They claimed that a statement was only meaningful if it could be verified. Metaphysical and logical explanations could not be verified empirically and were therefore outside the field of science. In this school of thinking, logic became marginalized. The need for empirically verified statements, along with the denial of the value of logical, empirically unverifiable explanations, was – according to the Vienna Circle – the dividing line between scientific and non-scientific statements, between sense and nonsense.

As a reaction to the positivistic tradition, Karl Popper (1902-1994) developed his ideas of falsification using two main arguments, Popper refuted the positivists' idea of having a theoretically unbiased observational language as the basis for their scientific investigations. Popper claimed that 1) there could be no such language since every observation inherited an interpretation that was affected by the observer’s own theoretical basis of ideas and apprehensions and 2) every observation was a subjective phenomenon, a private action within an individual. Consequently it could not, according to Popper, offer the stable foundation for science that the older empirical tradition had in mind. Popper suggested that instead of verifying hypotheses, »falsify« them, in the sense that if you find one single example that does not fit into the hypothesis, then it needs to be rejected.

Popper’s own ideas were rejected by Thomas Kuhn (1922-1996) who instead put forth the theory of shifting paradigms. He drew a picture of how scientific revolutions occur by using examples from the history of physics. Kuhn’s idea was that when a paradigm is successful, it will attract supporters, and will then be the normative or »normal science« at that
particular time, but when anomalies begin to appear too frequently, then belief in the paradigm will gradually fade, which in turn will create a crisis. Out of this crisis, a scientific revolution will rise, which will evolve into a new paradigm.

Kuhn’s methods of describing the different paradigms were further developed by Paul Feyerabend (1924-1994) who presented an anarchistic view of scientific methodology that had its core in the idea that the rules of method, which tie down the scientist, are always a product of their time and that scientific progress presumes that one acts and thinks in a way that the current society will interpret as irrational.

The Eyes through Which We Interpret
How one views, approaches, or believes in methods, theories and empirical observations differ in fundamental ways, not only over periods of time, but also between different scientific schools. This brief historical picture is presented to illuminate some of the choices of methodological approaches developed during the past 400 hundred years. It is also presented in order to clarify the fact that the methodological approach not only is a child of its time, but also, situated. We learn how to interpret the studied objects according to the dominating values that prevail in the scientific field and community to which we belong. This is of course important, in that there is a need to develop the knowledge and the skills necessary within the specific occupation. But, when one becomes part of a certain community, the difficulties in seeing and discerning the inherent characteristics and basic values, will at the same time become more numerous.

Objectivity or Subjectivity
The idea of objectivity in research is a concept that I find difficult to agree with. There is always some portion of subjectivity in interpretations. When conducting a study, there
are always several choices to be made; the choice of method or methods to be used when the question or studied object is to be investigated, choices of how to pick the studied object or objects, or choices concerning the theoretical platform that one prefers. When the choice falls on measuring tools, used on perfectly randomly picked objects, the idea of objectivity is often pointed out. The results are presented with different significance, which tells us something about the validity. But the choice of questions, the idea of what is important and the interpretation of the results are subjective. This does not mean that I agree with Popper’s solution of falsifying hypothesis and his attitude towards objectivity and subjectivity, it is rather a problem that needs to be taken into account when conducting research in the choice of methods.

Subjectivity as such, is not to be seen as the problem within research. The problem occurs when the idea of objectivity fools us into thinking that there is no subjectivity in the results that constitute the outcome of the construction of our studies. Objectivity has no value in itself. Things do exist objectively, like the earth, a table or other obviously existing things, but the moment we interpret what we see, the studied object will be transformed into a subjectively interpreted object, and although objectively existing will be affected by the experience, prerequisites and feelings which constitute the observer. In a sense, one can say that the observer is the observed.

A TRIPLE HELIX OF METHOD, THEORY AND PRACTICE

Three major scientific lines of action that are available when conducting scientific investigations are methods, theories and practice. Method, theory and practice are intimately intertwined and become interdependent in the exchange of knowledge between researchers and practitioners. These scientific lines of action mainly used by these two groups, are
expressed in the different benefits these groups anticipate gaining through the new knowledge that is developed.

**Snapshots from Life**

When conducting different kinds of social studies we have to keep in mind not only the fact that we affect our observations by our existence, but also that empirical findings are merely snapshots taken in the practitioners’ world. These snapshots are the frozen moments on which we build our notions or interpretations of the »real world«. Since the real world is not a series of frozen moments, but more of a continuum characterized by flux and transformation, the images are to be interpreted as snapshots and not as perfect reflections of reality.

The data that we collect in our studies is interpreted according to different sets of categories that we establish. As previously noted we carry within us an inclination to categorize. It can be seen as a strategy needed to manage life. The categorizations can be used to focus on »the relevant« in our surroundings, and help us keep focus on what is crucial or of importance in our environment. In research we need to thoroughly navigate along the path of our preconceived notions, we need to relate to the tools of method, theory and practice, and we need to find a satisfying balance between these three tools.

Following in the footsteps of the scientific world, the practitioners create a world in which models, theories and ideas are used and developed. It is in the practitioners’ world that the empirical studies are made. The results of these studies are analyzed and often generalized according to the ideas of classical induction; generalized conclusions are then drawn from the examples seen. The generalized results can be seen partially or in their entirety as potentially beneficial to the development of the practitioners’ own organization and business. The results are then often transformed and used by
the practitioner to support the steps that are to be taken within their own organization. In the interpretation of the scientific investigation, it becomes possible to twist the results in a way that they become not only usable but also give support to chosen strategies or decisions made within an organization. From the practitioners’ point of view, the most interesting results are (not surprisingly) derived from theories and methods that have a practical application. But from a scientific and theoretical point of view, results and discoveries of another kind may be of the same or even greater importance.

When using a scientific point of view there is occasionally a tendency to emphasize only one of the three lines of action; method, theory and practice, and in some studies they are handled as three completely independent and isolated entities, although ultimately interdependent and intertwined. The challenge however is to succeed in merging the three areas, while at the same time keeping in mind that they are three different entities presenting three different lines of action.

**THE QUESTION OF METHOD**

Over time the dominating methodological issues are characterized by questions concerning rationalism or empiricism, logic or experience, deduction or induction. Seen from this point of view, today’s scientific ideals can be divided into two major categories – positivism and hermeneutics. This crude distinction does not give justice to the wide field of interpretation that is found within the discourse of methodological approach, but it can serve as a generalized description of these issues.

Scientific theories or models can mainly be seen as tools used by the researcher to choose a method through which it is possible to foresee a certain outcome. The natural sciences rest on these kinds of methods, however the social sciences might not be well-suited for using of these types of methods. Every
seldom sciences.

Within the realm of research, the discussion that is often brought to the fore, concerns the relationship between the use of qualitative observations and the use of quantitative data. Some questions give rise to this discussion more than others, particularly questions concerning what scientific results are, and how results can be presented even though these results are derived from qualitative observations and not from quantitatively measurable data. Another such question is that which deals with the following query: if, and in that case how, can qualities be measured at all. The problem lies in that the
two concepts – qualitative and quantitative – are not interchangeable; the qualitative cannot be the same as the quantitative and vice versa. It is a question of the difference between measurable units and interpreted relations.

The idea of measuring qualities with quantitative measures has its origin in the exact method of natural science. This method can be described as the collaboration between observation and mathematical inference – induction and deduction. This method was mainly formed in the 16th and 17th centuries by the great founders of the field of modern physics, Galileo and Newton (Ahlberg, A. 1953). Over a period of time, Galileo went from consulting the authorities to, instead, searching for the answers in nature itself. He did this by questioning nature in the form of various experiments. Nature was found to be strictly regulated by mathematical laws. These laws of nature were then established through experiments and mathematical deduction. In order to be able to apply mathematical methods to nature, it was necessary to reduce the qualities into quantities, or as an example, interpreting light as wave motion, or sound as vibrations in the air. Galileo himself did not see this procedure as a reduction of qualities. Instead he put forth that the book of nature was written in the language of mathematics. He separated the qualities into primary and secondary qualities, where the secondary qualities were the qualities of the senses, such as color, sound, smell and heat. They were subjective and not measurable – in contrast to the primary qualities, which were objective and measurable and with which the world was described as it really was. It was the primary qualities that were written in the book of nature.

Today, the preferred choice of method in investigations is often to quantify qualities in order to make them measurable. This choice is made despite the fact that quantities and qualities are, in themselves, two completely different concepts. For instance, this is the case when a concept is broken down into smaller components, which can then be quantified and
measured, in order to finally be merged together and presented as a fact that is possible to generalize. But however, when a quality is quantified, a replacement – of one concept by another – takes place. For instance, the measure of beauty is something other than beauty itself just as the measure of IQ is something other than intelligence itself. A measurable unit needs to fulfill certain criteria such as the criteria of being reflexive (if $A=B$ then $B=A$), transitive (if $A=B$ and $B=C$ then $A=C$), and equivalent ($A=A$). A measurable unit is also characterized by its invariance, that is to say its independence of time and space. Qualities do not fulfill these criteria and therefore cannot be used in the same way. If, for example it is said that a woman is beautiful, a color is beautiful or a piece of music is beautiful, it does not mean that »beautiful« in these three cases will have exactly the same meaning. In fact, »beautiful« will have a somewhat different meaning. There are of course similarities, but the meanings are not identical. If instead, it is said that a pole is one meter in height, a sign is one meter in width or a pool has a depth of one meter, then »one meter« in all these cases will be identical, and not only in these examples, but in every single example.

**Different Approaches**

Within each scientific branch, one main approach or angle of reality is studied. Each branch determines the measures and the choice of methods it can deal with. This means that not any one single scientific field can give us the answer to what reality is in its entirety, or what the ultimate cause is for all phenomena and contexts that we can experience. Traditionally one of the basic metaphysical questions is how to interpret the relationship between the two different ways that we seem to experience the world: on the one hand, the experience derived from the outer, physical world, and on the other hand the experience that originates in the inner world of thoughts, feelings and will; the reality of the soul.
From an epistemological perspective, the world will be, in some sense something other than our knowledge or perception of what the world actually is. If our perception of the world is at least partly a product of our senses, then the question will be raised: Is knowledge really the instrument with which we can understand reality and create a true picture of it? This question is of a philosophical nature and part of the epistemological perspective, but there are other truths as well that are not built on experience but rather purely on thoughts. Take for instance, mathematical calculations such as the sum of the angles in a triangle is the same as the sum of two right angles.

The contemporary sciences such as the social sciences were originally included in the field of philosophy. Slowly, through a natural process, new scientific branches evolved. In this sense psychology can be described as sprung mainly from the theory of cognition, while pedagogy is more related to the field of moral philosophy. If a scientific approach is compared with a philosophical approach, then it becomes evident that the philosophical approach is not primarily concerned with the physical causality relations. The philosophical ways of investigating and asking questions have more in common with the fundamental questions about the essence of things, for instance, the question of what science is.

Conceptual Analysis

Conceptual comparisons are of vast interest. Language reflects basic values and trends, which we, more or less consciously, are attracted to. This is one of the reasons why it is important to investigate not only that which is measurable, but also the qualities in the surrounding measured environment. If the difference between quantities and qualities, may, in a sense, seem obvious, they are still often confused with each other. If we look at Wittgenstein’s way of thinking, we will see that he deals with the concrete reality, in which the concrete situation is used in order to reach clarity as to what this reality really is.
In his investigations of different kinds of language games, Wittgenstein argues for not saying or taking for granted that different kinds of games must have something in common or otherwise they wouldn’t be called games; he says that you should instead actually look and see if they have, in fact, something in common, because when you look at them all, you won’t find anything that is common for all of them, but you will find that similarities and kinships are present to a great extent. Wittgenstein then continues to explain that the similarities can best be described by the concept of family resemblance. He uses this metaphor because just as facial features, eye color, way of walking, etc. are shared by the members in the same family, so to, are these similarities related to each other. This is why he says that games constitute a family. (Wittgenstein, 1992, §§ 66, 67) Wittgenstein is important to this thesis because he does not depart from the examples taken from concrete reality and, by using these examples, he clarifies the real nature of the relationships.

Traditional philosophy, in contrast to Wittgenstein’s way of thinking, tries to explain the nature of relationships by introducing a construction in order to make clear the unclear. This construction could be a conceptualization, which in its aim to make clear what is unclear, instead makes the confusion even worse. This traditional way of working with philosophical investigations can also be observed within the social sciences. The idealized picture, that is to say the picture we get by searching for the essence of something – for instance by searching for what is common or typical for all usages of a word – will be an abstraction of reality, which in turn will become a generalized truth. For example, this could be a determination of the concept beautiful, a construction of what the essence of beautiful really is, which in turn will constitute the foundation of an investigation or a theory about qualities. The problem is that the investigation or the theory will then be built on an imaginary reality – fiction in fact – and therefore the
results of the investigation can never obtain a dignity other than that of fiction.

Validity and Reliability

Results presented in scientific contexts are to be proven valid and reliable. This is usually done by the use of a well-tested measuring instrument, from which one set of results can be compared to another set of results and thereby be validated. If the instrument is reliable, then the results will be comparable, and if the results are proven to be valid, then the instrument itself proves to have a high validity.

Validity and reliability are of importance in the evaluation of results particularly when presented in scientific work. But validity and reliability can not only be seen as the result of using methods that present units in a comparable and measurable way. The reliability lies also in the transparency in the presentation of the line of thought that lead to the results, which thereby can be validated.

Position

The scientific approach in this piece of work is not to be seen as inductive or deductive, subjective or objective, nor should it be seen as reflecting any single methodological school. When it comes to the methodological way of tackling my own research, my primary aim is to keep in mind the differences between qualities and quantities, between reality and the notion of reality, and to not lose sight of the fact that reality, in all its senses, may not be systematized into set models or processes.

In this thesis validity and reliability are not presented as measurable entities. The reliability lies in the presentation, which by describing the path of reasoning in my thoughts, together with a presentation of references, research and results will thus be open for criticism and validation.
THEORETICAL OBJECTIVES

As previously noted the theoretical framework is not merely a platform for the empirical work that is presented. In this theoretical section, I will present an overview of the theoretical ideas and platforms, that in one way or another, have been important for my research within the field of HCI. As stated earlier, the theoretical framework consists of a set of different scientific approaches that reflect the fact that HCI is a young and multidisciplinary field; a field that encompasses many different scientific backgrounds and views. I will begin by presenting a brief overview of the field of HCI and I will point out some specific aspects, which are of importance in my research. As a second area of focus, I will present and discuss design, in terms of design for work and its relationship to the design of work. I will then continue with a presentation of different understandings of people, their motives, behavior and interpretations of circumstances. Here, I will say some words about theories that are important for the interpretation of development processes; theories that deal primarily with the issues of basic values, metaphors, behavior and stress, and how these issues can be related to the concept of »a healthy work«. I will close the chapter with some thoughts about the states of conscious and consciousness.

HUMAN COMPUTER INTERACTION

HCI is a relatively new and expanding scientific field. Originally it dealt with the interaction between humans and the computer, particularly the understanding of how humans react to the interface that they are presented with. The field of HCI is seen as multi-disciplinary, as cross-disciplinary and
sometimes as an inter-disciplinary field. The differences emphasize the interpretation of how the various fields relate to each other. In the multi-disciplinary view, the fields remain quite separate. In the cross-disciplinary view the fields »pollinate« each other, while in the inter-disciplinary view the boundaries between the different fields become indiscernible. The field of HCI is discussed in the ACM SIGCHI curricula, and the breadth of it implies that it can encompass almost any kind of interpretation.

HCI has yet to arrive at a common definition of the range of topics that the field encompasses. The Association for Computer Machinery’s Special Interest Group on Computer Human Interaction, ACM SIGCHI, has offered a working definition that aims to make it easier to tackle the practical work of deciding what is to be taught within the area of HCI. The ACM SIGCHI Curricula for HCI defines the discipline as follows:

*Human-computer interaction is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them.*

In the ACM SIGCHI article on »Curricula for HCI«, one can also read: »From a computer science perspective, the focus is on interaction and specifically on interaction between one or more humans and one or more computational machines«. According to ACM SIGCHI, HCI is concerned with the joint performance of tasks by humans and machines, the structure of communication between human and machine, human capabilities to use machines (including the learnability of interfaces), algorithms and programming of the interface itself, engineering concerns that arise in designing and building interfaces, the process of specification, design and implementation of interfaces and design trade-offs.
ACM SIGCHI offers a model that attempts to illustrate the nature of HCI. This model shows how different points of view, different scientific branches, and different approaches and methods are related to one another within the field. It illustrates how HCI can be interpreted as »communication«, from an agent paradigm, a tool paradigm, as the work-centered point of view, in the human/system/tasks division or as supervisory control.

![Diagram of Human-Computer Interaction](image)

**Figure 1:** Human-Computer Interaction. ACM SIGCHI Curricula for HCI

The primary objectives of HCI are productivity and user empowerment. Figure 1 illustrates the history and intellectual roots of HCI and also presents HCI as an academic topic through journals, literature, its relation to other fields and as science vs. engineering vs. design aspects. The model contains four main topics or approaches: the use and context of computers, human characteristics, the computer system and interface architecture and finally the development process.

The »use and context of computers« point of view contains three elements: U1 in the picture – computer systems exist
within a larger social, organizational and work milieu. U2 in the picture illustrates the application areas and shows that within the context there are applications for which we wish to employ computer systems. The third element, U3, is the human-machine fit and adaptation part, which deals with the process of putting computers to work – meaning that the human, technical, and work aspects of the application situation must be coordinated through the human learning process, through system tailorability, or through other strategies. This contextual approach is of interest to my research, since I believe that the interpretation of different studied phenomena has to be made contextually.

The »human characteristics« point of view can be seen in conjunction with the use and social context of computers. This perspective shows that we must also take into account the human information processing illustrated by H1 in the model. There is also the need of understanding language, communication and interaction, H2, and physical characteristics of users such as ergonomics, H3. This area is one of the main concerns in my work – the human characteristics, which are more complex and extensive than generally accepted or believed, within the field of HCI.

The computer point of view, which deals with »computer system and interface architecture«, a variety of technologies has been developed for supporting interaction with humans. Input and output devices connect the human and the machine, C1, and these devices are used in a number of techniques for organizing a dialogue. These are labeled dialogue techniques in C2. These techniques are in turn used to implement larger design elements, such as the metaphor of the interface, labeled dialogue genre in C3. While getting deeper into the machine substrata that support the dialogue, the dialogue may make extensive use of computer graphics techniques, labeled computer graphics in C4. And finally there is the dialogue architecture in C5. This area cannot be ignored since the
outcome and the understanding of how technical solutions are made, is also of importance to my work.

The »development process« point of view deals with questions about design approaches, D1, implementation techniques, D2, evaluation techniques, D3 and example systems and case studies, D4. The development processes is also of interest in my work, especially as a reflection of the driving forces and hopes to find the ultimate process or strategy that will lead to the optimized software solutions. However, the area of development process in the curricula is also in great need of development.

The design is also a subject in itself, with different foci, and with a lot of well-developed knowledge when it comes to the information presentation on paper, but with less knowledge when it comes to presenting information electronically.

It is interesting to see that the concept of interaction is not really taken seriously into consideration. The ACM SIGCHI curriculum discusses the different point of views and claims that interaction between them exist, but the curriculum does not deal with what this interaction actually means or how it should be accomplished. The difficulties with interaction are not analyzed and also not reflected in suggested solutions.

In accordance with the ACM SIGCHI illustration of the HCI area, my approach focuses mainly on the »Use and Context«, the »Human« and the »Development Process« parts, while the »Computer« focus is limited to discussions mainly about the layout of the Graphical User Interface, GUI, and its implications on usability and work environment; in other words – not the strictly technical aspects. Yet it is central to my research to emphasize the importance of a contextual line of action and not simply take one part into consideration, without analyzing it in its context.

From a HCI perspective, some human traits are more emphasized than others, particularly such traits as understanding, learning and memory. However social and
organizational traits are examined as well. The interest in
cognition and how we perceive and understand information
has been of particular interest to researchers within this area.

**Cognitive Science**

One approach to the understanding of the human being and
his/her mental inner space is represented within the area of
cognitive science and cognitive psychology. Although they
share a common title, there is a great diversity in the issues
which are in focus. But in general, there is one dominating
approach linking together the differences in the various views.
The unifying common approach deals with information
processing and is based on an analogy between the mind and
the digital computer. This area of research was established in
the mid-1950s and enjoyed a substantial upswing. The ideas of
cognitive science were deeply affected by researchers such as
Chomsky and his work on the logic of language, as well as
Miller, who presented the idea of the magic number of seven in
artificial intelligence (AI) was a more or less natural
consequence that began to develop at the same time. Although
cognitive science was united in one sense, in another sense the
field was quite diverse. The diversities could briefly – as
sometimes suggested – be divided into the ideas of
experimental cognitive psychology with no computational
modeling; cognitive science understanding human cognition
with help from computational models; cognitive
neuropsychology providing information about the human
brain by studying brain-damage and effects from such; and
finally cognitive neuroscience using different techniques such
as brain scans, for studying brain functioning (Eysenck, M. W &
Keane, M. T 2000). The differences between the approaches are
fluid and there are many studies taking broader views than the
ones presented here, but as a brief description this
categorization can suffice.
The idea of the comparison between the mind and the digital computer and how it has revealed further ideas is of interest, suggesting that if one gets a certain input, then a certain output will appear. In this field of cognitive science it is as if the human being works with »IF…THEN« phrases.

Cognition itself can mainly be described as an individual’s thoughts, knowledge, interpretations, understandings or ideas, which are developed through cognitive processes such as perception, memory and information processing. Through these processes, the individual acquires information, makes plans and solves problems. In cognitive psychology, the role of mental processes in understanding behavior is stressed. Here, behavior is explained through the level of mental representations and the mental processes that operate on these representations, in order to produce responses, for example. In the 1970s, when the term cognitive science was introduced on a more generalized level, the focus was on how humans acquire and organize knowledge. It focused on mental representations, perception and information processing in general. One of the dominating areas within cognitive sciences is the biological/medical approach focusing on brain damage and the consequences and possibilities of recovering from different kinds of damage. The brain seems to have a better capacity to recover from damage than previously known. It has the capability as a consequence of its plasticity, but how the care of the damaged brain is design, is crucial. In terms of the capability and interpretation of the human mind, attitudes differ dramatically between different scientific areas. In research where brain scans and chemical chains of events are in focus, the idea of a free will or of individual capability to control emotions is interpreted as a consequence of mainly biological processes, such as hormonal levels; whereas within some areas of psychology, the biological reactions are interpreted as the stemming from psychological reactions. As previously noted, it is important to stress that cognitive
psychology is not a monogenetic field; in fact, within the field there are rather large dissimilarities in the interpretation of the information process.

Perception can be seen as a cognitive tool. Through our senses of sight, sound, smell, taste and touch, we can perceive. However perception describes not only the senses, but also the entire process of how we come to know what is happening around us. Perception encompasses the entire sequence of events – from the presentation of a physical stimulus to the phenomenological experiencing of this stimulus. Perception is viewed as a set of sub-processes that occur in a multi-level, interactive system. The lower levels in this system, namely those parts closely associated with the sense organs, are called sensory processes. In the software development process it is of great importance that knowledge gained from the work experience is taken into consideration. The importance of feelings and use of the senses ought to be seriously taken into consideration. For example, this can be done in terms of work tasks and work situations and how it feels when a change in the nature of the work reduces the use of the senses of touching, hearing, smelling and feeling, to simply using the sense of sight. The software system is usually the factor that sets limits, making the chosen information on the screen only perceptible through the sense of sight. It is therefore of great value to make use of the knowledge that has been compiled about perception when new software is designed.

Throughout our lives we acquire knowledge through perception, through cognition and through different ways of learning. The phases of accommodation and assimilation, discussed primarily in Piaget’s work (1950) are of particular interest. Piaget reasoned that in the first phase, knowledge is accommodated, meaning that it is outside us; it needs to be thought about; it is not assimilated. In the second phase, knowledge becomes assimilated and is then part of us, and will act as the platform for the possibility of gaining new
knowledge. The knowledge about knowledge itself is also important when developing software; if used correctly, this knowledge can result in a design that is better adapted to the user.

Not only the human body but also the human brain has a certain set capacity. If the brain operates at a near maximum over an extended period time, this workload will lead to symptoms usually shown in stress-related reactions. Knowledge about mental workload, such as the knowledge about the limits concerning short time memory, chunking, etcetera, is also of importance when developing new software. This is particularly true since increased risks of negative health effects, organizational consequences as well as efficiency problems, come in the wake of this knowledge being ignored.

Information overload and unorganized information has a tendency to overwhelm us and can lead to reactions such as difficulties in perceiving discrepancies between what is important and what is trivial. For instance, if there are hundreds of e-mails in the inbox of which ten might be of importance, fifty might concern us in some way, and the rest are simply spam mail – then we have a situation where a deficient overview will consume a lot of energy and mental capacity. In the long run, and in the worst cases, this can lead to severe stress-related consequences, especially if handling e-mail is just one of the many tasks to be dealt with in the work situation. When interviewing employees, some of them can for instance report that when it is time for lunch, they have not even begun the day’s work, due to the volume of e-mail, and the fact that the e-mails are supposed to be answered within a short time.

Social and Organizational Aspects
The complexity in organizations and all its entities is one area of focus within HCI, in addition to the focus on social behavior
as communicative and interactive relations between people or between people and computers.

People need to socialize. Already in the 1930s, the Hawthorn studies showed that people who feel that they are seen, and even more so, feel that they are appreciated, will have the motivation and capability to perform well. When developing software for office work the opportunity to meet real-life employees on a regular basis is often minimal. The work at the computer very often becomes too inflexible and more difficult to affect. The human-to-human communication diminishes, the possibilities of surveillance over the employees’ work increases, and the feeling of being controlled at every step, increases as well. At the same time the psychological safety valve seen in human interaction fades away and leaves the employee alone, without a natural occasion to discuss and reflect – in an informal way – over the new situation and the feelings it gives rise to among the employees.

The relation machine-man can be described as having its focus on how the machine is developed and how technical solutions can be made. From this perspective, the issue could be how to best fit man to the machine, as first seen in the Tayloristic ideas on the conveyor belt principle. Or it could be interpreted as the idea of man being part of a technical system.

In this perspective the focus is on the technical solution and the technical possibilities of developing some kind of technical artifact. (Preece, J. et al. 1994) Issues such as input and output devices, the number of pixels, the technical platforms or technical architecture are the main topics of discussion. The idea might be that, rather than putting man in the spotlight, concentrate instead on developing superior technology, which people will want and will want to use. Many system developers do not think that bringing users into the development process will result in better products, since they consider users to be rather conservative and seldom capable of
understanding the development process or the possibilities in a future system.

Interaction
The field of HCI concerns the human, the computer and the interaction between the two. But that which constitutes interaction, is not clearly taken into consideration. Interaction implies that there is a joint action going on between two or more parts. In all planned organizational and software development, the knowledge of strategies and how they can be used is very important. As seen in a number of cases, development of new systems, especially when made for a particular business, suffer from a lack of communication between the systems developers and the business developers. And even if the development of the system takes place in an in-house organization, communication often fails – despite the fact that the two parties inform and talk to each other. The understanding of the business, or of the system, is the result of the platform or frame of reference that each and every one of us possesses. If in this communication between different roles or competencies, we use the same words to describe different things, the risk that communication will fail probably increases, and in the worst case, the project as a whole is at risk. In the kinds of development that are referred to in this thesis, interaction is a re-occurring word, although often it is used from different points of view.

When it comes to behavior in organizations, some different theoretical standpoints can be seen. But rather than emphasizing the dispositions or situational influences on behavior, it has been argued that it is the interaction between the parts that most accurately accounts for behavior in organizations. In »New Directions for Organization Theory: Problems and Prospects« by Pfeffer (1997. p.37) five types of interaction between a person and a situation are presented:
1. Descriptive interaction meaning interaction describing interpersonal relationships and behavior, in terms of the individuals involved and the situation or context;

2. Statistical interaction,

3. Additive interaction, meaning that two or more variables are having additive effects,

4. Interdependent interaction, which emphasizes how individual traits and situational variables constitute a complex system and how changes in one variable may have different effects on other variables, and finally

5. Reciprocal action-transaction interaction, which maintains that a variable is influenced by its own effect on other variables.

In his description of a social model of behavior, Pfeffer says that social models emphasize the idea that one's behavior is rarely explicable, without reference to previous and persisting effects of interaction with others, or without reference to the overall pattern of such interactions in groups. (Ibid. p.55) Organizational behavior is a natural part of concrete, ongoing systems of social relations. Pfeffer also presents studies made on physical space and other factors affecting interaction in organizations (Ibid. p.199). These studies show that distance as a factor influencing interaction, probably only affects certain forms of interaction such as those occurring face-to-face. The relationship between physical barriers and interaction is less clear. The findings in one of Pfeffer’s studies show that among professional-technical workers, interaction may be greater between those workers who are given enclosed workspaces, than between those who lack physical barriers. The study’s conclusions showed that a certain amount of privacy and personal space was useful for building relationships and that an absence of privacy actually reduced interaction.
From a more untainted sociological perspective, different paradigms can be observed. But within the discipline, there are also different ways of describing the map of sociological trends. One way of interpretation is in terms of three major paradigms. Interactionism is one trend, which is placed somewhat differently on this map, depending on who is drawing it. In some descriptions, interactionism falls within the framework of functionalist sociology.

Interactionism can be seen as an outcome of the conflicting perspectives that dominated in Europe during the 19th century (Burell, 1979, p.69). In one corner of the ring, there was the German idealist tradition that maintained that there was a fundamental difference between nature and culture and that natural laws were inappropriate to the realm of human affairs, which were characterized by the human spirit. Accordingly, there could be no such thing as a social science. And in the other corner of the ring, there was the Anglo-French tradition that held that society did, in fact, have an objective existence and in many respects it could be likened to a biological organism. Consequently, society could be characterized by the operation of laws, which were open to investigation through the methods of natural science. These two extremes were rejected by a man called George Simmel, who instead, argued in favor of putting the focus on humanism and interaction. He said that sociology works with the questions of determining what rules man behaves by, how he forms groups and how in turn, he is affected by the group.

Another sociological influence discusses a different kind of interactionism called symbolic interactionism (p.79 ff. Burell, G., Morgan, G. 1979). If non-symbolic interaction is characterized by how humans respond directly to one another’s gestures or actions, then symbolic interaction can be characterized by how humans interpret each other’s gestures and how they act on the basis of the meaning yielded by their interpretation. Symbolic interactionism was highly influenced and inspired by Mead
(Svedberg, 1992) who had – in common with behaviorism - the idea that psychological investigations were to be based on contextual everyday situations, and not on the mind or the conscious or some other concept that lacked independent meaning.

