

# Designing Information Systems



Jonas Sjöström

# Designing Information Systems

*A Pragmatic Account*



UPPSALA  
UNIVERSITET

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**Abstract**

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Information technology (IT) plays an increasingly important role for individuals, organizations, markets, and society as a whole. IT systems are artefacts (human made objects) designed for various purposes. Given the multiple-purpose characteristics of computers, such artefacts may, for example, support workflows, perform advanced calculations, support human communication and socialization, enable delivery of services and digital products, facilitate learning, or simply entertain. The diverging application areas for IT present a challenge to designers who, as a consequence, have to address increasingly divergent design situations.

There have been numerous arguments suggesting that the IT artefact has been 'taken for granted', and needs to be understood and conceptualized better within information systems (IS) research. This thesis is based on the pragmatist notion that one important value of IT resides in its potential to support human collaboration. Such a belief has implications for the development of (1) knowledge aimed for action, change and improvement; (2) knowledge about actions, activities and practices; and (3) knowledge through action, experimentation and exploration. A view of the IT artefact is outlined, showing it as part of a social and technological context. IT artefact design is explained in relation to the induction of social change. The notion of stakeholder-centric design is advocated, along with practical theory to promote a situated understanding of use qualities and design ideals. A set of meta-theoretical implications for design-oriented IS research is proposed.

The research process consisted of five inquiries into different IT-reliant social contexts. In the first four inquiries, social and communicative qualities of IT artefacts were assessed, governed primarily by Dewey's notion of inquiry as a theory of knowledge. The fifth inquiry was a largescale action research project, including interventions into the social setting, and the design and implementation of a new IT artefact into that setting.

*Keywords:* information systems, design, pragmatism, design research, it artefact

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*Dedicated to my beloved girls,  
Hannah, Linnea and Helene*



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Part I:

Introduction



# 1. Introduction

This study aims at conceptualizing the IT artefact, its design ideals, and research into IT artefact design. A background to these three issues is discussed in sections 1.1 - 1.3. The problem domain, the purpose and the research questions are presented in section 1.4. Section 1.5 introduces the philosophical approach and its rationale, and section 1.6 depicts the collaborative characteristics of the research process, and gives credits to the author's research partners.

## 1.1 The IT Artefact

Information Technology (IT) is doubtless an integral part of the shaping of modern society, increasingly intersecting business life and our everyday experiences. In the midst of this, the academic field of information systems (IS) searches for its identity as a discipline. Benbasat and Zmud (2003) propose that the identity of the IS discipline is vague due to too much "borrowing" of theory from neighbouring disciplines (e.g. computer science). They claim that there is a need for IS researchers to identify the core of the discipline, and propose such a core in the form of a *nomological net* for IS research, consisting of the following concepts and their relations:

- IT artefact,
- IT usage,
- Impact of usage on the social setting,
- IT managerial, methodological, and operational practices, and
- IT managerial, methodological, and operational capabilities

The term *artefact* refers to any human-made object. The IT artefact, in the view of Benbasat and Zmud, is regarded as a tool, used to perform tasks within some social setting. They propose that IS research needs to address the concepts in the nomological net as a strategy to promote the *cognitive* legitimacy of the IS field – and to establish a distinction in the way phenomena are studied in IS and in other disciplines. The interest paid in the artefact is related to a recent call to 'theorize the IT artefact' in IS research (Orlikowski and Iacono, 2001). Orlikowski and Iacono point out that IS researchers have taken the artefact for granted, and assert five premises<sup>1</sup> for theorizing the IT artefact.

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<sup>1</sup>The five premises will be further discussed (section 3.4) and operationalized (section 12.3) in the thesis.

Benbasat and Zmud's nomological net has provoked a number of responses from other scholars. For example, Alter (2006) challenges Benbasat and Zmud's nomological net, proposing that the concept of a *work system*, rather than IT artefact, constitutes the core of IS, since it better explains phenomena addressed in IS research. Alter's conceptualization of work systems provides a perspective on the IT artefact as embedded in a workpractice context. As such, it may be conceived of as another candidate "nomological net" that could represent the core of IS research.

Agarwal and Lucas (2005) summarize Alter's and others' alternative views of the 'core of IS' and contribute additionally by concluding that the proposed nomological net provides a micro level perspective on the field, and argue that *macro* level issues also need to be acknowledged in IS research, such as the "emergence of new industries and the restructuring of old ones" (ibid, p 392) and "individual national economies and the global economy as a whole" (ibid, p 392). IS as a discipline should thus be aimed at understanding the meaning of IT at individual level, business level, and societal level. Their work recognizes the role of IS research outside a managerial and organizational context.

El Sawy (2003) argues that the understanding of IT within the IS community has undergone change over the years. An initial view (the *connection* view) was that IT and people were connected: IT was used as a tool to solve tasks, typically in the users' workplace. Around 1995, as a consequence of more sophisticated and interoperable systems, sometimes across organizational borders, the view of IT changed into an *immersion* view: IT became an integrated and inseparable part of the business environment. The third view, which evolved in the beginning of the new millennium, implies an even stronger connection between IT and business – a *fusion* – in which IT "[...] is fused with the business environment such that they are indistinguishable to our perception and form a unified fabric" (El Sawy, 2003, p 951). El Sawy argues that shifts in view occurred around 1995 (the immersion view is actualized) and 2004 (the fusion view is actualized). El Sawy draws on the field of organization studies to motivate the value of these concepts as a means to understand the identity of the IS field. The three views provide different perspectives on *development and application of IT in relation to its context* – both from a managerial point-of-view, and from the viewpoint of developers and other stakeholders.

The idea that IS as a discipline is going through a crisis is challenged by Robey (2003), who suggests that the identity of a discipline is shaped by other things than its thematic core. Robey (2003, p 355) summarizes the view of Benbasat and Zmud in the following way: "...They argue that IS has not yet gained 'cognitive legitimacy,' which is the state of being taken for granted by environmental constituents. They believe that a less amorphous definition of IS's core phenomenon would lead to cognitive legitimacy.". Robey disagrees with Benbasat and Zmud – claiming that cognitive legitimacy is an unreachable ideal – and instead suggests to establish and preserve *pragmatic* legit-

imacy for IS. Robey (2003, p 355) suggests that this can be "accomplished by diligent application of rigorous research methodologies and publication strategies that reach our varied audiences, both academic and practical." Pragmatic legitimacy, Robey argues, is a matter of being conceived of as a valued partner in the interaction with external constituents to the field, such as governing bodies, university officials, practitioners, and scholars from related disciplines. Robey (2003, p 357) – in the context of IS being quite a young and maturing discipline – concludes: "As an applied discipline, we depend upon a diversity of research approaches to ensure that we learn about the IT artifact in as many ways as we can."

I will sum up my interpretation of the discourse on the identity of the field in a few core points:

- The IT artefact tends to be 'taken for granted' in the IS discipline
- There appears to be an agreement among IS scholars that a conceptual understanding of the IT artefact and its social – and societal – context is important for the discipline
- The various 'nomological nets' proposed in IS are manifestations of a need to conceptualize important phenomena in the IS discipline
- It is important for IS as a discipline to satisfy a number of stakeholders, including scholars in related disciplines, and practitioners
- The identity of the discipline is upheld by its *pragmatic* legitimacy rather than its *cognitive* legitimacy
- A diversity of research methods should be accepted in IS, but these methods need to meet high standards, in order to establish and preserve a pragmatic legitimacy of the field

## 1.2 A Scattered Notion of Design Ideals

Computers are general-purpose machines (e.g. Beynon-Davies, 2002). The multi-purpose character of software creates an opportunity for innovation through design of information technology. Within IS research – and related disciplines – much attention has been paid to *design ideals*. That is, given the flexibility of IT, ideals to strive for in the design of software applications – ideals which tend to be discussed in terms of the software as such, the software in use, or the impact of software on individuals and organizations.

A significant example of the strive to meet design ideals is the well-known DeLone and McLean (1992) *IS success model* and its revised version (DeLone and McLean, 2003). When speaking of 'success' or 'high quality', there are always some ideals put into play – either explicitly or implicitly. A measure of success is logically infeasible without defining *what success means* – such a definition needs to take into account design ideals (*what should be*). Design ideals are tightly connected to the concept of use quality, defined by Löwgren (2006, p 384) as "[...] properties of digital designs that are experienced in

use and the designer is in a position to influence at design time." Following from that definition, a use quality is an aspect of the use of an IT artefact that may be assessed or measured against design ideals. Researchers from various academic fields are currently proposing many perceptions of *use quality*, emphasizing different aspects of IT use and its contextual meaning. It should be noted that the concept of use quality is not normative *per se*; it is merely a characteristic of an IT artefact. As stated by Holmlid (2002, p 169), "for use quality there is not an inherent need to deal primarily with positives, nor to reduce negatives". For clarity in reasoning, we need to distinguish between a quality and the ideal(s) put into play to assess quality.

There are many theories and methods for the design of interactive products (Preece et al., 2002), some of which are widely spread and considered to be useful analytic tools for designers. Preece et al (ibid) state that one aim of interaction design is to build *usable* interactive products. One of the definitions of usability that I find appealing, due to its simplicity, is that usability is the "user's view of software quality" (Bevan et al., 1991, p 4). However, usability is commonly conceived in a more specific manner, e.g. in the ISO definition, defining usability as the "[...] effectiveness, efficiency and satisfaction with which a specified set of users can achieve a specified set of goals in a particular environment." (ISO 9241, 1994). Effectiveness refers to users' ability to fulfill their goals through the use of the interactive product. Efficiency means that they should fulfill these goals with a minimum of effort. Satisfaction is a subjective measure, regarding whether the user is pleased with the product or not. User-centered design methods such as contextual inquiry, prototyping, and scenarios, all share the feature that the users' opinions about the evolving IT artefact is continuously feeding the design process, thus the application of such methods may render IT artefacts that serve purposes other than purely task-oriented ones.

Usability research has generated prescriptive criteria for the design and evaluation of IT artefacts. Common examples of such principles are Nielsen's (1993) 10 usability heuristics, Shneiderman's (1998) 8 golden rules of interface design, and the ISO 9241-10 dialogue principles. Keinonen (1998) provides an analysis and abstraction of many of these commonly cited guidelines for usability design. Usability is generally not conceived as characteristics of an interactive product *per se* – it is a contextualized view of an interactive product, in relation to a specific group of users of the product, using it in a certain context (Bevan 2001; ISO 9241 1996; Preece et al. 2002). Usability may be regarded as being primarily *task-oriented*. Löwgren (2006, p 10) states that "The field known as human-computer interaction [...] is mainly oriented towards improving the efficiency of computer-supported tasks". The original DeLone and McLean (1992) model shows relations between technical qualities (system functionality), which have consequences for usability, which in turn has implications for individual work and organizational performance.

The field of interaction design<sup>2</sup>, however, encompasses a broader view of use qualities than the ones focusing the performance of tasks within some organizational context. Preece et al. (2002) discuss a set of *user experience* (UX) goals, e.g. that the user finds the product satisfying, entertaining, motivating, aesthetically appealing, or supportive of creativity. One of the main points of the UX discussion is that we need to define this type of design ideals as a complement (or even alternative) to 'conventional' usability ideals, depending on the type of IT artefact we are about to design.

The emergence of the Internet – especially the World Wide Web – has led to a plethora of IT applications. Rayport and Sviokla (1995) predicted the emergence of an entirely new set of offerings from companies. They claimed that enterprises that adopted information technology internally would be able to exploit the potential to create new services, e.g. providing their customers with real-time information about the production status, or allowing end customers to place orders using a computer. This service-oriented adoption of Internet technologies is no longer a prediction of the future – it is reality. Dahlbom's (2003) discussions are in line with this, stating that the evolution of the Internet and the widespread use of personal computers (and other devices that 'bring people online') create a whole new area of interest for information systems research. Dahlbom suggests that a service perspective is well suited to inform theory development in IS. This has been further elaborated by others (e.g. Hultgren 2007; Hultgren and Eriksson 2005), who draw upon social action theory to conceptualize web applications from a service perspective, arguing that social interaction is the most important phenomena to focus in such a conceptualization.

The inception of the World Wide Web also attracts the attention of usability researchers. As an example, HOMERUN model (Nielsen, 2000) provides a set of categories focusing certain characteristics of a web site and – to some extent – the organization behind it. It advocates the following characteristics as preferable for web sites in their organizational context: High-Quality content, Often updated, Minimal download time, Ease of use, Relevant to users' needs, Unique to the online medium, and Net-centric corporate culture.

Web site quality has also been approached from other disciplines. Santos (2003) approaches the topic from a service management perspective. She uses a grounded theory approach to theorize on different qualities of a web site and the organization behind it, proposing that web site qualities can be categorized into an incubative dimension (mainly ease-of-use issues) and an active dimension (mainly communication and social issues – the business action needed to

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<sup>2</sup>Löwgren (2008) explains two interpretations of interaction design: Interaction design as a *design discipline* and interaction design as an *extension of HCI*. Löwgren mentions some influential and recognized names in interaction design as an extension of HCI, including Jenny Preece, Ben Shneiderman, and Donald Norman. Influential names from interaction design as a design discipline include among others Terry Winograd and Pelle Ehn. Löwgren concludes that these two interpretations of interaction design are converging.

keep the web site alive and respond to the customers' requests). Furthermore, from a service perspective, a web site can be looked upon as one communication channel out of many, which makes web site design part of a larger context – one communication channel among others. Some scholars focus on the appropriateness of different communication channels, depending on the type of communication at hand (e.g. Johansson and Axelsson 2005). The matter of a strategy for using different channels, to meet the variety of needs from clients, is also addressed in service design research. In an updated version of the IS success model (Delone and McLean, 2003), *service quality* (among other things) was added.

A number of IS researchers (e.g. Goldkuhl and Lyytinen 1982; Winograd and Flores 1986; Auramäki et al. 1988; Dietz 2001; Ågerfalk 2003) have put forward the idea that communication and the resulting social relations such as commitments – are fruitful conceptual foundations within the IS field. The emergence of the World Wide Web has caused researchers to further investigate the meaning of such commitment structures. The 'web 2.0' movement (O'Reilly, 2005) adopts the idea that people are eager to share their opinions and experiences on the web – the web turns into a vehicle for various identity-shaping activities (Flores, 1998). Life as we know it is undergoing change, given the radical shift in how we socialize – contemporary examples include Facebook, Twitter, and mobile technologies enabling us to be 'connected' regardless of our whereabouts.

IS researchers have targeted social aspects of IT use in various ways. One approach is to conceive of IT use as performance of communicative actions – leading to the establishment and maintenance of social relations (e.g. commitments) between actors using some IT application. There are several examples of this approach (e.g. Goldkuhl and Lyytinen 1982; Winograd and Flores 1986; Auramäki et al. 1988; Dietz 2001; Ågerfalk 2003). This type of research highlight qualities based on the perspective that the IT artefact is a complex communication medium and a social agent. One of the more elaborated theories based on this perspective is Information Systems Actability Theory, or ISAT (Ågerfalk, 2003). ISAT was developed as a pragmatic (action-oriented) perspective on the design and use of IT. Actability intersects with service management theory (which includes concepts like expectations, commitments, and communication breakdowns) and interaction design (which provides concepts to aid design and evaluation of user interfaces). Apart from these specific communities addressing social issues in relation to the design of information systems, there are other relevant examples of IS research primarily focusing the relation between technology and its social context, e.g. the work on sociability (Lazar and Preece, 2002; Preece, 2000), investigating how to design IT that supports our social needs, and work connected to Giddens' structuration theory (e.g. Orlikowski 1992; Walsham 2005), applying sociological concepts to improve the understanding of the role of IT and its meaning in the relation between action and social structures. Further, research in HCI has explored

activity theory as a theoretical foundation to understand human-computer interaction in a socio-cultural and historical context (e.g. Bannon, 1991; Bødker, 1993; Kaptelinin et al., 1995).

The discussion above shows a rich but scattered view of design ideals and use qualities – both in IS and related disciplines. In summary, these ideals may be categorized as follows:

- Task-oriented design ideals (e.g. usability)
- Experience-oriented design ideals (e.g. user experience)
- Service-oriented design ideals (e.g. web usability, and service quality)
- Social and pragmatic design ideals (e.g. information systems actability and sociability)

### 1.3 Design-oriented IS research

As indicated in the previous section, in discussing use qualities and design ideals, IS researchers have shown an increased interest in design and design-oriented research over the last two decades. Arguably, IS as a discipline is inherently design-oriented. Niehaves (2007, p 99) states that "[...] design-oriented research can be somewhat regarded as the dominant, but implicit research perspective." Scholars express that design science research is becoming recognized as equally important as behavioral research in the IS field (Hevner 2007; Iivari 2007). Design is even described as "fundamental to the IS discipline" in a recent *MIS Quarterly* special issue on design science research (March and Storey, 2008).

Ontological and epistemological assumptions in design-oriented IS research are currently being debated in special issues in leading journals, conference tracks, and a dedicated conference for design science research in IS. Puro et al. (2008) provide a good overview of this development. It has been suggested that we may understand the situation as an emergence of two 'schools' of design-oriented IS research (Carlsson, 2007). First, a school of thought exploring the epistemology and methodology of IS design science research (Hevner et al. 2004; March and Smith 1995). Second, a school of thought primarily dealing with the issue of how to formulate design theory in IS (Gregor and Jones 2007b; Walls et al. 1992, 2004). In addition to these 'schools', alternative views of design science research and its relation to other research approaches are proposed (Bratteteig, 2007; Iivari, 2007; Sein et al., 2007; Carlsson, 2007; Järvinen, 2008; Cole et al., 2005), and some scholars make a case for epistemological pluralism in design-oriented IS research (Niehaves, 2007; Puro et al., 2008).

Design-oriented research is also an important topic in various related disciplines. One well-known example of this is the concept of design patterns, originally suggested as a representation of design guidance within architecture (Alexander et al., 1977) and popularized in computer science by the 'gang of

four<sup>3</sup> (Gamma et al., 1995). Computer science design patterns typically show generic object-oriented design solutions to common software design problems. A pattern is a generic solution to a class of problems. By applying a design pattern to a problem, a situated solution may be rapidly developed. A pattern is thus a way of packaging re-usable design knowledge. Design-oriented human-computer interaction (HCI) researchers have adapted the design pattern concept into that of interaction design patterns (IDPs)—patterns providing generic (situationally adaptable) solutions to different types of user interface design situations. Several scholars have put forward ideas on how to structure IDPs (Borchers, 2001; Van Welie and Van der Veer, 2003; Folmer et al., 2005; Tidwell, 2005). Other authors in the HCI community propose theory formulations promoting a stronger theoretical rigor, and the establishment of a cumulative research tradition in HCI Sutcliffe and Carroll (1998); Sutcliffe (2005) – very much in line with the ideas of Gregor and Jones (2007a) in IS research.

I conceive of interaction design patterns and IS design theories as manifestations of a cross-disciplinary interest in design-oriented research. This cross-disciplinary interest is inadequately addressed (Sjöström, 2010). Puroo et al. (2008, p 18) call for "bridging the inherent multi-disciplinarity with a common language". Such a 'bridging' is hardly a feasible goal for a single researcher – it is rather the results of an evolutionary process taking place in maturing academic disciplines. The responsibility of individual scholars – in my view – is to critically reflect upon the contemporary assertions about design-oriented research, and to contribute to the discourse in constructive ways – and to actively pay an interest in its neighbouring disciplines: Both to learn, and to contribute to those disciplines. *Design as a discipline* in its own (Cross, 2001) is an interesting reference discipline for design-oriented research in IS.

## 1.4 Research Problem

As outlined in section 1.2 there are multiple – and 'competing' – ways of perceiving use qualities, design ideals and representation of design knowledge. The discussion in section 1.2 shows a number of use qualities that are more or less intuitively interrelated; however these relations tend to remain implicit and may be confusing in a practical design or evaluation situation<sup>4</sup>. In addition to the outline of design knowledge representation in section 1.3, there is a study of HCI practitioners perceptions of theory adoption (Rogers, 2004), stating that one of the reasons for research results not being adopted is that

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<sup>3</sup>The 'gang of four' refers to Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides, the authors of the book *Design Patterns* (Gamma et al., 1995), who brought design patterns into computer science.

<sup>4</sup>There is, however, typically a focus on *use* and the *use context* of the IT artefact – hence the wording *use* qualities.

there are too many (and diverging) theories out there. It is a major task to identify, and assess the usefulness of a theory in some design context, which makes it more convenient for practitioners to do business as usual. Practitioners typically find the existing way of working satisfactory. As a consequence, they do not actively search for new methods for evaluation and design.

Research results are often targeted towards other researchers, and may require an extensive understanding of the scientific terminology and the underpinning philosophy to be operationalized in practice. We need to create relevant, coherent and practically useful research outputs, and package those outputs with the intended audience in mind, in order for academic research to have an impact in practice (Benbasat and Zmud, 1999; Rogers, 2004; Hevner et al., 2004; Goldkuhl, 2008b). These stakeholders take different action, and possess different skills, which means that they are interested in different types of design knowledge representations. Additionally, the research community is an obvious target group, given the ideal of research as a cumulative process, building on and contributing to an existing body of knowledge (Hevner et al. 2004; Gregor and Jones 2007a). Sutcliffe (2006) suggests that we need to 'unfold' theory so that different actors are only exposed to what they need to know, saving them from irrelevant and unnecessary complex issues. This view is clearly in resonance with the ongoing discourse among design-oriented IS scholars. Research risks being hidden in academic discourse, rather than adopted by practice, although many of the theories are well grounded both theoretically and empirically. A well-reflected strategy for selecting research topics, formulating theory, and for disseminating theory, has the potential to produce research results that are valuable in practice to aid design and evaluation of IT systems.

As suggested in section 1.2, the interest in ideals related to the design and use of IT has increased over the years. Orlikowski and Iacono (2001) argue that IS scholars have emphasized the artefact's context of use, its processing capabilities, and the 'dependent variable' (e.g. the *social setting* which is changed through the development and implementation of IT). In emphasizing these issues, they state: "The IT artefact itself tends to disappear from view, be taken for granted, or is presumed to be unproblematic once it is built and installed" (Orlikowski and Iacono, 2001, p 121).

This thesis aims at theorizing the IT artefact, examining various qualities related to its use, as well as exploring in depth implications of the theorized artefact and its use qualities for IS design and design-oriented IS research:

**The purpose of this thesis is to develop a conceptualization of the IT artefact, which allows for a theoretically sound and coherent formulation of design ideals and use qualities for such artefacts. Further, the aim is to explore implications of the proposed conceptualization of the IT artefact for i) information systems design and ii) design-oriented information systems research.**

To govern research, the purpose needs to be clarified through researchable questions:

- How can the IT artefact be conceptualized to adhere to the scattered notion of design ideals and use qualities in the IS field?
- How can existing IS use qualities be described, interrelated and well understood based on such a conceptualization?
- Based on the proposed conceptualization of the IT artefact, how can we conduct research on information systems design, and how may we represent our research results in a way that satisfies the stakeholders for such research?

The first research question is motivated by the discussions in section 1.1, highlighting the need to conceptualize the IT artefact, and the tendency that it is taken for granted in IS research. The 'scattered notion' of design ideals and use qualities, as discussed in section 1.2, should be acknowledged in such a conceptualization of the IT artefact. This leads to the second research question. The conceptualization of the IT artefact should lead to a better understanding of design ideals and use qualities, and help us to understand their relations better. The third research question is motivated by the notion of IS as a design-oriented discipline, and the discourse on design and design-oriented research in the IS field (section 1.3). A conceptualization of the IT artefact should resonate with a conceptualization of IT artefact design.