In psychology, interaction is mentioned particularly in the context of how the personality is shaped and this perspective is also called interactionism, but it differs slightly from the interactionism perspective in the phenomenological sociology perspective. In personality developmental theory, the joint interaction between the child and the environment provides the framework in which the child’s personality will be developed. The interaction can be understood as the correlation between the genetically inherited characteristics (genotype) and the environment which, in most cases is provided by the parents. In personality theory, behavior is seen as resulting from the interaction between consistent personality dispositions or traits and the situations in which people find themselves. Three types of dynamic interaction are discussed: reactive interaction, evocative interaction and pro-active interaction (Atkinson. et. al. 1990).

Different individuals react differently even when they are exposed to the same situation. They experience the situation differently and interpret it differently. For example, a person who is exposed to a hurtful act can interpret it as a product of hostility, while another person might interpret it as a product of insensitivity. Reactive interaction is a way of attacking a problem that is supported by phenomenological psychologists, since their emphasis is on each individual’s interpretation of the situation.

Within the scope of evocative interaction, every individual’s personality is seen as evoking distinctive responses from other people. A person with an insensitive manner is more apt to evoke a hostile response from the social environment, as compared to a person who is tactful and sensitive to the
feelings of others. From this point of view, the conceptual and methodological tools are seen as necessary for analyzing reciprocal behavioral interactions. Here the social-learning theorists have taken the lead.

The pro-active interaction way of thinking implies that each individual's personality leads him or her to seek out certain situations while avoiding others. A person who has a need to dominate others might seek confrontation, whereas a more submissive person would try to avoid such a situation.

Some Approaches within the Field of HCI

From an HCI perspective, interaction can be described as a process (Monk & Gilbert. 1995). In this particular interpretation, interaction is broken down into the elements that it consists of. Based on what these elements are determined to be, an application is built. Just as in the cases of the other disciplines that are presented, HCI does not interpret or use interaction in just one, single way. The discipline has a wide range and includes many different perspectives. Within the area of HCI, certain different theoretical approaches dominate more than others. Since the dissimilarities and conflicts within this field are important to the development of this thesis, in that they broach the subject of basic values in different ways, I will briefly describe some of the different approaches below.

Activity Theory

The object of analysis in activity theory is, as reflected in the term itself, an activity. The theory is developed by the Russian psychologist, Vygotsky, whose work is based on the idea that there are both physical and technical tools, as well as psychological and mental tools, which we use in our activities. (http://www.massey.ac.nz/~alock//virtual/colevyg.htm)
The basic idea in this theoretical framework is the possibility of interpreting the activity in its context. Or as Hasu and Engeström put it »[…] contexts are activity systems. An activity system integrates the subject, the object and the instruments (physical tools, as well as signs and symbols) into a unified whole. Activity is driven by a collective object and motive, but it is carried out in goal-oriented individual and group actions.« (Hasu M. & Engeström Y. 2000)

The diagram above is developed by Engeström and illustrates the main elements of the context in which an action can be described (ibid). The basic element and the first one to be developed in the diagram, is the top triangle representing the mediating artifact, the subject and the object. The diagram has then been expanded and, in this new state, contains the bottom layer as well. This layer includes all new relations that are the outcome of the expansion. An action can incorporate one or more people. But when activity theory is used to interpret the action, there will be differently activated diagrams, depending on which part is in focus. For example, different subjects can have different views on what the object or the mediating artifact is. Or one object can have different relations to the subject or to the mediating artifact – as well as to rules, communities and division of labor. This makes use of
the activity theory rather demanding. The interpreter must keep in mind at all times, the angle from which the action is interpreted and he or she must see to it that the different approaches don’t get mixed in the same phase of interpretation. As seen in some investigations, the object and the subject can be transformed. This transformation from (for instance) object to subject, reflects the use of the two concepts »object« and »subject« as they are interpreted in psychology. The subject is the internal personality, the character, the interpretation and feeling of the self or the soul, while the object is to be interpreted as the more rationally studied, as for instance when the self is described without referring to an emotional connection.

In activity theory, there is sometimes a distinction made between person-plus and person-solo situations. The person-solo term is used when the object of analysis is limited to the person him- or herself, while the person-plus term is used when the object of analysis is the person plus his surroundings. For instance, it can be a person working with case-handling at the national registration and his or her computer, incoming errands, handbooks etcetera. In education, it can be of interest to keep in mind that characteristics change in the information processing capacities, depending on if the situation is a person-plus or a person-solo situation. (Salomon, G)

The activity theory proposes to be an object-oriented theory. However object-orientation becomes problematic in the case where the object in the action differs, as a consequence of different points of view.

Distributed Cognition
The object of analysis in distributed cognition is a cognitive system composed of the individuals and the artifacts they use. (Nardi, B. M.) The primary idea of distributed cognition is that cognition not only can be within our minds, but also within our relations to the tool we are using in a particular situation.
Or, to put it differently, knowledge is not only within man, it can also be what is encompassed within the interaction between man and tool. Man and tools together develop knowledge. For instance, our memory does not retain all information we need, especially when it comes to factual information. Therefore we might need help with information that our mind has not retained. In the relationship between man and technology, the tool itself and the facts provided by the tool are translated into knowledge or cognition. From this distributed cognition point of view, man is seen as the meaning-processing component in the interaction, while the tool or technology can be seen as the catalyst in the meaning-making process.

The concept of distributed cognition is in some ways similar to the activity theory concept in that they both use some of the same theoretical construction. It is through the interaction with a technological tool that distributed cognition can be developed. As with action theory, distributed cognition is a contextual analysis. But in distributed cognition, the analysis is built upon the idea of mental representations as well as on artifacts. In some works of research, the distribution of cognition is described as a learning process providing the members of a certain community the same understanding of the situations that have to be interpreted and reacted upon. For instance, Hutchins studies the learning processes on the commando bridge on a ship, in which the necessary knowledge is learned systematically so that the different roles on the bridge enhance the knowledge step by step in a certain order by practicing and experiencing the theoretical knowledge in a learning hierarchy, where the captain has attained the greatest knowledge and experience. In this particular learning situation, cognition is systematically distributed by the mentor and by surveillance of the learning situation, where the pupil experiences the situation by using
the knowledge acquired and, if necessary, be corrected by the mentor. (Hutchins, E., in Chaiklin, S., and Lave, J., 1996)

Distributed cognition distinguishes between the effects with technology and the effects of technology. (Salomon G., Perkins D.N., Globerson T. 1991, pp 2-9) The effects with technology are immediate and seen as cognition that is distributed as a result of the relation man-machine, whereas the effects of technology evolve when the person is away from the technology. The technology has affected the person’s cognition, in her mind and in her awareness or her knowledge – that is to say as cognitive spin-off effects or as cognitive remains. The technology can also be roughly divided into two different categories: machines that work for us and machines or tools with which we work. It is the latter kind of technology that is especially interesting and in focus when discussing distributed cognition. This is because the machines and the tools with which we work, more or less require intellectual engagement from the user and where results depend on the joint effort between man and machine. We can choose to distribute some of our load to a computer or some other technological tool, but we must be sure of what we distribute. To ease the burden we need to distribute the right parts. For instance, a computer is best at counting big volumes of systematic information, while the human is best at interpreting for example social situations.

Reception Theory
There is at least one line of approach that is borrowed from the field of literature research, called reception theory. The responding user and interpreter, or the user as a reader, is in focus in reception theory. This theory reflects a reader-response action and it is sometimes called reader-response theory. The idea put forth in reception theory is that the author’s intent with a text, is of less interest and not in focus. Rather it is the reader and the reader’s interpretation of the text that is of interest. In this perspective, each interpreter’s unique
understanding of a text is in fact the content of the text. Or to put it in another way, without the interpreter, the text, in a sense does not exist. To give the text an author is actually to impose a limitation on the interpretation of the text (Barthes). The interpretation will focus on the author’s intention and not on the reading of the text. A text’s content lies not in its origin, but in its destination. To put it in a slightly different way ».../the entities that were once seen as competing for the right to constrain interpretation (text, reader, author) are now all seen to be the products of interpretation.« (Fish, S. 1980)

This way of reasoning is developed from humanistic research, specifically from the field of literature research. The development of the idea that the interpreter is the »text-maker« or at least »content-maker«, is in part, derived from a discussion concerning the issue that has been going on for the past century, namely: what is a text? Does it exist if no one reads it? Does it exist in the author’s mind, does it exist if written on a paper, or does it need a reader in order to exist? The focus has shifted during this last century from emphasis on the author and the author’s intention in writing a text, to emphasis on the reader and the reader’s interpretation of the text. In its most drastic interpretation, this theory puts forth that it is only through the reader the text can exist. In this extreme way of thinking, it is not only the text that does not exist without a reader, not even the author exists without a reader!

If this concept is applied to computer-supported work, then the user can be seen as the interpreter of the system, and as such, the user constitutes the system. In this sense, the system becomes what the user interprets it to be.

The differences and the similarities in these three different ways of interpreting the user and the context are examples of how different theoretical approaches can result in completely different interpretations of the same situation. The approaches used within HCI are activity theory and distributed cognition
theory. Reception theory is not as frequently discussed, but it raises a few questions within HCI concerning the relation to, and interpretation of, the user.

**Designing Software**

The design of software is a process in which the needs expressed by the users and in the requirements are to be met. The knowledge about the technical implications as well as the knowledge about the effects of different solutions affecting the use of the system is of great concern. However, some of the difficulties in achieving this are obvious. The requirements must be drawn up in a way that they will genuinely meet the users’ needs as well as utilize the developers’ ability to transform them into the software that is desired. There are several suggestions for how to accomplish this goal, and most of them are described as development processes or models, which in turn have usually been developed by and for software developers. Using a narrow interpretation, software development is an engineering art. But the use of software, as well as the planning of its use, is not an art of engineering. Rather, it is an art of organizational development, taking into consideration not only usability matters but also labor relations, management, work environment, the design of work, the care of people, and their reactions as consequences of computer-supported work.

**Engineering**

Engineering is built upon the idea of problem solving and this, in a sense, is seen as a way of understanding the world. One of the main targets of an engineering education is to teach how to pinpoint problems in order to find the solutions. Each specific problem has to be defined and limited in order to be able to accomplish this mission. The problems that are identified are often rather tangible, although sometimes virtual. Tangibility
lies in the problem identification more than in the process of interpreting the entire environment in which the piece of software is going to be used. Tangibility is often referred to in the development process as functional requirements, meaning requirements that are measurable and in some way can be coded or programmed.

An overview is achieved by structuring the problem or problems and categorizing the components. This is reflected in the software development process and the use of modeling tools as the unified modeling language, UML, with which the targeted world can be modeled, meaning not only application structure, behavior, and architecture, but also business process and data structure.

One issue, which we have seen in the work with the IT-strategy, is that when using development models, or interpreting models originally developed for software engineering, the business processes, behavior and other relevant foci are reduced to information processes. A method as the method of modeling is developed by and for engineers to get a grasp of the information processes from which the system will in turn be developed. The information processes are the processes that information technology is developed to support, as reflected in the term IT.

**Methods**

Different lines of action are seen in the methods concerning software development. Some suggest methods built on the idea of involving the user in the development process, while others suggest that the developers, in their professional role, ought to take responsibility for the usability in the system. Some suggest that traceability in the development process should be a priority and that every step should be documented, while others suggest more rapid development processes, where documentation is given a lower priority in order to exploit the developers’ creativity. The attempt to find and develop highly
qualitative software solutions unites the different approaches, although their choice of path sometimes differs quite a bit.

**Participatory Design**

Participatory design suggests that the user shall participate throughout the entire software development process. It is an approach that uses work-oriented design to develop computer artifacts. In Bødker’s dissertation »Through the Interface: A Human Activity Approach to User Interface Design« (1987/1991), the first attempts to work with participatory design are developed and described. The main focus was originally on »computer support for purposeful work« however the main focus is now on the user and the user’s work situation in general. (Bødker, 1991, p.3.) The origins of participatory design come from a project called UTOPIA, which was a research project in collaboration with the trade union of graphic workers. The aim of the project was to focus on the development of, as well as training in, computer technology and work organization within the graphic industries in Scandinavia. This approach was chosen in order to contribute to the development of powerful, skill-enhancing tools for graphic workers, stressing not only the development of technology but also the development of human qualifications and education. (Bødker, p.7). In this early phase the focus was mainly on the interface and its design. Or put in another way, the focus is on the development of the technological tool, although with the goal of making it a useful tool supporting the work and the workers that it is being developed for. The UTOPIA project revealed a number of new aspects of which some are expressed in the outcome of the part of the project concerning computer-based tools for page make-up, summarized by Ehn as:

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4 The name of the project UTOPIA is in Scandinavian languages an acronym for Training, Technology and Products from the Quality of Work Perspective.
1. Designing advanced computer artifacts for skilled work based on skilled work is a possibility
2. Important aspects of labor processes, in relation to design of computer artifacts, neither can nor have to be formally described
3. Design should be done with users, not just for them
4. Mutual learning should be an important part of the work in a design group
5. Design-by-doing and the design of use models are ways of making it possible for users to utilize their practical skills of design and use
6. Hardware should be considered early in the design, in parallel with software, not after
7. The tool perspective is not such a bad idea

(Ehn, P., 1988, p.389)

Participatory design is still an approach to the assessment, design and development of technological and organizational systems. It benefits from having deep user and stakeholder involvement throughout all stages of system development, including planning, testing and implementation. Participatory design is also known as the Scandinavian school of design, since it originated in cooperation with the Scandinavian trade unions of the 60s and 70s.

User-Centered Systems Design
If participatory design focuses on the development of the technological tools in participation with the users, then user-centered systems design, UCSD, can be said to focus on the users, although not necessarily by involving them actively in the development process. UCSD has different interpretations and is used in different ways and settings since it lacks a generally accepted definition. Originally UCSD was an approach suggested by Norman and Draper (1986). They emphasized the importance of having a good understanding of
the users. Norman also emphasized that «the purpose of the system is to serve the user and not to use a specific technology, not to be an elegant piece of programming. The needs of the users should dominate the design of the interface, and the needs of the interface should dominate the design of the rest of the system» (Norman, 1986). The fact that the definition of UCSD is general and non-specific, makes it difficult for developers to use. The development process in UCSD becomes more of a description of an iterative process, involving the needs of the users and maybe the users themselves, although it was not a requirement in the original UCSD approach.

In a study conducted within our research group at Uppsala University, an attempt has been made to clarify and transform UCSD into a tool for software developers. The idea was to define a work or design process based on a set of twelve principles, which, if followed, would enhance the possibilities of succeeding in the development of usable systems. The idea of defining the principles was also to illuminate the discrepancies in the interpretations of UCSD, and as a result, be able to define more clearly how UCSD could be used by the practitioner. This definition was made by defining a set of key principles based on experience from several projects and by using previously developed principles and guidance5. (Gulliksen et. al. 2003). The twelve suggested principles are developed from the idea that UCSD is a process focusing on usability throughout the entire development process and further throughout the lifecycle of the system. The key principles are as follows:

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5 The principles and guidance taken into consideration come from Gould et al (1997), ISO 13407 (1999), Greenbaum and Kyng (1991) whose work in some communities is known as participatory design, and also from well-known approaches such as contextual design (Beyer and Holzblatt (1999), goal-directed design (Cooper 1999), and usability engineering (Nielsen 1993, Mayhew 1999)
1. **User focus** – the goals of the activity, the work domain or context of use, the users’ goals, tasks and needs should early guide the development

2. **Active user involvement** – representative users should actively participate, early and consciously throughout the entire development process and throughout the system lifecycle

3. **Evolutionary systems development** – the systems development should be both iterative and incremental

4. **Simple design representations** – the design must be represented in such ways that it can be easily understood by users and all other stakeholders

5. **Prototyping** – early and continuously, prototypes should be used to visualize and evaluate ideas and design solutions in comparison with the end users

6. **Evaluate use in context** – baselined usability goals and design criteria should control the development

7. **Explicit and conscious design activities** – the development process should contain dedicated design activities

8. **A professional attitude** – the development process should be performed by effective multidisciplinary teams

9. **Usability champion** – usability experts should be involved early and continuously throughout the development lifecycle

10. **Holistic design** – all aspects that influence the future use situation should be developed in parallel

11. **Process customization** – the user-centered systems design process must be specified, adapted and/or implemented locally in each organization

12. **A user centered attitude** – should always be established

**Usage-Centered Design**

In usage-centered design, the focus has shifted a bit more, away from the user and the user’s needs towards the actual usage of the system. Constantine and Lockwood describe this
approach as having its focus «on the work that workers are trying to accomplish and on what the software will need to supply via the user interface to help them accomplish it» (Constantine and Lockwood, 1999, p 23). Usage-centered design incorporates five key elements, which according to the authors, can lead to significant improvements in the usability of software. The suggested elements are:

1. Pragmatic design guidelines
2. Model-driven design process
3. Organized development activities
4. Iterative improvement
5. Measures of quality

The design guidelines are based on aspects of usability, in that the goal for the developed software is to make it learnable, rememberable, efficient, reliable, and satisfying to use. The guidelines include both usability rules and design principles in order to provide broad, overall directions for user interface design so that superior design can be developed. Hopefully by using user-centered design, the developers will better understand usage and thereby more clearly communicate their perception of the work that the software is being developed for. In turn this can lead to better communication with users and thereby provide the programmers with better guidance. The development process is a streamlined process, which can be scaled to suit projects of varying size and scope. The improvements are made iteratively. According to the authors, successive refinements are incorporated, based on the findings from usability inspections and tests. In turn these refinements increase the prospects of being able to quickly deploy workable and usable systems and improve them on an ongoing basis. Finally, the usage-centered model offers qualitative measures, that can be used early on in the development process, i.e. metrics, which allow comparisons of design alternatives.
The contextual design method is developed in the practice of software development, and used by design teams to solve different problems. Whereas the other development approaches addresses the users, contextual design addresses the customers. Contextual design consists of a set of parts, which together reflects the steps taken in the development process. (Beyer and Holzblatt, 1998) These steps are:

1. Contextual inquiry
2. Work modeling
3. Consolidation
4. Work redesign
5. User environment design
6. Mock-up and text with customers
7. Putting into practice

In the contextual inquiry phase, the focus is on understanding the customers - their needs, their desires and their approach to work. This phase begins with interviews with customers in their workplace while they carry out their usual tasks. This interview process is then followed by team interpretation sessions, where everyone is given the opportunity to express their own perception of what the targeted work actually is and how it is carried out. The interpretations are then modeled and drawn in communicative pictures or representations. Each of these work models provide a picture of the customer, showing the general work practice, while focusing on a single set of issues. Using these pictures as a point of departure one single picture is consolidated bringing data from the different customers together. This merging process is accomplished mainly by the use of two techniques. The first of these techniques is an »affinity diagram«, which helps bring together the individual points that were expressed during the interpretation sessions. These are illustrated in a
wall-sized, hierarchical diagram showing the scope of issues in the work domain. The second technique is the use of »consolidated work models« with which one can show the underlying pattern and structure of the work design that the models will address. Taken together, these two techniques will show what is essential to the targeted work and will also provide a guide as how to structure a coherent response. (Beyer and Holzblatt). The consolidated data is then used to lead discussions about how to improve work and about how technology could be put in place and support the new work practice. By envisioning the future work practice and organizational development, and by using storyboards as a tool for discussing the future structure of the work and organization, the basis for the new system will be put in into place. Using this basis as a foundation, a system work model showing the floor plan of the new system is developed, called »user environment design«. This floor plan shows the different parts of the system and how they are related to each other from the user’s point of view. The floor plan also shows how it supports the user’s work, exactly what function is available in each part, and how it is connected to any other part of the system; however the aim of the floor plan is not to structure the user interface. Furthermore the floor plan will serve as an illumination of the software development process (the project plan) making it clear when to develop which part of the system and when to deliver and implement the different parts. Contextual design suggests continuous testing of ideas with users, using rough paper prototypes, which can be easily redesigned. The work with the paper prototype increases the possibility of better resolving and eliminating potential disagreements. In the final step, the contextual design approach has to be put into practice and tailored to fit the organization in which the new system is going to be used. It is here that design problems can be recognized and judged in
terms of how more or less important they are to the design of the new software system,

**Agile**

In contrast to the aforementioned methods, agile methods rest on the idea that software development has to be relieved from heavy documentation in order to increase the creativity in the development process and furthermore to find new and superior software solutions. Agile processes focus on the people involved in the processes and on the required interaction rather than on development processes and development tools in themselves. Agile methods also emphasize the importance of responding to the changes that always occur in projects, rather than just strictly following a contract or a plan. Agile methods have their basis in four defined values of software development (Blomkvist, 2004, Cockburn, 2002):

1. **Individuals and interactions are preferable to processes and tools**
   
   The first value reflects the idea that it is people, not processes and tools, who develop software. The individual’s skill and communication between people become one important issue and therefore face-to-face communication is presented as the most effective way to communicate.

2. **Functional software is preferable to comprehensive documentation**

   The second value emphasizes the idea that requirements, documents, models and other intermediate products, are to be seen only as different means of communication during development. These tools can be very useful as long as they are utilized only when they serve a purpose in delivering functional and useful software.

3. **Customer collaboration is preferable to contracted negotiation**

   The third value describes the relationship between the
people who need the system, and the people who develop it. The idea is that successful projects involve regular and frequent customer feedback. Instead of depending solely upon what is written in contracts, the customers work in close collaboration with the development team, preferably in the same room throughout the entire project.

4. **Responding to change is preferable to following a plan**

The fourth value emphasizes plans as being useful in software development, and that each of the agile methods includes planning activities. The agile approach plans for the possibility of adapting to changes, instead of strictly following a plan. This strategy to adjust to flux is seen as necessary since the prerequisites in most software development projects will successively be transformed throughout the development process.

These agile values are not to be seen as in opposition to other approaches to software development. Rather, the advocates of agile methods suggest that the values are to be interpreted as follows: when there is value in the items on the right, the items on the left are to be more valued. To break down the values into approaches that can be put into practice, the agile values are described on a more detailed level, using twelve principles (Agile Alliance, 2001):

1. Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
2. Welcome changing requirements, even late in development. Agile processes harness change for the customer’s competitive advantage.
3. Deliver functioning software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
4. Business people and developers must work together on a daily basis throughout the project.
5. Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
6. The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
7. Functioning software is the primary measure of progress.
8. Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a steady pace indefinitely.
9. Continuous attention to technical excellence and good design enhances agility.
10. Simplicity – the art of maximizing the amount of work not done—is essential.
11. The best architectures, requirements and designs emerge from self-organizing teams.
12. At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

According to agile developers, the answers to successful software development have primarily to do with craftsmanship, community, pride and learning. The essence of agile ideas is the pragmatic use of simple but sufficient rules in terms of project behavior and the use of human and communication oriented rules. (Blomkvist, 2004, Cockburn, 2002)

MODELS

There is no sharp line drawn between the definition of methods and the definition of working models. But if we regard methods as reflecting different approaches to the development process, then development models are to be regarded more as ways of setting up rules and regulations, or step-by-step guidelines for how to carry out development
processes in practice. One of the currently dominating software development models is called the Rational Unified Process, RUP, which has been used within the organizations that are focused on in this thesis.

**Rational Unified Process**

The RUP software development model encompasses a smorgasbord of modules, which can be picked out and put together in order to adjust the model to the organization in focus. From a general perspective RUP follows four general phases. These are:

1. Inception
2. Elaboration
3. Construction
4. Implementation

Within each phase, the development work is carried out iteratively. Instead of following a traditional waterfall model, the process in RUP is intended to be iterative. Throughout the entire development process a number of workflows are in focus. These are:

1. Business engineering
2. Requirements
3. Analysis and design
4. Implementation
5. Test
6. Deployment
7. Configuration and change management
8. Project management
9. Environment

By putting these sets of phases and workflows together in a matrix, the entire development process and – in different times
of the development process – specific workflows, give an overview as to how the resources are to be planned for and used.

The problem with a generalized project model is that it easily becomes so extensive, that it becomes almost impossible to use effectively. The generalized model has to be adapted to the actual project but in reality, most project, are neither given the time or take the time themselves to accomplish this. RUP is a highly refined software development model, and as such it tries to take into consideration all kinds of eventualities that might appear during a software development project. The RUP manual contains thousands of pages and therefore it is difficult to gain an overview of how the process should work. RUP demands constant documentation and provides the project with a large number of templates. In some cases, the documentation process has become a project in itself, stealing time and energy from the software development project. The modeling sessions, characterizing the first iterations in the RUP development process, produced problematic consequences in the project that was studied in this thesis. These consequences are described in greater detail in the empirical section of the thesis.

**Designing for Work**

Research can be seen as the art of descriptions and discourses about systematic measures and interpretations of relations on all levels in our surroundings, concerning both »reality« as in social sciences as well as »fictions« as seen in intellectual experiments made in fields of science such as theoretical physics. In research concerning design, the studies are conducted in practice, where empirical data can be found. Interpretations are then made from this data, with the goal of being able to present conclusions that will lead to improvements in actual practice.
The field of HCI highlights attempts made to identify values, processes and structures to be able to develop more adequate artifacts. ACM SIGCHI's curricula (previously quoted) emphasize the disciplines concerned with design, evaluation and implementation of interactive computing systems for human use in terms of the context in which it is used.

Although the curricula expresses a perspective that takes the context into consideration – or as noted – the major phenomena surrounding the design and the designed artifact in relation to the users, research within HCI often limits the scope of the design process itself, in one way or another. It is within this process that the attempt to find the keys to how to develop well-designed IT-tools can be seen. The aim in research on design is usually to facilitate the practitioners' work in developing better designed and therefore artifacts of a higher quality.

Several research projects express frustration over the fact that quantitative studies and measures often miss important issues, which are of concern for the objects studied. Occasionally an attempt is made to find qualitative ways of studying phenomena, but it is difficult to do this while at the same time being able to present conclusions that are highly valued and appreciated within the research domain. The development of new approaches is slow and difficult. We need to question basic values and »rules of nature« as we might find them, and be able to develop new ways of interpreting the surrounding environment. We need to do this in scientifically appropriate ways, that will not run the risk of becoming too eclectic or developing the research domain's own »new age«.

A more qualitative approach is albeit expressed in different studies. One such example is a study of the design process where the concepts of massification and demassification are used (Lund, 2003) to examine the ideas of the intangible – described as that, which is important to us although it does not
appear explicitly. He argues for the importance of bringing both aesthetic and functional issues into the design of physical artifacts. Lund describes demassification on the one hand as »a matter of physical change of artifacts that new media and information technology bring about« and on the other hand as being associated with a social demassification in which »mass« implies the kind of understanding as used in the concept mass communication (Lund, 2003, p.25). Through reasoning about the demassification concept, Lund suggests a new concept of massification design by in which he stated that the development of artifacts taking social aspects and not just functional aspects into consideration, will take the edge off the consequences of physical demassification. It is presented as design that not only strives towards aesthetic values, but also »towards expression of the kind of abstract meaning that physical artifacts are associated with« (Lund, 2003, p.41). This abstract meaning is captured by the idea of embodied interaction, which can be explained in the quote by Lund from Dourish as »/.../the creation, manipulation, and sharing of meaning through engaged interaction with artifacts« (Lund, 2003, p. 83). In relation to embodied interaction, Lund also mentions embodied realism, referring to Lakoff & Johnson. In embodied realism, the human mind is described as essentially embodied, meaning that thought is largely unconscious and that abstract phenomena are understood by means of metaphorical projection and image schemas. Even though the intent in Lund’s study might be to raise the qualitative issues, the results show that the structural, rationalistic way of thinking is pervasive throughout his work.

In other research described in a thesis by Dunne, Hertzian Tales (Dunne, 1999), Dunne argues that the aesthetic values are of great importance, that we sense these values although we are not able to express them and therefore »design is existential and cannot ignore its complicated relationship to people and their mental lives.«(Dunne, 1999, p. 109) But at the same time he
ends up with a toolbox for the designers, which can help in the
development of knowledge and insight concerning design
problems. The toolbox is to be seen as a conceptual toolbox
through which we might be able to raise some of the important
issues affecting design and the design process.

The same problems are discussed by Fällman in his thesis,
In Romance with the Materials of Mobile Interaction (Fällman,
2004) in which he argues for a phenomenological approach
when investigating the qualities that are important in the
design process. But, even though his intent is to find new
approaches to research, the idea that he puts forth still uses a
traditional general structure for how to improve ideas. The
phenomenological approach as described by Fällman, also
expresses an idea of the possibility of finding and focusing on
the basic characteristics, or essence of a phenomenon, thereby
supporting the notion that there has to be one or a few basic
characteristics common to a certain kind of situation or artifact.

In the attempt to grasp the qualities that are present in
design, other researchers have focused on the development
process in order to find keys or principles which might
facilitate the possibility of steering the development of
software in a way that usability matters will not get lost
(Gulliksen & Göransson, 2000). The idea is to affect the attitudes
within the development process, mainly by using a user-
centered approach throughout the whole process.

However, the attitudes within the development processes
are affected by different conditions that are more or less
obvious. The actions affected by the attitudes within the
development project can be interpreted as situated, in the sense
that the time, place or surrounding environment as a whole,
affects or even predicts the actions taken. It does not have to be
actions that are necessarily personalized, but actions in general.
When the psychologist, Barker (Westlander, G., 1999. Elg, M.,
2001) developed the idea of behavior settings he interpreted the
settings as being pre-existing realities, which we are not

Theoretical Objectives
necessarily aware of, but into which we enter and leave and which affect our behavior while being there. He called the theoretical framework «ecological psychology», which at the time was a new research approach within the domain of psychology. Barker attempted to find methods and concepts for studying human behavior in different environments. According to Barker, the idea of a social setting was a well-defined spatial area, a boundary zone, which when entered, causes people to change or adjust their behavior in a more or less conscious way. The idea of boundary zones that originates from Lewin (Westlander 1999), shows that the environment, including the people who enter it, affects us in different ways, which in turn show in one sense that attitudes can be interpreted as contextual.

In the design process, we try to find usable solutions that encompass not only the use and usage of the designed, but also the aesthetic values, that is to say, the way the designed artifact will attract us. When designing for use, each ready-made design solution can be seen as unique. At the same time we have a desire – on a more generalized level – to understand what good or superior design is as well as to define what good design is. The idea of an agreed upon definition can be seen as triggered by an attempt to find the unique keys and elements that constitutes good design. This attempt is based on the notion that there are such elements and that they are in some way tangible. The attempt includes putting forward the problems that can originate in the idea that it is possible to find keys and elements, or the lowest common denominator, not only for quantitative units but for qualities as well, within such areas as design. But it is also raises the question of how to approach research concerning phenomena such as design, design criteria or processes.
FORM, FUNCTION AND THEIR INTER-RELATED EQUILIBRIUM

In a sense, design can be seen in all manmade objects, or conversely, all man-made objects are designed. But when we talk about design, we like to see it as superior to the design that is a more or less conscious consequence of the construction phase or process. Design is about taste, about learned values, and for instance about the time in which we live. Design implies that there are values beyond functionality. For instance, in the actual development process of software, functionality often is given priority over other values. This is not always due to the superior importance of functionality, but in some cases might be due to the fact that it is easier to measure functionality. This is reflected in the desire of developers to get answers primarily to the questions concerning what they are supposed to develop, rather than to find answers to questions concerning how the artifact is going to be used or developed, or where it is going to be placed or by whom it is going to be used. This latter set of questions could give answers to dimensions in the design process which otherwise risk getting lost in the development process. The relationship between form and function that is discussed in design is of importance. There has to be a balance between the two, otherwise it might as well be seen as either art or construction. It is often suggested that the balance between form and function are to be achieved through work processes which highlight certain values. A foundation that promotes industrial design concerns in Sweden (Svensk Industridesign, SVID\(^5\)), defines design as a work process where creative solutions are made that focus on the user while at the same time fulfilling functional as well as aesthetic requirements\(^7\).