## 1.5 Motivation

This thesis may be seen as part of the cumulative research on Socio-Instrumental Pragmatism (SIP; Goldkuhl 2005) and Information Systems Actability Theory (Ågerfalk 2003). These theoretical foundations, which are both expressions of pragmatism in IS research, are further elaborated in chapter 2. The thesis contributes to these theories, but the intention is also that the thesis findings are understandable and practically applicable without a sophisticated understanding of the underlying perspectives (SIP and ISAT). The aim is a set of loosely coupled, but still coherent, practically useful theories. This is further discussed in chapter 3. On a more abstract level, this thesis is an *exploration of pragmatism as a philosophical approach to conceptualizing IS phenomena, and to conducting IS research*.

The philosophy of pragmatism also asserts that research results should be useful in practice – the aim here is to create *practical* theory. Ideally, practitioners will regard the results as useful instruments for design and evaluation of information technology in the context of change of some social setting. Practical theory should be *relevant*. Benbasat and Zmud (1999) discuss four aspects of relevance. Research should be *interesting* and *current*, i.e. address problems that are of concern to IS professionals. The idea of a conceptualization of the IT artefact from the point of view of communication and social

interaction is highly interesting, given the contemporary development of information technology, characterized by buzzwords such as 'social media', and the general dissemination of IT into all levels of society. Research should also be *applicable* - the strive to create practical theory is clearly connected to the applicability of research. In addition, research should be *accessible*. To make research accessible, researchers need a strategy to communicate their results to practitioners. The discussion on research ideals is continued in detail in chapters 3 and 11.

Keen (1980) asked an important question: What are the reference disciplines for IS? Orlikowski and Barley (2001) put forward that there is a need to better understand the relation between IT and organizational studies. They address this bi-directionally by asking: 1) What organization studies can learn from IT research and 2) What IT research can learn from organizational studies. They argue that research in the intersection of these fields differs from the mainstream research in each field, with respect to both content and epistemology. They argue that such hybrid research "goes beyond informing one field by the other to a possibility of new syntheses that fuse accounts of human agency, material constraints/affordances, and institutional dynamics into richer explanations of techno-social change." (p 159). I agree with Orlikowski and Barley that research needs to take into account theories from related disciplines. My research is partially based on theories from related disciplines, such as organizational change, sociology, service management, and various expressions of design studies. The concept of human communication, although addressed differently in different contexts, appears to be a phenomena of common interest in these (and other) disciplines. Although this thesis primarily targets the IS field, , a long-term goal is to publish some of the results in outlets for other disciplines.

Ideally, academic scholars will find this work a valuable contribution to the accumulated body of knowledge in IS research, especially IS perspectives on organizational change, development methodology and interaction design. The results may contribute to other researchers seeking ways to conceive of the IT artefact and communicate their view of it. This is, for example, valuable to investigate the conceptual foundations of one's work – *what are we designing, and on what grounds do we assess it?*

Finally, I also take the position that research needs to address the field of information systems philosophically. Keen (1980) stated that *information* is a dependent variable in IS research, and that the concept is used vaguely by many IS researchers. Keen states that "information and organizational design" are closely linked, and that information "may be best defined in terms of a process of exchange and negotiation, flows and nodes, cognitive transformations, and not a physical commodity." This thesis contributes to the discourse on how to conceptualize "information" (among other things) within IS research and IS practice – something that, according to Keen, may have a value in its own sake.

## 1.6 Research Collaboration Context

The work presented in this thesis is the result of joint efforts involving a number of people. This is manifested through a number of research publications, published between 2002 and 2010 (Table 1.1).

My work has to a large extent been externally funded. Two evaluations (chapters 4 and 5) were part of the project *IS Actability through evaluation and re-design*, financed by the Swedish research council VINNOVA. The purpose of this project was to develop guidelines for evaluation and re-design of information systems based on the actability concept. One of the empirical studies (chapter 6) was funded by the National Library of Sweden.

My research from 2006 to 2008 was partially funded by VINNOVA's project *e-services for cooperative use*. The purpose of this project was to investigate how Swedish municipalities may improve their methods for organizational change, with a specific emphasis on IT-enabled organizational change and development of e-services. VINNOVA granted another project, aiming at improving the inter-organization collaboration between government agencies and local governments.

All the projects have been highly collaborative, which means that several publications have been co-authored with project colleagues (see Table 1.1). Partially, the contents of this thesis – a monograph – have been presented previously through these publications. There are overlaps between the thesis and the articles. The way this is managed in the thesis is to explicitly point out the parts that were the result of collaboration: It is clearly stated in the beginning of a section if (and where) it has been published. If there were several authors, there are statements like "we therefore conclude" in the text, to clearly point out that a particular statement is not a result of my individual work. This explains the (seemingly inconsequent) use of the terms "we" and "I" in the thesis.

Table 1.1: *Scholarly publications that intersect with this thesis*

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Sjöström, J. and Goldkuhl, G. (2010) "Stakeholder-centric IS Design in an e-Government Context". In Proceedings of eChallenges 2010, Warsaw, Poland, October 2010.

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Sjöström, J. (2010) "Five Critical Remarks on Interaction Design Patterns as Theory Representation". In Proceedings of the 18th European Conference on Information Systems (ECIS'2010), Pretoria, South Africa, June 2010.

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Sjöström, J. and Iqbal, I. (2010) "An Emerging Collaboration Model for e-Government Projects". In Proceedings of the 7th Scandinavian Workshop on e-Government (SWEG 2010), Örebro, Sweden, January 2010..

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Sjöström, J. and Ågerfalk, P. J. (2009) "An Analytic Framework for Design-oriented IS Research". In Proceedings of the 15th Americas Conference of Information Systems (AM-CIS'2010). San Francisco, CA, USA, August 2009.

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Sjöström, J. and Goldkuhl, G. (2009) "Socio-Instrumental Pragmatism in Action". In Handbook of Research on Socio-Technical Design and Social Networking Systems (de Moor, A. and Whitworth, B., Eds.). IGI.

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Sjöström, J. and Ågerfalk, P. J. (2008) "Socio-Instrumental Design Patterns". In Proceedings of the Mediterranean Conference of Information Systems (MCIS'2008). Hammamet, Tunisia, October 2008.

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Ågerfalk, P. J. and Sjöström, J. (2008) "The Principle of Identity Cultivation on the Web". In ERCIM NEWS, Vol. 72, January 2008.

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Ågerfalk, P. J. and Sjöström, J. (2007) "Sowing the Seeds of Self: A Socio-Pragmatic Penetration of the Web Artefact". In Proceedings of the 2nd International Pragmatic Web Conference. 22-23 October 2007. Tilburg, The Netherlands. [Best paper award]

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Sjöström, J. and Ågerfalk, P. J. (2005) "Investigating Communicative Features of User Interfaces", in Systems, Signs & Actions, 1(1), pp. 80–102.

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Sjöström, J. and Goldkuhl, G. (2004) "The semiotics of user interfaces: a socio-pragmatic perspective", in Virtual, Distributed and Flexible Organisations - Studies in Organisational Semiotics, Liu, K. (Ed.), Kluwer Academic Publishers. ISBN 1-4020-2161-5.

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Goldkuhl, G., Cronholm, S., Sjöström, J. (2004) "User Interfaces as Organisational Action Media", in Proceedings of the 7th International Workshop on Organisational Semiotics, July 2004, Setúbal, Portugal

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Sjöström, J. and Ågerfalk, P. J. (2003) "Socio-Instrumental Criteria for Assessing Information Systems", in Proceedings of the 8th International Working Conference on the Language-Action Perspective on Communication Modelling (LAP 2003), 1–2 July 2003, Tilburg, The Netherlands

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Sjöström, J. (2003) "Socio-pragmatical analysis of IS Actability Evaluation Heuristics", in Proceedings of Action in Language, Organisations and Information Systems (ALOIS 2003), Linköping, Sweden, March 12-13 2003

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Sjöström, J. and Goldkuhl, G. (2002) "Information systems as instruments for communication – Refining the actability concept", in Proceedings of the 5th International Workshop on Organisational Semiotics (OS 2002), Delft, The Netherlands

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Ågerfalk, P. J., Sjöström, J., Eliasson, E., Cronholm, S. and Goldkuhl, G. (2002) "Setting the Scene for Actability Evaluation - Understanding Information Systems in Context", In Proceedings of the 9th European Conference on IT Evaluation (ECITE 2002), 15–16 July 2002, Université Paris-Dauphine, France, (Eds, Brown A and Remenyi D) Reading, UK: MCIL, pp. 1–9

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## 2. From Signs to Socio-Instrumental Action

This chapter presents - and motivates the use of - essential theories in this thesis. These theories are the basis for the research process and at the same time a fundament for the research product (the result of the thesis work). Hence, the ontological positioning in this chapter prepares the reader both for the epistemological discussions in the following research design chapter, and for the last chapters containing results and conclusions. In 2.1, the notion of semiotics is introduced, which provides a basic perspective on human communication. In 2.2, the perspective moves beyond a representational perspective into a socio-pragmatic perspective, with an elaboration on why we act in certain ways, and an exploration of the social relations that are established and cultivated through communication. Further, section 2.3 focuses the role of instruments in communication, with special attention paid to the IT artefact as such an instrument. Section 2.4 is a summarizing section, where a number of philosophical-ontological statements are presented, based on what has been said in sections 2.1 – 2.3.

### 2.1 On Signs and Communication

Andersen (2001) put forward the claim that semiotics - the study of signs - may provide useful insights to Human-Computer Interaction (HCI) research. Andersen mentions four potential contributions of the semiotics discipline: making HCI more coherent, exploiting insights from older media, defining the characteristic properties of the computer medium, and situating HCI-systems in a broader context. Given Andersen's claims, semiotics is directly connected to the research questions with respect to all four claims at hand, even though this thesis does not limit the perspective on the IT artefact to a HCI context. This section is an introduction to some fundamentals of semiotics.

The work of Charles Saunders Peirce had a major impact on the discipline of semiotics. The Peircean definition of a sign is broad: "Something which stands to somebody for something in some respect or capacity" (Peirce, 1985, p 5). His semiotic triangle (Figure 2.1) describes the triadic relation between an interpretant, a representamen [sign], and an object.

According to this definition, the only thing that is not a sign is something that only represents itself. Such things are hard to find, though, since even a

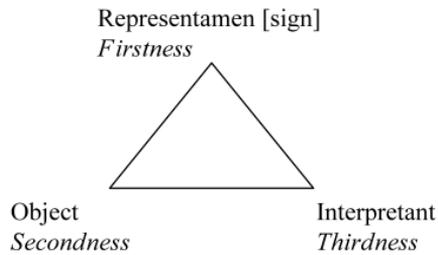


Figure 2.1: The semiotic triangle (after Peirce 1931)

physical object, such as a car, may be seen as a representamen for its context - one could for instance see the car and draw conclusions about the owner based on its condition. That is; everything represents its own context to some extent, in the sense that a subject who perceives it will make an attempt to make sense of it, or an attempt to make sense of something else based on its interpretation of it. Peirce, commonly referred to as the “father” of semiotics, of course elaborated a lot further in his study of signs. His concepts of Firstness, secondness, and thirdness are concerned with how the human mind processes its impressions of the world. Peirce struggled a long time with how to coin these words. Firstness refers to the sensory impression, the very perception of a sign. Secondness is the twofold relation between a sign and some object which it represents. Thirdness, finally, is the very connection made in our mind between Firstness and Secondness. Thus, the meaning of our perception needs to be understood through all the categories: We perceive a sign (firstness), and relate it to some concept (secondness) through an internal process of relating them to each other (thirdness).

A reflection about Peirce’s theory, which may be somewhat hard to comprehend, is that contemporary authors have presented similar thoughts. As an example, Michael Polanyi formulated the same phenomena in a similar way: “We may say [...] that the triad of tacit knowing consists in subsidiary things (B) bearing on a focus (C) by virtue of an integration performed by a person (A)” (Polanyi, 1969, p 182). The subsidiary things correspond to Peirce’s firstness. The bearing on a focus corresponds to Peirce’s secondness, and the integration performed by the actor corresponds to Peirce’s thirdness. Polanyi (1966) coined the concept of tacit power, which is an overarching term to describe people’s ability to make sense of the surrounding world, and express themselves in a sensible way in any given situation. Polanyi is important to mention here, because he has contributed to popularizing a semiotic perspective on communication and knowledge, although he has also been misinterpreted on a quite large scale (Walsham, 2005).

Peirce further put forward the concept of semiosis – continuous interpretations being performed by the human mind, as an explanation of human think-

ing. Secondness, for example, in one interpretation act, may be firstness in the next act. Imagine that you are sitting on a train, and there is a picture of a fire extinguisher on the wall. This firstness will generate secondness – through thirdness you will realize that there is an actual fire extinguisher nearby. The presence of a fire extinguisher is a new sign – a first – which may cause you to think of a possible fire (secondness) through another, inferring thirdness.

This theory of semiosis indeed looks upon humans as subjects, constantly interpreting (thus making sense of) the surrounding world. The human mind is always under attack from a torrent of impressions from its sensory organs, which it seeks to filter, order and make sense of, in order to properly respond to its social and material environment. As such, Peirce’s concept of semiosis is also a theory of human communication. Figure 2.2, created by Walsham (2005) drawing on Polanyi, is one good example of how to start out from semiotics to conceptualize the basics of human communication.

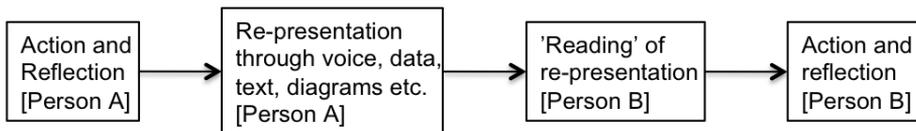


Figure 2.2: A model of basic communication (Walsham, 1995)

A very important part of Peirce’s message is that we need to acknowledge both intervening<sup>1</sup> and interpreting<sup>2</sup> as important actions in relation to the sign. The semiotic triangle can thus be understood both in the context of intervention and interpretation. When we express ourselves, there is an internal process of translating secondness (e.g. the way one currently feels) into a firstness (an expressible sign) through a thirdness (an act of translation from secondness to firstness).

When reasoning about these matters, one may easily be biased towards the representational function of signs, i.e. the relation between a sign and some object or concept. An interesting complement to Peirce is the semiotician Karl Bühler, who elaborated on a sign as a relation between a locutor (the creator of the sign), an addressee, and the object the sign refers to. Bühler (1934) discusses these three relations as three functions of language: The symptom, the signal, and the referring function (Figure 2.3). That is; while Peirce seems mainly to focus the cognitive processes related to interpretation and formulation of representations, Bühler places the representation of the sign in the

<sup>1</sup>The term "intervening" is not used by Peirce. It will, however, be consequently used in this thesis. Intervening refers to "speaking"; the act of creating representamens. A wider interpretation of intervention, which is not elaborated on in this thesis, also includes intervention in the physical world, e.g. cutting wood, carrying a log, or opening a window.

<sup>2</sup>Interpreting is looked upon here as the internal process of perceiving a representamen as a sign and assigning meaning to it.

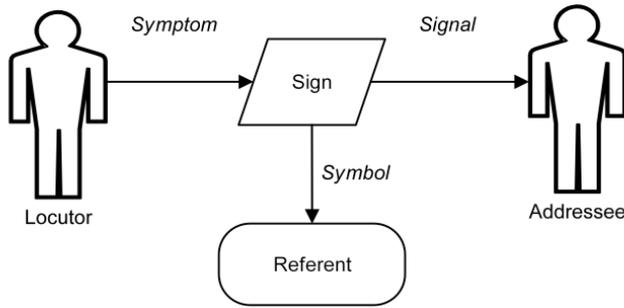


Figure 2.3: Three language functions in relation to a sign (after Bühler 1934)

foreground. He discusses the understanding of a sign in terms of language functions – relating it to both creators and interpreters at the same time. This view emphasizes signs as part of some social interaction situation. An interpretation of a sign is not only based on the sign as such, but also on the basis of who expressed the sign. This also has implications for the locutor: Depending on who is listening, we express ourselves differently. Signs can thus be viewed as parts of action relations: Joint actions of intervention-interpretation, between the actors.

Morris (1964), following in the traces of Peirce, has elaborated on the pragmatic relation of signs to the interpreter. Morris distinguishes between different pragmatic meanings of sign (designative, prescriptive, appraisive), all in relation to the interpreter and what he possibly may do based on the sign. These pragmatic meanings are based on the notion of the act as it is described by Mead (1938), also considered a seminal researcher within American pragmatism. Mead distinguishes between four phases of an act: impulse, perception, manipulation and consummation. Although these distinctions are useful, this is still a limited view on sign pragmatics since there is no reference given to the creator of the sign.

## 2.2 Socio-Instrumental Pragmatism

The semiotic reflection above is important, in the sense that it provides a basic view on some fundamentals of communication. However, it is a very shallow instrument to help us understand the social aspects of human action and collaboration. We also need to address the issue why people communicate – the social grounds and social purposes of engaging in social interaction. Thus, the basic semiotic discussion needs to be complemented by other concepts to constitute a useful theoretical foundation to understand the phenomenon of people using information technology.

The theoretical framework of socio-instrumental pragmatism (SIP) as presented by Goldkuhl (2005) is an action-theoretic synthesis tailored to be used for IS research purposes. SIP primarily draws on American pragmatism (e.g. Dewey, 1938; James, 1907; Mead, 1938; Peirce, 1931), symbolic interactionism (Blumer, 1969), Weber’s (1978) sociology, and speech act theory (Habermas, 1984; Searle, 1969). SIP itself is the result of a pragmatic approach to synthesizing theory, which in practice means that it is no attempt to integrate fully the theories it is informed by, but rather an eclectic approach to synthesizing aiming at a coherent framework, tailored for IS research. Selected parts of SIP are presented here (the ones that are relevant within this study). Confer Goldkuhl (2005) for a more thorough discussion about socio-instrumental pragmatism.

Figure 2.4 serves as a starting point for this discussion, through a model that reveals some of the most important concepts within SIP. The concepts in the figure are presented below. The relation to Bühler’s semiotics is clear: One actor intervenes in the social world through action, which renders a result. The result – a representation that can be perceived by others – is interpreted by some other actor(s), attempting to make sense of this representation. The representation may be a written or spoken word, but it could also be somebody walking out of a room or even someone doing nothing at all. Andersen (2001), in his call to further integrate semiotics into human-computer interaction research, states that humans are compulsive talkers and interpreters, constantly trying to make sense of the world.

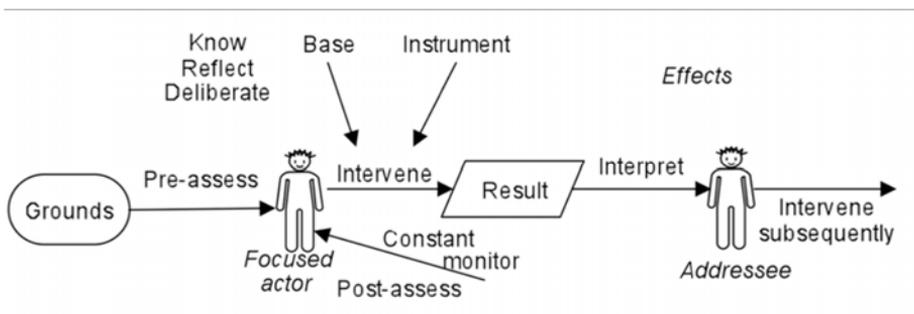


Figure 2.4: A model of socio-instrumental action (Goldkuhl, 2005)

Max Weber has profoundly discussed the term social action. Weber conceptualized social action in a minimalistic, yet powerful way: “Action will be called ‘social’ which in its meaning as intended by the actor or actors, takes account of the behavior of others and is thereby oriented in its course” (Weber, 1978, p 4). This means that he describes social action as action oriented towards other people’s previous, current or anticipated future behavior. “Others”, in this case, refers to individuals known to the actor or a number of

unknown individuals. Weber’s notion of social action is that the performing actor takes other individuals into consideration, which affects the way he/she acts. The social aspect of action lies within the actor – this would mean that it cannot always be determined whether some performed action is social or not, without knowing what influenced the actor to perform the act in a certain way.

Weber further discusses four different orientations of social action. These are goal rationality (instrumental rationality), value rationality, affectual orientation and traditional orientation. These are not means for classifying actions, but a sociological tool that can be useful in discussing social action. Social action can be oriented different ways with regards to its goals and the sociological or psychological circumstances that affect the way the actor performs the action. Table 2.1 provides an overview of these orientations. Weber (1978) also points out that social action seldom can be said to belong to only one of the orientations above. An action can, for instance, be goal rational to some degree and value rational to some degree. Weber (ibid) also points out that these orientations can contradict each other.

Table 2.1: *Orientations on social action (after Weber, 1978)*

<b>Orientation</b>	<b>Goals</b>
Goal rationality	Clear goals; Affecting the world in some intentional sense (desired effects outside the action itself).
Value rationality	The goal lies within the action itself, e.g. religious, ethical or esthetical actions.
Affectual orientation	These actions are emotional, which means that they do not necessarily have meaningful goals, at least not reflected goals.
Traditional orientation	These actions are governed by habits, and traditions, which means that there are not necessarily conscious goals.

Goldkuhl (2005) further elaborate on Weber’s definition of social action by stating that action may have social grounds (“takes account of the behaviour of others”) and social purposes (“is thereby oriented in its course”). Given this way of conceiving social action, it is hard to find examples of action which is not socially oriented in its course.

The intervening actor performs a pre-assessment, which may be more or less reflected. The pre-assessment is a phase where the actor shapes his action in the context of the social grounds and social purposes. After the intervention, there is a post-assessment made by the actor, striving to make sense of how the intervention has affected the material and social world. Goldkuhl thus distinguishes between three important phases in a social action setting: Pre-assessment, intervention, and post-assessment. Goldkuhl grounds this discussion theoretically by referring to Mead’s (1938) four stage model of human ac-

tion, including impulse, perception, manipulation and consummation. In SIP, the first two stages have been integrated into one.

As a reflection, we must understand this model, focusing on single actions, in a larger context of intervention and interpretation. We should view single actions in the context of Peirce's concept of semiosis, as explained in section 2.1. Every action is thus part of a never-ending series of interventions and interpretations, which continually changes our understanding of the world. We are all interveners and interpreters, and there is an ongoing change of roles and relations in any communication process.

It is important to state that the discussion above is an attempt to find useful concepts to discuss the very complex phenomenon of people acting in a social world. Every such conceptualization has its strengths and its limitations. SIP discusses instruments used when acting, which, when compared to other similar theories, increases its appropriateness for IS research (given the perspective that we may conceive IT artefacts as instruments). As argued by Wertsch (1998), instruments enable, direct and constrain action. Depending on which instrument we use at a given time, the action result or the acting itself will be different. Most instruments are artefacts (human made), which means that we have assigned certain properties to them in their design. Different instruments afford actions - however, these affordances may be interpreted differently by different actors (Gibson, 1979).

IT artefacts – and some other types of artefacts with a high degree of automation (such as fuzzy-logic based washing machines) are capable of operating independently of human beings (e.g. Goldkuhl and Agerfalk, 2005). After configuration and initiation, they carry out material or semiotic tasks without active continuous operation by humans. We may say that action that once used to be carried out fully by humans have been delegated to the instrument, through its capability to read its surrounding world through sensors, process this information based on rules, and process it through algorithms to a desired result. These artefacts may be conceptualized as agents, operating on behalf of human beings. They are still instruments for action, although they are more complex than tools which depend on active human operation to function properly (e.g. knives and forks). SIP clearly points out that we still need to think of action as performed by humans – the instruments, regardless of their degree of agency and autonomy, are still created by and operated by humans, and the responsibility for action is always to be found among human actors. As stated by Collins and Kusch (1999), IT artefacts may perform action in a mimeomorphic manner, i.e. do things repeatedly given a set of instructions, while human action is polymorphic. A pre-requisite for polymorph (thus human) action is experience of the complex society in which action takes place, which makes it vastly more complex to predict human action, and to "design" human systems. Thus, we need to understand both the design of artefacts which support and replace human action, but also the soft human system which undergoes change when such an artefact is introduced to it. Thus, as thoroughly theo-

alized by Checkland (1981), we need to properly understand and acknowledge the difference between *design* of hard systems and *change* of soft systems.