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\(^5\) Swedish Industrial Design – a foundation in support of industrial design matters in Sweden

\(^7\) Design, according to Swedish Industrial Design, is to be seen as a work process drawn to develop solutions in creative ways where both functional and aesthetic requirements focusing the user become parts.

http://www.svid.se/wf/33C0D726-BC9C-40D1-B212-A9394A51CC71.wit
Suggestions for balancing form and function differ, but many of the suggestions have some idea of structure in common. Structure is problematic in that it might only appear as a theoretical or ideological construction, an interpretation of that which is seen, and not something that really exists. The idea of studying design from an objective point of view, as well as the idea and the desire to find universal solutions, principles or guidelines, reflect the same kind of problem as the desire for structure. The desire for structure can be interpreted both as the researchers’ desire for rational thinking and as the designers’ desire to find answers about how to manage the concrete steps within their design assignments.

*Design as Art*
Design can focus primarily on the aesthetic values while leaving function behind. In this case, the aesthetic values are interpreted as essential to function. This attitude is seldom seen in the development of software that is developed to support administrative work or other required software tools to be used in everyday work. Design that focuses on aesthetic values is more often seen in the development of household utensils, furniture, or couture etcetera. More often than not functionality is almost non-existent or at least not very well developed when design focuses primarily on the aesthetic values.

*Design as Construction*
Software that is developed for everyday work, focuses more often on functionality than on aesthetic values. Requirements rule the development process, together with an attitude that »we only develop what is required, and if the requirements are poorly expressed, then you’ll get a poor system«. However, the problem here is that many organizations have severe difficulty in formulating their needs in such a specific way as requested by the software developers. And requirements that are formulated for the development process are seen by the
developers as being non-functional, and thereby they can be handled with less care. When design focuses almost entirely on functionality, it becomes poor design and the usability and usage of the software product looses its edge.

Form and Function
The balance between form and function is of great importance. In the shaping of an artifact, values that might not be explicit or tangible are often of great importance. If the design is made for workplaces then it is crucial that everyone involved is conscious of the fact that design not only shapes the artifact itself, it also shapes the work environment, the work tasks and the work situation. It is the synthesis of form and function that when well merged will give the higher value; the value of the design is thereby seen not only as the sum of form and function, but as the higher value which is implied in a synthesis of the two.

Designing Work
When designing and developing software for computer-supported office work, an implicit development of the design of the work itself takes place. In the design process, the choice to make the development of the work a more explicit goal, can thus enhance the possibilities of succeeding in the development of software for computer supported work.

Organization Theory
As in the case of HCL, organization theory is a growing area of research that originates mainly from the field of the social sciences. Since organizations are clearly affected by the new systems that are being developed, it is increasingly important to understand the question of how an organization can change and what the implications for change are – or can be. Organization theory has a long tradition, both in practical use
as well as in theory. The dominating trends are most clearly seen in actual practice, while organization theory still reflects various parallel scientific ideals that are reflected in varying degrees, in practice.

A Century of Organizational Development

Viewing the development of organization theory and how it has been put into practice during the 20th century, we can see how the trends fluctuate. They shift in the interpretation of what motivates people, in decision strategies, in how to put up goals, etcetera.

Two trends in organizational theory were predominant in the beginning of the last century - the Tayloristic ideas concerning industrial work and Weber’s ideas concerning administrative work in bureaucracies. (Taylor, F. 1911, Weber, M. 1921/1968) In both these trends the ideas were based on the belief that efficiency is best reached through a clear hierarchical system, where the different roles are well defined. In the bureaucratic organization, authority and responsibility were to go hand in hand, whereas in the industrial sector, the worker was to execute his duties and not think for himself. The responsibility for “thinking” rested on the manager. In both kinds of work places, authority and obedience were the dominant values, together with rules and regulations.

From the ideas that dominated in the first part of the century, new ways of understanding organizations and the people in them successively evolved - first with the human relations movement within the industrial sector as well as within theoretical models concerning different interests in an organization. The idea of man having social needs that also should be fulfilled at work was brought to light, in addition to the idea that different interests in the organization motivate the choice of different strategies and behavior. The fulfillment of the need to be seen and appreciated for the effort that one has put in to the organization, will especially have an impact on
behavior and motivation. This is seen, for example, in the Hawthorne studies by Elton Mayo in the 20s and 30s. (Mayo, 1945)

When interpreting the organization as a system, the scientific management school as well as the bureaucracy school, looked at the organization as a closed system, where man had to adjust to the mechanical process. In the human relations movement, interest in the social system was given priority over interest in the technical system.

The cooperation between the social systems and technical systems within organizations started to develop theoretically at the Tavistock Institute in London, where the socio-technical school was of great interest. (Trist, E. & Murray, H. ed. 1993) Here, the discovery of the negative consequences of increasing the capability of the technical systems, but not paying attention to the way that people are affected, as well as the discovery of the positive effects on the social relations within a changing environment, was now taken into consideration. Organizations were not only affected by the changes within them, they were also affected by the environment surrounding them. This idea developed into a way of looking at organizations as systems within an environment. In a stable environment it was said that the organization can be handled as a closed system, whereas an organization existing in an environment that is in a state of flux, has to open up towards the surrounding environment. Open systems and contingency theories were thus developed.

In the late 20th century, different kinds of organizational structures became more popular. In his work, Structure in Fives (Mintzberg, 1983), Mintzberg suggested that there are five coordinating mechanisms that explain different dominating organizational structures and ways of coordinating work. Different organizations have one or more of these dominating structures, and the different organizational structures need different kinds of leadership to manage the business. In certain
organizations, the leadership would do best to practice management by objectives, whereas in other organizations, other types of management are considered superior. New kinds of organizations, such as project organizations, consulting organizations and so on, started to develop as well. Some key concepts that either remain or diminish in relevance, only to come back into fashion after a while are common to the different organizational theoretical standpoints. At the moment, some of the popular concepts that are used to describe the organizations’ workings include processes, flows and other metaphors, which in a way reflect present basic values.

When looking at movements today, there is a tendency in organizations (at least in Sweden) to handle efficiency issues in the same way they were once handled within the different theories of scientific management. But, the target today is not explicitly the industrial sector; rather the target seems to be the office sector.

Rationalizing in the name of efficiency and profit is the rule of the day. Computer systems are being built from models and measures, which in a way imply a mechanistic thinking. Time studies are made on different elements in the work process and the time for keeping the social systems going is ultimately shortened and, at times, rationalized out of existence. This has resulted in an increasing number of health-related problems and reports of illnesses that are the result of both the organizational environment and the computerized work. (Statistics Sweden 2001)

**Interpreting Organization Theory**

Organization theory is not a monogenetic scientific branch. If the brief exposé over the last century can serve as a picture primarily of the development process in organizational practice, then the spectra of ideologies seen in the theoretical approaches used to interpret organizations, can also serve as a
picture in which practice can be reflected. Various attempts to present a theoretical framework have been made. One such attempt is that of Burell & Morgan (1992). They try to relate different theories to each other by sorting them into different paradigms. The suggested matrix has two dimensions, the subjectivist/objectivist on the one hand and the sociology of radical change/the sociology of regulation, on the other. In the dimension of subjectivity/objectivity, which is used to reflect the nature of science, the following key ideas are represented.

The Dimension of Subjectivity/Objectivity

In this theory, a set of assumptions is made, based on the idea that organization theory is partly a philosophy of science and partly a theory of society. The first assumption is of an ontological nature, which concerns the very essence of the phenomena under investigation. The nominalist position revolves around the assumption that the social world, external to individual cognition, consists of names, concepts and labels, which are used to structure reality. For the realist, the social world exists independently of an individual’s appreciation of it.

The second assumption is of an epistemological nature and reflects assumptions about what constitutes the basis of knowledge, and about how one might begin to understand the world and communicate this to others, in the form of knowledge. The concept positivist is used to characterize epistemologies, which seek to explain and predict what happens in the social world by searching for regularities and causal relationships between its constituent elements. Positivist epistemology is based upon the traditional elements that dominate the natural sciences. The anti-positivists epistemology is concerned with the social world as being essentially relativistic. The world can only be understood from the point of view of the individuals who are directly involved in the activities studied. From this point of view, the
The third assumption made, is associated with the first two, but is conceptually separated from them. It concerns human nature, in particular the relationship between human beings and their environment. At one extreme, there is the voluntarist view, meaning that man is completely autonomous and has a free will. At the other extreme is the determinist view, which regards man and his activities as being completely determined by the situation or environment in which he is located.

<table>
<thead>
<tr>
<th>THE SUBJECTIVIST APPROACH TO SOCIAL SCIENCE</th>
<th>THE NATURE OF ASSUMPTION DEALING WITH THE DIFFERENT APPROACHES</th>
<th>THE OBJECTIVIST APPROACH TO SOCIAL SCIENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominalism</td>
<td>Ontology</td>
<td>Realism</td>
</tr>
<tr>
<td>Anti-positivism</td>
<td>Epistemology</td>
<td>Positivism</td>
</tr>
<tr>
<td>Voluntarism</td>
<td>Human Nature</td>
<td>Determinism</td>
</tr>
<tr>
<td>Ideographic</td>
<td>Methodology</td>
<td>Nomothetic</td>
</tr>
</tbody>
</table>

Figure 3: The dimension of subjectivity – objectivity according to Burell & Morgan

These three sets of assumptions have direct implications of a methodological nature, which has consequence in terms how to investigate and obtain knowledge about the social world. The number of methods that can be used within the field of social science, is far larger than what is regarded as science by the traditional natural scientists. The ideographic approach emphasizes the analysis of the subjective accounts which one generates by getting inside situations and involving oneself in the everyday flow of life. The detailed analysis can be made from insights generated from the subjective interpretation of
information gathered in diaries, biographies, journalistic records, etcetera. The ideographic method stresses the importance of letting one’s subject unfold its nature and characteristics during the process of investigation. The nomothetic approach to social science emphasizes the importance of basing research on systematic protocol and technique. In the suggested interpretation the nomothetic approach is preoccupied with the construction of scientific tests and the use of quantitative techniques for the analysis of data. Surveys, questionnaires, personality tests and standardized research instruments of all kinds, are prominent among the tools, which comprise nomothetic methodology. It is important to note that the discussion on ideographic/nomothetic approaches does not take into consideration the debate on induction and deduction. Both the ideographic and the nomothetic approaches can be employed in a deductive and inductive sense and the debate on induction/deduction is deliberately not taken into consideration in the paradigmatic map drawn by Burell and Morgan.

*The Dimension of Regulation/Radical Change*

If the subjective/objective dimension is supposed to reflect the nature of science, then the dimension of regulation/radical change is supposed to reflect the nature of society.

The term sociology of regulation is introduced and used to refer to the writings of theorists who are primarily concerned with providing explanations of society in terms that emphasize its underlying unity and cohesiveness. It is essentially concerned with man’s emancipation from the structures which limit and stunt his or her potential for development.

The sociology of radical change stands in contrast to the sociology of regulation, in that its basic concern is to find explanations for the radical change, deep-rooted structural conflict, modes of domination and structural contradiction, which its theorists see as characterizing modern society. It is
often visionary and Utopian, in that it looks towards potentiality as much as actuality. It is concerned with what is possible, rather than what is; preferring to deal with alternatives rather than with acceptance of the status quo. In an effort clarify the characterization of the two dimensions, they are presented in figure 4.

<table>
<thead>
<tr>
<th>THE SOCIOLOGY OF REGULATION IS CONCERNED WITH:</th>
<th>THE SOCIOLOGY OF RADICAL CHANGE IS CONCERNED WITH:</th>
</tr>
</thead>
<tbody>
<tr>
<td>The status quo</td>
<td>Radical change</td>
</tr>
<tr>
<td>Social order</td>
<td>Structural conflict</td>
</tr>
<tr>
<td>Consensus or voluntary and spontaneous agreement of opinion</td>
<td>Modes of domination</td>
</tr>
<tr>
<td>Social integration and cohesion</td>
<td>Contradiction</td>
</tr>
<tr>
<td>Solidarity</td>
<td>Emancipation</td>
</tr>
<tr>
<td>Need satisfaction (focused on satisfaction of individual or system needs)</td>
<td>Deprivation</td>
</tr>
<tr>
<td>Actuality</td>
<td>Potentiality</td>
</tr>
</tbody>
</table>

**Figure 4:** The dimension of sociology of regulation and sociology of radical change, according to Burell & Morgan

**Two Dimensions – Four Paradigms**
The suggested dimensions in this interpretation are, on the one hand, the subjective/objective dimension and on the other hand, the regulation/radical change dimension. The idea behind this attempt to draw a map, is to provide a tool for establishing where one is ideologically or theoretically, where one has been and where one can possibly go in the future. As the authors state, it provides »a tool for mapping intellectual journeys in social theory – one’s own and those of the theorists who have contributed to the subject area«. (Burell & Morgan, 1992)
Four, more or less distinct, sociological paradigms are presented. The paradigms ought to be viewed as contiguous but separate – contiguous because of the shared characteristics, but separate because the differences are of sufficient importance to warrant treatment of the paradigms as four distinct entities. The four paradigms are said to fundamentally define the different perspectives used in the analysis of social phenomena.

Different theories, methodologies and »isms« have then been scrutinized and put into the diagram. The overview of how the different theoretical approaches are mapped out in Burell’s and Morgan’s presentation, is presented in figure 5.

<table>
<thead>
<tr>
<th>The Sociology of Radical Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subjective</strong></td>
</tr>
<tr>
<td>Phenomenology</td>
</tr>
<tr>
<td>French Existentialism</td>
</tr>
<tr>
<td><em>Anarchic Individualism</em></td>
</tr>
<tr>
<td><strong>Objective</strong></td>
</tr>
<tr>
<td>Hermeneutics</td>
</tr>
<tr>
<td>Radical Humanism</td>
</tr>
<tr>
<td>Contemporary Mediterranean Marxism</td>
</tr>
<tr>
<td><strong>Objective</strong></td>
</tr>
<tr>
<td>Interactionism and Social Action Theory</td>
</tr>
<tr>
<td>Action Frame of Reference</td>
</tr>
<tr>
<td>Theories of Bureaucratic Dysfunctions</td>
</tr>
<tr>
<td><strong>Subjective</strong></td>
</tr>
<tr>
<td>Interpretive Sociology</td>
</tr>
<tr>
<td>Symbolic Interactionism</td>
</tr>
<tr>
<td><strong>Objective</strong></td>
</tr>
<tr>
<td>Hermeneutics</td>
</tr>
<tr>
<td>Sociological Symbolism</td>
</tr>
<tr>
<td>Radical Structuralism</td>
</tr>
<tr>
<td>Conflict Theory</td>
</tr>
<tr>
<td>Radical Organization Theory</td>
</tr>
<tr>
<td><strong>Objective</strong></td>
</tr>
<tr>
<td>Sociological Symbolism</td>
</tr>
<tr>
<td>Symbolic Interactionism</td>
</tr>
</tbody>
</table>

**Figure 5:** Methodologies and theories related to the paradigms presented. According to Burell & Morgan
In organization theory, there is a bias towards functionalist sociology paradigm, however methods and theories from other paradigms can be seen as well.

**The Functionalist Paradigm**
The ideological ground on which the functionalist paradigm stands is characterized by the ideas of the status quo, social order, consensus, social integration, solidarity, need satisfaction and actuality. These general sociological concerns are approached from a standpoint, which tends to be realist, positivist, determinist and nomothetic, and it is out of these ideas and methodological foundation that most of the explanations are perceived. The functionalist perspective is firmly rooted within the sociology of regulation and it approaches its subjective from an objectivist point of view.

**The Interpretive Sociological Paradigm**
A direct product of the German idealist tradition of social thought is the interpretive paradigm, which has its foundations in the work of Kant. Interpretative philosophers and sociologists seek to understand the very basis and source of social reality. To a great extent, it addresses the same issues as in the functionalist paradigm - issues relating to the nature of the status quo, social order, consensus, social integration and cohesion, solidarity and actuality, but the interpretive approaches its subjective from a subjectivist point of view and tends thereby to be nominalist, anti-positivist, voluntarist and ideographic.

**The Radical Humanist Paradigm**
From a subjectivist point of view, the aim of the radical humanist paradigm is to develop a sociology of radical change. The perspective tends to be nominalist, anti-positivist, voluntarist and ideographic. A basic notion within the paradigm is that the ideological superstructures with which
the individual interacts, dominate the consciousness of man, and that these superstructures drive a cognitive wedge between the individual and true consciousness. The emphasis is on radical change, modes of domination, emancipation, deprivation and potentiality.

*The Radical Structuralist Paradigm*

From an objectivist point of view, the sociology of radical change is advocated in this paradigm. The paradigm is committed to radical change, emancipation, modes of domination, contradiction and deprivation. It approaches these general concerns from a standpoint which tends to be realist, positivist, determinist and nomothetic. Radical structuralists emphasize the fact that radical change is built into the very nature and structure of contemporary society, and they seek explanations of the basic relationships within the context of total social formations.

Taking these interpretations of the different paradigms from Burell and Morgan and using them in an attempt to map the different software development approaches to the diagram, most of the approaches would be mapped into the right field, and probably in the upper quadrant – the radical structuralist paradigm. Using Burell’s and Morgan’s conceptual framework, the HCI approaches are mostly objectivist, and on the dimension of regulation/radical change, most software development approaches are characterized as being visionary, focusing on potentiality, and working with what is possible. And they are also characterized by attempts to find alternatives rather than by acceptance of the status quo. But, influences from theories placed in other paradigmatic fields, for instance ethno-methodology, phenomenology or social system theory, influence the field of HCI as well. And over time, the development of theories and approaches traditionally adapted to the interpretation of organizations, might influence the understanding of how software developed for computer-
supported office work, might affect people and their work environment in the organization that the software is developed for.

**ETHICS**

Understanding the choices of methods from a paradigmatical perspective can increase the possibilities of discovering preconceived notions and trends using new perspectives. The drive to develop work situations effectively – by rationalizing them, by letting the monotonous work be taken care of by the technical system, by creating new work environments characterized by work tasks of a more dynamic and challenging kind – paradoxically often produce results opposite to the original intent: monotonous, highly demanding work that leaves little or no autonomy and allows for little or no social support.

The problems stemming from ambitious rationalizations, where human qualities and values are of diminished interest, can be interpreted ultimately as ethical problems. The disregard of human values other than maximizing profit, affects the development of organizations not only relevant for computer-supported work, but in the work environment in its entirety. This is clearly reflected in the way that facts are presented in annual reports as well as in strategic decisions in general.

Our basic values can be articulated at different levels. In different ways, ethical questions are all about values. The issue of ethics is often interpreted as being synonymous with morality. But there is a distinction between these two concepts. Ethics can be understood as the theoretical expression through which we reflect our thoughts about human values and their basis, while morality is understood as people’s actions in practice and thereby their underlying and – not always clearly expressed – values. A person’s or a group’s morality is
expressed in what they think is right to do or wrong to do. In work with management, ethical standpoints are crucial, and not only ethical standpoints, but moral behavior as well.

Traditionally, ethics is developed within the field of philosophy as well as in the field of theology and does not represent one single scientific approach. Four main approaches include: normative ethics, which investigates which moral can best be argued for; it wants to give advice in ambiguous situations or present clear alternatives for action; it weighs the reasons that speak in favor of, or against, the different alternatives. Moral science investigates the psychology, biology, history and social background as prerequisites for moral phenomena and representations. Moral theology investigates moral phenomena and representations in relation to religious beliefs and thoughts. And meta-ethics deals with theoretical problems brought to the fore by moral phenomena and how these phenomena are represented, for instance, in statements made about them. The choice of approach depends on the nature of the moral problem that is being discussed.

While not delving deeply into the scientific field of ethics, some ethical issues will be discussed. These concern approaches to qualities in human life and especially in relation to work and work situations. The development of ethical competence can help people to cope with stressful and problematic situations. Ethical competence can be defined as being based on the psychological ability described as autonomy. An autonomous person is unconstrained by fixations, authorities and uncontrolled reactions and is able to start the process of thought, considering and analyzing critically and systematically, all relevant values in a situation characterized by a moral problem. Psychological research has shown that plenty of time and certain conditions are required before people can acquire and use the ethical ability of autonomy. (Piaget, 1932, Kohlberg, 1985, Schwartz 2000, Kavathatzopoulos, 2003) Autonomy is, in essence, the opening
of the opportunity to create a complete picture of the problematic situation. As opposed to autonomy, heteronomy implies thinking that is locked and constrained by on one or a few general moral principles, while overlooking other significant ones. Heteronomous people make uncontrolled decisions and react automatically to a moral problem. Heteronomy is also characterized by responsibility avoidance. Rather, responsibility is shifted over to another party, for instance on general conditions, on tradition or authorities. In terms of the overall question in this thesis, about how our basic values affect software development processes and organizational change, the idea of ethical competence becomes interesting. The understanding of autonomy and heteronomy, reflecting different strategies of coping with difficult situations, can be of help in the interpretation of how to discover what is essential and not merely accept the obvious, as the basis for explanations.

The question of how to facilitate and maintain the qualities in human life and the synchronization with different new techniques, is of growing interest within several scientific fields. Occupational health aspects, ergonomics, and human factors are well-established within HCI, but other interests can be discerned as well in the immediate sphere of HCI. Various new interest groups are developing, with just slightly different foci and foundations.

One such coming area is how information and communication technology (ICT) is related to qualities in life. The issues that are raised here include the effects of ICT on worklife and organizations, as well as on private life. In an anthology on the subject Humans on the Net (Bradley, G., ed. 2002) the editor comes to the conclusion that it is of great importance to protect our human needs when new technology is developed; the need to protect a secure and safe life, the need for us to influence our own circumstances, the need to
feel a sense of belonging and the need to learn and develop. All these needs are crucial for feeling that life has meaning.

We can begin to see changes in behavior, as a consequence of the new technology – in what is considered to be ok and what is not. The changes in behavior and in how behavior is valued, is seen for instance, in the attitudes towards downloading music, films, programs, etcetera from the web. Many people who would normally never steal do in fact download and crack codes in order to gain access to these products. Similar changes are seen in the increasing amount of offers to buy drugs via the internet, which normally require prescriptions to be bought, or offers on the internet to buy sex in different forms – of which pedophilia and other forms of immoral and illegal exploitations are common. The expansion of a virtual, global, illegal market that functions parallel with the real world, where the same people who exploit the illegal virtual market, claim to detest their own kinds of behaviors, is a crucial ethical issue that society as a whole must deal with and relate to. The kinds of extremes used in the examples might not be a fair interpretation of the attitude towards technological development in general, however the changes in behavior can be seen as a warning signal, telling us that technological development and use can lead to changes in behavior which are not desirable but which will become normative in the long run, even though not originally not not considered acceptable from a morality point of view.

As seen in the behavioral trends briefly discussed in the previous paragraph, virtual reality provides us with the possibility to act »in cognito« or in disguise. We can pretend to be someone else, with other interests, a different age, gender, height, weight, education, etcetera; it is even possible to »borrow« someone else’s identity. Sherry Turkle describes this in her work, »Life on the Screen« (1997) where she investigates relations and lives lived in a virtual reality, where people meet and exchange often virtual experiences in a completely virtual...
society; a society where the border between what is real and what is not is extremely fuzzy. Among other things, she found her own identity had been borrowed and lived by someone else on the net. It is as if a giant role-play is going on, where people with different backgrounds are playing the parts. The problem with the virtual reality on the net, is that it has implications for reality. It affects the real world, not only in the changes in moral judgment, but also in that the commercial forces selling for instance sex and drugs, affect real people whose bodies and souls are exploited.

**Computer Ethics**

A field called computer ethics has become of interest as a reaction to the changes that are the result of the technological development. Computer ethics has evolved into a field that deals with raising questions about technology and its impact on human values or human qualities. The profound social consequences arising from powerful technologies are seen in organizations that have been completely transformed as a consequence of the introduction of powerful information technology. The focus of computer ethics is on how new technology has affected our environment, in so far as activities have radically changed both within organizations and in the collaboration between different actors. The consequences of this kind of radical change challenge our legal systems and social norms and highlight concerns about the general impact of such changes on us, as well as on our interaction with organizations. This raises questions that are important for several different fields of research.

The ethical issues raised in software development for computer-supported work concerns different aspects. Many of these aspects are defined in different codes of ethics. Two codes of ethics are of particular interest in this thesis - both dealing with civil engineers, but coming from two different countries, the US and Sweden. The American Society of Civil
Theoretical Objectives

Engineers (ASCE) adopted their first version as far back as 1914 and it has continuously been updated, with the latest update in 1997. The ASCE code of ethics is divided into two parts - fundamental principles and fundamental canons. The fundamental principles read as follows:

1. Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:
2. using their knowledge and skill for the enhancement of human welfare and the environment;
3. being honest and impartial and serving with fidelity the public, their employers and clients;
4. striving to increase the competence and prestige of the engineering profession; and
5. supporting the professional and technical societies of their disciplines.

The Swedish Society of Civil Engineers has a similar code of ethics that was first adopted in 1929 and then further developed, with the latest version adopted in 2000. It is expressed in principles8 (www.cf.se).

1. The engineer shall in his or her profession feel personal responsibility for insuring that the techniques be used in a way that supports man, environments and society.
2. The engineer shall strive for techniques and technological knowledge to be enhanced in the direction of a more effective and efficient use of resources, without causing harm.
3. The engineer shall provide, in official and individual situations, his or her knowledge in order to achieve the best foundation for decisions and as well to illuminate the possibilities and risks of the techniques.

8 My translation
4. The engineer shall not work for or in cooperation with companies and organizations with suspicious characteristics or with goals that go against personal conviction.

5. The engineer shall show complete loyalty toward employers and workmates. Difficulties of this nature shall be brought into light for discussion, primarily in the workplace.

6. The engineer shall not use unfair methods in competition concerning employment, projects or bids, nor shall the engineer try to defame colleagues' reputations by misleading accusation.

7. The engineer shall respect confidential information as well as others' rights to ideas, inventions, investigations, plans and sketches.

8. The engineer shall not promote undesirable interests and shall openly present economical and other interests that can affect the liability for his or her impartiality and judgment.

9. The engineer shall in person and officially, in speech and in writing, strive for substantial presentations and avoid erroneous, misleading or exaggerated statements.

10. The engineer shall actively support colleagues who get into difficulties having followed these rules, and shall in accordance with his or her conviction help to avoid accusations against them.

By defining ethical codes, the moral approach to the profession has to be taken seriously into consideration. It has to reflect the values of the time and the values have to be well-grounded and reflected upon in the engineering curricula. The changing environment and the development of technology does not just affect the world of users, it affects the world of developers as well. Different views on what is to be developed are negotiated and discussed within the development process.
The artifact that is to be developed can be seen as a system, a work, a workflow or as some other interpretation of what the development process actually is supporting.

In both the examples of ethical codes, one intent is emphasized – the intent to support or enhance human rights such as human welfare and the environment. The codes state that it is important to behave honorably and with respect for other people and their needs. In one way, these intentions reflect some of the general basic values of today, but by putting them in print, they are emphasized and illuminated as prioritized values. It is thereby possible to judge how we act in relation to the codes. The responsibility for one’s own actions is defined in the codes, stating that the engineer is to act autonomously within the framework of agreed upon ethical values, and with justice as a guiding principle. The ethical code is emphasizing accountability in terms of responsibility and trust.

Standards are defined as a complement to ethical codes that pinpoint how to relate to different issues in the development processes. One such standard that is often used within the area of HCI is the ISO 9241-11 (1998) which defines usability as:

“The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.”

In this standard, the emphasis is on two main issues - is the first is that the standard is written for specified users in a specified context of use, who have specified goals. The second is that these goals are to be reached with effectiveness, efficiency and satisfaction - three values, which are to be treated with equal importance. The idea that a system has to be usable, seems at first to be axiomatic. In one sense, a system is always usable if it can be used at all. But the point of usability in software is to highlight the fact that the system is being
developed in the first place for users whose work-related needs and skills are to be the center of attention, as well as for the design of the work as a whole. The standard is thus expressed to highlight the importance of having the user in focus, specifying some important dimensions that a system has to fulfill.

Despite all good intentions to elevate the importance of usability in software, there are systems still being developed today, that lead to severe risks for negative health effects. The causes can be many, and a few of these have been illuminated in this thesis. An autonomously held approach, valuing the risks and facing the responsibility of the consequences of the development, might help slow the development of poor computer-supported work. The ethical skills thus become thus of importance, not only for the users and their ability to handle new situations, but for the organizational management and for the software developers as well.

**Equality**

Equality is also seen as an issue of values or norms. The discussion on equality illuminates how different groups of people are unfairly judged and treated. This unfairness is often well-hidden but can sometimes be exemplified in common experiences. One such example is the fact that every nation has its own nation suffix in the e-addresses. Sweden has .se, Denmark .dk and England .uk, and so forth, except the United States, who (in this case) by not having a country suffix become the norm, which every other country will have to relate to. The US is, so to say, the world. In the same hidden manner, although completely obvious, other relationships can be found. There is an ongoing effort towards reaching equality in workplaces, equality in terms of gender, age, ethnicity, etcetera. If this strive is going to be successful, then the unequal settings and the understanding of the impact of social fields must be clarified and dealt with.
Social Fields

More theoretical foundations need to be mentioned in terms of understanding different interpretations of development processes and the effects of basic values. In this thesis, the discussion will be limited to the idea of basic values, what they are, of theories of behavior, the usage of metaphors and motivation and of the understanding of stress and stress-reactions.

Basic Values

Our basic values are embodied in us and affect everything we do. They make up the underlying sonority that we can be more or less aware of. »Basic values« is not primarily a concept that is used in order to find a methodological approach, nor is it in focus for measurable units. Basic values are the values that might not be obvious to us, but are seen as naturally existing references in our environment. Our language reflects our basic values, in that they are expressed in the choice of vocabulary. For instance when the vocabulary that originates from disciplines such as economics, medicine, systems development etcetera, becomes dominant within a field other than its origin, then our understanding for the new field will change; a change that initially might not be obvious at all. The new way of using the once specific vocabulary, also becomes the new way of using it metaphorically. The symbolic undertone in the way the words are used will change our way of understanding situations that exist in the new field.