When discussing social grounds and social purposes for action, it is important to adopt concepts that help us reason about these grounds and purposes, which are to be found in the social relations pre-dating any action. Blumer (1969, p 71) states: "the essence of society lies in an ongoing process of action - not in a posited structure of relations. Without action, any structure of relations between people is meaningless. To be understood, a society must be seen and grasped in terms of the action that comprises it". This view of action in some social context is embraced by SIP – thus it is essential to actually study actions to properly understand any social environment. At the same time, SIP acknowledges the existing social relations as the seed for social grounds and social purposes for action. In line with Giddens' theory of structuration (1984), the SIP perspective also acknowledges that any action causes changes to existing social structure and interpersonal relations. When acting, representamens are created, which are interpreted by others. Consequently, social relations are affected. These relations may, as an example, be promises causing expectations. The concept of social relations is clearly visible in SIP, primarily due to the influence from communicative action theory (Habermas, 1984) and Searle (1969, 's) speech act theory, which will be discussed further in section 2.3.

SIP further emphasizes the importance of understanding the interrelated concepts of material treatment and communication. Drawing on Wittgenstein's (1953) concept of language games, Goldkuhl (1996) introduces the broader concept of activity games. Goldkuhl and Ågerfalk (2002, p 1) state: "Material acts and communicative acts together form patterns of action. They form not only a language game, but also an 'activity game' [...], with relations between communication and material treatment. Large parts of this activity game are recurrent actions and are thus institutionalized in the organization and the practical consciousness of its participants". The concept of activity games is thus anchored in institutionalization; a relation between action and structure discussed by, among others, Berger and Luckmann (1966) and Giddens (1984).

## 2.3 Information Systems Actability Theory

Since the early 80's, many IS scholars have shown an interest in a pragmatic perspective on IT systems. Scholars such as Flores and Ludlow (1980), Goldkuhl and Lyytinen (1982), Lyytinen (1985) and Winograd and Flores (1986) challenged the dominant semantic perspective at the time, and proposed an action-oriented turn in the IS discipline. Today, IS research drawing explicitly on pragmatism is still relatively rare in comparison to other contemporary research fields (such as the semantic web). However, there are signs of an

increased interest in pragmatic and social issues related to IT systems on IS conferences and in journals. Recent examples of this include the EJIS special issue on "Action in Language, Organizations and Information Systems" (Vol. 15, No. 1), and the birth of the AIS Special Interest Group on Pragmatist IS Research (SIGPrag).

One of the theories descending from (and being part of) this pragmatic tradition is Information Systems Actability Theory (ISAT). ISAT is coherent with socio-instrumental pragmatism, and can be seen as a branch of SIP with a special focus on action-oriented design and evaluation of IT artefacts in social settings. A thorough account of the emergence of these two theories, and their interconnection, can be found in Goldkuhl and Röstlinger (2003). In fact, the first articulation of ISAT pre-dates the formulation of SIP, and the two theories have evolved in parallel. This also implies that it is problematic to draw a distinct line between these intertwined theories. In this section, a few basic ISAT principles will be discussed, which need to be interpreted in the light of SIP as described in section 2.2.

First, a part of the ISAT perspective, is a view of actability as a type of quality in the relation between an IT artefact (the instrument) and a user (the actor using it). Actability is defined as "[...] an information system's ability to perform actions, and to permit, promote and facilitate the performance of actions by users, both through the system and based on information from the system, in some business context" (Goldkuhl and Ågerfalk, 2002, p 2). A few critical reflections need to be made about this definition. First, it is stated that information systems perform actions. I hesitate to adopt this formulation, since it increases the risk for confusion. I prefer Weber's (1978) terminology, stating that humans perform actions. An IT artefact, the way I see it, may process data based on algorithms. This view is indeed adopted within ISAT. (Goldkuhl and Ågerfalk, 2002, p 10) explain: "The system's actions derive ultimately from the rules predefined to the system. We do not presuppose computers to have human properties of consciousness and ethical responsibility". Thus, a definition of the IT artefact as a performer of action should be based on a more precise terminology, which clearly separates the polymorphic action performed by humans and the mimeomorphic action performed by the IT artefact (as discussed in section 2.2). Another reflection about the definition concerns the business context. Given the amount of applications of IT, as discussed in the introduction chapter, it is more relevant to speak of actability in *any* social context. A final reflection concerns the use of the term information system – which is often used (e.g. Beynon-Davies, 2002) to encompass more than information technology. It is thus more appropriate to use the phrasing IT system or IT artefact, as part of this definition.

Second, one pragmatic aspect of IT artefacts is to understand more than the semantic (referential) aspect of a message. Within ISAT, speech act theory is proposed as a way of conceiving important action aspects of a message. Several scholars have advocated that we need to understand communication

as action, since it affects the social world (e.g. Winograd and Flores, 1986; Goldkuhl and Lyytinen, 1982). ISAT adopts this view, and proposes that we need to understand messages from several points of view. Based on Searle's (1969) scheme, we may reason about a message as a result of an utterance act, a propositional act, an illocutionary act and a perlocutionary act. The utterance act is a syntactic view of a message; a production of a set of words. The propositional act is an act of referring to something in the material or social world. The illocutionary act is what we are doing in relation to some other actor(s); e.g. promising, commanding or declaring something. The perlocutionary act is an intentional cause of effect on the other actors. In ISAT, the perlocutionary act is questioned as part of the speech act, since the intervening actor does not control the actual implications of his act. It is rather an unpredictable result, based on the interpretations and following actions performed by other actors. The illocution, or action mode, is considered important in ISAT, since many design problems concerning this phenomenon have been identified in the empirical work underlying ISAT.

In IS actability a distinction is made between three usage situations of information systems. There are *interactive* usage situations, where users interact with the IT system. In this kind of situation, a user can perform a communicative action through and by support of the system. A user can perform some action (outside the IT system) based on messages retrieved from the IT system. This kind of action is called a *consequential* action. The IS itself can also perform actions according to this view: these actions are called *automatic* actions. A computer is an advanced artefact and has the ability to perform certain information processing in an independent way, still on the basis of rules defined by human actors.

Messages play an important role in the actability concept. The pragmatic aspects of messages have been proposed (c.f. Goldkuhl and Ågerfalk, 2002) as important within actability. Based on universal pragmatics (Habermas, 1984) and speech act theory (Searle, 1969), messages are considered to be products of speech acts, which contain not only a propositional content, but also an illocutionary force (this is referred to as 'action mode' within actability).

An important issue in actability (following speech act theory) is the assertion that there is an action aspect within the sign itself (the illocutionary force) and not only as effects arising from interpreting the sign. An actability claim is that pragmatic relationships are established through the sign between sender and recipient. For example, commanding or promising establishes different pragmatic relations between sender (the intervening actor) and recipient (the receiving actor). The sender of a message through an IS may not be the original communicator. He can be a 'performer', mediating a communication from the original communicator to the indented interpreters (recipients).

Actability has to date paid a lot of attention to Habermas' (1984) theory of communicative action, and also to speech acts as defined by Searle (1969). One of the main reasons for the birth of IS actability was a reaction towards

viewing information systems specification as only a matter of semantic analysis. By paying attention to the illocutionary force of speech acts during information systems specification, and even conceptual modeling, pragmatic aspects of communication could be taken into consideration (Goldkuhl and Lyytinen, 1982; Goldkuhl and Ågerfalk, 2002). Ågerfalk (2003) proposes an extension of Langefors' (1995) definition of elementary messages, by an incorporation of an action mode (illocution) component as an integrated part of a message. Ågerfalk refers to this extended basic definition as an ae-message (action elementary message).

One way of creating a useful instrument out of a theory such as actability is to formulate concrete 'how to'-suggestions on IS design and/or evaluation. One part of the development of the actability concept is the formulation of a set of actability heuristics, or design ideals, which should guide an IS designer or evaluator to focus different actability properties of an IS (Table 2.2). These design ideals could be compared to design ideals from the usability field, for instance Nielsen's (1993) usability heuristics, which may be used as guidelines when designing or evaluating information systems. The design ideals within the actability are no replacement for Nielsen's heuristics, but rather an alternative perspective on use qualities. They focus somewhat different phenomena, but in some senses they are much alike (Ågerfalk, 2003; Sjöström and Ågerfalk, 2003). The actability design ideals and their relation to other types of use quality are further discussed in chapter 10.

Goldkuhl and Röstlinger (2003) define actability as a property of something; a property contributing to or enabling the actor to perform an action. The authors (*ibid*) include both executable and informative properties into the notion of actability, and they designate actability to be properties of external objects (signs or artefacts) or internal (subjective) constructs. The view of actability as a property is sprung from the concept of affordances (Gibson, 1979).

Table 2.2: *Actability heuristics* (Ågerfalk et al., 2002)

1.	<b>Situational context awareness.</b> Performers should ultimately always know what they are doing and what they are supposed to do; only by looking at the interactive screen documents available.
2.	<b>Good conditions for action in shown information.</b> Information shown to performers should be adequate (necessary and sufficient) so that actions can be intuitively based on it. This accounts for both information from developer-to-user (labels, captions, help texts, et cetera) and information involved in user-to-user communication.
3.	<b>Good conditions for action in required information.</b> Information that the system requires from performers shall be meaningful and easily provided to the system. That is, the performer shall understand why the information is required and the information shall be convenient to provide.
4.	<b>Easily accessible and adequate action memory.</b> Information about previously performed actions and other action prerequisites shall be easy to access.
5.	<b>Action-legible IT-systems.</b> Expressive interactive user interface components (icons, labels, et cetera) should be used. The language used should be in correspondence with users' professional language. Known and understandable consequences of possible actions. Propositional content, signifier of action mode and information about communicator should be visible and kept together. Separate messages should be kept separate (one thing at a time).
6.	<b>Legible and relevant feedback.</b> Description and explanation of the system's performed and scheduled future action(s) should be readily available. Effects of these actions should be shown. Alternative future user actions should be visible and choice of course of action to take should be informed by the system.
7.	<b>Visible actors.</b> Information about performer, communicator and intended interpreter(s) should be easily accessible – both role and person.
8.	<b>Restrictions and opportunities in navigation utilized.</b> Admit focus and work task changes. Sometimes sequence restrictions are necessary and desirable.

## 2.4 Philosophical and Ontological Manifesto

Sometimes, important concepts are uncritically adopted in IS research. Modern scholars are referred to in order to support some theoretical statement, but the authors do not fully examine the philosophy behind their work. Walsham (2005) provides one example of this; claiming that Polanyi has been misunderstood by certain researchers, which in turn has led to some cascading misconceptualizations, due to the massive amount of researchers basing their arguments on the misinterpretations of the original work. Had these scholars satisficingly paid attention to the philosophy underpinning Polanyi's work, these misconceptualizations would most likely have been avoided. This is a reason to put some effort into adopting a coherent philosophy on the IS field as part of any IS research endeavor.

Apparently, the characteristics of language use are considered vital in this study. It is my belief that we continuously need to question our perspective on language in our role as IS researchers. This chapter has presented the view I adopt on human communication and language. This section summarizes a set of philosophical and ontological statements, which reveal my perspective on the world, and which is the basis for this study:

- Humans are continuously trying to make sense of the world through interpretations of the signs surrounding them.
- These interpretations are made possible through the inherent "tacit power", which is an accumulation of all our life experiences.
- Conversely, humans want to be made sense of by others. This is done through interventions in the world, which is manifested in the representations made through speaking, writing, walking away et cetera.
- Representations should be conceived in a broad sense, since the absence of action may also be subject to human interpretation.
- There is a need to explicitly separate the performance of action from the results of action, and to separate the action results (which are in the performer's control) from its social consequences (which are likely to diverge from the performer's intentions due to human complexity).
- Communication may be conceived of as action pairs, where one act of intervention results in a representation that is later interpreted through an act of interpretation another actor.
- Information Technology has multiple roles in communication, both as media (carriers of representations) and as agents (processing and directing representations based on rules defined by human instrument builders).
- Communication is not merely a semantic issue; it also has a pragmatic meaning, since it has an impact on the social relations in communities.
- Human action has social grounds and social purposes. In order to properly understand how to design and evaluate Information Technology, we need to take into account these social aspects of IT use.