Habitus

How we interpret our environment is affected not only by language, but also by all the experience embedded within ourselves. The French sociologist, Pierre Bourdieu’s concept »habitus« describes the experience, knowledge and social possession that exist within a person (Bourdieu, P. 1979). With our habitus embedded, we have the natural authority needed
to fit into a social field, and which by belonging to this particular field, we also contribute to, maintain as well as form it. In the social field, our social skills and cultural capital is useful and understood in all its nuances, but if we want to change social fields, it will become difficult, since our habitus consists of both the skills and the experience we can achieve, as well as other factors, which we cannot control. As stated before, all these attributes taken together give us the authority we need to enter the social field. This means that should we try to change social fields, for example by education, by moving to a new neighborhood, maybe to a new country, we will be accepted and respected to a certain extent, but not completely.

Bourdieu provides the following examples. Take for instance the medical doctor, who is a skilled brain surgeon, but is also a woman or perhaps someone with a different ethnic background. He or she is accepted within the work group, but can never achieve the top position within their branch at the hospital – not due to a lack of experience or skills, but rather due to a lack of acceptance as a member of the social field.

![Figure 6: Social classes in relation to the amount of cultural and economic capital. After Bourdieu](image)
The diagram illustrates how four different social fields – in this case, social classes – are related to each other. In the kind of investigation such as the sociological investigation that Bourdieu carried out, different social fields will appear. These do not only concern social classes, but in addition will show differences between various workgroups, workplaces, neighborhoods, etcetera, in so far as they have a place, or a dominating social field on the sociologic map that is drawn. The differences that are acceptable in the different fields cannot be explained solely with criteria or with logic classifications such as education, skill, neighborhood, economy or other measurable criteria. And this is why Bourdieu talks about habitus.

Habitus is the formative structure, which organizes the practices and the interpretation of the attributes, while at the same time habitus acts as the structured structure. This in turn is the principle for the division into the different logical classifications that organize the way of assessing the social world that will then exist in an embodied form. It can be noted that the social world itself is a product and a result of the way societies divide social classes. The social class is defined by the structure of all relevant characteristics. This is why we have to make clear that there is a web of secondary characteristics, with which we exhibit, more or less consciously, every time we deal with classes that are constructed on the basis of only one single criterion or on a number of criteria, as often seen in investigations.

It is common practice to reduce the number of criteria in the investigation of a particular phenomenon. We need to limit our investigations in order to be able to consider the phenomenon in its entirety. In this limiting process, our image of what the typical criteria are, is usually chosen to represent the phenomena as a whole, but in fact a reduction has taken place. This affects the results, which due to the reduction become more uncertain. Reflecting Bourdieu’s thoughts about habitus,
this reduction leaves the formative structure outside the investigation, in favor of the structured structure, namely the division into different logical classifications. Consequently this makes the investigation fractional and the results that follow are more or less biased towards the expected. A redundant approach does have a tendency to overestimate the interpretation of the results, rather than to underestimate them.

In Bourdieu’s discourses, the focus is on the possibilities of moving between different social classes. In my research, I want to show how basic values as a part of our habitus (as defined by Bourdieu) affect us within development processes. The understanding of values is traditionally discussed and developed within the fields of ethics and moral philosophy and is perhaps most associated with these areas. From this point of view, it is important to at least briefly consider the different ways of approaching the understanding of values.

These are just some examples of how ethical issues influence different views on technology, work environment and on organizations as a whole. Due to this influence, ethical issues affect most scientific branches.

**People**

People live and act according to different ideals. But some of our reactions are immediate and not to be regarded as consequences of sensible reasoning. Rather, they are to be seen as primitive biological reactions to the experience. Or they could be regarded as undeveloped skills to handle difficult situations as in a state of heteronomy.

On the other hand, there are situations where our conscious selves are in command. In these kinds of situations it is important to enhance awareness of the predominant common values of our time and awareness of our own basic values that affect our ways of managing different situations. As developed, these skills are seen in the state of autonomy.
By studying the development of the understanding of human behavior and human motives, it is possible to discuss the reasons to and maybe achievable changes in the behavior when wanted. The recognition of different behavior and of different beliefs can as well enhance people’s awareness and in the long run improve the possibilities to discover lines of actions and development processes that can guide us to a better working life, a healthy work, so to say.

The Primitive Man
If, in one sense, technology develops rapidly, then the opposite can be said of human beings. For the most part, modern humans are as they were thousands of years ago – at least in terms of their basic biological reactions. When something threatening happens, a human being reacts in the same way as he/she has reacted during the past thousands of years. This initial reaction, that comes from the instinct of survival, does not help him/her to make a distinction between different kinds of threats. The reaction is the same whether the threat is a poisonous snake, a crashing computer, or vital information suddenly disappearing from the screen. The difference is however, that in the latter examples, the injection of adrenalin that follows the fight-flight reaction, will not be used, since physical activity such as fleeing or fighting, is not the likely response to these situations. Thus, the levels of substances such as adrenalin will remain high and a feeling of stress will develop. In the long term, this will affect us in many different ways. Knowledge of man’s biological reactions to different situations is important in the development of (for instance) computer-supported work, since reactions that will cause severe problems can then be limited.

Body and Soul
An inner balance between body and soul, is a prerequisite for our well-being. Most psychoanalytical theories focus on inner
imbalance and try to develop methods to help people find this inner harmony. The endeavor to reach harmony in life is expressed in different ways across the world. The image representing the Buddhist concept of yin and yang is just one of the symbols for inner balance. It is a visualization of the "supreme ultimate". Through its rotational symmetry, a continuous cyclic movement is suggested. Each of the two elements, yin and yang, has a seed of the other within itself, preventing each of the elements from manifesting itself in the extreme. Instead the elements will maintain a non-static state – and thus remain in a state of constant flux and transformation. The idea of inner balance has always been of universal interest, not in the least reflected in the many diverse beliefs of the new age era. But, regardless of the eclectic nature of current interpretations, the inner balance between body and soul remains essential to the well-being of individuals and therefore to society in general. Inner balance is under constant threat from outer influences, such as people, actions, categorizations, labeling, etcetera. It is possible that the primary threat to achieving inner balance is the different interpretations of a person - both the person's own interpretations and the interpretations of others.

People are interpreted in different ways in different communities. Often we draw conclusions built on preconceived notions of how certain categories of people are. For instance, women over the age of 55, with a generally rather low level of education, is one of the categories in the narratives that are described in the empirical segment of my research. Within the organization, these women are characterized as "Women over 55, you know. But we're developing the new software for other people". It is as if these women would not be able to learn anything new (whatever that might be) and it is as if their comments on the new system have no value and therefore need not be seriously taken into consideration. It is as if there are ultimately different kinds of people. This kind of
categorization can serve as one example of an category (women over 55), that although it obviously exists, may not at all be an essential category.

However, as previously noted, categorizations in general are necessary to us and our ability to navigate through life. But when our categorizations become rigid for legitimate reason – other than occasional impulses instantly generalized into dogmatic truths – then the categorization will become a threat to the ability to navigate and ability to make well-grounded decisions and thereby a threat to finding the best paths to follow in life.

In this regard it is very important, at least in terms of human, organizational and software development, that we constantly question the categorizations that we make more or less consciously and which are also reflected in our basic values.

Personalities and the Shaping of the Self

In the discussion on basic values, the understanding of the human and the shaping of the self becomes of interest. Questions of how we develop our social framework, understanding and relationships to the outer environment, can thus be raised. But perhaps of even more concern, is the understanding of the basis for our categorization of people and consequently the understanding of our interpretations of our own behavior.

Sigmund Freud and Carl G. Jung are still two of the most influential psychoanalysts. While Freud is described as the father or creator of psychoanalytic theory, Jung as well as other contemporary psychoanalysts are often described as dissidents or as being skeptical towards Freud’s theoretical grounds, especially Freud’s emphasis on sexuality. However the perspectives that the different analysts use share the fact that they are exploring and interpreting people from a personality point of view.
Freud suggested that a diversity of the personality structure exists and that it is composed of three major systems; the id, the ego and the superego. According to Freud, the id is the part of the psyche that is completely unconscious and which is the source of psychic energy derived from instinctual needs and drives. The id is already present in the newborn child. The instinctual needs and drives consists of the basic biological impulses, such as the need to eat, to drink, to eliminate wastes, to avoid pain, and to gain sexual – or sensual – pleasure. Freud also believed that aggression is a basic drive and that aggression together with sexuality are the two basic biological drives that are a human being’s most important instinctual determinants of personality throughout life. The id operates on the »pleasure principle« and seeks immediate gratification on the impulses of basic biological needs by endeavoring to obtain pleasure and to avoid pain, regardless of the external circumstances.

The ego, according to Freud, develops from the id and is – or becomes – a new part of the personality. It develops when the child learns to consider the demands of reality. The gratification of the impulses must be delayed until the time and environment is appropriate; using this insight the ego can be said to obey the »reality principle«. In a way the ego is the manager of the personality in that it decides what conditions are appropriate for satisfying sexual impulses, for example.

According to Freud, the superego is the third part of the personality. In a sense, the superego can be seen as the individual’s conscience. It bears the internalized representation of the values and morals of society as taught to the child by parents and others, and judges what is right and what is wrong. The superego develops in response to the parents’ rewards and punishments, according to Freud. Through the incorporation of the proposed standards into the superego, the child brings behavior under his or her own control and will thereby know what is right or wrong behavior in different
situations. If violated, the superego’s standards will produce anxiety. Even if there is only an impulse to violate the standards, anxiety will be produced. Depending on if the standards are too rigid or too flexible, the personality will possess a strong or weak superego from which different typical behaviors will develop according to Freud.

These three elements of the personality affect or control our behavior in different ways. The id seeks pleasure, the ego tests reality and the superego seeks perfection and judges whether an action is right or wrong. Consequently, the three elements are often in conflict with each other; the ego pushes back the gratification that the id wants immediately, and the superego battles with both the id and the ego since behavior often fails in relation to the moral code it represents. The ego can be interpreted as the conscious part of the self, while the id and the superego act or affect our actions more or less unconsciously; in that sense they represent the gut feeling. For a person or personality who has managed to integrate the three parts well, the ego will remain in firm but flexible control and the person will be able to adjust smoothly to the surrounding reality.

In addition to the personality components, Freud believed that each individual has a constant amount of psychic energy, which he called «libido», and which is part of the closed system that each person, according to Freud, constitutes. He believed that if a forbidden act or impulse is suppressed it will – or its energy will – seek an outlet somewhere else in the system. The outlet and the form that the outlet takes can be disguised and because of this, it can be difficult to trace to its origin and to understand. But, according to Freud it has to come out in one way or another.

If Freud is the father of psychoanalysis, then Jung might be one of the most influential analysts when it comes to personality theory. Many of today’s management ideas derive from Jungian theory, but Jung himself was not specifically
dedicated to the idea of sorting people into different personalities. To him, personality traits were a way to diagnose his patients in order to be able to decide how to design each therapy. Jung uses the concept »archetype« to describe characteristics of the imbalance within a personality. He describes the personality as being composed of a set of characteristics in which one or more would dominate in the imbalanced person. The purpose was to find the characteristics to work with, in order to help the patient to develop a well-integrated personality. In Jung’s terminology, personality moves on an axle possessing two extremes ranging from the extravert personality to the introvert personality. Attached to the extremes are four different qualities in the psychological functional grounds: thinking, feeling, sensing and intuition. These grounds constitute the two categories of rational and irrational functions within the two-dimensional scale of extravert-introvert, where thinking and sensing are the rational functions and feeling and intuition are the irrational functions.

Jung suggests that the »psyche« is the totality of all psychological courses of events, of both a conscious and unconscious nature. The »soul« in Jung’s terminology is instead described as a limited complex of functions, which can be characterized as the »personality«. The personality can be multifunctional and diverse in different settings. A change in the personality, which Jung calls dissociated personalities, is not just seen among people with personality disturbances, but among normal personalities as well. The identification with the present expectation in accordance to the social conditions and obligations, will form the personality and it is in this orientation that the social character will adjust - for instance, the official environment on the one hand and the private environment on the other hand. Whether one of the personalities within one individual is truer, is a question that Jung often claims is impossible to answer. Jung suggests that a person, who shows different personalities in different contexts,
lacks a sound and steady character; he or she is not individual but collective, i.e. he or she will live up to the expectations from the surrounding environment. If the person was individual, he or she would show the same personality characteristics regardless of the environment. The collective personality wears a »mask«, which will correspond to the individuals own intent, as well as to the surrounding environment’s expectations and attitudes. The inner and the outer influences will vary in the extent to which they dominate.

The mask Jung talks about is the temporarily chosen attitude, which he calls the »persona«, the same term used for the ancient actor’s masks. The person who identifies him- or herself with the persona is according to Jung »personal« as opposed to being »individual«. The persona’s complex set of functions is exclusively in relation to outer objects, and is constructed out of causes, which have to do with the person’s conformity or personal convenience. According to Jung, the relation to the subject is something completely different from the relation to the object, since it appears from the obscure inner self, like a disturbing, impeding or sometimes even helpful influence, which in its entirety will serve as our perception of the unconscious. The subject – interpreted as the inner object – is the unconscious.

Jung describes personas as the masks we bear in relationship to the outer world, our official character or personality - our public image. In a similar way, Jung talks about the inner character or personality, which is the relationship one has towards the inner psychological processes with which we meet the unconscious. This inner character is called »anima« referring to the classical female characteristics usually reflected in the inner of men and »animus« which refers to the classical male characteristics usually reflected in the inner of women. Jung interprets the inner anima/animus as a complement to the outer personas. In Jung’s interpretation, the two sides compensate for each other. If the persona is
tough, rational and hard then the anima/animus will be weak, emotional and sentimental and vice versa.

The typology Jung developed has later been used in disparate ways, and is often based on interpretations that lie far from Jung’s original intent. In his foreword to the Argentinean edition of »The Psychological Types«, written in 1934, Jung emphasizes his standpoint as an approach that reflects his work as a genuinely critical psychology. Jung points out his that his approach often has been overlooked and that too many readers have made the mistake of thinking that the description of the types is the essential content and purpose of his work, in that it puts forward a classification system and a tool to make a fair clinical judgment of the human character. He continues by saying that in the area of medicine, the interpretation of his work and treatment methods has lead to attempts to try to fit the patients into the model and from that, give them corresponding advice. He ends his foreword by clearly pointing out the interpretations are misunderstandings, completely ignoring the fact that a classification of this kind can only be seen as a childish parlor game, as meaningless as a categorization of people into cone-heads and fatheads.

Jung emphasizes over and over again, that his typology is a critical apparatus for sorting and organizing his empirical material, and not to label people at first sight. It is not physiognomy and it is not an anthropological system, but a critical psychology discussing organization and limitation of psychological processes, which can be interpreted as typical.

Myers-Briggs
The Myers-Briggs Type Indicator (MBTI®) can be seen as an example of how Jung’s typology has been used in a way he did not intend. This famous and widely used management tool has been put together by Isabel Myers and her mother, Katharine Cook Briggs to be used as a tool to categorize personalities, and this MBTI instrument has been used in many organizations.
They felt that Jung’s way of writing was too academic for people to comprehend, so they tried to simplify the description of his typology to make it usable for people in general. Their vision was to enable individuals to grow through an understanding and appreciation of individual differences in healthy personalities and to enhance harmony and productivity through diverse groups.

(http://www.myersbriggs.org)

By putting together a questionnaire based on four separate indices, the MBTI sorts out index preferences as follows

- Between EI – **E Extraversion** or **I Introversion** – the index affecting choices as to whether to direct perception judgment mainly on the outer world (E) or mainly on the inner world (I) of ideas.
- Between SN – **S Sensing perception** or **N Intuitive perception** – the index affecting choices as to which kind of perception is preferred when one needs or wishes to perceive
- Between TF – **T Thinking judgment** or **F Feeling judgment** – the index affecting choices as to which kind of judgment to trust when one needs or wishes to make a decision
- Between JP – **J Judgment** or **P Perception** – the index affecting choices as to whether to deal with the outer world in judging (J) attitude (using T or F) or in the perceptive (P) attitude (using S or N)

From these four indices, sixteen different personality types are targeted. According to Myers-Briggs, these personality types will be related to each other as shown in the table below. The letter combination reflects the combination constituting the dominating preferences for a specific personality type. The first letter reflects the dominating function at the personality, the second and third letters reflect the auxiliary functions and the last letter reflects the inferior preference. The basic idea is that the different functions help balance the personality.
The Myers-Briggs categorization emphasizes that the typology is not to be used as an instrument for sorting or labeling people, but at the same time, the instrument - in the MBTI instrument – is used as a type indicator of the personality. The Myers and Briggs Foundation suggests that the MBTI instrument can also be used in situations such as in the choice of education, career planning, in parenting, organizations, by couples, in healthcare, for spirituality and finally in counseling and psychotherapy.

This way of categorizing or measuring personality types, is in complete opposition to Jung’s own way of using the organization of the different functions. Jung comments on this drive within psychology to find measurable facts in accordance with methods borrowed from the natural sciences. He notes
that some even very complicated psychological data is within
the reach of measurability – but, that those who have delved
more deeply into the topic of psychology, and who see
psychology as a scientific field not trapped within the narrow
borders of the methods of natural sciences, indeed these people
would also have discovered that experimental methodology
can never succeed in doing justice to mans psyche, or even
sketch a near to accurate picture of more complicated
psychological processes. (Jung, 1922)

Defense Mechanisms
One kind of psychological process is seen in the study of
defense mechanisms. Within the area of psychoanalysis, the
interpretation of people’s different defense mechanisms is
divided into primary or primitive defense processes and
secondary or more mature defense processes. These different
defense processes are more or less sophisticated and more or
less difficult to penetrate. But by being aware of what they
might look like, the chances of understanding and accurately
meeting different behaviors and reactions will increase.

The psychological phenomenon called defense mechanism
is, in its origin, seen as a healthy and positive function and not
– as sometimes is interpreted something negative. Originating
as a sound, creative adjustment to the surrounding
environment, the defense mechanisms can continually adapt
throughout life. The defense reaction usually strives to reach
one or both of the two goals;

1. to avoid or control a strong, threatening feeling, usually
   anxiety, but it can also be a strong feeling of grief or some
   other overwhelming feeling that seems to threaten the
   identity, and
2. to sustain self-respect.
The primary defense mechanisms are seen as more difficult to describe than the secondary, in that they are preverbal, pre-logical, undifferentiated, and based on fantasies and magical notions. (McWilliams, 1994) Different primary defense mechanisms, commonly used by psychoanalysts, are described by the psychoanalyst and teacher in psychoanalytic theory, McWilliams (1994). These defense mechanisms are psychological avoidance, denial, omnipotent control, primitive idealizing, projection, introjection and projective identification, splitting of the self, and finally dissociation. All these primary defense mechanisms will not be discussed in this thesis. But, some of them will be highlighted and then an emphasis will be put on those secondary defense mechanisms that are more relevant to this thesis.

Of all the primary defense mechanisms, projection is perhaps the one that is considered to be more or less difficult to penetrate, both when using it and when being the target for it. The opposite side of the coin is called introjection. Both projection and introjection has its origins in a weak or non-existing dividing line between the self and the outer world. Projection is a psychological process where that which is within us, is erroneously interpreted as coming from the outside. In its positive and mature form projection is a prerequisite for empathy. To be empathetic, we need to use our own experiences and emotions to understand another person, to project these feelings. In its negative form, projection can cause hazardous misunderstandings and damage in relations with other people. The projected attitudes can severely distort the other person (the targeted object) especially if the subject denies that the projected feelings or traits are part of his/her own person. The targeted object can be insulted and feel misunderstood and want revenge, if he or she is seen as for instance judgmental, jealous or aggressive; traits that are often denied as being part of the own person.
As opposed to projection, introjection is the process where the outer is interpreted as coming from the inner. In its positive form it will lead to a primitive identification with significant others. In this sense, it is part of the process of taking in the basic values of the surrounding environment. In its negative forms it can be a destructive behavior, for example when threatened people try to adapt the attitudes and values of for example intruders’ or attackers’ attitudes and values. An example of this is presented in an experiment by Milgram. This experiment which involved obedience to authority, is further described later in the section concerning motivation and obedience. Another example of introjection is when we internalize other people and, by doing so, become a part of them. For instance, if we lose an internalized other i.e. wife, husband, friend, etcetera, we will as well feel as if we have lost a part of ourselves.

The secondary defense mechanisms are seen as more mature in that they are developed over time and are more complex, in the sense that this behavior is more intellectual, more aware and more purposeful. One of the more basic secondary defense mechanisms is repression, which was the first defense mechanism to catch Freud’s interest. The significance of repression is motivated oblivion or intentional omission. According to Freud, the essence of repression is to omit something and to keep it at a distance from the conscious. Repression is generally not forgetting something or having difficulties in admitting something. It is only when there are signs that a feeling, thought or a perception is intentionally made inaccessible due to its power to worry, that there is reason to believe it is a question of the defense mechanism called repression. An example of repression is post-traumatic stress-syndrome, which sometimes is seen as a reaction to traumatic experiences such as war or severe accidents. In most of the more developed defense processes there is an element of
repression. Of course at times, it could be discussed if behavior is a matter of regression or a matter of denial.

In terms of this thesis, the most interesting of the secondary defense mechanisms are intellectualizing and rationalizing. Intellectualizing is a developed form of the defense mechanism called isolation, with which, feelings from traumatic experiences are isolated from the cognitive mechanisms. The defense mechanism of isolation is characterized by a person’s claiming that an experience does not affect him or her, and that he or she does not feel anything. The defense mechanism called intellectualization is in turn characterized by an intellectual relation to what is happening. The intellectualizing person talks about feelings, but does not express that he or she feels them. When in stressful situations the intellectualizing way of relating can be helpful. And as long as the emotional reactions are continuously cultivated, the intellectualizing defense mechanism can be a good asset in handling tough situations. However, when a person becomes incapable giving up the defensive, intellectualizing, anti-emotional position, people will start seeing him or her as emotionally dishonest.

Rationalization as defense is another interesting mechanism. Within psychoanalysis, the term rationalization is used in just about the same way as it is used in common language. Usually two kinds of rationalization are seen. One is a rational explanation to an emotional disappointment, for example when one says that something they really wished for was too expensive to purchase anyway. The other kind of rationalization is when something is made better, reflected in comments such as – well, at least it was an enlightening experience. The more intelligent and creative a person is, the better he or she will be at rationalization. Intellectualization is a positive tool as long as it is used to make the best out of difficult situations by minimizing the situations’ negative effects. But when a person starts to rationalize everything – all behaviors, experiences, decisions and consequences – then the
effects of rationalization become negative, as for instance in situations when physically punishing a child is given the rational explanation that is was for the child’s own sake. A similar kind of rationalization is often used in the world of software development. An example of this is when inferior software is developed that claims to increase efficiency. When the effect is, in fact, just the opposite, resulting in symptoms of stress, the software developers can simply comment that it is up to the employees to make the best of the situation.

A close relative to rationalization is moralization. The difference between rationalization and moralization is that in the rationalizing process, we seek intellectually acceptable explanations and motives to our behavior. We talk about our actions in rational and reasonable terms, such as when a disappointing experience is seen as edifying or enriching. However, in the moralizing process, we motivate and legitimatize our actions by explaining them or perceiving them as our «duty» the morally correct alternative. We talk about our actions as being moral, as the fight for the good cause, and the fostering nature of doing the right thing; a disappointment is handled by regarding it as strengthening the character.

Most of our different defense mechanisms (they are far more numerous then the ones presented here) are needed to be used in a balanced way, but if they begin to dominate our behavior, they will become a problem. Freud calls the vigorous way of using the defense mechanisms, sublimation. Through sublimation, one can find a positive outlet for one’s own «sadistic» traits. Examples of this could be when one chooses the dental or medical profession, where one is helping people, yet at the same time and in a certain sense, hurting them. An understanding of our most common defense mechanisms can be especially helpful in work with development processes and changing environments.

If awareness of the categorization of people into different personalities, as well as the awareness of our defense
mechanisms, increases the possibility of achieving an in-depth understanding and interpretation of situations – then it will be easier to focus on what is essential and to avoid losing ones way in what is simply obvious.

ORGANIZATIONS

Organizations are communities of people, sharing goals and working in a more or less structured way. Being part of a group is usually part of the work experience. This can be a challenge in itself. And when it comes to conducting an organizational change (or working with other kinds of development processes) where different people have to handle the sometimes unexpected and the emotional reaction it produces – it becomes essential to understand different interpretations of organizations, different behavior and group dynamics in organizations.

Our basic values influence our understanding of human behavior. These values play a role in the questions that research poses, as well as in the interpretation and the use of the results. For instance, there is an idea that – in order to understand, control or manage changing situations – one must understand people’s behavior. There are several tools that can be used to achieve such an understanding and these tools affect the outcome of our interpretation, just as our values do. For instance, when presenting the ideas of the specific environment, it is common to use metaphors to describe an organizational structure that we are leaving, outsourcing, in-sourcing or moving towards. Not only in psychology but in organization theory as well, the understanding of behavior and of what motivates people has become a central issue.

Initially, two fundamental ways of understanding behavior are seen. On the one hand, there is the idea that behavior evolves from inherited dispositions, and on the other hand, the idea that behavior emerges from situational influences. Lately
Theoretical Objectives

however, a merged perspective has become predominant. This perspective states that it is not inherited dispositions alone, or just environments that determine how behavior evolves. Rather the solution lies in the interaction between these two basic ways of interpreting behavior.

Behavior is not only discussed on an individual level but on an organizational level as well. In »New Directions for Organization Theory« by J. Pfeffer (1997), the author discusses five models of organizational behavior: an economic model, a social model, a retrospectively rational model, a moral model and finally an interpretive, cognitive model. These models are used to illuminate different psychological approaches used to understand and explain behavior within organizations.

In the economic model, behavior is supposed to be rational and intentionally chosen on the basis of the best information available at the time, in order to maximize the individual’s convenience. Using this perspective, Pfeffer also claims that it is through natural selection (in situations that are not conscious, managerial decision-making) that organizational, as well as, individual action achieves rationality. The organizations are seen to be aggregations of individual preferences and actions, and the economic model also emphasizes comprehensiveness and the idea that they proceed from an assumption of equilibrium, which is one of the reasons that for example stresses the idea of a free market. Traditional economic models exclude social context and social behavior, which, of course, in the social model is the central issue. In the retrospectively rational model, the suggestion is that individuals and organizations will take actions to legitimate, or to appear to be consistent with previous choices. The moral model perspective says that individuals pursue not only pleasure but also morality. It also emphasizes the fact that individuals choose not only the goals but the means as well, and that these means are chosen on the basis of their values and emotions. Finally, in the case of the interpreting, cognitive
model, the focus is on the sense-making and perception processes and the extent to which researchers separate cognition from objective reality. (Pfeffer, 1997).

Other foci on organizations can be metaphorical, participatory, paradigmatical, cultural, etcetera. Regardless of the focus chosen, there is an idea that an organization has to be efficient in one way or another, in order to be able to survive, at least in the market place. Bringing the concept of efficiency into the organizational analysis will affect the interpretation and the focus, in that an economic undertone will color the analysis, even if by efficiency, one does not necessarily mean economic efficiency.

Efficiency is a concept originally used in the field of economics. It describes the outcome of different economic transactions and it measures profit in relation to effort. The idea of efficiency has become more common within all kinds of disciplines. In organization theory, an economic way of expressing various conditions is common. Efficiency is one of the expressions sprung from the field of economics and has become an end in itself. And sadly enough, efficiency is more often a shortsighted goal that is given priority over long-term goals. In this way, efficiency becomes metaphorical when used in organization analysis.

**Metaphors & Social Settings**

In the understanding of how the human mind works, there are (among others) theories about mental models and how they develop. A mental model is a cognitive way of organizing and understanding the surrounding environment. By structuring a situation, we can more easily cope with different situations and make them more understandable. One categorization of the mental models is made by dividing them into two categories: structural or functional. Structural models are made when the knowledge of how to use something is already internalized, but we also need support to grasp larger domains. Functional
models are made when we need help in understanding how to use something. For instance, a structural model could be a map of some kind, while a functional model could, for instance, be instructions or a handbook on how to use video recorder or a computer system.

We often try to find a better way of understanding an organization by building descriptive models or metaphors. The metaphor is a magnificent descriptive tool, but the moment the metaphor takes precedence over reality, we will loose ourselves in sub-discussions. Or to put it differently, when the metaphor itself becomes the focus for decisions about strategies or changes, the risk of losing control or diminishing the understanding of the actual organization, increases dramatically. If we are aware of what theoretical values or ideas constitute the framework of the decisions we make, it will benefit our search to find ways to reach our goals.

Metaphors are the pictures we choose to help us describe and understand certain situations, or more or less specific relations. In organization theory, as well as in managerial work situations, metaphors are often used. For instance, we portray organizations in different ways, depending on what we want to focus on. The concept of efficiency, as described above, is one such metaphor that affects the choices of how and what to focus on in an organization.

One of the key works, important to the discussion of understanding organizations in a metaphorical way is »Images of Organization« (Morgan, G. 1986). Morgan describes a number of different metaphors, with which we can analyze organizations; metaphors such as machines, organisms, brains, cultures, political systems, psychic prisons, and flux and transformation. The metaphors are to be used to understand organizations in their complexity. Morgan’s idea is that organizational analysis must take into consideration, and that organizations can be many things at the same time. The complexity, the ambiguity and the paradoxical basis of an
organization, must be considered, if one truly wants to understand the organization. Morgan also discusses the assumptions that are often made by organization theorists and managers. One such assumption is »that organizations are ultimately rational phenomena that must be understood with reference to their goals or objectives« (Morgan, 1986, p.322). He points out that this tendency to use a perspective will disregard the complexity of an organization, and will also get in the way of realistic analysis. In organizational analysis, Morgan suggests a two-step method. The first step is a diagnostic reading of the organization, where key aspects of the situation are highlighted, with the help of relevant metaphors. In the second step, there is a critical evaluation of the different interpretations that were found in the first step. According to Morgan, these two steps will make it possible to explore the complexity of organizations in both a descriptive and prescriptive manner.

The use of metaphors – and not just economic metaphors – to portray the different states in organizations has expanded. Current trends imply that metaphors describe reality in terms of processes and flows. Everything is interpreted as a process or processes: the decision-making process, the work process, the life process, and the development process... As a tool for interpreting a phenomenon, the concept of a process might be useful. However with this instrument, as with other instruments, using the idea of a process implies something specific. Process thinking evolves from something that will color our understanding of that which is interpreted. In organizational analysis the concept of process evolves from the process industry, which implies that the business in the organization can be interpreted as a set of different flows, similar to those in an industrial unit. In an organization other than a mechanized plant, the flow would consist of people’s behavior in certain situations, which, if we use the process model, requires people to behave in the same way at a
particular moment in a workflow. In software development, process thinking is predominant, but when interpreting businesses as a whole, process thinking is too subtle as a method of interpretation.