Another important starting point is the concept of information systems actability, revised as follows on basis of the discussion in section 2.3:

**Information Systems Actability refers to the properties of an IT artefact that define its ability to process information and mediate intentions on behalf of human actors, and to promote and facilitate the performance of actions by users, both through the system and based on information from the system, in some social setting.**

## 3. Research Design

In this chapter, the research process and its rationale – based on *American pragmatism* – is accounted for. The contents and structure of the chapter are explicated in section 3.1.

### 3.1 Research Design at a Glance

This section provides an overview of research design and its rationale, as abstracted in figure 3.1. The foundation for research design is a set of meta-theoretical considerations. These considerations outline the pragmatic concept of *inquiry as a theory of knowledge* (section 3.2) and an elaborated view on *action design research* (section 3.3), which builds upon inquiry as a philosophical basis. Further, the meta-theoretical knowledge base prescribes *research ideals* (section 3.4) that form a basis for assessing the *research results*, and a rationale for selection of inquiry cases.

The empirical work consists of five different inquiries. An overview of these inquiries and their relations is shown in section 3.5. The characteristics of the inquiry processes is discussed in abstract in section 3.6. The detailed characteristics of each inquiry are shown in chapters 4 – 8. *Inquiries #1 – #4* are *evaluations* of IT artefacts in their social context. Inquiry as a theory of knowledge motivates evaluations as a research method, and provides guidance to the evaluations. *Inquiry #5* is motivated and guided by the proposed view of design-oriented action research. Each inquiry is informed by a *theory base* (that may be inquiry-specific) and renders *results and experiences*, which are analyzed and abstracted into *research results*. Thus, the inquiries provide empirical justification for the research results. The knowledge base is the foundation for a theoretical justification of the research results. There is also a process internal justification. Over time, as several inquiries are conducted, there is a continuous strive for consistency in the relations between emerging conceptualizations. Finally, the research results are contributions to the knowledge base.

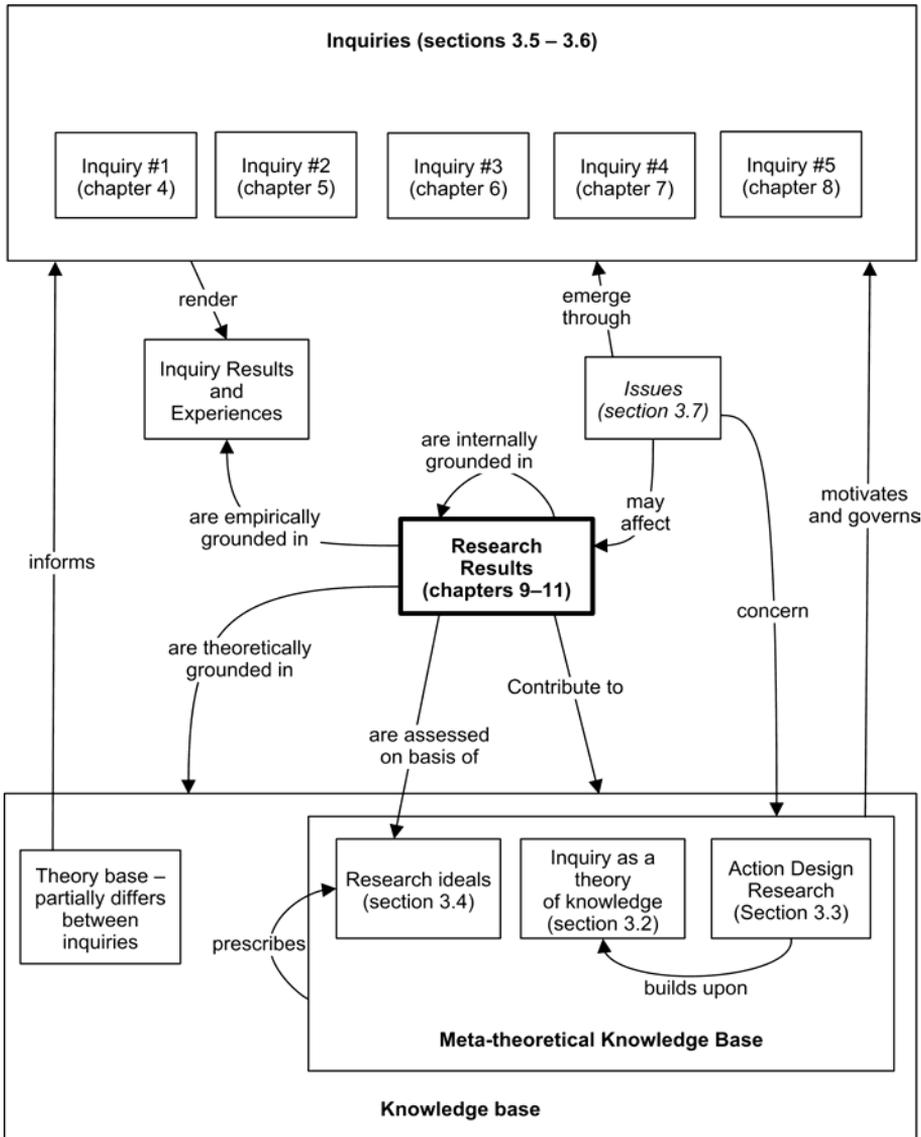


Figure 3.1: Research Design and its Rationale

## 3.2 Inquiry as a Theory of Knowledge

This thesis is built upon pragmatism as a foundation for IS research. Dewey (1938) presents inquiry as a *theory of knowledge*. Inquiry, in Dewey's view, encompasses both evaluation and design. This section discusses inquiry as an instrument to develop scientific knowledge.

Peirce's semiotics, as discussed in chapter 2, is not only a theory of human interpretation and intervention; it is also one of the fundamentals of the philosophical school of American pragmatism. This research is based on a pragmatic perspective on theory and theory development. The pragmatics of James' (1907) state that it is the application of a concept that determines its value. This has epistemological consequences – in order to determine the "goodness", or "trueness", of a concept, we need to apply it in order to be able to evaluate its consequences. James argues that the practical usefulness of a concept is the first indication of its goodness; but there is also a need to anchor concepts in older truths. Based on this epistemological stance, it is indeed possible to make theoretical generalizations based on single or few observations – as long as the concepts are also anchored in established theories, in this case theories in the IS discipline, and theories from the domains of semiotics and social action. In line with James' thoughts, the inquiries are not only assessments of the IT artefacts at hand; we also assess the theoretical concepts used to guide the evaluation. Thus, each inquiry in the research process has been informative in the development of new – or improvement of existing – theoretical concepts.

There are similarities between this strategy of conceptual development and the strategy to generalize results presented by Baskerville (1996). Baskerville suggests that a *general case* is abstracted from a *base case*. In my terms, a *concept* is abstracted from an *inquiry*. Baskerville further suggests that the general case is applied to a *goal case*. In my terms, an emerging concept is applied in *further inquiry*, which feeds the researcher with new empirical insights through which the concept is further refined. Still, as formulated by Lee and Baskerville (2003, p 241), "Whether research is conducted quantitatively or qualitatively, there is only one scientifically acceptable way to establish a theory's generalizability to a new setting: It is for the theory to survive an empirical test in that setting". In resonance with this, I make no claims to generalize my results beyond the empirical settings studied. However, each inquiry has taken place in a new empirical setting differing from the previous ones, thus 'extended' the generalizability of the concepts into the studied settings. In line with Cronen (2001), my view is that the generalizability of any concept also lies in the hand of the one utilizing the concept in a new setting.

Even though Peirce's semiotics provides great explanatory power regarding human communication, his work on inquiry is not sufficient in this research context. Peirce (1931) defines inquiry as the change of psychological state from doubt to belief. Dewey's (1938) conception of inquiry is further elabo-

rated than Peirce's, and in some ways their views are not at all compatible. Even though they are often referred to as "American pragmatists", their views of inquiry as a theory of knowledge differs significantly (Talissee, 2002). While Peirce's inquiry concept – related to his theory of semiosis – primarily focuses experience as *interpretation*, Dewey argues that that experience is a result of *doing*. Peirce views inquiry as a process of discovery, while Dewey defines it in terms of reconstruction (Talissee, 2002). Dewey points out that we actively change our world, and that the process of inquiry changes a situation from being indeterminate to being determinate. Thus, Dewey's conception is more in line with a contemporary view of action research, aiming at changing practice, and at the same time using that experience to develop various forms of instrumentalities (e.g. propositions and models) which may be operationalized and useful in other practical situations.

Dewey's definition of a situation is that it is a *contextual whole* consisting of *objects and events* (Dewey, 1938, p 66):

"What is designated by the word 'situation' is not a single object or event or set of events. For we never experience nor form judgments about objects and events in isolation, but only in connection with a contextual whole. This latter is what is called a situation"

The IT artefact may be considered an object, and the use situation is characterized by a number of events and actions where the IT artefact is an instrument. This view of inquiry is in harmony with both usability research (focusing the *use* of interactive products), socio-instrumental pragmatism (focusing *social action and its consequences on social relations*), and the research questions as such, which aim at understanding *IT in its action context*.

Another important distinction between Peirce's and Dewey's perspective on inquiry is that Peirce's view of reality does not correspond well with social science research. Peirce (1878) stated: "All the followers of science are animated by a cheerful hope that the processes of investigation, if only pushed far enough, will give one certain solution to each question to which they apply it". Such a statement may make sense in the domains of chemistry, physics, mathematics, and other domains that are governed by forces of nature or formal axioms. However, in the field of information systems and other branches of social science, there are multiple paradigms, which are sometimes governed by philosophical concerns rather than quantifiable and measurable phenomena. Peirce's view, while striving for theory that thoroughly explains causalities in a natural science manner, is epistemologically problematic in relation to moral aspects of inquiry (Talissee, 2002). Dewey, on the other hand, also recognizes *morally* indeterminate situations – situations where social conditions are disordered, i.e. there is a lack of knowledge or a number of conflicts between people in a group. Moral inquiry is a process where these social conditions are changed in order to obtain a determinate situation. According to

Talisse, "[...] one can say with some confidence that the main objective of Dewey's entire philosophical career was to dissolve the supposed dichotomy of fact and value" (Talisse, 2002, p 78).

### 3.3 Design-oriented Action Research

The first four inquiries were based on evaluations of IT artefacts in their social context. In the fifth inquiry, two researchers participated in a project, assuming roles of analysts/designers. An action research approach was adopted in this study. The researchers combined active roles in 1) active inquiry leading to the induction of change in work processes, partially through the design of IT artefacts and 2) observing as well as exploring and testing new design processes and design outcomes. As a researcher it is important to critically assess one's approach, and reflect about its meaning. This section makes four claims about action research:

- Action Research is pragmatic
- Action Research is interpretive
- Action Research in IS is design-oriented
- Action Research results need justification

In the following subsections, these four claims and their implications for research are substantiated through discussions. As part of the discussion on the four claims, the notion of practical inquiry and the relation between action research and design-oriented IS research is discussed. The term 'action design research' is embraced to refer to the approach taken in inquiry #5.

#### Action Research is Pragmatic

It is typical in action research projects to combine a role of active change with a research-focused role (e.g. Susman & Evered, 1978; Davison et al, 2004). The process followed a typical action research loop<sup>1</sup> with diagnosis, action planning, action taking/intervention, evaluation and specifying learning/reflection.

In line with another pragmatically oriented strand of research, *collaborative practice research* (Mathiassen, 2002), the research efforts here aim at 1) understanding the situation-in-view (the current practice), 2) designing new artefacts and 3) intervening in practice to experience the character of change work, thus better understand the meaning of our proposed design for practice. The three elements are often found in relation to one another (e.g. in pragmatism (Dewey, 1938); in organisational learning (Argyris and Schön, 1978), and in organisational problem solving (Checkland, 1981).

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<sup>1</sup>Baskerville and Wood-Harper (1998) refers to this as *canonical* action research.

Information Systems research is often dedicated to understanding and supporting practice (Mathiassen, 2002). Action research means, among other things, a commitment to *contribute* to the immediate practice (Baskerville and Wood-Harper, 1996). The study should also result in practical knowledge of more general character – practical theories to be disseminated in various ways (e.g. through this thesis), thus aid designers in other development situations. This makes the study a *practical inquiry* (Goldkuhl, 2007) with the double aim of contributing to local and general practice. The concept of *practical inquiry* (ibid) is based on the ideas of inquiry in American pragmatism outlined in the previous section. One important aspect of this is the use and development of *practical theories* (Cronen, 1995, 2001) during a practical inquiry. Practical theories should not only help us in observation and diagnosis, but should *also be a companion in design issues*. In such cases a practical theory becomes a design theory.

Baskerville and Myers (2004) discuss pragmatism as the most important philosophical underpinning of action research, highlighting the following premises:

- Drawing on Charles Saunders Peirce, Baskerville and Myers (2004, p 331) state that consequences define human concepts: "In order to bring any concept into clear focus, human beings need only determine the human purpose and consequences of the thought." A research consequence of this is that the theoretical purpose should be formulated before action is taken.
- Action research is also based on the premise that *practical outcome embodies truth* – the notion that human thought is revealed in human action. James' (1907) argument is that any action is preceded by a theoretic truth. Thus, James' view is an expansion of Peirce's view into a theory of thought and action. Practical interventions in the situation-in-view need to be made to assess the theory guiding action.
- The work of Dewey (1938) turns pragmatism into a theory explaining *the logic of controlled inquiry*, as discussed earlier in this section. An important implication for research – along with the previous premise – is that the intervention is the basis for theory building.
- The fourth pragmatic premise of action research is the emphasis on the social context of action, elaborated upon by Mead (1938). Mead states that action is to be understood in relation to the social context. Mead further addresses that the inquirer becomes part of the social context in study, through their presence and interventions.

The point of this small discussion is to demonstrate that the philosophical foundation of pragmatism resonates well with an action research approach.

## Action Research is Interpretive

Galliers (1991) points out the potential problem arising from *subjective interpretation* of the world. Two stakeholders (e.g. researchers) may conceive

of a situation in different ways, thus theorize differently about the situation. By adopting the term *interpretive*, I position myself as a subject<sup>2</sup>, striving to interpret and understand real-world phenomena and conceptualize these. An important theoretical foundation to motivate this is Peirce's (1931) semiotics, i.e. human interpretation of – and intervention in – the world through signs. By looking upon myself as a subject, I acknowledge that my results are highly dependent on myself (as pointed out by Galliers (1991) as a weakness of action research).

One strategy to overcome the 'weaknesses of self' has been to expose the emerging results in various communities, thus generate feedback and food for thought on how to improve the concepts. Basically, academic exposure (e.g. conference papers and seminars) generates theoretically informed criticism and development ideas, thus the research results have passed through the academic quality control system of peer-review a number of cycles<sup>3</sup>.

Throughout this thesis, the term 'interpretation' is heavily used. The notion of an interpretative approach in this study does not fully correspond to interpretive IS research as commonly discussed in the IS field, e.g. by Walsham (1993, 1995) and others sharing that particular view of interpretive research. Still, the inquiry-based approach to research shares the interpretivist notion of researchers as subjects, and should thus acknowledge and live up to quality criteria of interpretive research. Klein and Myers (1999) propose a set of principles on how to conduct interpretive IS research. In the following discussion, it is shown how this research relates to those principles.

Klein and Myers (1999) suggests a *fundamental principle of the hermeneutic circle* that is the basis for interpretive research. This principle suggests that there is a need to shift focus between details and the situation as a whole to develop understanding of a phenomena. This is in line with the ontological and philosophical manifesto in this thesis, and this perspective on understanding has been a sensitizing concept in the interpretive process throughout empirical work.

Klein and Myers (1999) further define *the principle of contextualization*. This principle states that a critical reflection of the social and historical background is necessary, in order to understand how the current situation emerged. Such an understanding is desirable, and when possible, the inquiries in this thesis have been aimed at gaining such understanding. This is most evident in inquiry #5 – the inquiry situation promoted us to gain such contextual understanding.

As pointed out by Galliers (1991, p 336), action research requires ethical considerations: "[The action research] approach places a great deal of responsibility on the action researcher, who must be aware that in certain circumstances they would align themselves with a particular grouping whose objec-

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<sup>2</sup>The view of the researcher as a subject is clearly coherent with the ontological-philosophical manifesto in chapter 2

<sup>3</sup>See table 1.1 for an overview of publications intersecting with this thesis.

tives are at odds with other groupings." Thus, there is a need for self-reflection from the researchers, regarding the way they are liasoned with stakeholders, and the consequences this may have for their actions. This is clearly related to the *principle of interaction between the researchers and the subjects*, which assert that interpretive research "requires critical reflection on how the research materials (or "data") were socially constructed through the interaction between the researchers and participants." (Klein and Myers, 1999, p 72)

The *principle of abstraction and generalization*, according to Klein and Myers (1999, p 72) emphasizes the crucial role of theory in interpretive research. Theory is a sensitizing instrument aiding the researcher in viewing the world in a certain way. As expressed by Klein and Myers (1999, p 72), "[..] it is important that theoretical abstractions should be carefully related to the field study details as they were experienced and/or collected by the researcher". In this research project, there has been a strive to apply this dialectical type of understanding – based on both empirical findings and theoretical studies in the realm of human understanding and social action – in the process of theoretical abstraction.

Further, interpretive research requires an openness to revision of previous abstractions. The researcher should be sensitive to differences between 'the story that data tells' and the theory base of the actual inquiry. Such sensitivity is a prerequisite for continuous cycles of revision, allowing theoretical abstractions to emerge through empirical studies. Klein and Myers (1999) refer to this as *the principle of dialogical reasoning*. The view of knowledge as provisional and evolving is coherent with Dewey (1938).

In resonance with the actor-as-subject issue, and the semiotic starting points for this thesis shown in chapter 2, Klein and Myers (1999) define *the principle of multiple interpretations*. The principle states that the researcher needs to acknowledge that there are different views – a.k.a. different interpretations – of phenomena occurring in practice.

Finally, Klein and Myers (1999) point out an aspect of power and politics in interpretive research. *The principle of suspicion* suggests that the researcher needs to be sensitive to "'biases' and systematic 'distortions' in the narratives collected from the participants" (Klein and Myers, 1999, p 72). Such political sensitivity is supported by the pragmatic approach, which recognizes intention as an important aspect of action. As a researcher, one must strive at understanding not only *what* is being expressed, also *why* it is being expressed.

## Action Research in IS is design-oriented

The process of writing this thesis has been a ten year endeavor. During this elongated process, the interest for *design science research* and *design theory* has grown strong in the information systems community. Some scholars claim that action research and design science research are similar (Lindgren et al., 2004; Järvinen, 2007). Iivari (2007) considers it problematic to view the two

approaches as similar. There have also been explicit proposals on how to integrate action research and design research (e.g. Sein et al., in press).

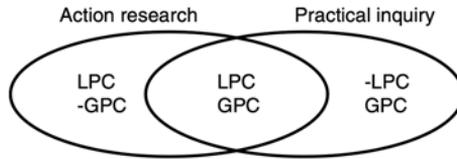


Figure 3.2: Action Research versus Practical Inquiry (Goldkuhl, 2008b)

Goldkuhl (2008b) defines the relation between practical inquiry and action research as depicted by the action diagram in figure 3.2. **LPC** refers to *local practice contribution*, while **GPC** means *general practice contribution*. As shown in the figure, Goldkuhl states that action research is typically expected to contribute to local practice, while practical inquiry always should contribute to general practice. An important implication of this, as Goldkuhl (2008b, p 5) puts it, is that "intervention is not a necessary condition for all practical inquiries. Sometimes a close investigation and diagnosis of local practices will give sufficient data for formulation of practical SBK [Scientific Body of Knowledge]". In this thesis, this motivates the notion of inquiry as an overarching concept: **Inquiry encompasses both evaluation and design**. This is also consistent with Dewey's pragmatism, as discussed in the previous section.

The focus we put on *technology design* as part of inducing change into the social world is a design-oriented research approach. We acknowledge that design theory (and design-oriented research) within IS research may be conducted and assessed using other lenses (as outlined in section 1.3). Järvinen (2007) proposed that action research shares essential characteristics with design research. This is disputed by – among others – Iivari (2007). The fifth inquiry in this thesis is an action research project, with a special focus on the induction of change in a work practice, accompanied by design and implementation of an IT artefact into that workpractice. We conceptualize this approach in general as a practical inquiry; in specific as a **design-oriented action research approach**. Recently, the *action design research* approach, combining action research and design research, has been proposed Sein et al. (in press) as a reaction against the bias towards technological rigor at the cost of organizational relevance.

At this point, there is a need to reflect about the relation between *practical* theory and *design* theory. The way practical theory connects to the philosophical perspective in this thesis – pragmatism – is a rationale to adopt practical theory as a meta-theory to assess my findings. There is clearly a relation between practical theory and design theory (which also has pragmatist roots). According to Goldkuhl (2008b, p 9), a design theory may be conceived of as "a special case of a practical theory; a design focused practical theory."

Conceptually, I agree with this statement, but there is a need to reflect about the consequences of such a definition. Practical theory is inclusive: Any concept (instrument) that helps the inquirer in the endeavour of understanding a contextual whole may be assessed using the criteria for practical theory. This thesis results in a number of concepts (instruments) that aim at being practically useful in inquiry. These concepts could also be conceived of as design science artefacts (March and Smith, 1995; Hevner et al., 2004), or possibly design theory (Walls et al., 1992, 2004; Gregor and Jones, 2007a). These design-oriented IS research strands offer insights into both the process of design-oriented research and the product of such research. The starting point for my research is clearly practical inquiry and practical theory. However, while design-oriented IS researchers pursued a valuable meta-theoretical discussion on design-oriented IS research throughout the last decade, an important part of this research process has been to continually follow and assess the discourse on IS design science research and design theory in IS. Consequentially, this work has been strongly influenced by ideas from those areas, and led to contributions into the ongoing discourse on design-oriented IS research. These contributions – corresponding to the third research question – are further discussed in chapter 11, and also partially reported in other research publications (Sjöström and Ågerfalk, 2008, 2009; Sjöström, 2010).

## Action Research Results Need Justification

Action research clearly promotes relevant research, in that it typically starts out from problems in real-world practical settings. As a researcher it is also important to demonstrate the validity of one's findings. The problem is illuminated by Goldkuhl (2004, p 63): "How do we know that some practical knowledge is good knowledge? This is the problem of practical knowledge validity." Without a clear strategy for justification of research results, one cannot raise credible claims about the validity of those results.

Goldkuhl (2004) suggests that we justify the validity of practical knowledge through three grounding process: Empirical grounding, theoretical grounding and internal grounding. The iterative approach to theorizing in this study – which continuously alters focus between theory, empirical investigation, and conceptualizations that aim at being related and cohesive – fulfils the idea that "these three grounding processes should be used in a continual and iterative way through the emergence of a design theory." (Goldkuhl and Lind, 2010, p 4). Given pragmatism as a philosophical origin of multi-grounding, and Goldkuhl's (2004) explicit view on design theory as a type of practical theory, I conceive of the quote to be valid for practical theory in general, not only design theory. Figure 3.3 illustrates the three grounding process<sup>4</sup>.

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<sup>4</sup>The design of this study is clearly based on the multi-grounding approach, as illustrated in figure 3.1.