The use of personas\(^9\) is a concrete example of a metaphor used in software development processes. User-centered design implies that the users are part of the software development process. In order to reflect the computer systems’ functionality and design during the development process, one tool is the creation of personas, which are descriptions of archetypal people. Although similar to Jung’s use of the concept, personas are different, since they describe the characteristics of a non-existent, clustered person. The descriptions are comprised of a set of assumptions, not only about the person in the work situation, but also in their life outside the organization as well. There are assumptions about age, gender, health, family life, pets, interests, etcetera that contribute to the understanding of a person. But, the person described does not exist in reality. He or she is an archetype constructed from the knowledge gathered about the people working in the organization, which is then condensed into personas. These personas can be seen as metaphorical descriptions of the people in the organization, and are used to increase the possibilities of developing a usable system. The software developers can now use the personas when considering the decisions they must make about different solutions in the system. Personas also serve as reminders of the fact that the system is built for specific users, with specific requirements.

As opposed to when developers use personas as metaphors to understand the users, metaphors can also be used to help the users themselves understand the new technology. Technology must be useful and understandable. The use of metaphors is a

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9 In his book on interaction design, Cooper defines personas as follows. »Personas are not real people, but they represent them throughout the design process. They are hypothetical archetypes of actual users. [...] Personas are defined by their goals«. (Cooper, p124)
way of helping the users to understand a certain technique – for instance, how to use a computer. An interface metaphor can be described as a representation of a familiar domain that is used to present a system model to the user in the form of a physical world of objects – for example, the desktop metaphor or the window metaphor. The metaphor is not only verbal; it also reflects the intention to portray the representation. In this case the metaphor is supposed to help the user by making it easier to understand how the technique can be used.

In the understanding of the user and the usage of new software developed for computer-supported office work, there is also a need to understand the use and usage in its context. The reasons are primarily because of the fact that actions can be interpreted as situated, in the sense that the time, place or the surrounding environment as a whole, affects or even predicts the actions taken. These actions are not necessarily personalized; at times they can be seen as actions on a more generalized level.

The idea of behavior settings, previously discussed in the section on design of work, describes settings as miniature social systems whose basic functions are to carry out the programs of a specific setting. The ideas of ecological psychology and especially the concepts of behavior settings and boundary zones (Westlander. 1999) are of interest in the development of software and in the work with organizational change. The idea of behavior settings accepts the possibility that we are affected by situations though sometimes not aware of what is affecting us, or of how we affect the situation, and in fact sometimes are completely unaware that we are being affected.

The idea of boundary zones has been used in research concerning aspects other than those originally studied. Fuhrer is a researcher who, for instance, uses the concept to study newcomers’ behavior in libraries and university career planning and placement centers. (Fuhrer, 1996) He experiments
with different behavior settings within the same environment. For instance, by creating a situation where people are placed in specific situations in the room into which the newcomer will enter, Fuhrer interprets different characteristic behaviors in the studied zone or setting. The results focus mainly on how newcomers move in the room. These results are then complemented by retrospective verbal protocols, containing information about the emotions, reactions, and thoughts of the person studied. Another way of analyzing behavior settings is seen in Hutchins’ research, in which he interprets the learning processes in the environment and specifically task of navigation at sea. He illustrates a learning process described as distributed cognition. The navigation learning process on board the ship is described as taking place in three steps. By practicing different steps – accurately deconstructed from the skill of experienced navigators – the novice learns one element at a time, slowly putting each element together step-by-step. By practicing the new skills under supervision of an experienced navigator, the knowledge and cognition of the art of navigation is gradually acquired. The importance of situational learning, that is to say learning in the proper environment, is stressed together with the step by step learning process, which facilitates the navigation objectives on board the ship, by making clear the hierarchical learning procedure and thereby the clarity in the different roles. (Hutchins, 1996 in Chaikling & Lave, 1996) Yet another way of understanding behavior settings is seen in research carried out by Keller and Keller, who use the idea of situated learning in the act or art of blacksmithing. The art of blacksmithing is described as a skill from which different artifacts are forged. They use the process of blacksmithing a skimmer, to discuss the relationship between preconceived knowledge and the actual knowledge as seen in the skills used and developed during the process of forging the skimmer. In their study, they use the concept of activity theory to interpret the process, which leads to the
interpretation that it can only be possible to have an umbrella plan and that the different steps in the blacksmithing process are impossible to foresee in explicit detail. Situations will develop which were not predicted, and solutions must be continuously adjusted to the specific situation throughout the process. This can be understood as a process of the internal representations (in this case, blacksmithing) which during the process will continuously be enriched and/or altered as they become reconstructed on the basis of the results of the actions. (Keller & Keller, 1996 in Chaikling & Lave, 1996)

The use of the concepts of boundary zones and behavior settings is also used by Elg in his thesis studying the area of managerial work. He studies performance measures and the way they are, and can be, used in managerial situations on different levels, in order to find the functions and kinds of activities related to usage. He also looks at how the social, material and temporal environment of managerial work, influence the usage of performance measures. (Elg, 2001)

Comparing different approaches as to how the ideas of situated analysis and situated learning can be used, leads to a broad spectrum of methods that can be used to conduct research in and about social settings. The different research approaches range from formal analysis, used to see if the environments are to be interpreted as behavior settings, to an activity research perspective seen in the work of Keller and Keller, which is more in line with a grounded theory approach, in that they are at least trying to be unbiased while studying how skills and knowledge were acquired during the process of forging a skimmer.

The learning process studied in different environments, shows different ways of developing skills, as well as different ways of relating to skills and knowledge. If comparing for instance Hutchins’ navigators with Kellers’ blacksmith, the approach to the understanding of the learning process differs radically. The need for situational learning is comparable, but
the view of the cognitive learning process differs. In Hutchins’ case, the knowledge and skills needed are distributed to the novice by more skilled navigators, whereas the learning process in the blacksmithing example deals with the development of knowledge and skill based on experience, but developed by trial and error, with no senior blacksmith surveillance and shared experience present.

The idea in Hutchins’ case is that, to a certain extent, the competence of a navigator needs to perfectly match what is expected in certain situations. Thereby, navigation is not a skill developed in just any manner; it has to be »socialized« as well. In Hutchins’ example, the learning process contains three steps. These steps follow in a certain order. Depending on the person’s role or position on the ship - one, two or three of the learning steps are carried out. This results in enhanced navigation skills, which are very much reflected in the hierarchical order of the different roles on board the ship.

In Kellers’ work, the skills needed are not acquired interdependently. This means that failure during the blacksmithing process does not need to lead to any severe consequences, except those affecting the time and material used by the blacksmith himself. In the example of navigation instruction it is of great importance that the people in the different roles on the bridge of the ship are completely secure in terms of their own skill as well as the skills of their colleagues.

The differences in situated learning in the examples given, may not at first seem very disparate. But, when examining the different approaches more closely the more dissimilar they appear. In a situation, the view on stability on uniqueness in knowledge or on the affects of the environment changes depending on which perspective is used. The measurability of different issues in the development processes or in the social settings is examined through different lenses and arguments, for or against, is presented in different ways.
It is interesting that Lewin’s original idea of boundary zones that is taken into account by Barker, did not survive or at least became reconstructed and »developed« in favor of the idea that boundary zones cannot exist as something beyond our influence or even participation. If, as argued by later scientists, Barker’s definition of behavior settings seems too general (and in a way naïve) then the proposed interpretations and development of the concept ought to be enhanced. But, Wicker adds the idea of time and argues that the primary structure of a behavior setting could not possibly be pre-perceptual – in its early phase it needs to be interpreted through the eyes of the organizers who actively influenced the setting. According to Wicker, it is not possible, prior to the second stage to talk about behavior settings in the way Barker does. In this sense, Wicker’s analysis pushes the ecological psychology perspective towards social psychology or even sociology, whereas originally in Barkers theory, the individual was still the one to be psychologically analyzed as well as to be understood in the context in which he or she lives and acts.

As a reflection on the concepts of boundary zones and ecological psychology, automated behavior can also be mentioned. As previously noted, boundary zones affect behavior in more or less conscious ways. Whether one is aware of it or not, behavior can be transformed into automated behavior. When learned in certain settings, situated behavior can develop into not only into situated, but also automated behavior. Categorizing something according to what it is, on the one hand, and on the other hand according to how it is used, is one of the main ideas behind explanations about automated behavior, or automation. In a sense, this can be seen as a consequence of the behaviorist ideas in, for example, Pavlov’s work on conditioned reflexes and later in Skinner’s work, which showed how actions and reactions come so close to becoming reflexes, that they are hard to keep apart. (Atkinson, R. et al 1990) Skinner’s work has had great impact,
particularlly on how researchers conceptualize and study operant conditioning. The understanding of automated processes and conditioned reflexes is of importance within software development, as it has great implications for, as an example design decisions that are based on whether or not the software is going to be used continuously in everyday work, or if it is a real-time surveillance system, etcetera. The understanding of these work processes is also of importance when evaluating new software products. Skinner’s research is further described in the section »motivation or obedience«.

Organizational Learning

The understanding of work processes affects the dynamics and changes in organizations, which create a need for employees to become a part of an ongoing learning process. This learning process, or rather, both the individual learning process and the organizational learning process, can be interpreted as situated. The understanding of the learning process is also clearly related to the understanding of behavior and of what motivates people. When it comes to organizational learning, the theory of single-loop and double-loop learning (Argyris, 1977) is often brought up. In the single-loop process, the organization corrects mistakes and irregularities in order to be able to better keep up with the duties it is set to do. However, in double-loop learning however, there is also an interest in understanding the underlying implications that can answer the question of why this is a better way.

In a study by Löfberg, the learning process is interpreted as the development of knowledge seen as a relation and a constant exchange between content and form (Löfberg, A., 1989). Löfberg describes this state of constant change in his work, by drawing on Piaget’s research on the development of logical thought. On an individual level, learning is of course affected by different mental and physical states. New knowledge is first acquired, and when understood and
experienced, it becomes assimilated, and will then create the platform for gaining further new knowledge and understanding. From a psychological point of view, there are similar theories that imply man’s need to move back and forth between a secure and well-known environment and a developing, insecure and unknown environment.

**Management**

The understanding of the learning process, and particularly the organizational learning process, is one of the crucial elements in the art of management. Different management ideals emphasize different ways of understanding the learning process, human behavior, human interaction, etcetera.

Classical management theory evolves from the interest in codifying successful practical management, which others can follow when running organizations. The idea of management being a process of planning, organization, command, coordination and control, can be seen as the basic premise. Rational ways of planning and controlling are the goal. From the beginning of the 20th century, when classical management theory dominated views on leadership, different ways of looking at management have been developed, such as management by objectives (MBO) or management by coaching. The choice of management strategy is also correlated to the idea of what motivates people, and on what bases people behave.

Management has been an issue of great concern for a long time. Machiavelli is often mentioned as the first management or organization theorist. In 1513 he wrote a book, The Prince (Machiavelli, 1513) on the principles of securing and maintaining political power. It has been (and still is) a highly-debated book, in which Machiavelli claims that among other things, morality sometimes has to be sacrificed for the sake of the state. His work affected European leaders for hundreds of years.
The understanding of motivation is a much discussed issue in management. If motivation theories emphasize one’s own will and finding pleasure in work, then theories of obedience attempt to find an explanation for what makes people do things that are in complete opposition to their moral values. Machiavelli pleaded obedience, which we usually associate with the management of dictators, but it is important to understand the motivational structures that lead to unquestioning obedience, in order to render these structures less influential.

**Motivation or Obedience**

Motivation theories are usually based on the assumption that motives induce, direct and energize behavior. Three types of motives are primarily discussed. These are motives for survival, social motives and curiosity motives. Earlier in the 1940s and 50s, the dominating idea was that all basic motives operated according to the principle of drive reduction, but in later research the idea of drive reduction is more or less abandoned in favor of the principle of arousal level, in which people seek an optimal level of drive or arousal. Motives linked to survival (such as hunger and thirst) operate according to homeostasis, which involves several parts: a regulated variable, sensors that measure the variable, an ideal value of the variable, a comparator, and the adjustments that the system makes when the variable is at a value above or below the ideal value. Sensors for survival are located in various regions of the body. The most crucial region is the hypothalamus, from which ideal values and comparisons are regulated, according to neuroscientists.

Abraham Maslow (1908-1970) is one of the most influential theorists in discussions about motivation. He developed a theory called »a hierarchy of needs«, which shows how different basic needs are activated in a certain order. (Maslow, A. 1954) At first Maslow was inspired by the behaviorists, but
he abandoned their ideas in favor of theories of psychoanalysis. However he became critical of their psychoanalytical theories on motivation, and instead developed his own theory. The basic idea with his hierarchy of needs, was that needs that are lower in the hierarchy must be at least partially satisfied before needs that are higher up in the hierarchy can become important sources of motivation. Maslow suggested seven levels of needs:

1. Physiological needs,  
2. Security needs,  
3. Belongingness,  
4. Esteem needs,  
5. Cognitive needs,  
6. Aesthetic needs,  
7. Self-actualization.

Physiological needs are seen as the primary needs, whereas self-actualization is seen as reflecting the highest needs. Maslow’s later research dealt with the characteristics of self-actualization and the behaviors leading to self-actualization.

The characteristics of self-actualization are described more or less as abilities to interpret and handle life. These characteristics are seen in people who have the ability to perceive reality efficiently and the ability to be able to tolerate uncertainty. Self-actualization lets people accept themselves and others for what they are. These people are spontaneous in thought and behavior and act in a problem-centered way rather than in a self-centered way. They have a good sense of humor and are highly creative. They are also resistant to enculturation, although not purposely unconventional. They are concerned for the welfare of humanity and capable of deep appreciation of the basic experiences of life. They also have the ability to establish deep, satisfying interpersonal relationships
with a few, rather than many people, and they are described as being able to look at life from an objective viewpoint.

To reach the level of self-actualization some behaviors are pinpointed which lead to self-actualization. These behaviors are characterized by the ability to experience life as a child does, with full absorption and concentration and to try something new rather than sticking to secure and safe ways. The ability to listen to one’s own feelings in evaluating experience rather than to the voice of tradition or authority or the majority, as well as the ability to be honest by avoiding pretences or »game playing« is of importance. To be prepared to be unpopular if one’s views do not coincide with those of most people is also a behavior, or reaction to behavior, which needs to be appropriately dealt with. This behavior presumes a sense of responsibility and that one takes each undertaking seriously. Finally, this type of individual tries to identify his or her own defenses and has the courage to give them up.

If self-actualization, as expressed in Maslow’s hierarchy, is the level we are striving for, and if his theory is accurate, then we should develop environments that increase the possibility of developing the behaviors that lead to self-actualization.

The American researcher, Herzberg, developed a theory on interviews that contained two basic questions concerning work satisfaction and concerning work dissatisfaction. This is sometimes referred to as Herzberg’s two-factor theory. (Mabon, H. 1990) The respondents were asked to describe situations or periods that had been satisfying in terms of the work situation and also to describe examples that had been dissatisfying in terms of the work situation. Using the great number of situations described in the interviews, which Herzberg developed and classified, two types of causal factors were found. These were motivators and hygiene factors.

The motivating factors are not completely in contrast to the hygiene factors. The relationship is to be understood in such a way that the factors causing motivation or hygiene differ only
in some parts. The motivating factors are more related to the work itself, while the hygiene factors are more related to work relationships and work environment. If the hygiene factors are handled in a correct way in the organization then they will be motivating. But if they do not reach a minimum level of acceptance among the employees, then it will be impossible to compensate this low level with the motivating factors that may be present as well.

According to Herzberg, the hygiene factors must reach a minimum level of acceptance before the motivating factors can be effective or motivating. In other words, people do not become motivated simply by working in an organization where just the factors in the hygiene column have been perfectly incorporated. Nor are they motivated by working in an organization where just the factors in the motivating column have been perfectly incorporated. Both categories must have reached a reasonable level in order for an organization to be able to offer a creative satisfying work environment.

![Figure 8: Illustration of Herzberg's two-factor theory](image)

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The relationship between the hygiene factors and the motivating factors can be illustrated as shown in figure 8. Herzberg’s theory is often referred to in management literature, but although it is well-known within the academic world, it has never really won true acceptance.

The importance of reinforcement has a natural role in motivation theory. B. F. Skinner's (1904-1990) work on schedules of reinforcement is probably the most complete and influential piece of research within behaviorism. In the Skinnerian experiments, a hungry animal, usually a rat or a pigeon, is placed in a box. The inside of the box is bare except for a protruding bar with a food dish beneath it. When the rat moves around and explores the box, it occasionally inspects the bar and presses it. The initial rate at which the rat presses the bar then becomes the baseline level of bar pressing. A food source located outside the box will be activated after the baseline level is set. Every time the rat presses the bar, a food pellet will be released into the dish. The fact that the food acts to reinforce bar pressing, can be seen in the rate of pressing, which increases dramatically. If the food source is disconnected, so that pressing the bar no longer delivers food, the rate of bar pressing will diminish. This experiment indicated that an operantly conditioned response can undergo extinction in the same way that a conditioned response can. In many psychological experiments, it is noted that the delay of reinforcement is an important factor. Immediate reinforcement is more effective than delayed reinforcement; the more time that elapses between the operant and the reinforcer, the weaker the response.

If Skinner was interested in understanding the power of reinforcement, then it could be said that Milgram was interested in the understanding of obedience to authority, the other side of the coin one might say. In Milgram’s most famous obedience experiment in 1963 (repeated in 1974) was set up
with three people: one experimenter, one student and one teacher (Milgram, 1974).

The person who was to play the role of the teacher was in fact the object of the study; however s/he was not told that the other two participants were part of the research team. »The teacher« was instead lulled into security, thinking that both his role and the student’s role were the object of study. In the experiment the teacher was to read a series of word pairs to the student, who was to memorize them. Then the teacher was to test the student’s memory by reading the first word in a word pair and then letting the student choose the correct second word from four given alternatives. Each time the student made an error, the teacher was to press a lever that delivered an electric shock to the student. In the set-up, the person playing the role of the teacher watched while the student was strapped into an electrically wired chair with an electrode attached to his wrist. The teacher was then seated in an adjoining room, facing a shock generator with a front panel equipped with 30 lever switches in a row. Each switch was labeled with a voltage rating, ranging from 15 to 450 volts. The switches were also labeled descriptively in groups ranging from Slight Shock to Danger: Severe Shock. Every time a switch was pressed an electric buzz sounded, lights flashed and the needle on the voltage meter deflected to the right. To illustrate how it worked, the teacher was given a sample shock of 45 volts from the generator. As the procedure started, the experimenter instructed the teacher to move one step higher on the shock generator after each error made by the student. As the student made more errors and the shock levels escalated, the student started to protest, which could be heard through the adjoining wall. As the shocks became stronger, he began to shout and curse. At 300 volts, the student started to kick the wall and at the next shock level, marked Extreme Intensity Shock; he no longer answered the questions or made any noise. At this point in the experiment, many subjects who played the role of the
teacher began to object to the procedure, pleading with the experimenter to stop the experiment. But the experimenter just replied that it was essential for obtaining results that the experiment continued. The maximum level of shock that the teacher administered, before refusing to continue, expressed the level of obedience. In Milgram’s experiment, 65% of those who played the role of the teacher continued to obey the experimenter throughout the entire experiment. None of the subjects stopped prior to administering 300 volts. In Milgram’s interpretation of his results, he says that obedience to authority has to be understood in its particular context, in every specific situation and for every individual. Some factors are of greater importance than others, as one can see in the results from the Milgram experiments. These experiments show that there are at least four persuasive factors in the understanding of obedience: social norms, surveillance, buffers and ideological justification.

STRESS

The change in organizations and especially the change in computer-supported office work and how it is designed in its entirety, have led to different effects for the people performing this work. Examples from inferior design are often seen in software solutions made for computer-supported work. Tailor-made software, developed without concern for the people it is tailored for, leads to an increase of stress-related consequences such as musculoskeletal disorders, psychosomatic problems and in the worst cases, to chronic fatigue depression.

The motivating factors are experienced in a positive way, however when the factors instead are experienced as persuasive and requiring obedience, they may be stress-

10 In the experiment, no real electric shocks were given
inducing. But the interpretation of stress is not so simple. Physical and psychological ways of understanding stress and stress-related symptoms are of particular focus within the field of occupational health and human factors. Different trends in stress diagnoses can be observed over longer periods of time.

Within the field of HCI at Uppsala University, some attempts have been made to develop a method for analyzing computer support in work life (Sandblad, B., et al 1992). The theoretical background for this method, called the ADA-method, deals with problems common for cognitive work-environmental situations and graphical user interfaces, GUIs.

The aim of the ADA project was to analyze computer-support in work life. Different kinds of cognitive work-environmental problems were identified, and different strategies for change were made. The project came to the conclusion that cognitive work-environmental problems appear when the computer support or software – especially the graphical user interface (GUI) – is designed in a way that does not promote efficient, effective and satisfying ways of working. Problems of a cognitive nature are often seen within computer-supported work and they can be the source of negative effects such as inefficiency, pointless distress, irritation and stress.

Psychological and psycho-physiological research has showed the importance of balance between demands from the environment and the individual’s ability to handle the demands. If the individual has sufficient resources, as well as sufficient control over the situation, then high demands can stimulate and develop the individual, whereas if the resources and the control over the situation are insufficient, then the demands will lead to physical and psychological illness. If computerization will increase the degree of unpredictability and decrease the degree of control and influence, it will contribute to increasing the risks for severe negative health effects.
In a historical perspective, underlying values can be seen when comparing differences in time, trends and social fields as well as in the similarities in diagnosis such as burnout, chronic fatigue syndrome, neurasthenia and depression. The different values that are reflected in the diagnoses, are the result of both the underlying values in the social status of the person being diagnosed and of the trends in diagnosis at that particular time.

An investigation of the historical development of different diagnoses related to fatigue symptoms has been made by Johannisson. (2001, 2002) Her research describes how in the early 20th century, fatigue-related problems were discussed within domains such as cultural analysis and scientific discourses, which in turn gave legitimacy, status and funds for research. The first diagnosis related to fatigue symptoms was the diagnosis of nostalgia in the 17th century that was characterized by a painful feeling of homesickness, seen especially among the young soldiers who were sent to military operations far away from home. This diagnosis shares several similarities with today’s stress-related diagnoses and this type of diagnosis can also be seen episodically.

Both at the turn of the 19th century and the turn of the 20th century, one can observe several similarities in terms of the increasing number of diagnoses concerning poor mental health. Both these periods are characterized by changing environments, an increase in information, rapid communication and a demanding life for the urban individual. New names for these diagnoses legitimize symptoms that were once considered signs of psychological weakness. If the predominant diagnosis at the turn of the 19th century was neurasthenia, then the diagnosis that predominates at the turn of 20th century is chronic fatigue syndrome. Neurasthenia was considered a legitimate diagnosis up until the 1940s and 50s when it started to lose its legitimacy as a diagnosis. During the first half of the 20th century, problems with fatigue were mostly
associated with neurotic, astheniatic or depressive personalities or with the female identity; and consequently these problems lost their social status. During this period, expressions such as overstrained, overworked and nervous breakdowns were described in popular media in a mythologized semi-scientific manner. They were considered to be reactions beyond the expected normal reaction. It was first during the late 20th century that fatigue and overexertion gained legitimacy through the establishment of new diagnoses such as chronic fatigue syndrome and burnout. The various fatigue diagnoses experienced a period of declining popularity in the 1980s, when a new, strange diagnosis was reported. The newcomer was often referred to in the popular media as »the yuppie disease«, while the medical term was »chronic fatigue syndrome« – after what seemed to be an epidemic in Lake Tahoe, Nevada in the U.S. In Johannisson’s interpretation of the evolution of stress diagnoses and comparison of the diagnoses, it is shown that the similarities not only appear in the diagnoses but also in the social structure of the patients who received these different diagnoses. The patients who were given the diagnosis of neurasthenia at the turn of the 19th century, as well as those patients who received the diagnosis of chronic fatigue syndrome one hundred years later, were in both cases, highly educated men, and this initially gave the diagnoses high status. The diagnoses, which were also expressed in bio-medical terms, became a symbol for the elite – those equipped with ambition, success, intellect, etcetera. In this way, the diagnoses gave legitimacy to these illnesses, which had now received a medically accepted explanation - instead of being labeled with negative expressions as neurosis, hypochondria or depression.

Interestingly enough, the diagnosis burnout has not yet been given a bio-medical explanation, although it has obvious similarities to chronic fatigue syndrome. Such a similarity is the fact that explanations for burnout are found in both the cultural environment and in the field of medicine - where it is
considered as a disease, not as an emotion or a healthy reaction. Burnout is clinically defined as physical discomfort, mental and emotional exhaustion, and a decrease in empathy. The burnout diagnosis was first established to apply to people in care-giver occupations such as social workers, nurses and therapists, who felt drained of energy. The diagnosis was well-defined already in the 1980s, but it never had a real breakthrough outside the US. Johannisson’s suggested explanation, is that the diagnosis of burnout was associated with personality characteristics such as adaptation, weak ego, sensibility, and feelings of guilt – and these characteristics were hardly »worthy« of highly educated, efficient people – for example, those working in the IT-industry.

The diagnosis depression is also similar to the aforementioned diagnoses of nostalgia, neurasthenia and chronic fatigue syndrome. It is characterized as a mood disorder, although depression involves four sets of symptoms: emotional, cognitive, motivational and physical. (Atkinson, 1990) The emotional symptoms could be sadness and dejection, expressed in a feeling of hopelessness and unhappiness and at times even in the contemplation of suicide. The cognitive symptoms are primarily expressed as negative thoughts, low self-esteem, a feeling of being inadequate and blaming oneself for failures. Motivation is at a low and it is difficult to initiate activities. In physical terms, depression is expressed in loss of appetite, sleep disturbances and loss of energy. Depression, as well as the previously discussed diagnoses, can all be triggered by stress and stressful situations.

The concept of stress does not have one, uniform definition. The term stress can be used in a variety of ways, both within scientific areas and common life situations. The concept is originally sprung from the branches of physics and technology. In these areas, stress is seen as a chain consisting, of load, stress and strain. Stress in terms of load, is the force that something is subjected to, that can affect and deform or ruin it, as well as
ruin the different physical materials that the object is made of. A strength test of a bridge is a classical example; stress is the outer force that is imposed by the load (e.g. heavy traffic) that will be manifested in strain, which in turn, produces effects that can be observed – for instance, cracks in the bridge pillars. When translated into the psychology of working life, load would be the general workload, stress would be the pressure felt by the individual, and strain would be the reactions that will follow, for example irritability or stomach-aches. (Åborg, 2002)

When the concept of stress first used in the beginning of 20th century, in biology and later in medicine, it became increasingly common to use the term stress to describe the reaction within an organism when it is put under pressure from the outer environment. This is an interpretation that shares many similarities with the concept of strain, in the world of technology.

In early biological stress research, the main subject of the research was organisms’ reactions to immediate stress that threatened the organisms’ survival. Walter Cannon is usually seen as the pioneer in this new research field. He was the first to use hormones to explain reactions from stress. (Karasek, R. et al 1990) According to Cannon, the body strives to maintain a physical equilibrium or balance called homeostasis. He described stress as a stimulus disturbing or threatening the homeostasis. By analyzing animals put under stress, Cannon found a set of general reactions that prepared the animal to fight or escape. He called this response »fight or flight« and this is a metaphor still used in the understanding of stress reactions.

In the medical literature of the 1930s, Hans Selye was the first to mention stress. (Karasek, R. 1990, Åborg, C. 2002) He studied people and tried to understand the causes behind diffuse medical symptoms. He started to employ terms such as »stressor« to name the causal stimuli and »stress« to refer to
the responding reactions. Selye defined stress as the body’s
general, non-specific response to a straining stimulus. He argued that this non-specific response followed a decided,
general pattern, which he called »General Adaptation Syndrome« (GAS). The pattern consists of three phases that occur in a specific order. The alarm phase exhibits a number of physiological changes such as hormone reactions. The resistance phase follows, if the stressors are still having an
effect, and hormones are still on a high level. A successful resistance phase can reduce or eliminate the stress reaction, but if the stressors are too powerful, the exhaust phase will take over. In the exhaust phase the body’s defense can no longer manage the demands - symptoms of stress will appear and eventually diseases will develop. According to Selye, all threatening stimuli, both physical and psychological, will produce the same general GAS-response within an organism. However, later research argues against this assumption.

Both Cannon’s and Selye’s research has lead to a deeper knowledge of our physiological reactions to stress. Research within the stress domain has also lead to knowledge about different kinds of stress and their various harmful effects on the body. Selye made a distinction between positive stress, eustress, and negative stress, distress. (Karasek, R. 1990. Åborg, C. 2002) Negative stress is associated with feelings of anger and aggressiveness and has a harmful effect on the organism, while positive stress is associated with empathy, motivation and positive energy, which will increase health and well-being. The theory about eustress and distress has weak empirical support and there are indications that positive stress may also have negative effects on health, especially in the long term.

There are also biological differences in the hormonal reactions to positive and negative stress. In a demanding, positive situation, where we have a feeling of control, there is mainly a hormonal reaction with nor-adrenalin from the gland, and the body will quickly return to its normal state. Higher
levels of concentration of nor-adrenalin, in combination with low levels of adrenalin and cortisol, will give a positive stress reaction that is not harmful to the body. If instead, high demands are combined with a feeling of insufficient control, then the level of adrenalin will be higher than the level of nor-adrenalin. This combination, together with cortisol from the adrenalin gland, will give a prolonged stress reaction, thus the return to a normal state will be delayed. Negative effects will also appear as a result of positive stress, if the person is subject to this stress over a longer period of time. (Frankenheuser, M. & Ödman, M. 1983). These differences are much discussed within stress research.

High levels of cortisol have shown a causality relation with feelings of helplessness and depression. This negative stress reaction can also be induced by a work situation that demands too little of a person, that provides too little stimulation in combination with too little control – for example, an extremely monotonous, routine work task. Selye’s concept of stressor and stress, are still used today and are comparable with other frequently used concepts such as stress factor and stress reaction.

The leading theoretical model on healthy work is the 3-dimensional model of the psycho-social work environment developed mainly by Robert Karasek and Töres Theorell. In the expanded model, there are three main components that – depending on their internal relations - affect people in a way that has been observed in stress reactions to work situations. The three components are demand and control as in the early model, and social support, which is also taken into consideration in the expanded model.

Karasek’s model was developed in the field of stress research. At first, the model was called the control-demand model and, at the time, it did not take social support into consideration. But empirical studies showed that the significance in the relation between control and demand could
not sufficiently explain how stress reactions occur in work situations. This lead to the idea of adding another variable to the model, namely social support.

Work Stress
Since the 1990s, the concept of stress is defined neither as a reaction, nor as an outer force causing the reaction, but instead, as a process with extremely close links between man and the situation, as well as between the mental and the physical processes. Stress arises when there is a discrepancy between stressors and the current »strength« of the individual – or to put it differently, the discrepancy between the individual’s interpretations of the perceived demands in relation to the perceived ability to deal with them. The stress process could be described as involving three different systems: social, psychological and biological. This is sometimes referred to as the bio-psycho-social approach.

From a dynamic perspective, stress symptoms can evolve as a result of different strains or loads. How these symptoms evolve depends on both the nature and the intensity of the load/strain, as well as on the particular individual. But the same individual can manage different amounts of load or strain in different situations and at different times in life. Although the differences are there, some commonly occurring work situations tend to cause stress reactions among large groups and in many different settings. These situations are condensed and presented into four categories in a piece of research presented by Levi, Frankenheuser and Gardell (1982).

1. Quantitative Overload – an over-dimensioned workload in relation to the given amount of time. For example, work with a tight deadline, or repetitive work in an accelerated work tempo, or work that demands little attention.
2. **Qualitative Under-load** – a meager and impoverished work content with little variation, the absence of creative moments of problem-solving and social isolation.

3. **Deficient Influence and Control** – insufficient control over one’s own work situation. Not being able to control the work tempo or the way in which the work is to be done, is seen as especially trying. Conflicting instructions and the absence of clear information contribute to insecurity and is, in fact, another form of deficient control. In a continuously changing work setting, the individual’s control will normally diminish due to deficient predictability.

4. **Deficient Support** – lack of support from colleagues and/or, leaders and management when outside demands pile up.

In terms of stress and load, the relationship between work and the rest of daily life, is often brought to the fore. In one article, Johansson claims that when comparing male and female managers and lower-level employees at the end of the 1980s, the results showed obvious differences between the groups. (Lennerlöf, L. (Ed.) 1991) The female managers showed a slower return to their base level of heart rate and slower secretion of hormones than the other groups in the study. The women also reported a stronger feeling of conflict between the responsibilities at work and the responsibility for duties at home. These male-female differences were also present in the group of lower-level employees, although to a lesser extent. The time a person had to wind down after a day’s work, was considered a critical factor when it came to the health risks stemming from the work process. A connection was established between a slow «recovery» at the end of the workday, and a very demanding work situation as seen in machine-governed work, short-cycled tempo work, monotonous data-input work, and continuous overtime work.
Theoretical Objectives

In an article on work organization and leadership by Rubenowitz, five factors within the research field of work and work environment are presented as the main factors that are the most important when creating the prerequisites for satisfying a number of human needs. (Lennerlöf, L. (Ed.) 1991) The five factors Rubenowitz found were:

1. *supervisor attitude factors* – the effects that are produced depending on to what degree the supervisors had a positive and confident attitude towards other people
2. *organization factors* – describe the effects of a strictly hierarchical and procedural organization structure
3. *machine system factors* – related to technically advanced production systems with high levels of automation
4. *competence usage factors* – describe the effects that are dependent on the degree to which the work situation is organized to encourage the employees to use their competence in an optimal way
5. *specific work-related factor* - affected by the work organization that encourages active contribution.

All these results point in the same direction, that is, towards the importance of understanding the environment or organization, of exploiting skills, of providing social support and creating a balance between the work situation and private life.

As early as 1958, Marie Jahoda proposed a number of criteria for positive mental health. According to her research on positive mental health, there are six criteria: attitudes towards oneself, development and self-realization, coordination of the individual’s psychological powers, freedom from social influences, a sense of reality and the ability to handle a given situation.
1. **Attitudes towards Oneself** – Self-esteem and self-confidence are crucial for the psychologically healthy human being. Self-esteem means that the individual accepts his/her self, with all the assets and shortcomings and that the individual has a positive view about solving problems and reaching goals. It is not a question of uncritical self-esteem or self-assertion; it is rather a form of self-esteem that is based on a realistic picture of oneself.

2. **Development and Self-Realization** – A person that has good mental health – as defined by most personality theorists – has a need of constant development, change and growth, which is achieved by using skills and by making the most of opportunities that arise.

3. **Coordination of the Individual's Psychological Powers** – A person that is in good health can balance his/her psychological assets and his/her needs. S/he possesses an inner feeling of confidence, which means that she can answer questions such as »who am I?« In the balance between the different assets, lies an ability to adapt appropriately to each situation. Such a person can, in one context, be frolicsome and impulsive and in another context be controlled, ambitious and capable of making very responsible decisions.

4. **Freedom from Social Influences** – The ability of freely choosing whether to conform or not, in relation to influences from others, lies in the concept of independence. The person who lacks independence will often uncritically adjust to the demands from the surrounding world. Or alternatively, a person lacking independence can be opposed to everything. This type of behavior is as compulsive as the behavior of uncritical adjustment. In other words, the independent person can free him/herself
from the »programming« that previous experience could otherwise lead her to repeat compulsively.

5. **Sense of Reality** – Jahoda emphasizes that there is not any, single »right« way to understand reality. However the understanding of reality can be developed to a greater or lesser extent. Social competence encompasses, among other traits, empathy, or the ability of feeling for other people and an ability to perceive, without distortion, other people’s feelings and behavior. Many scientists see social competence as a crucial element of psychological health.

6. **Ability to Handle a Given Situation** – Under this heading, Jahoda gathers the most commonly referred to factors that are used to determine the state on an individual’s psychological health. They are mainly a summary of what has been listed under the aforementioned headings; however, one quality emphasized in this section is the mentally healthy person’s ability to function in loving relationships as well as in work.

Maturity, self-realization and psychological health are not static but rather, dynamic states. They can be interpreted as goals, as landmarks or as beacons to strive towards. In a research text on the psychology of the work group the authors argue that occasionally concepts such as maturity or self-realization are not accepted as scientifically established concepts, rather they are dispatched as valuations. (Lennéer-Axelsson, B. Thylefors, I, 1979) But the picture of the psychologically healthy person is based on solid psychological and scientific investigations and on experience from working with people seeking relief within the healthcare sector of psychology. The picture of a psychologically healthy person is also a prerequisite for being able to create conditions in a workplace that will promote health in life and in work, for the people who work there. In economically harsh situations, there
is a tendency to find excuses for not changing environments that are having negative effects on people, and therefore to criticize psychologically well-established concepts. The requirements for good psychological health are lowered, using various explanations such as the idea that many people really don’t want to develop, or that some people, in fact, do not have the natural prerequisites for real self-esteem. In this process, people are divided into different groups with different goals. Resignation and lack of opportunities to change people’s poor working conditions are excused by using one-sided, genetic models of explanation. When these kinds of explanations begin to gain acceptance, it is crucial to hold on to the ideals of the psychologically healthy person and maintain them as goals to strive towards, since these ideals are also the foundation of a healthy society.

To handle situations characterized by stress and to handle our own stress-reactions, we develop different strategies for coping. The skill to adapt to different situations and conditions is a skill crucial to our survival. Lazarus, a researcher who thoroughly studied coping strategies, developed a transactional stress model, which is one of the most influential models within the scientific area of coping strategies (Atkinson, R. 1990. Åborg, C. 2002). It is built on the principal of cognitive judgment – a process where we continuously categorize different situations depending on their imagined consequences for our well-being and our health. At the start of the process, there is a primary judgment of the situation as either

a) irrelevant,
b) benign, or
c) stressing.

If we judge the situation to be stressing, it could then be further judged as:
Theoretical Objectives

a) damage or loss (the damage is already done),
b) threat (there is risk for damage in the future) or
c) challenge (possibility for personal development).

Qualities within the situation (the stimuli), which affect our judgment, could be the for instance the nature of the threat or the controllability in the situation. Factors within the individual also affect the judgment, as for instance the picture of one’s own self, one’s values and goals. If a stimulus is judged as stressing and in need of some kind of action (called a coping response, by Lazarus) a second judgment will be made, where the individual estimates his/her own capacity to deal with the situation. If the individual thinks that s/he cannot deal with the situation, then a stress response will be released.

Lazarus’ coping theory has been very influential, particularly in the discussion about possible ways to reduce negative stress, and ways to develop stress-reducing or stress-handling programs. Many different coping strategies have been studied and they are commonly divided into the two categories: problem-focused and emotionally-focused. Problem-focused coping strategies are seen as more active, more focused on causes and are also seen as more constructive and health promoting than emotionally-focused. Lazarus himself regarded the two kinds of strategies as parallel and cooperative. Different individuals with different coping behaviors raise more or less inevitable questions about the individualistic personality and its meaning. The Swedish tradition within research on work environment has for the most part, chosen not to take the effects of personality into consideration, and instead has focused on other factors of importance such as problem-focused and emotionally-focused factors, despite the differences in personality that are present on an individual level. One individuality factor, which according to Lazarus is crucial for a successful coping-strategy, is the belief in one’s own ability, in that the individual’s choice
of action can have crucial effect on how well he or she is able to cope.

A later theory that alludes to different ideas on coping, is Antonovsky’s theory on the sense of coherence. (Åborg, C 2002) Three variables are included in the concept: intelligibility, manageability and meaningfulness. There is a correlation between these variables and psychological well-being. Intelligibility, manageability and meaningfulness all have an effect on all different kinds of work situations. These variables are particularly useful when interpreting and illuminating the kinds of questions that HCI deals with.

If the coping strategies are underdeveloped or for some reason »out of order« a state of learned helplessness can be developed. The theory of learned helplessness was developed in the 1960s and 70s by Abrahamsson, Seligman and Teasdale. (Aronsson, G. in Lennerlöf, ed. 1991) The theory mainly deals with individuals who lack control, who are in a state of »uncontrollability«. It is not possible for these individuals to maneuver or control what happens, for instance in a work situation. There is a causal relationship between the feeling of uncontrollability and negative learning, which in turn, can lead to learned helplessness. Uncontrollability means that an individual does not perceive any connection between what she does and what is going on around her. The individual’s expectations are thereby seen as a mediating variable that steers future expectations. Therefore, the mere fact that someone has a feeling of uncontrollability does not, in and of itself, lead to learned helplessness. In a given situation, the process will follow a number of steps:

Objective uncontrollability > Sense-making of contemporary and previously experienced uncontrollability > Attribution of contemporary and previously experienced uncontrollability > Expectations about later uncontrollability > Symptoms of learned helplessness
When the individual fails with a task, she will find different causality explanations or attributions related to her own person, to time to and exposure. These three dimensions act together in different ways in the process:

1. **Internal/External Dimension** - Is the state of personal helplessness that can occur when the individual perceives that it is impossible to take control over the situation, and at the same time understands that other relevant people, who she is comparing herself to, who she identifies with, and who are in the same or similar situation, can, in her eyes, take control over their situation. In such a situation, an internal attribution takes place, which results in a state of personal helplessness. If instead, the individual perceives that other relevant people, are also not able to take control over their situation, then a external attribution will take place and the result is a state of universal helplessness.

2. **Stability Dimension** - Is seen when a stable attribution is of a long-term nature, and thereby will affect expectations about future helplessness in a stronger way than an attribution of a temporary kind.

3. **Global/Specific Dimension** – Is a specific attribution that refers to a limited number of situations where helplessness will appear, while global attribution means that helplessness can appear in an unlimited number of situations.

Depending on how the different dimensions are combined, the individual will develop different strategies. An internal, global and stable attribution produces chronic and generalized helplessness, while an external, specific and instable attribution will produce the best possibilities for optimized handling of new situations in the future. In a situation of control, it is best if
the individual attributes internally, globally and in a stable way. The fact that unfavorable attribution will lead to learned helplessness is explained by changes in the three components of motivation, cognition and emotion.

Changes in Motivation

If the individual is repeatedly in a state of uncontrollability, then the will to act will diminish, especially in situations that have certain similarities. In fact, the will to take any action at all, will diminish. The helpless individual does not expect that her actions will lead to any change and she will therefore not even attempt to change the situation; she will be pacified.

The changes in motivation can be seen in cognitive effects. In future situations, the individual will have difficulties in perceiving the correlation between her actions and their consequences. And when the individual’s actions actually result in positive changes, the changes will merely be addressed to chance or to fate. The state of learned helplessness will thereby render development impossible, since development pre-supposes the individual’s ability to understand the relationship between results and the actions that led to these results.

A change in motivation can also be seen in emotional effects. The primary reactions to uncontrollability are anxiety and fear. An extended period of uncontrollability will trigger psychological reactions – a state of depression and low spiritedness – as well as somatic problems, for instance, gastric ulcer, headaches and sleep disturbances.

Back in the 1980s, Brod discovered a state he called technostress. Brod wrote about the consequences of a highly technological environment, and especially the relationship between computers and stress. (Brod, C. 1984, Åborg, C. 2002) Brod claims that computerization affects in a crucial way, our behavior, our personality and our relations to other people, both at work and in our private lives. Some people are not able
to adjust to the arrival of computerization in a healthy way. Instead, they develop what Brod sees as a new kind of disease, which he calls techno-stress. In his description of the disease, he divides the problem into two main parts: techno-centeredness and techno-anxiety. Those who are positive, motivated and strive to learn the new technique as quickly as possible, can develop the form of illness Brod calls techno-centeredness, which is characterized by disruptions in empathy, intuition and social skills. In a severe form, techno-centeredness could lead to (among other things) antisocial behavior, inability to understand other people’s situations and feelings, as well as the inability to think intuitively. Those who react in the opposite way, who are negative, ambiguous or frightened by computer technique, can instead develop techno-anxiety, which is not only evidenced in psychological or psychosomatic symptoms, but also in a complete dissociation from the new technique.

When interpreting a changing work environment and the reactions that follow, theories about understanding crises can be used. One of the most well-known theories within this area is concerns the relationship between crisis and development (Cullberg, 1992). The reaction following a traumatic experience is called a crisis reaction, which according to Cullberg consists of a certain number of phases. The first reaction is chock, which is a state characterized by lack of emotion and often by complete rationality. When the chock loosens its grip, the next phase is entered, called the reaction phase. This is the phase when the person comprehends the experience and releases all the emotion and pain caused by the experience, which is now perceived in its entirety. When this phase successively fades, a new phase is entered, characterized by an effort to understand and to handle everyday situations. The fourth and final phase is one of new orientation, where the new situation becomes accepted and where energy is focused primarily on the future.
Transforming this theory into an understanding of organizational change provides some keys to managing a changing environment. Nevander-Fristöm (1999) suggests such an interpretation in a handbook for practitioners. In this interpretation, the steps in the organizational change are seen as similar way as to the phases in the original theory. A suggested change should incorporate the need for time to react, reflect and to accept the suggested change. If not given this opportunity, people will generally not be cooperative. However, if managed properly, the greater the chances that the change will succeed.

Through this chapter, an attempt to focus on different scientific approaches, on different objectives and on different interpretations of the causes of the consequences in general, as to people’s reactions from diverse organizational prerequisites including the design of computer-supported office work, has served as an exposé over the discrepancies within the area of HCI. And as such it has also served as a critical overview trying to point out the difficulties in finding strategies, which by raising awareness about, might decrease the hindering aspects and instead help promote a focus on what is actually essential. The obvious negative effects from poorly designed workplaces needs to be attacked by pinpointing essential issues affecting the development in a negative way.
EMPIRICAL OBJECTIVES

From an empirical point of view, the different approaches and issues focused on in the theoretical part of this thesis are crucial in the actual development processes within organizations. Costs for sick-leaves are increasing as a consequence of the fact that people are suffering from stress-related health problems, stemming from poor work environments in general and specifically computer-supported office work. There are several ways of understanding the reasons for this evolution, at different levels and from different perspectives. Psychological, sociological, technological and economical bases for explanations represent some of the perspectives brought up in this thesis. One of the main aims of my research has been to increase the possibilities of developing »healthy work« in organizations, meaning that the organizations are characterized by efficiency, effectiveness and – not the least – by satisfied employees in satisfying work situations, equipped with satisfying tools. This goal requires references from practice as well as ideas reflected in practice. The empirical references are presented as narratives from practice.

DESIGNING SOFTWARE FOR WORKPLACES

Software that is tailored and used in everyday work and in specific environments requires a sound understanding of the particular design of the work and what characterizes it. In the research project VERKA, the aim was to provide several software development projects with knowledge about
development processes concerning software development, as well as organizational development.

As background information, a brief overview is presented of how the amount of computer-supported work is rapidly increasing in Sweden. The computer as a work tool is seen in almost all workplaces. When it comes to office work, the number of computer-supported tasks is growing enormously. Approximately one third of the population in Sweden does clerical work of some kind, and within this group, there was an increase in computer use from 65% to 90% between 1989 and 1997. (Marklund 2000) Among women in this group, the trend has continued – between 1997 and 1999 computer use increased from 91% to 94% (Ekman et al 2001). During the same time period, an enormous increase of stress and work-related symptoms was seen, often due explicitly to computer-supported work. This development is unacceptable and raises thereby questions about how a healthier work environment can be developed. In the VERKA project one of the main foci is on the question of how to develop usable systems.

In Sweden, in 2001, 69.5% of the women and 72.4% of the men used computers in their work. Of the women 35.9% were using their computers more than half the working day while 33.2% of the men used their computers more than half the working day. The reported incidence of neck and shoulder complaints from computer supported work during that time period, indicated that 61% of the women spending more than four hours a day at the computer, suffered from neck/shoulder complaints more than three days per month, as compared to the users spending less than four hours a day at the computer. In this group 35% suffered from neck/shoulder complaints more than three days per month. (Statistics Sweden 2001)

Originally, the VERKA project focused on two of the major authorities in Sweden; the National Social Insurance Board and the National Tax Board, which in 2004 became the National Tax
Agency\textsuperscript{11}. The intent was to determine what should be focused on in the systems development process, in order to facilitate computer-supported work and improve the work environment for the users. In the end, the goal was to make the user’s work a healthy work. Some factors necessary to achieving this goal, were already well known, while others were more difficult to detect, and therefore more difficult to acquire knowledge about. Knowledge and experience gleaned from earlier research, was taken into consideration in the development process, especially knowledge about health aspects in work with visual displays. Some of the theoretical aims as well as the empirical study would together illuminate the question and problem of the balance between organizational development and software development.

In one study within the VERKA-project, usability matters were in particular focused. The purpose of the study was to shed light on what happens to usability and occupational health issues in the course of a software development project. Usability is an essential quality in software, especially in a work context, where poor usability may cause health problems. Despite the abundance of models, methods and professions that claim to guarantee usable software, poor usability is still a huge problem for many computer users. A number of software developers, usability experts and users were interviewed in two Swedish organizations that have in-house development of custom-made software. The study came to the conclusion that several factors combine to push usability and occupational health matters aside in software development projects. Some of the factors include negative attitudes, unclear responsibilities, and weak support for user-centeredness and usability in software development models. Other contributing factors include ineffective user participation and the fact that usability is often ignored or forgotten in decisions about the software, its

\textsuperscript{11} The National Tax Board will in the following mainly be referred to as the National Tax Agency
use and its design. (Boivie, I. Åborg, C. Persson, J. Löfberg, M. 2002) This can be seen at the two organizations that were studied, despite the fact that the original aim of the systems development projects was to build systems for an environment that supported healthy work.

Different issues of the work environment, e.g. symptoms and risk factors, can affect the user in negative ways. The interrelations are complex, in that all factors are more or less linked to one another. Of particular interest is the fact that the design of the software has an impact on virtually all the other risk factors. To various degrees, the software shapes work organizations, job content, job design and decision latitude (Clegg, Eason). The design and contents of the software can also influence such important factors as the number of hours of computer work as well as work posture. Thus, computers and software (including usability aspects) have both direct and indirect effects on workers’ health and well-being. (Ibid. p.3)

The particular emphasis in my research came to be issues concerning how to improve the computer-supported work for case-handling at the Swedish national population registration. The research project focused on the possibilities for taking into consideration knowledge gathered from earlier studies in the
development process. By avoiding development of a software solution that resulted in a way of designing work that would lead to various negative health effects, the chances for creating a superior work environment would then increase.

The very specific assignment of developing software for everyday work encompasses many different ideas of how to succeed. The difficulties met in the development process share some similarities. The requirements are too imprecise, the understanding of how the new system will affect the work is too shallow, the ideas of what characterizes a well-functioning system differ and the ideas of the acquired future work are too unclear.

**Information Systems vs Work Environment**

Problems that once again became obvious when working with the VERKA project, were conflicts between the ideas of how, what and for whom the system was to be developed. On a generalized level there was agreement on what was important in terms of the projects requirements, but when the work with the development of the system began, these conflicts were once again evident for example in the dialogue between the IT-project and the user representatives from the population registration. Moreover they were seen within both these groups.

In the project dealing with the IT-strategy, the same kind of problems could be observed. But in this project they were present in interpretations of the strategy document and in the discussions that took place in the interviews. Furthermore, these same problems were also reflected in how different parts of the strategy were written, and in how different issues in the different parts were emphasized.

Both in the VERKA project and in the IT-strategy project, usability and work environment issues were to be prioritized. Development of superior software tools to support superior work and work environments was in focus, and the desire to
take the end users' knowledge and ideas into consideration was of importance as well. In the VERKA-project, the goal was to create a »healthy work« and this goal was given the highest priority in the sense that the aim of this project was to find the path that would lead to a healthy work.

On a general level, the essentials were agreed upon. Everyone in the project wanted to create software that really would better support the work with national population registration in Sweden. In the overall directive, the idea of calling attention to usability and work environment issues was illuminated, and the software development project was put together in a way that was to enhance the chances for success. The same conviction and effort was seen in the work with the business- and IT-strategy at the Swedish National Tax Agency.

**Developing a Case-handling System in Practice**

The software system whose development we followed will be used primarily by about 700 people, but it will indirectly affect thousands of employees within the organization, thousands of employees in other organizations and moreover the citizens in the country. In this sense, the system will affect the work environment and the organization in its entirety. The system, which has been given the name »Folke« is being developed to handle the Swedish national population registration.

The national population registration in Sweden has a long history. Since the 16th century, all residents of Sweden are registered in the state church. Sweden’s oldest existing church books are from the beginning of the 17th century. The first law dealing with national registration was written in 1686. According to this law, priests in all parts of the country were obliged to register all the important details of the lives of all parishioners, for example, births, deaths, marriages, etcetera. When the national registration system was reformed in 1946, it was clarified that the main purpose of the national registration
was to keep records about the population, as a service to society. Thereby, the national registration became an instrument for efficient tax collection, control of income tax refunds, keeping records of social statistics and regulation of the labor market.

Everyone has his or her own personal registration number that is linked to one’s date of birth. The records are fairly complete in terms of the number of people whose information is registered in the system. On July 1, 1991, the responsibility for handling the national registration was transferred from the state church to the National Tax Agency. The people working with national registration were transferred as well, and in conjunction with the move, were introduced to a completely different work environment. This new environment included an introduction to computerized work – the old church books were now just a thing of the past. Today, the computer system used by the national population registration has once again been reconstructed and revised. However, the Folke system, which was supposed to replace the system from 1991, has never fulfilled its original intent to be a model project.

The Organization

The population registration encompasses more than 40 different elements. Everything connected to the basic registration of people is entered into the system - such as where we live, when and where we were born, died, buried, moved, married, divorced, etcetera. When information about a person is updated, the old information remains registered, which makes it possible to trace the history of people, far back in time.

The population registration is located at over 200 different local tax offices around the country and these offices are sorted into ten regions. When the new system is completely implemented, the case-load and work tasks will be sorted according to each autonomous region and from there,
delegated to the people that handle the national population registration. The delegation of work can either take place at the regional organizational level or via the local tax offices. The offices for case-handling work are located in traditional office environments with minor variations in modernization. After thirteen years, work with national registration is, in most cases, still located at the tax offices and is for the most part, carried out autonomously by the same people who originally came from the church offices.

Within the National Tax Agency, the office employees working with the population registration generally have a low status. The group is still mostly made up of the women who were transferred thirteen years ago from the church offices, when the case handling of the national registration was transferred to the National Tax Agency. Most of the women are over 55 years old, although some are younger employees and some male employees. It is interesting to note that there still are some supervisors who do not exactly know what the work with national population registration actually encompasses.

The National Tax Agency could be seen as consisting of three main sectors – the primary sector, which is set to discharge the duties of the Tax Authorities, the Tax Authorities themselves, who are set to discharge the duties of the citizens and the companies that do business in Sweden, and finally, the National Tax Agency’s own IT-department whose job is to develop and support the systems used within the authority. But even if the IT department was a part of the National Tax Agency, there was, and still is, a desire to work as if the relation between the discharging units and the IT-department is a normal client – supplier relationship.

The Swedish National Tax Agency

Throughout 2003, the Swedish Tax Administration was made up of the National Tax Board and ten regional tax authorities. But since January, 2004 the processes of merging the National
Empirical Objectives

Tax Board and the ten regional tax authorities began. The name of this new organization is »The Swedish Tax Agency« (Skatteverket). The reasoning is that by combining the administration of the regional tax offices and the tax board into one tax authority, a number of advantages can be gained, such as increased flexibility, optimized handling of legal issues etcetera. However, the enforcement authorities will remain intact, with the National Tax Board as parent agency.

The Tax Administration and the Enforcement Service has just over 13,000 employees. At the beginning of 2003, the National Tax Agency had 1,174 employees, half of them working in the IT department. The Agency’s mission (as they express it) is to lead, coordinate and support the regional authorities working with taxation, debt collection, population registration and general elections. From 1992-2000 the Tax Administration has cut the number of employees by about 2,900 to 9,000. (The Swedish Tax Agency, 2004)

The Mission

The mission was to enhance the possibilities to develop a computerized work resulting in superior work environment, satisfied employees and a more efficient and effective organization. The Folke project came to be one of our major objects of research, within the VERKA-project. As such it was called a »model project«. By being a part of the research project, the idea was not only to conduct research, but also to bring the experience and the knowledge that has evolved from earlier research, into the development process, so that the number of mistakes or poor choices that result in severe negative health effects, hopefully would diminish.

The Path

The project manager for the development process that includes all national registration (in which the system development is
the largest part) was an executive officer coming from the business sector of the National Tax Agency. Next in the hierarchy, is the manager of the systems development, referred to as the IT project manager. The project group consisted mainly of different system developers, but there was also a group of users who represented the user organization or the business that the system is developed for. This created a situation whereby the same party is both the customer and the supplier. The customer who orders the system is responsible for the development of the system, they will own the system, and they also function as the authority that is responsible for the administration of the user organization.

At the time of the start-up of the Folke project, the National Tax Agency decided to purchase and implement a systems development model that was completely new for the organization. The choice fell on the Rational Unified Process (RUP) (2000), is the systems development model currently used by several Swedish government authorities. The purpose of RUP is to make the development process as efficient as possible and to insure that the system being developed, really will support the business it is supposed to support. RUP is a far reaching model that is difficult to survey in its entirety. By modeling all parts of the business into the development process, together with an understanding of the different situations that can appear, and an understanding of all the relations in the organization – the model will give a comprehensive picture of the situation. Modeling is a way to gain an understanding of organizations as different workflows. The descriptions of the different workflows are called use cases. At an early stage in the process, an element called business engineering is worked into the model in order to get a better idea of the business.

RUP contains a number of steps that are to be followed. Each step is to be iterated until the process is ready for the next step – although there are limits here. The number of iterations
is usually planned ahead of time, and in that sense, can be interpreted as time periods more so than iterations. The four steps in the model are called Inception, Elaboration, Construction and Transition. Most of the time and effort is devoted to the construction phase.

When the Folke project first started in the spring of 2000, a lot of time was spent learning RUP, which was a development model never before used in the organization. Pressures of time forced the project to start with the modeling work, before people had really achieved an understanding of the purpose of it, for instance, how the use cases later were to be used. Every move was documented in the templates that followed with RUP. From an organizational point of view, the ultimate focus was on gaining an understanding of what business the system was being developed for.

After spending almost a year modeling all kinds of situations, the project ended up in a jungle of use cases, which were to be transformed into system use cases. At this juncture, the question arose as to why the modeled situations were the ones chosen, and especially why the structure and content in the use cases were the way they were. What was their purpose and how were they going to use them? Everything had been documented, in accordance with RUP procedures, but at this point, the documentation had almost become a project in itself.

On our advice, the system development project brought in a usability designer as a part of the research project. One of the project’s first decisions was to design a graphical user interface (GUI). Since the GUI was to be based on the needs found in the user organization, a preliminary design was developed at the outset, as opposed to letting this phase be pushed to the end of the project – as »icing on the cake«. Users were interviewed, personas were shaped and the work with designing the GUI was partly carried out together with users. This work was done primarily by one researcher from the research project, together with the usability designer, who was employed at the National
Tax Agency, working part-time in the project and part-time with other issues. The result was presented for the system development project and for a number of users, who were all pleased with the preliminary results.

After the work with the GUI, a strategic decision was made within the organization (but outside the realm of the development project) about the technical format of the system. In addition, there was a decision made to develop a new system that would drastically affect the Folke system in several ways. The new system was to be built for a generalized process and all executed tasks, not just the national registration tasks, were to follow this new system. This system was to be developed on an assumption of how the generalized process works, an assumption based on a survey done at another Swedish authority.

From there, it was decided that the GUI should be web-based. These strategic decisions affected the Folke project, in that a lot of work now had to be redone. These decisions also had consequences in terms of being able to predict response time in the system, as well as in terms of the design of the GUI as a whole. Meanwhile, a discussion had started about which of the software development projects within the organization would be responsible for constructing the inbox in the Folke system. This discussion went on for several months and it was finally decided that the new system development project would do this work.

As the Folke project developed, there was a change in the language of those who were working with the software development. This change was seen particularly in the user representatives. During the work process a new language, with a new vocabulary, evolved. The concepts were used in such a natural way within the project, that there is barely any longer an awareness of the vocabulary used by the user organization outside the project. And there was also a much diminished awareness, in terms of the extent to which outside users could
understand the presentations made about the project. The awareness of how the work environment is to be understood also changed as the project progressed. The user representatives became more and more indoctrinated into the software developers’ way of understanding the work environment, mostly due to the fact that it was the developers’ language that dominated.

At this time, focus was being placed on plans for implementing the system into the organization, and educating future users. The difficulties in the development process thus far, had led members of the team to feel more or less disillusioned. However, they were currently working with forming a plan for user education, which they were responsible for carrying out. The start-up date for the system was at the time still uncertain and the design and capacity of the system was still not clear. In the first stage, about 700 people were scheduled to learn how to work with the new system. It was possible that the system had become »good enough« in one sense, but from a health perspective, it was already possible to see some of the problems that followed in the wake of the new system coming into use. Several problems – at least to a certain degree – could have been avoided. This list includes the increased risks of work-related musculoskeletal disorders (particularly the mouse-arm syndrome), eyestrain and stress-related mental and somatic symptoms.

As a part of the implementation process for the new system, various information activities were planned and carried out. One of the activities included a tour to all regional offices, where those parts of the system that were »ready« to be shown, were presented to the users. This was done in the form of full-day seminars held with all national registrators from each region, together with most of their supervisors. The seminar program included a one-hour lecture that I held, in my role as a researcher associated with the development project. The lecture dealt mainly with information about reactions to
changes, leadership, the understanding of new technology, ergonomics, learning ability at an older age, and stress/stress-related symptoms. This lecture was a part of the main program, which included a demonstration of parts of the system, followed by a session for questions and discussion. The inbox was the main topic of the discussion period, specifically the subject of whether the users would prefer individual inboxes or team inboxes – and accordingly, how the division of work tasks would best fit the users. The seminars were very popular among the users, who were finally given the chance to ask questions about their upcoming work situation, as well as the opportunity to express both fear and enthusiasm about the new system. When just one regional office remained to be visited on the tour, the organization of the Folke project changed, suddenly and radically.

When it had become clear that the deadline for implementation, once again had to be moved forward, the project leaders were suddenly dismissed from their jobs, literally from one day to the next. At the same time the deadline was revised for the second time. No one within the project was informed about these decisions. The new project leader was picked from inside the organization, but from outside the project. All the decisions that have followed in the wake of these changes, concern how to slim down the project into something that is more manageable time-wise. Different actions were being taken to determine if the concept of the Folke project as a model project was sustainable. The timetable for the remainder of the project was not completely clear when the project management was changed, but the project still seemed to have the potential to succeed. After a few months the project was put on ice, and over time it was successively disassembled. Finally it was put aside or as it was officially presented »reassembled«. At that point, the new direction for the Folke project was simply just to get it up and running, as fast as possible, and at as low a cost as possible.
THE OUTCOME

This summary of the Folke-project shows how decisions affecting the project – particularly some highly unexpected decisions – changed the nature of the work in the software development project, as well as its development process. Some decisions were seen as completely rational and as being the only possible ones to make, for instance, the decision about the technical platform. This decision was made despite the fact that this particular solution was repeatedly questioned by people outside the group of decision-makers.

It is interesting to see how the project has evolved as a result of the steps that were taken, in many cases taken without an awareness of the changes that would follow the different steps. An example of this is the consequences that followed in the wake of the decision on the new technical platform. The decision was made despite the fact that the software developers stated that solutions within the originally suggested GUI (that had been designed in cooperation with the usability designer) were not possible to develop with the new technical platform. However the same developers, one year later, said that it might once have been possible, but now it had become too late, since time was running short.

With time running out, new decisions were being made, not only by people within the project, but also by people who are inside the organization, but who are not connected to the Folke project. In the end, time and money control the process, and all the magnificent ideas of a system built for a better work environment have faded away. A lot of good work has gone to waste, as well the initial enthusiasm of many people. The model project with its original ideals is now a mere shadow of its former self. But, the development model has been followed, decisions have been made from rational perspectives and much work and effort have been put into the project. In all likelihood, the new system will be up and running at some point, although not according to the original schedule.
Hopefully the result is hopefully better than it would have been, if the ideas of usability and health issues had not been brought into the project at all. From a positive point of view, the awareness of ideas such as usability, work issues and health aspects is raised and in that way, the chances to succeed in new projects increase. Although, with time and money as controlling factors, and with a short-sighted rational approach to making decisions, there is a risk that many important values in the organization will get lost.

A Survey

As a complement to the case-study, a survey questionnaire with fixed alternatives was used to collect data. The questionnaire raised questions about stress in computerized work. The dimensions covered in the questionnaire concerned stress and fatigue, relaxation and recovery (Kjellberg & Wadman, 2002), health conditions, work demands, support and control, work with the computer system, and ethical competence and confidence. Each dimension was represented by a single question.

The participants in the survey were employees at the Swedish national population registration offices. The questionnaire was answered by 638 people, of which 568 were women and 53 men. Most of them, 432 people, were between 40-59 years of age. They had an average of 15 years of experience at National Registration. The division of the answers was 207 assistants, 354 clerks, 36 junior managers, and 17 senior managers.

The results presented a rather positive picture of general work conditions at the national population registration, especially in terms of the computer-supported work conditions. The results showed a well-functioning workplace with a good environment and work climate, satisfying levels of control over work tasks and adequate support from colleagues and superiors. The results also showed high levels of interest
and positive stimulation, combined with low stress and good health. Participants were seldom confronted with moral problems at work and even less in their private life. They were not very stressed by moral problems, and it was not difficult to cope with the moral problems that came up. They could explain their decisions convincingly, and they had confidence in their ability to handle moral problems. But the organization had somewhat insufficient routines to deal with moral problems and to support the employees. Despite this generally positive picture, some negative aspects were reported:

1. Participants were worried that the shortcomings of IT tools or the way those IT tools were used, might have serious consequences for the clients.
2. They felt that they had little opportunity to influence the construction of IT tools or to select the IT tools that they had to use in order to achieve their work goals.
3. IT tools were complex and difficult to use.
4. There were some worries that computer work might cause health problems.
5. Computer breakdowns occurred rather often.
6. Work tasks were too simple and monotonous, but difficult.
7. Too much responsibility at work.
8. Very little training and education dealing with ethical competence.

The results showed that the national population registration in Sweden was a rather good workplace. There are, however, some important aspects that detracted from that overall positive picture. Despite the fact that there were few moral problems at work, participants showed a high level of concern about what effects the use of their IT-tools might have on the clients. They were worried that IT-tool deficiencies or the possibility to misuse or abuse them might cause harm. At the same time they reported that their IT systems often broke
down and that using them was complex and difficult. Furthermore, they had few opportunities to choose the IT tool they preferred to use, or to participate in the development and construction process of the new IT systems for their work. These results showed that, even in a well-functioning computerized workplace, there are serious, moral concerns about IT-systems. We may therefore assume that in workplaces where IT-systems are flawed, a higher level of moral stress would be expected. The results also showed that certain aspects and conditions of work with IT-tools are indeed correlated to moral stress and worries about health. (Kavathatzopoulos, I., et al 2004)

**Scrutinizing a Strategy for Development**

As a complement to the study of a development project in practice, an interesting research project was carried out to scrutinize the strategy for development of IT to support the business and its workings in the Swedish National Tax Agency. The research project was a cooperative work between Uppsala University and the Royal Institute of Technology (KTH) in Stockholm, and its goal was to analyze the current strategy and to carry out the analysis with an emphasis on the issues of usability and work environment. The results were presented in a report to the Swedish National Tax Agency. In order to accomplish this, nineteen interviews were conducted with a total of twenty people. Each interview was approximately one hour long. The interviews were analyzed using five criteria; values, the document, the content, the work with the strategy and the organizational culture discussed.

As a complement to the interviews and the strategy document, several other strategic documents were read, together with literature on strategies. In addition to the interviews and the document analysis, an overview of the literature dealing with strategies has been made. In our roles as
researchers in the strategy project, our knowledge about usability, work environment, organizational psychology and requirements can also be seen as a platform for the analysis. In conjunction with the interviews, a mini-survey was conducted, dealing with an organizational culture analysis. The main purpose of this analysis was to find ways to present information that can serve as a basis for discussions about where the own organization’s business is heading and how that direction and development can be managed in a strategic way.

Strategies
The description and idea of what a strategy is will vary to some extent depending on how and for what it is used. Originally the strategy concept was used in military planning. But since the mid-20th century, the concept is being used in fields such as economics and later on, in different kinds of developmental planning. In the same way that metaphors can be used in analyzing organizations they also can be used in the work with formulating strategies. For instance, Strategies can be understood as plans, as patterns, as a position or a perspective, etcetera (De Wit, B. & Meyer, R. 1999). The most common use however, is when strategies are developed to show the direction, the path to the future, and the goals set up for a specific organization.

Strategies can be made and decided at different levels and for different interests. In larger organizations for instance, they can be developed on an overall organizational level, reflecting the general strategies and goals in the organization; on a divisional level reflecting strategies concerning how to reach the goals in the specific business area or unit; and on a functional level reflecting more specific and detailed strategies to indicate the direction and to alleviate the work with for example production, marketing, financial issues, logistics and procurement. The strategy or strategies can be used to give
meaning to as well as define the organization; it creates consistency, reduces ambiguities and brings order to the understanding of the organizational work. On the other hand, strategy is merely a reflection of people’s representations of reality, which in different ways are reduced and transformed into describable pictures. Thereby, there is a risk that the complexity of the organization will be overlooked.

Throughout the years, different parameters have been discussed concerning strategies. The relation between the strategic work and the operative work is one such parameter, others are who the organization is supporting, for whom it exists and how the interests of the management, of the employees and of the customers are valued and taken care of. The strategic work and the management of changes are limited by a number of factors such as the organizational culture, social norms, relations, illusions and preconceived notions. The organizational culture can be seen as an asset as well as a limitation in the development process, but it does exist, and it needs to be taken into consideration when working with development strategies or strategies at all.

The process of formulating a strategy provides the targeted work with ideas concerning the organization and how to structure and value these ideas. When formulating a strategy, some issues are more agreed upon than others. The strategy should point out the direction which is made clear through visions and goals. The vision reflects the imagined future state of the organization, where the goals are elements that are attainable in a more tangible way. The goals can be given different time-lines, as for instance goals to reach in one year, in five years and in ten or twenty years. As a complement, a strategy can present solutions in terms of how to operationalize the goals. This work should be adjusted to the goals and continuously revised, in order to support the chosen direction. When working with strategies in organizations such as governmental authorities, the goals are not explicitly
commercial. These goals deal with generally fundamental issues concerning customers, innovations, resources, productivity and regulations.

A strategy for IT has its own implications. It usually reflects the part of an organization that supports the business. A complete information system involves the choices of IT and how it is going to deal with the business and the employees that make up the infrastructure in the organization. It will also deal with issues such as how the choices of IT will communicate with the outer environment and other technologies of importance. Management of the information system as well as making more explicit choices, for instance infrastructure questions is also a part of the IT-strategy. It is important that the IT-strategy is written in a way that is comprehensible to non-technicians, at least in its most generalized sections. The idea is to make the strategy explicit, in order to insure that it supports the general organizational and business goals and to prohibit a technology driven development of the organization. This is of course particularly valid for non-technology organizations, meaning organizations whose overall business handles issues other than development of technology, for instance an organization such as the Swedish National Tax Agency.

The Strategy

The Tax Agency has developed a combined business and IT-strategy. The original directives ordered a strategy proposal for the IT-area and how it would best be managed and developed to support the authority’s operations during the period of 2002-2004. During this phase, the strategy was referred to as the IT-strategy and was created during the period of 2001-2002 by a project group with representatives from the head office of the National Tax Agency and all its departments. The work was presented as a business and IT-strategy, with a more concrete emphasis on IT-support, taking into consideration the different
business areas as well as the Tax Agency’s overall target for 2010. A plan of action geared towards achieving the targeted goal was developed as well. In January, 2003, the directives were renewed with the purpose of creating a revised and updated version of the business and IT-strategy, and to present an analysis and updated version of the action plan in the IT-strategy. The overall purpose with the business and IT-strategy is to support the Tax Agency’s business and also to fulfill the authority’s targeted goal.

Within the research project, the strategy was analyzed from various perspectives. The overall assignment was to scrutinize the strategy with emphasis on usability and work environment issues. The preliminary analysis of the strategy document was based on the questions asked and then analyzed, both in the discussions during the interviews and in our internal discussions. The results from the analysis were presented in a report to the Swedish National Tax Agency\(^\text{12}\).

In order to discuss the strategy in more detail, the results of the report were sorted under a number of headings. The main conclusions were presented as follows

**Size**
The strategy exists in two versions - a shorter one and a longer one. The short version is about 40 pages which is rather extensive for a short version, although far from the size of the full document. Additionally the strategy has a number of appendixes that describe more thoroughly the different parts of the strategy. The size of the report makes it difficult to browse through in order to gain an opinion of its content. Even the short version is too long to allow for a brief overview.

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\(^{12}\) Genomlysning av skatteverkets verksamhets- och IT-strategi – Rapport, januari 2004
Structure
Various structures are used, making the document difficult to read. Goals and strategies are mixed in a way that makes it difficult to follow the strategy’s line of reasoning.

Details
The level of detail shifts inconsistently. Sometimes the goals and strategies are described on a generalized level and sometimes on a very specific level, describing in detail certain steps and how they should be carried out. It is not clear why a particular level of specification is chosen; rather, it seems to be chosen arbitrarily.

Traceability
The connection and links to other strategic documents are missing to some extent. For example, it is difficult to trace efforts described in the strategy back to the overall goal defined for the organization. Traceability back to the vision and goals is of importance in that it is needed to motivate the proposed paths, as well as to insure that the goal and its intents are being in focused.

Focus
The focus is too biased. The strategy focuses mainly on information processing issues while usability and work environment issues are inadequately treated. Reducing the development of a business and its workings to interpretations as information processes alone, ignores other dimensions of importance for the business in its entirety. The information processing view may be feasible and necessary in the IT-development process, but it needs to be weighed in its relation to usability and to the work and work environment in the business.
Expressions
The method of expressions, and especially verb tense, shift throughout the description in the strategy. This shift can be traced to the use of a strategy process tool called LOTS, developed at the pharmaceutical company, Pharmacia, originally for internal use. It suggests that future states in the target organization are to be described in the present tense. This grammatical »leftover« from the time when the LOTS tool was used to write the strategy for the Swedish National Tax Agency, makes the text confusing, since it is difficult to know when the present state is being described and when the future state is being described.

Perspectives
Three different perspectives are taken into account in the strategy; that of the citizens’, that of the employees’ and that of the assigners’. In the current phase of the change that the government and its organizations are in, which entails developing e-governmental services, the focus has come to be biased towards the needs of the citizens’. The environment and usability issues concerning the systems developed for internal use, often become unfairly treated. By illuminating the three perspectives, hopefully problems will be revealed and light will be shed on the importance of solving these problems.

Limitation
The borders between the IT-area and the assigned business in the tax authority are not easy to draw. The different parts of the business are intertwined and interrelated, but in the strategic work concerning the authority in its entirety, questions ought to be raised on a more generalized level than the questions concerning the IT-development in particular and also how it is management. This raises the question of whether or not the strategy should be divided into separate strategies, working on different levels and different business areas.
Empirical Objectives

**Recipient**
The employees within the organization are the intended recipients of the strategy. Due to this fact, the language and the vocabulary used in the strategy should be free from technical terminology and concepts having meaning to only a small group of people. The strategy has to be written in a way that encourages a dialogue and can convince those it has been created for. In its contemporary form, a significant part of the written description of the strategy is not accessible to the majority of the employees.

**Work Environment and Usability**
Usability and work environment issues are of great concern in all parts of the business. These issues should pervade all development, but they should be explicitly expressed in the strategy as being values of importance and as being basic prerequisites for the business and its workings for which the strategy is intended to develop.

**Contradictions**
The strategy describes the idea of having a business driven IT development process, as a relationship characterized by flux and continuous transformation as in figure 9. The goals the organization has set up are described mainly from a business perspective, while the strategies are described from a technologically oriented perspective. This

![Figure 9: The continuous transformation in the relationship between the IT-development and the business, as described by the Swedish National Tax Agency](image-url)
may result in conclusions which make the strategy too instrumental from a technique perspective, while leaving the business goals behind.

In summary, one can view the strategy as the initial description that deals with the business in its entirety, where work environment and usability are integrated into the ideas of the business and its workings, showing that usability and work environment issues should be natural parts of the development of the business. But in the more IT-focused parts of the strategy, the issues of work environment and usability almost cease to be mentioned. This can be interpreted as a consequence of the fact that work environment and usability issues have low priority in the work with IT development. The importance of a good work environment is a common value among the interviewees, at least as long as it concerns their own work environment. But when these issues or values are to be transformed into strategies, or when work environment and usability issues are to be introduced into the strategy, obstacles appear. In practice a number of preconceived notions: usability being is expensive, it slows down the development process, it makes it ineffective and inefficient. However, these notions are without proof. In the strategy, an emphasis on the IT development appears to override the focus on business development. Focus on the (often) more tangible software development is sustained by short-sighted economic goals taking precedence over long-term goals. This bias is also upheld by the routines for how time and budget are accounted for and presented.

**Interviews**

The interviews were made to balance the inquiry and support the research work with information other than just the written texts. The interviews were semi-structured and mainly covered opinions on:
1. How to run projects in general and software development projects in particular
2. How to make strategies usable from different perspectives
3. Organizational culture

We also had short discussions about the specific work issues that were of particular interest to each interviewee. The 19 interviews were concluded by talking about thought and opinions about different strategies and strategic decisions within the authority. During the interviews the same strategic decisions were often brought up, although they were interpreted in different ways. The decisions discussed were generally about rationalizations, strategic decisions about employees, and about automation of the work procedures, etcetera.

Generally, the current strategy can be described as a functional strategy rather than a business strategy. The business part is formulated as an objective on a functional level, rather than a strategy for the business. The strategy is thus oriented toward creating procedures, routines and approaches in software development instead of establishing a stable development of the business where technology is one of many tools used to reach the goal.

During the interviews, thoughts and ideas were brought to light about how rationalizations in the National Tax Agency could be accomplished and what the consequences would be for the employees. Some attitudes seemed to pervade the organization - attitudes shown in expressions such as: the new system is developed to support the »new people« who are going to work with the »new work«. The new work is described as being developed to assist more creative ways of working. But at the same time, there is a great risk that the automated procedures will create work which, to a great extent, will be monotonous and impoverished. Although mentioned, this is not seen as something that will characterize
The organization. The organization’s operational parts describing what new work actually will be like, especially for all those employees who will be responsible for the authority’s service occupations, for instance in the task of answering the service telephone.

There is an idea that many more academics will be needed in the future, since the monotonous and routine jobs will be taken care of using the technique, without any human involved. At the same time attitudes revealed in opinions such as one does not actually need all that knowledge to work with the assignments, since they probably will become easier to carry out, or, it will be easier to find information, or, probably everything will become easier. Already today, most of the case-handlers are working below the level of their competence.

Today, the average age of the employees is high and many have been employed at the tax agency for a long period of time. The rate of retirement among the employees will increase within the next couple of years. But, those who are currently employed are also a group of people extremely loyal to the organization and to their work. And with many still want to further develop their work skills. Despite the increasing number of retirements, many believe that the new merged organization (i.e. the National Tax Agency) together with rationalizations through new IT-tools, will result in employee layoffs. At the same time, there are indications saying that job reduction will be achieved through refilling just eight out of ten of the currently existing posts. But the signals are unclear and a general sense of worry is widespread within the organization. This is reflected in the different interpretations of how the rationalization of the authority will continue, and that were brought up in the interviews.

The retirements are a problem, since many of the positions must be quickly refilled. Another problem that is noted is the fact that long sick-leaves are not only seen in the older category
of employees. Many are in their mid-30s, on sick-leave for various burnout diagnoses. In the process of rationalization, work environment issues get lost. People in the organization are perceived in a stereotypical manner. Their work pace is considered as static, and by introducing new, efficient and effective IT-tools, overall effectiveness will be achieved. The strategy can be interpreted as emphasizing the information processes in the organization. But, if the IT-tools are developed without any greater respect given to usability and work environment issues, then the risk of losing what was initially won in the rationalization will be great. Employees will have fewer possibilities to use their capacity and competence in an adequate way.

The goal of the rationalization process to handle 80% of all cases by the automated technical system is mentioned in many of the interviews. There is no proof that it will be possible to achieve this goal. The automated process is of course possible when it comes to extremely routine cases or tasks. But the prerequisites are dependent to a great extent on factors such as citizens being able to fill in the forms correctly and other manifestations of the human factor. As another consequence of automation is the fact that the reported information coming in to the authority showing too many discrepancies. The automated work also results in new tasks meaning that the profit from the automated work is equalized or actually decreased.

In the work with the development of the business, a document such as the strategy document becomes important. One of the difficulties in an organization the size of the National Tax Agency, is to reach all employees with the information in a satisfying way and to gain approval for the ideas. It is also of importance that the strategic direction is seen in the different actions taken within the organization.

The business is supposed to be the driving force in the software development projects. This idea has gained approval
within the tax authority, but how it shall be accomplished in practice is not formulated in the strategy. The strategy reflects a reoccurring problem shown in the difficulties in describing the business in a dynamic way in order to illuminate all the important dimensions that are needed. An approach that advocates a user-centered software development process and includes highly developed competence concerning requirements, increases the possibilities of succeeding with software development projects. Although there is a generally agreed upon opinion, saying that the business should be the driving force, there is also general agreement on the fact that the current situation in terms of business as a driving force in software development projects, is unsatisfying.

Not only in the interviews, but also in the literature on strategies, there are descriptions of how the strategies reflect the values and attitudes within its organization. The relationship between the in-house client and supplier at the National Tax Agency also reflects a specific idea about how the software development process ought to proceed, but it seldom works as planned. Examples of this relationship are brought to light in the interviews where, for instance, an internal work task described in an in-house report called »The New Work«. The suggested organization of the work, how it should be performed and what environment it should be part of, has not been accepted since the suggestions in the report were said to not have been anchored thoroughly in the organization. Meanwhile the IT-department sees suggested organization as already decided upon and thereby to be carried out. It becomes clear that the idea of the business as a driving force in software development is a goal difficult to accomplish in reality, where problems occur different from those occurring in theory.

One strategy missing at the time of the interviews, is a strategy for how to manage the sweeping overhaul aimed at transforming the Swedish tax authority into a single merged authority; from being one separate board and several
independent authorities reporting to the board, to becoming one merged authority with the former board transformed into the head office of the new authority, with the director general still the head of the organization.

In sum, most of the respondents working with the strategy document have an awareness of the strategy as being a incomplete document. It is not a finished work and it should not be. Instead the strategy is seen as a process, which is reflected in a rather well-developed document, which in turn is to be seen as a »living document« able to adjust to new conditions and experiences. There is an obvious problem with ideas that 80% of the work tasks are going to be automated, leaving the interesting and challenging 20% of the work tasks to be handled by people. None of the software projects carried out thus far within the National Tax Agency, show results that can support such an idea. The work with the strategy is important to the organization in that it raises essential questions, which otherwise would never have been raised.

Cultural Analysis

The mini-survey is adapted from a tool developed for diagnosing and changing organizational culture by Cameron and Quinn (Cameron, K. S., & Quinn, R. E. 1999). It is built on the idea of the organizational culture as being one of the most important issues to deal with in development and changing processes. The organization is being interpreted from two dimensions, on six different levels. The two dimensions are: flexibility/discretion – control/stability and internal focus/integration – external focus/differentiation. Drawn in a matrix these dimensions will provide four different quadrants, each representing one out of four major culture types. The four suggested culture types are:

1. The hierarchy culture – represents stability and control on one level and internal focus and integrations on the other.
This culture is characterized by having formalized and structured workplaces, where efficient leaders are good creators and organizers. The long-term ideals are stability, predictability and efficiency.

2. *The market culture* – represents stability and control on one level and external focus and differentiation on the other. This culture is characterized by having its focus on the surrounding environment, rather than on their internal relations.

3. *The clan culture* – represents flexibility and discretion on one level and internal focus and integration on the other. This culture is characterized by emphasizing the long-term benefit of individual development, with high cohesion and morale being important.

4. *The adhocracy culture* – represents flexibility and discretion on one level and external focus and differentiation on the other. This culture is characterized by a dynamic, entrepreneurial, and creative workplace. The long-term emphasis is on rapid growth and acquisition on new resources.

To diagnose the organizational culture, six questions are asked. These questions focus on different levels of concern in an organization. The six levels are:

1. Dominant characteristics
2. Organizational leadership
3. Management and employees
4. Organizational glue
5. Strategic emphasis
6. Criteria of success

Each of the questions has four alternative answers expressed as statements. The respondent will then use 100
points to divide among the four alternatives. When entered into the matrix, the results will indicate an area that characterizes the perceived organizational culture. One matrix is drawn for each question. Then the six questions are asked again, but with focus on how the respondent would like the organization to be in five years, and a new area is then drawn. The discrepancies between the areas representing the current state and the desired state, can be discussed and strategies for targeting the new goal can be made.

Due to the very small number of participants, the results from the analysis could only be used in the discussions about the participants own organization, where it is heading, and where the participants wished it was heading. In the group of respondents at the National Tax Agency, a general tendency to move from being a rather hierarchical organization towards an organization with more market characteristics was seen; there was a wish for a change towards a more flexible and broad-minded organizational culture.

In the two studies presented in this thesis, several of the ideas of how to develop a superior computer-supported office work have been tested. The Folke project has provided a lot of input in the interpretation of the matters affecting the development processes. The IT-strategy project has served as a complement, in that the questions concerning usability and work environment in the development of computer-supported work and its software, have been studied from a strategic point of view in the same organization as the Folke project was a part of.
Many diverse thoughts and ideas are triggered by the notion of challenging a research field that has its roots in the natural sciences as well as in the time in which we live – and therefore is under the influence of the current dominant paradigms. Even if it would be possible to initially put your preconceived notions aside (as suggested within the phenomenological approach) when studying something and focus on the naive way of seeing the studied phenomenon, the idea of finding the basic characteristics will still be there. These might not exist, but as human beings we have a high regard for categorization, which is natural. Without categorization, life would be too complicated to manage. But in research, we must be aware of the fact that this impulse to categorize might not be the most appropriate one. There might not be any basic characteristics at all; there might instead be commonalities, which do not share a lowest common denominator.

The problem could be that an efficient structure of the essential issues, for instance in the design or development process of computer-supported office work is not sufficient. There has to be «more to it», a sense of what is better and what is worse, like two musicians who play the same tones, but only one of them succeeds in conveying an emotion, though the other one reproduces the same tone completely correctly. If there is no efficient way of structuring the essential issues in the development process, why are we pursuing research on subjects such as the design of software and computer-supported work? Why not just design it? The defining edge between practice and research is not sharp within a field such as HCI. The opportunities for developing knowledge from working inside real design projects, are often superior to the
opportunities won by an objectivity approach. As research has evolved within this field, a practitioner’s perspective has been adopted to some extent, in that the results often have the goal to be put into practice. Taking into account that attitudes can be seen as contextual, the importance of developing well-designed artifacts and environments become even greater.

The notion that interpretations are affected by our experiences, thoughts and preconceived notions is an issue to take into consideration. Basic values are the underlying sonority that colors all our ways of acting. In the interpretation of our environment, basic values have great impact. One inescapable conclusion is that the difficulties in development strategies and organizational change are several and severe. But the result most important to discuss here, is the fact that in every moment and with every move, we are challenging the understanding of the environment with all our previous beliefs and experiences. It is only through awareness of one’s own basic values and knowledge that we can begin to talk about a genuine understanding of reality.

In a changing environment, we use metaphors to better communicate different conditions, for instance, in an organization or in a software development project. A metaphor can be used as a tool in the interpretation and understanding of the organization. In relation to the discourse on basic values, these values are not to be seen as a tool, but as a more or less conscious interpretive filter, through which we look at our environment. Basic values thereby also color the interpretation of a metaphor, which will provide us with different images depending on our interpretive filter. If we are unaware of the bias of our own basic values, our interpretation of a metaphor runs a great risk of contributing to strategic decisions that will sub-optimize parts of the business.

One risk that should be noted when it comes to the use of metaphors, is the fact that metaphors can easily come into focus in such a way that they are seen as more real than reality
Discussion

itself. In this way they can sometimes overrule reality. The strategic decisions about changes may be made within the metaphor and the interpretation of real employees, real situations and real relations are read through the eyes of the metaphor. The metaphor could be a brain or a machine, but what’s important to remember is that all metaphors are simply just metaphors. Even the organization charts are metaphors from which decisions about rationalizations, fusions or other structural changes are made, and these decisions that will have an impact – not only on the formal structure – but also on other issues in the organization. It is important to remember that the organization is more than the sum of its parts. It is in the synthesis of the parts, where many relations, values, knowledge, skills, and feelings actually exist that are not obvious in the picture created from the different parts.

When redrawing an organization plan, or chart of any kind, there may be no clear awareness that the work is theoretical, in the sense that the organizational units that we are moving around, are a complex system of people, physical work environments, work space, relations, affections etcetera. It would be extremely difficult to manage change, if all the conditions that affect the change, and are affected by the change, were taken into consideration. In this sense, the discussions about the organizational changes must be about changes in an organizational plan, or in the work processes, or in work content or other aspects that might influence reality. But as a basis for discussion about the abstraction of the organization, the discussion can also be interpreted as a sub-discussion, which we – if we don’t look up once in while and take time to reflect – will lose ourselves in. The change will only be in the image of the organization and not in the organization itself – or it will have consequences for the organization that were not represented in the image.

Organizational change can be seen as the intentional change through which we try to control the direction and outcome of a
particular development strategy or particular strategies for change. Organizational change can result in a different focus for the organization, and in that way, can be much more radical than a development process. The organization’s readiness to adjust to a changing environment is essential. Dynamics such as the interpretations of situations and relations, which differ depending on our individual basic values, can be seen as something organic. This is the natural change that always exists in an organizational environment as a result of all the criteria, such as people, the outer environment, and the organizational culture.

Cultural analyses can be of great value as an instrument for bringing the organizational culture to the fore, and preparing the employees to take part in the work with a changing organization. But, as with categorizations in general, one has to be careful not to use the cultural categories in too rigid a way. The risk of categorizing inappropriately runs high, especially on a generalized level in the organizations. This raises the question about how strategic work must be accomplished. In strategic work, issues other than structural or budget decisions should be included. Using the concept of organizational culture is also a way of managing the organization’s objectives; it is a way of raising issues of importance for the organization, its efficiency and its organizational climate. It is also a way of managing the development processes, taking aspects such as healthy work into consideration. Development would then, to a certain extent, be accomplished already in the strategies used within the existing business or organization. An organization must permit employees to have different interpretations and to be in different phases in life and in work – a kind of broad-mindedness – which is of key importance in successful management. And using the concept of organizational culture is also a way of taking into consideration the basic values within the organization. Achieving consensus must be related to the actual steps that are put into practice – and not primarily
to the basic values present within the organization. In fact, different basic values must be respected within the development team, even if these values are not shared by all members of the development team. We need to reconsider our preconceived notions and consciously try to understand what other people mean. It is a matter of finding the equilibrium between structure and content, between form and function, or, as in the case of research, between science and common sense. Open-mindedness, the ability to take responsibility and to act according to one’s own ethical conviction (as seen in the autonomous person) will thus be of key importance.

In a changing situation, many questions may be raised concerning such issues as work organization, supervision, work processes and flows as well as questions concerning rationalization, efficiency profits, and ethical issues. In such a situation, it is of great importance to make clear how the different issues are to be prioritized. The relationship between these issues are also important to understand – how they affect each other and whether the outcome of a certain order of priorities will have detrimental consequences for positive effects, even if these consequences were never the result of a conscious decision. The positive effects are so to say, sub-optimized. Such consequence could be for instance, how the changed work situation will affect the employees’ health.

Most organizations consider the issues concerning health and healthy work to be important. But the ways of integrating these issues into the development process are not sufficiently mapped out. From the perspective of a software development process, healthy work issues are seen as difficult to deal with since they »slow down« the development process, and are thus seen as inefficient. The software development project’s »inefficiency« should however be seen in relation to the »mess« created by an inefficient computer system, whose consequences the users are forced to live with for several years,
in the form of reduced efficiency/slower work speed and, not at least, severe negative health effects.

Healthy work can be seen as a consequence of a well-implemented development process, but it can also be treated as a main target in the development process. The reasons can differ as to why an organization shows an interest in healthy work. In order to successfully motivate or negotiate for improving the work environment in an organization with the aim of creating a healthy work environment, the efficiency potential must usually be brought to the fore, if interest in the idea of healthy work is to be aroused. Efficiency, or that is to say, increased profit, is usually the primary goal in an organization. Interestingly enough, if asked about ethical issues – Is it defensible to have a work environment contributing to negative health effects? – the answer in most cases would be »no«. But when decisions in organizations are made, the issues concerning healthy work become secondary. In such cases, the employer often starts to search outside the organization for explanations to increasing health problems, for instance in the employees’ private sphere, in their personality, their age, etc. This is seen in some of the periodic, internal questionnaires that are done on work satisfaction within different organizations. The answers give a hint about some of the basic values that are present in the decisions about development strategies in the organizations within the VERKA-project. In practice, ethical issues are seldom, or never given priority over expected profit. Governmental authorities are not profit-making businesses, but the economic system and the requirements on how to report the workings of governmental authorities, lead to a management that is mainly concerned with values seen from the economic perspective of making a profit.

Awareness helps us reflect over our ideas and our understanding of the world. The notion of being in control can be sufficient if we understand that we all create our own
framework of how things in the world are related to each other. This framework helps us in various ways, in our struggle through daily life, in conducting research or in handling the different phases we pass through in life. If we can accept this, then the structure of the world can be dynamic and can be used as a context for development that we can challenge. Through awareness, it may be possible for us to promote a healthier climate in organizations. It is only through awareness that we can find the confidence and courage to adhere to our beliefs and ideas of what is right and wrong. Different ways of explaining one’s own behavior is investigated in several studies. Some that have been presented earlier, such as Pfeffer’s analysis of the psychological ways of understanding and explaining behavior within organizations, show that, depending on what organizational behavior model is emphasized, different explanations as to why decisions are made will be presented. In the same way, theories about motivation affect the management and decisions concerning the employees’ situation in an organization. These different understandings also reflect different basic values and ways of understanding human nature. Theories about motivation, on the one hand, and obedience on the other hand, are of interest in management strategies and ideas. But, is there a defining line between motivation and manipulation? Motivation, as long as it evolves from the individuals who are to be motivated, is seen as something positive. The behaviorist experiments are also motivational, testing as they do, the power of reinforcement. And as long as it is rats and doves being used in the experiment, most of us consider it ethical. But the moment we use humans in the experiment (as in the Milgram experiments on obedience to authority) we suddenly get the feeling that the experiment is unethical. The unethical part might just be the feeling that obedience to authority is stronger than we want to think it is. If these premises are accurate, then they imply that when organizing development
projects, it is of the utmost importance to understand the hierarchy in the project in terms of professional role, social status and competence. Otherwise there is a risk that important issues, where users play a vital role, will fall into obscurity. These important issues include work environment, health-related issues and decisions about the design of user-centered systems.

Many of the theories discussed in this thesis, reflect the different ways people react in different situations. As psychoanalysts, Freud and Jung focus on the self and the understanding of different driving forces and personal strategies for handling difficult situations. The idea of having unconsciously inherited emotions, social prerequisites and preconceived notions that affects our behavior, is dealt with in Bourdieu’s sociological work as well. In attempts to understand the mechanisms in decisions, people’s behavior in general, and specifically in the development processes studied in this thesis, the theories concerning defense mechanisms are also of interest. If, for instance, decisions are explained by intellectualizing or rationalizing, this will color the development processes, and the possibilities of finding keys to the essential issues will diminish. In the same way, if analyses are made of what consequences are expected and what development directions should be followed, based on misinterpretations (as those seen in the Myers-Briggs conceptual tool) then the outcome will be based only on what is obvious and not on what is essential to the organization and its development.

Basic values influence not only the development processes in organizations, they also affect the understanding and interpretation of what is being investigated. This is why it is important not only to research the subject, in practice, but also to investigate and interpret previous scientific works on which new development tools or models are often are based. For instance, the interpretation of motivation, obedience to
authority and manipulation are important issues in the understanding of people’s choices of strategies in changing environments. In the same way, it is of great importance to understand the ideologies behind systems development models, as well as to understand the values that affect different communities in the development process. Bourdieu’s investigations on habitus and the authorization to enter different social fields, will also help us in the understanding of how values affect decisions in the development processes within organizations and software development projects. These values are not necessarily political; they can be reflected in the understandings of relations, situations, and acceptance of different kinds of people, as well as in the understanding of (for instance) humor. Preconceived notions of situations are obvious in activities such as the interpretation of the use of metaphors. Depending on the interpreter’s education and background, the metaphors that are used will be interpreted in different ways. These different interpretations symbolize the references embodied within the interpreter. When new software is to be developed – such as the software in the Folke project – the metaphors are usually gathered from the development of new technology and the dominating idea that work consists of different flows. Modeling activities are carried out in order to find these different flows. Use cases will then symbolize the different parts of the work; they will become models for fragments of the work and when they are merged, they are presented as a model of the work, a model that itself a metaphor as well.

The work environment of the National Tax Authorities is, to a certain extent, in constant change. New technology requires continual renewal of computer systems and software products. New ideas about rationalizing the public sector are continually being brought to the fore. In the previous pages of this thesis, I have presented various theories and research projects that
reflect the ideas about software development, users, supervision, learning, rationality, etcetera.

As opposed to the organizational development process, the software development process does not actually concern the software developers. The RUP model, that is referred to earlier in this thesis, deals with the software product. The iterations in the different phases are focused on the product, and the understanding of an iterative development process is rather mechanical, as if problem solving and thinking are linear functions.

After a while, the original idea of developing a system that contributes to a healthy work environment, continues to be emphasized only among some of the user representatives, while the developers are mainly focused on technical solutions and the challenge of getting the system to work at all. The strategic decisions made outside the project lead to severe interruptions in the development work and drain energy from the project. This makes the questions about healthy work and user-centeredness even more difficult to promote. And the consequences are obvious – the goals of healthy work and user-centeredness become even less clear, in the development project as a whole.

**Theoretical Synthesis**

The theoretical synthesis reflects the outcome of the presentation and investigation that outlines the theoretical objective in the thesis; it deals with some different scientific approaches to various kinds of development processes. When comparing the dominating scientific ideals, organization theory, stress diagnosis and technical development of the past century, and reflecting them in terms of what is obvious and what is essential, there are similarities and trends that can be observed; trends in the dominating values that are evident in
areas such as equality, personal responsibility, efficiency and ethical ideals. Motivation, obedience, psychological and sociological approaches, and the ideas of positive and negative stress are all interpretations of human reactions and behavior, and the understanding of this behavior has various different points of departure. A spectrum of these understandings is presented in the theoretical overview in this thesis. The different approaches are, in some cases, contradictory, as in the example with Jungian theory and Myers-Briggs. And without claiming that the theoretical part gives a complete picture of all the various theories, the picture at least serves as a basis for raising and discussing the main questions in this thesis; the questions of basic values, of science and its relation to common sense. And, last but not least, the question of what is essential and how it can be discerned from what is simply obvious. One might ask whether or not there is objectivity in the theoretical framework, the knowledge and the experiences on which the choices of strategies are based. These questions can be answered in different ways. From a positivistic scientific view, that which can be measured is also seen as possessing objectivity. Theories, knowledge and experience based on something that has been measured can from this perspective be seen as objective. However, the problem is that, in the best of cases, only the units of measurement are objective, and that the interpretation is always more or less subjective, and as argued earlier, the studied object is usually more than the measured entities, and even if all existing entities in a studied object were measurable, the sum of them will be less than its whole. In this thesis, I have therefore tried to bring to the fore the different theories that have an impact on the field of HCI. Using the overall perspective of basic values, the relationship between science and common sense has been discussed, together with the idea that the essential might be possible to discover by heightened awareness, thereby reducing the risk of getting bogged down in the picture of the obvious. The theoretical
synthesis will explicitly focus on a few issues; the impact of methods, software development models, organizations and IT, as well as on psychological prerequisites.

The Impact of Methods

Methods are tools with great impact. They are needed in scientific research, although they are used differently within different scientific fields. The methodological approach indicates how to approach a problem or an issue that is being investigated. In research, the choice of method is also a choice of paradigm, telling how to relate to the studied objects and how to gather and interpret information. Within the field represented by the paradigm, the analyses will be accepted. But if the choice of method will fall outside the frame of the scientific field to which it belongs, the results might be questioned for completely different reasons than if they were drawn from a method that is accepted within the field. The method will thereby affect the preconceived understanding of the studied object and the outcome of the study, in several ways. The method will affect how and where we study the object, and will also affect what characteristics of the object we decide to study. In a field such as HCI, the difficulties in conducting convincing studies become obvious. For instance, studies within an area such as computer ethics, are supposed to negotiate between traditional philosophical approaches to the investigation and traditional engineering approaches. The idea of what a result is, may differ from the outset, and when a methodological approach is used to study something that it is not suited for, the result will be confusing. Since it may not be possible to successfully merge the different theoretical points of view within the field of HCI, one may be left in a state of confusion. It might in fact make better sense to keep the different approaches separate, but then it becomes important to respect each of the approaches and use them in appropriate ways. By doing so, HCI can become a fusion – a field
characterized by diversity, while at the same time maintaining a common goal.

**Software Development Models**

If the choice of method is crucial to the research projects, then the software development model is crucial to the software development project. The software development model, RUP, used in contemporary research projects, presents different ways to structure the software development process. It uses traditional modeling methods to draw up the picture of the information processes it intends to support. However at the same time, the understanding of the work, the work environment and the organization will be reduced into the specific entities presented by the modeling language. When developing software for computer-supported work, as in the Folke software project presented in this thesis, the software development model, RUP, is used to extract and pinpoint the information processes in an organization, in order to be able to providing the organization with the system that is being developed. To do this, the information that is going to be processed by the system is targeted. The perception of the organization will thereby be interpreted solely through its information processing. The values, relationships, work environment, etcetera in the organization, is thereby ignored in terms of non-functional aspects. In research projects within HCI, attempts have been made to develop models to better insure that the values of usability and work environment are already present in the software development process. These attempts have primarily resulted in a focus on attitudes among the developers. This does not necessarily mean that the models themselves are problematic, rather, the problem lies in the lack of a true understanding of the importance of issues concerning healthy work and its relationship to the actual system being developed that is essential if whether or not to succeed.
ORGANIZATIONS AND INFORMATION TECHNOLOGY

Technology has affected organizations over a long period of time. Much heavy, dangerous and monotonous work is now taken care of by machines or technologies of different kinds. But although there are great improvements in different work processes, there is also a reduction in the depth of perceptive knowledge that was previously used in the work. Due to the changes in office work, the use of all the senses is being diminished. This diminished perception affects our understanding of the work tasks. The overview and a feeling for the scope of the work task is adversely affected, as well as the feeling for what is important and what is less important. The possibilities of surveillance follows in the footsteps of the use of IT-tools, leave a feeling of not knowing how and when one is being watched and judged – a condition which is as much an ethical problem as it is a stress factor in the work situation. The feeling of not being in control is a problem that stems from poorly developed IT-tools, expectations that IT-tools will lead to a faster work pace, diminished social contacts resulting in diminishing social support – these are all consequences that we know increase the risks of developing stress-related symptoms and in the end, perhaps severe health problems. Organizational and human aspects must be emphasized in ways more effective than they are currently being handled.

PSYCHOLOGICAL PREREQUISITES

People have to work in environments characterized by prerequisites nourishing certain needs and values; values such as wellbeing, communication, justice, and respect - which all can function as reinforcements. From an efficiency point of view, an organization with satisfied employees will have better chances of succeeding. Though many theories about human motivation can be questioned, many of them point in the same
direction: people perform better if they believe in themselves and their basic needs are being satisfied. However, if an organization comes to a point where people start obstructing the work process, then it is high time that organization rethinks how it is designed from a work environment point of view.

**Empirical Synthesis**

In the empirical synthesis, some of the characteristics from the Folke-project and from the IT-strategy project are illuminated. From the outset of the project there was consensus concerning the aim of the software project, however this aim was interpreted differently. People with different roles in the project dealt with different issues and represented very different values. This stemmed partly from the different habitus that were represented among the different competencies.

The software development project has changed over time, mostly due to strategic decisions such as the ones concerning a generalized case-handling system and, even more so, the decision to change the technical platform. Despite the far-reaching consequences of these decisions, no changes were made in terms of the time or money that was available to carry out the project. This new set of circumstances put the development team under greater pressure than if they had been able to work under the original premises that were presented at the outset of the project. And the sudden change of project management put the team under even more stress.

The question of how knowledge about healthy work, usability and organizational matters can be used in practice in the organizational and software development process still remains to be answered. The results show that even if knowledge about these issues and methods are presented and put into practice, the pressures of time and money are too strong for the project management to stand up against. Much
The good work done to reach the goal of a healthy work environment has gone to waste. This project, that had the potential to become a model for how to create a computer-supported work environment that contributed to a «healthy work», is now a mere shadow of its former self.

The empirical synthesis will focus primarily on development strategies, information processing, work environment, and health issues.

**Development Strategies**

The work with the strategy as opposed to the work with the development project, showed some of the difficulties in making the organization and its projects accept that issues such as usability and work environment must be emphasized. A focus on these issues, clearly expressed in the strategy, was requested by the organization. Some of the difficulties in developing a strategy for such a large organization became rather obvious. The need for a differentiated strategy, for instance, dividing the strategy into a general business strategy, functional strategies and strategic plans, will make it possible to emphasize the essential issues for each part of the business. On the other hand, a joint strategy will pinpoint the most important targeted goals for the organization as a whole.

**Information Processing**

It becomes especially clear in the strategy that the perception of the organization is interpreted solely through its information processing. Problems with reducing the interpretation of the organization in this manner, were seen in the work with the strategy. Although the aim of the research work concerning the strategy was to bring values other than information processing to the surface, the emphasis on technology reflected quite a biased image of what is important in the organization.
Work Environment

Different dimensions in the work environment have to be taken into consideration. The psychological environment is as important as the physiological. From that perspective, the implementation phase will be of great importance when introducing new software systems. In the Folke project, preparing the organization for the new system was an ongoing project. The users were informed in groups through a number of presentations in the various governmental regions. At these gatherings there was time allowed for questions and open discussions. At first one could sense quite a degree of skepticism towards the new system, but as time went on the skepticism faded, and most of the case-handlers showed interest in the new system. They looked forward to using the new work tool, and saw getting to learn the new technology as a challenge.

Health

Consequences from poor work environment are not only seen in the economic results, they are also seen in the negative health consequences for the employees. These kinds of consequences can of course be presented in economic terms, but they might also – or maybe preferably – be seen from an ethical point of view. It is hardly defensible to develop work places and work processes that will ultimately lead to poorer health for the employees. The knowledge about stress and stress-related diagnoses is well developed. However, the knowledge is difficult to carry over into development strategies and methods for avoiding poorly developed computer-supported office work.

The win – win situation

People want to perform well, to feel satisfied with their accomplishments. However, when one feels that the
possibilities to perform well decrease, then obstructive behavior, nonchalant behavior can begin to appear. As previously noted, the satisfied employee will perform better. The investments in superior work environments will pay for themselves. Potentially higher costs in the development phase will be reimbursed at the other end of the process, when the software is put into use. Sick leave costs are extensive, and from a moral perspective, a high number of sick leaves resulting from a poor computer-supported work environment, is hardly defensible. The investments in superior environments can thus be seen as a win-win situation.

**EPIPHANY OR NEVER-ENDING SEARCH**

If, in the long run, the targeted goal is to find keys to developing better computer-supported work environments, perhaps an »epiphany« is not the optimal solution. It may be a question that is not yet solved, that gives better work environments a central role in the software development process. This presents several difficulties, not the least the difficulty in understanding the discrepancies between different interests and between what one sees as essential and how it is related to the obvious. People see different things when they interpret the surrounding environment. This is a condition that will make a statement as »what you see is what you get« meaningless in some situations. Take the situation of ordering a software system – if one requires a software product which is to be developed in accordance with a specific set of concerns, then some problems could be revealed. The requirements set up, may have been interpreted based on other experiences, prerequisites and feelings, which in turn will constitute a different picture of what is required, as compared to the picture presented in the original software requirements. This can be seen as a consequence of the idea that the observer,
when making observations, will at the same time constitute what is being observed.

VALUES
In the struggle towards reaching better designed work environments, the expressed values will color the approach to different steps that are to be taken to reach this goal. The values of respect and the right to a »healthy work« permeate my work. The question of basic values has to be seriously taken into consideration. The changing environment influences us more or less consciously. Take for instance the changes in behavior that we witness as the result of the changes in virtual reality. These changes affect our basic values and our judgment of what is right and what is wrong, even in terms of our behavior in the real world. The idea of what is ethically acceptable is raised in the debate on surveillance and control mechanisms, built into IT-tools, which makes it possible for management to acquire information about what each and every employee is working with and about different work paces, which in turn results in an overview over large parts of the organization. This may have other implications for how the people put under surveillance will regard their work environment. Values are also having an affect on the development processes. Different values constitute different communities within the organization. These values are not only affected by the people and their habitus, but also by the different boundary zones that exist within the organization.

MOTIVES
The motivating factors can also differ in many ways. They can be economical, sociological, and psychological; some might be humanitarian and some might be private. Regardless of which of the motives is emphasized, the targeted goal of »healthy work« that is discussed in this thesis, can be better fulfilled if it
is taken into consideration. The development of superior computer-supported office work is crucial if the negative health trends resulting from poorly designed work environments are to be broken. The usability goals of effectiveness, efficiency and satisfaction in a specified work environment, can serve as the foundation for the overall goal of creating a healthy work, in real life.
CONCLUSION

Concluding what has been brought to the fore can be done in many different ways. In this thesis, my aim has been to maintain focus on the impact that basic values have on development processes. In practice, this focus has concerned software development and organizational change and in research, the focus has been on science and its relation to common sense. Moreover, my aim has been to discuss how it is possible to discover what is essential and how that which is essential, can be interpreted as something other than that which is simply obvious. Many of the different issues are presented in the preceding discussion chapter, which concludes with theoretical and empirical syntheses. In this final chapter, the focus will be on the three main issues of the thesis. Consequently, the presentation of the conclusions will be discussed from the perspectives of the obvious and the essential, reflecting the issues of basic values and of science and common sense.

THE OBVIOUS

The obvious can be understood as something that everyone can see. The obvious reflects the categories that we often, automatically use when making our interpretations. The obvious can be described as the circumstances that we do not question. An explicit example of an obvious fact that is presented in this thesis, is the fact that the case handling workers at the national population registration are generally women over the age of 55. Another fact is that most of them were transferred in 1991 from the state church to the tax organization. A third fact is that they have a generally low
level of education. And a forth fact is that they have generally not yet been fully accepted as part of the workforce at the tax authorities; they have the lowest status in the organization. These obvious facts are hardly essential in terms of understanding their work situation. However, they have become essential, in the sense that the interpretations of what these facts mean have affected the development of the software system that is being built for the national population registration. These interpretations are reflected in the attitude that the knowledge these women possess does not need to be taken seriously into consideration due to how the facts about them are subject to preconceived notions, that is to say these women does not have to be listened to because of their age and educational background. This attitude is reflected in the excuse given as to why these women are not listened to – they are soon going to quit anyway, so better that the system be developed for other people. The excuses, for not seriously taking users opinions and reactions on the system into consideration, can be interpreted as expressions for defense mechanisms, that have been developed to defend the individuals own values and ways of interpreting the world. These psychological tendencies are not productive for the organization or for the development of the system. The ability to question one’s own image of the world needs to be enhanced.

**What You See is What You Get**

»What you see is what you get« - but the eyes through which we interpret the surrounding environment will see it in different ways depending on our preconceived notions, experiences and personal strategies that constitutes our person. If that which is obvious is generally considered to be that which we see, then the question of what we see will become of importance. As previously discussed in the thesis, we interpret our environment differently; different because of different
social settings and different because of our different frames of reference. The interpretations of what is studied will in that sense, become subjective. Objective interpretations will thus be difficult to achieve in the studies made within a field such as HCI. But the problem is not whether there is objectivity or not, rather the problem is the lack of awareness in terms of how we are affected, what we study, and how we affect the studied object and the interpretations of it.

In practice, the effects from misunderstandings and incorrect interpretations of the targeted objects can have severe effects for many people, as in the case of poor usability in computer systems that are developed for everyday office work. The obvious conditions affecting the development process must be illuminated; conditions such as preconceived notions about the users, about what their work tasks actually are or could be and, last but not least, about their needs for IT-tools and how these tools should be best designed. The degree of awareness of how one interprets the outer environment, and of how one acts and reacts is also of great importance in the case of the practitioners. The attitudes towards the task and towards what one shall accomplish are crucial, as seen in the attempts to create methods and models for development of software. These attitudes are more crucial than the different, concrete steps in the software development process, even if a clear plan, of course is of great help.

From this perspective, the obvious – that is to say, what we see, how we categorize and how we relate – must be reflected in the attitudes that are agreed on. An ethical approach must be chosen, taking ideas of equality into consideration, and respecting people’s differences, particularly their different needs and their different phases in life. The ability to act autonomously and to adjust to the surrounding environment in an appropriate way while following one’s convictions, will thus become of prime importance.
THE ESSENTIAL

If the obvious is what you see, then the feeling of what you see might be part of its essence. The consequences from decisions, interpretations and acts must be taken into consideration, as for instance, the situation with poorly designed computer-supported office work, which leads to nothing but stress-related consequences as evidenced in the declining health of the users. It might not always possible to sort out what is essential from what is simply obvious, but the awareness of the fact that the essential could be something other than the simply obvious, is a step in the right direction. This insight can help to choose strategies that can be used to find qualities i.e. work satisfaction, which might not be obviously present when making categorizations such as gender, age, and ethnicity etcetera. By searching for new ways of interpreting what we see, illuminating the different interpretations, and reflecting their possible outcomes, the possibilities of pinpointing what is essential, will hopefully increase.

FUSION OR CONFUSION

Bringing the field of HCI together is an undertaking that concerns all parties represented within the field – an undertaking associated with several problems. The differences in approaches, attitudes and methods stemming from the different fields that have been incorporated into the single field of HCI, are in some cases completely incompatible. The challenge might not be to find one common approach to be used within HCI, it might in fact make better sense to keep the different approaches separate. But then it becomes important to respect each of the approaches and use them in appropriate ways. By doing so, HCI can become a fusion – a field characterized by diversity, while at the same time maintaining a common goal.
The way of modeling organizations is an example of how a method can be developed in order to interpret what is being studied in a specific manner. The method of modeling should still be used, but only in the way for which it is intended. If it is used in other ways or in any other settings, then it becomes important to continuously keep in focus the importance of adjusting and adapting it, and not forgetting its original meaning.

Sense or Nonsense

If the disparate approaches within the field of HCI sometimes lead to confusion, then the use of methods in different ways might lead to results characterized as nonsense. The use of methods, in order to investigate certain issues of interest, demands a thoroughly thought out method, that is appropriate in terms of what is being focused on. Forcing data into models or methods that are not equipped to interpret this particular data will not produce sensible results. For instance, using statistical methods to calculate different causalities can make sense in investigations concerning for instance, relationships between specific entities. But, if statistical data is presented in investigations where the statistical results are of secondary or of no importance to what is being studied, then the results will make no sense, for instance, results where each and every one of studied objects are assigned the same importance.

With scientific queries and results, as with other kinds of questions and answers, the important issue is to analyze if the results relate back to the question, and to ask oneself whether or not the results really make sense. Through development of judgment skills such as the logical and ethical skills, the possibilities for presenting investigations and results that make genuine sense, will increase.

Attitudes that are reflected in how one relates to oneself, and to the outer environment, seem to play an important role in the
development of computer-supported office work. A number of these attitudes and approaches have been discussed in this thesis in terms of how they view the user, the customer, the software developers, the software development process, the organizational development process, the implementation process, organizational management, aesthetic values, functionality and use, research, methods, paradigmatic approaches, ethical issues, the self, psychological reactions, sociological prerequisites, categorizations of people and not the least, stress-related health consequences.

At the outset of my research, when I chose to examine how our basic values affect development processes, how research is related to common sense and how the essential can be differentiated from the obvious, my investigation grew to include the many issues listed above. In the discussions about these issues, one particular prerequisite for developing a healthy computer-supported office work, repeatedly presented itself: an open, questioning attitude towards the software development process, towards the organizational change that the process is a part of, and towards the people working in the organizations. A similar attitude towards research and its design can also be seen as crucial in the development of new knowledge. This circumstance can be interpreted as an indication of how important it is that we be aware of, and question our preconceived notions, in order to develop an autonomous behavior where we consciously take responsibility for our actions. By doing so, we can avoid misinterpretations and not get trapped into making categorizations that are simply obvious. This is essential and must be emphasized in our search for the path to »a healthy work«.
EPILOGUE

Even if we were able to fully comprehend the consequences of our decisions, we could never be able to make decisions in an absolutely rational way, since absolute rationality lacks emotion. One may wonder why the story about Phineas Gage was told in the opening chapter of this thesis. In fact, Phineas Gage is a fitting metaphor for the idea that an ultimately rational organization will be malfunctioning in its social context. Each entity may be rational and correct, in and of itself; however, when merged together they will create an inhumane organization where no one is likely to thrive.

People need to be seen, appreciated, loved and respected. But when organizations begin a rationalization process, there is often a search for rational explanations that can sanction certain decisions, while neglecting issues such as usability, aesthetics and satisfying work environments – in other words, while neglecting the importance of a »healthy work«. The rational and economic values will thereby overrule the cultural values. But a civilized world needs to be built on values other than those of time and money. If the values that constitute the essence of life are respected, then profit will follow; but if profit is emphasized as the main goal, the civilized world will revert to a barbarian state, where «survival of the fittest» is the guiding principle. Values that encompass more than merely the ability to survive, indeed, the values that «civilize» us, will be lost.

I suspect that the question of what is obvious and what is essential will continue to interest me for a long period of time. All of the keys to this Holy Grail (or Pandora’s Box) will probably never be found. However, some of the key issues might be perceived and revealed thereby increasing our
potential to further develop our knowledge and our awareness of not merely that which is obvious, but more importantly, of that which is essential.
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SUMMARY IN SWEDISH

DET UPPENBARA OCH DET VÄSENTLIGA
ATT FÖSTÅ SYSTEMUTVECKLING OCH ORGANISATIONSFÖRÄNDRING

Utgångspunkt för denna avhandling är tanken att våra grundläggande värderingar och föreställningar på olika och mer eller mindre medvetna sätt påverkar de utvecklings-processer vi är del av. Två frågor har ställts. Den ena gäller vad som är väsentligt och hur det ska kunna särskiljas från det som är uppenbart (det vi i förstone tror är väsentligt). Den andra frågan belyser relationen mellan vetenskaplighet och förnuft. Forskningsområdet människa–datorinteraktion, MDI, har fått utgöra avgränsningen. Målet med avhandlingen har i första hand varit att föräna en diskussion om hur dessa frågor kan relateras till MDI. Frågorna har ställts i samband med de systemutvecklingsprojekt och organisationsförändringar som studerats, och de har fokuserats och diskuterats i relation till forskning och forskningsinriktningar som på olika sätt omfattas av MDI-området.

grad om vilka konsekvenser det nya datorstödet kommer att få för utformningen av arbetet i sig, för arbetsmiljön, för människor – och hur dessa kommer att agera och reagera – för hur organisationer fungerar och inte minst för hur våra grundläggande värderingar påverkar vår förståelse av vad vi ser. Därför måste vi bli bättre på att sortera ut vad som är väsentligt och när detta skiljer sig från det som endast är uppenbart.


Avhandlingen består av fem delar. I den inledande delen, prologen, presenteras de motiv och bevekelsegrunder som avhandlingen bygger på. Den andra delen omfattar en presentation av metoder samt en förklaring till valet av metodologisk ansats. Den tredje delen omfattar dels det
teoretiska ramverket, som samtidigt är föremål för granskning, dels empirin, som utgöras av berättelser från verkligheten. Den fjärde delen omfattar dels en diskussion av de teoretiska och empiriska exemplen, dels en teoretisk och en empirisk syntes. Slutligen, i den femte delen, knyts avhandlingen ihop med slutsatser och en epilog med mer personliga reflektioner.


I avhandlingen diskuteras attityder och förhållningssätt i relation till ett flertal faktorer och aspekter – användare,
beställare, systemutvecklare, systemutvecklingsprocesser, organisationsutvecklingsprocesser, införandeprocesser, organisatoriskt ledarskap, estetiska värden, funktionalitet och användbarhet, forskning, paradigm, etiska frågeställningar, psychologiska reaktioner och försvarsmekanismer, sociologiska förutsättningar, kategoriseringar av människor och, sist men inte minst, de stressrelaterade hälsoweekter som följer av dåligt utformade datorstödda arbetsmiljöer. Attityder inom utvecklingsprocesserna har visat sig vara avgörande för ett lyckat resultat. Det kan gälla attityder dels inom systemutvecklingsprojekten, dels sådana som uppstår i samband med organisationsförändringar och slutligen systemutvecklarnas attityder gentemot dem som ska komma att arbeta i den nya miljön, med det nya arbetet. På liknande sätt kan attityder i och gentemot forskning och dess utformning också ses som avgörande för utvecklingen av ny kunskap. Det är viktigt att medvetandegöra och ifrågasätta våra värderingar för att utveckla autonomi i vårt förhållningssätt. Det är också väsentligt att skapa förutsättningar för var och en att ta ansvar för sina handlingar, att undvika att fastna i, och bli förblindad av uppenbara kategoriseringar. Medvetenheten måste sättas i fokus om vi ska lyckas finna vägen till det goda arbetet.

Målet med denna avhandling har varit att bidra till utvecklingen av sådan kunskap som kan användas i utvecklingsprocesser inom olika slag av organisationer, verksamheter och arbetsplatser. Valet av frågeställning är en följd av tankar och idéer som utvecklats under en längre tid; Dels under min grundutbildning, som hade sin införkning mot arbetsmiljö och organisationspsykologi, dels under mina år som utredare på riksrevisionserket, rrv, och slutligen under min forskarutbildning i MDI. Trots olika utbildningsområden, skilda projekt och utredningar, har jag hela tiden återvändt till frågan om hur våra grundläggande värderingar, mer eller mindre medvetet, påverkar de utvecklingsprocesser vi är en del av. Under de senaste åren har datorstödda kontors-
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