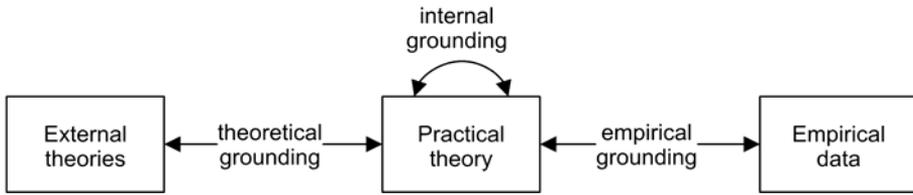


Figure 3.3: Three types of grounding (after Goldkuhl, 2004)

Empirical grounding is the process where the researcher interprets data and experiences from the empirical setting to inform theory development. In this study, this corresponds to the inquiries. Theoretical grounding is the process where the knowledge base informs the researcher in generation and validation of results. Internal grounding refers to the process where the emerging results is checked for internal cohesion. As shown in each inquiry, there is a theory base and empirical data. The theory base consists of both external theories, and the emerging results in this study. Thus, each inquiry includes both empirical, theoretical, and internal grounding. Furthermore, the results chapters are based on all five inquiries, and establish and relate a set of constructs (and relations between constructs). As such, there has been a continued effort of theorizing that is not bound to the inquiries *in isolation*, but to the bulk of them. This means additional theoretical and internal grounding of the concepts.

A note on the topic of internal grounding is how the research questions as such invite to an internal grounding process. Considering the second research question ("How can commonly discussed IS use qualities be described, related and well understood based on such a conceptualization [of the IT artefact]?"), it may be seen as a way of validating the first research question: By attempting to theorize further based on the conceptualizations made as a response to the first question, the progenitive qualities of the conceptualizations are assessed, and implications for further research may be derived. This approach benefits the answer provided to the first two questions, while triggering an iterative conceptualization process. The way the questions are posed is thus a way of facilitating a hermeneutic circle in the research process. In a similar manner, there is a dialectic relation between the third research question and the first two questions.

### 3.4 Research Ideals

The meta-theoretical discussions above have revealed a number of ideals governing this study. Some ideals were also briefly introduced in section 1.5. For clarity, those ideals – and the manner in which they are addressed as part of research design – are repeated here:

- *Relevance* – ideally, research should contribute to society by addressing real-world problems. The approach in this study addresses this ideal through research that is conducted in close collaboration with practice, and on basis of problems experienced in practice.
- *Rigor* – research should be conducted in a rigorous manner, and clearly address the validity of the results. This study adopts the notion of three grounding processes from multi-grounded theory: Empirical grounding, theoretical grounding, and internal grounding.
- *Principles for Interpretive Field Research* - based on the perspective that researchers are subjects interpreting the world, there is a need to adopt well-reflected principles for interpretive research. In the previous section, such principles and their meaning in this study were addressed.

Whereas the three ideals listed above are addressed *throughout* research, and by the way in which research is conducted, there are two additional ideals – *practical utility* and *premises for theorizing the IT artefact* – that primarily address the characteristics of the research *results*. These ideals will be explicitly used as instruments to post-assess the results, and deserve further elaboration in the subsections below.

## Practical Utility

As stated in the previous section, there is a strive to develop *practically useful* knowledge in this thesis. Thus there is a need to reflect about how the practical utility of research results can be assessed. Drawing on (among others) Dewey's pragmatism, Cronen (1995, 2001) elaborates on *practical theory* – theory that is used for and within an inquiry process by the inquirer in joint action with other participants in the process. Practical theories should help us to see things, aspects, properties and relations which otherwise would be missed (Cronen, 2001). As expressed by Cronen: "Its use should, to offer a few examples, make one a more sensitive observer of details of action, better at asking useful questions, more capable of seeing the ways actions are patterned, and more adept at forming systemic hypotheses and entertaining alternatives" (ibid, p 30).

Practical theory is clearly in line with the pragmatist thought that the application of a concept is the most relevant criterion of its value (James, 1907). Cronen (2001) discusses criteria for evaluation of practical theory, as presented in table 3.1. This view of practical theory has been present in the research process, and also the basis for a structured discussion about the results of the research (section 12.3 is a Cronen-based assessment of the theoretical contributions presented in this thesis). A motivation for the practical theory approach is to promote the results of the thesis to be adopted by practitioners, thus counteract the problematic issues of theory use in practice (Rogers, 2004) which were discussed in section 1.5.

Table 3.1: *Evaluation criteria for practical theory (after Cronen, 2001)*

<p><b>General characteristics as a practical theory.</b> The instrumentalities of a practical theory should guide those activities of inquiry that develop, organize, test, and reconstruct: 1) Percepts of the situation-in-view, 2) Provisional Hypotheses about how particular percepts are related, 3) systemic hypotheses (judgments), 4) actions taken in the inquiry process, and 5) consequences implicated by actions taken beyond the original situation in view.</p>
<p><b>Guide for theory application.</b> A practical theory should provide sufficient guidance for the use of its instrumentalities. Definitions, descriptions, models, and case examples all contribute to guiding its use. Meeting this criterion is not a matter limited to providing formal definitions with the form of analytic propositions.</p>
<p><b>Generation of alternative hypothesis.</b> A practical theory should facilitate the creation of alternative systemic hypotheses. The details of experience typically amenable to more than one coherent explanation. A single explanation blinds the inquiry process to alternatives and stymies an investigator when a particular line of inquiry is unfruitful.</p>
<p><b>Adaptability to specific situations.</b> A practical theory should allow for further development of old methods and creation of new ones. As a practical theory is employed in a new and different kind of situation, methods may have to be developed or adapted in response.</p>
<p><b>Richness of instrumentalities.</b> A practical theory should grow in the richness of its instrumentalities. Logical positivist theories depend on propositional form. The terms in a proposition are elaborated only by breaking them down into smaller component parts. In practical theory, by contrast, we look for richer, more useful ways to explore what is involved in, say, a "consummatory moment" or a client's "story". Our understanding of such instrumentalities should develop as we use the theory.</p>
<p><b>Support for observations and explanations.</b> A practical theory should lead to greater sophistication for all parties involved including the professional inquirer. Its use should make one a more sensitive observer of details in action, better at asking useful questions, more capable of seeing the ways action are patterned, and more adept at formic systemic hypotheses and entertaining alternatives.</p>
<p><b>Support for participation.</b> A practical theory should provide instrumentalities for including the person using it as a part of the inquiry process. Practical theories reject both a subjective and an objective understanding of inquiry. Thus they need to be able to take account of the practitioner as participant when that is useful.</p>

Cronen summarizes the evaluation criteria in four categories, by stating that they determine if a theory is useful for "(1) identifying a situation-in-view, (2) constructing judgments (systemic hypotheses) that (3) implicate actions leading to (4) the consequence of improving the situation" (ibid p. 29). These stages are a condensed version of Dewey's (1938) description of the stages of inquiry.

## Premises for Theorizing the IT Artefact

Orlikowski and Iacono (2001) propose five premises as a starting point for theorizing the IT artefact. These five premises are well-cited in the IS field and are clearly relevant to the purpose of the thesis.

1. *Design is value laden* (c.f. Järvinen, 2008). Said Orlikowski and Iacono (2001, p 131) "IT artefacts are not natural, neutral, universal or given [...] We need to recognize IT artefacts as products of human design, thus shaped by the "interests, values, and assumptions of a wide variety of communities of developers, investors, users, etc."
2. *IT artefacts are part of socio-cultural context*. Orlikowski and Iacono (2001, p 131) argue that we need to see the artefact as "embedded in some time, place, discourse and community."
3. *IT artefacts are parts of a technological context*. Orlikowski and Iacono (2001, p 131) state that "IT artefacts are usually made up of a multiplicity of often fragile and fragmentary components, whose interconnections are often partial and provisional and which require bridging, integration, and articulation in order for them to work together".
4. *IT artefacts emerge in human activity*, and "undergo various transitions over time [...], while coexisting and coevolving with multiple generations of the same or new technologies at various points in time." (Orlikowski and Iacono, 2001, p 131)
5. *IT artefacts are dynamic*, and need be dynamic since the world around them is in flux. In the words of Orlikowski and Iacono (2001, p 131), "[The IT artefact's] stability is conditional because new materials are invented, existing functions fail and are corrected, new standards are set, and users adapt the artifact for new and different uses."

## 3.5 Overview of Inquiry Situations

This section is an overview of the characteristics of the five inquiry situations, including a motivation of the selection of cases. Table 3.2 introduces the five inquiry situations.

The five cases target a diversity of IT artefacts in different social settings. The emerging theoretical concepts have been developed and tested in different ways in the five inquiries. The inquiry contexts encompass both 'discovery'

Table 3.2: *Overview of inquiry situations*

Inquiry situation	IT artefact(s)	Intervening actors and media	Interpreting actors and media
<p><b>#1: Evaluation</b></p> <p>Coordination of shared resources in a university environment</p>	Scheduling System, Intranet, TV Screens	Teachers and administrators update schedules using a desktop application.	Teachers, administrators, and students interpret schedules using intranet, web site and TV screens located at the university.
<p><b>#2: Evaluation</b></p> <p>Managing syllabi in a university environment</p>	Syllabus Database (Intranet)	Teachers and administrators update and access syllabi using a desktop application.	Teachers, administrators, and students interpret syllabi using intranet.
<p><b>#3: Evaluation</b></p> <p>Navigating complex information repositories in a library</p>	Search application (3rd party artefacts)	3rd party systems and library staff maintain the publication index which is the basis for searching.	Students, teachers and library staff search for publications using the library's intranet.
<p><b>#4: Evaluation</b></p> <p>Essential and accidental communication in a web shop &amp; community</p>	Social Web Shop (3rd party artefacts)	The interventions and interpretations taking place in this situation are too complex to summarize here. They are presented in detail in chapter 7.	
<p><b>#5: Design &amp; evaluation</b></p> <p>Change of work processes and design of IT system for administration of personal assistance in Swedish municipalities.</p>	Web application for assistants and clients, Mobile application for assistants, desktop application for managers	The interventions and interpretations taking place in this situation are too complex to summarize here. They are elaborated on in detail in chapter 8.	

and 'justification', to paraphrase Kuhn (1970). Each inquiry is presented in a dedicated chapter (chapters 4 – 8), showing the detailed structure and contribution of each inquiry.

At this point there is a need to clarify details on each inquiry and reflect upon the connection between the five inquiry situations and the inquiry process. Inquiries #1, #2, and #4 were performed by researchers only, and they did not include any actual intervention in the world. Inquiry #3 meets all of Dewey's stages of inquiry, from situation-in-view to the consequences of improving the situation. However, in line with Dewey's thoughts on inquiry, a contextual approach has been adopted in all inquiries, and the IT artefact has been studied from a broad perspective, taking into account the "contextual whole" (people acting by using artefacts in a social setting). Inquiry #3 was a "full" inquiry, involving the staff from the library and the library's clients (students and staff). The IT artefact was re-designed after the evaluation, partially based on the evaluation results. Inquiry #5 is a full-scale design-oriented action research project (still ongoing), with an analysis of the current situation, and an intervention through change of work processes and design of an IT artefact to empower various actors in the organization. Table 3.3 depicts the empirical data in the five studies, and short statements characterizing the inquiries.

Table 3.3: *Characterization of Inquiries*

#	Empirical Data	Character of Study
1	IT artefact and logged reflections of problematic situations related to the use of the system.	Heuristic evaluation of a scheduling system, combined with author's experience from using the system in the teacher role.
2	IT artefact, system documentation, and staff e-mails	Analysis of business communication problems in relation to the design of the user interface of the syllabus database.
3	IT artefact, interviews with users, think-aloud observations of users working with system, inquiry of business issues.	Triple-perspective study of a search application in its context: Library point of view, Student point of view, and University staff point of view.
4	IT artefact, user-to-user communication through IT artefact, HTTP request logs	Evaluation of communication and identity cultivation in an online web community/shop.
5	Field notes, interviews, workshop notes including feedback from prototyping sessions and development sprints.	Work process changes; design and construction of IT artefact to improve administration of personal assistance in the Swedish municipal sector. Continuous evaluation through prototyping and agile development, and specific evaluation of pilot use of the IT artefact.

The five inquiries show the use of IT in different social contexts, thus provides a *variation* of empirical data as a basis for conceptualizations. They represent different types of task (scheduling, formulating and disseminating education service contracts, searching information, engaging in an online community, and collaborating to handle time reporting, report auditing and invoicing in public administration). They also represent different social environments: The first two IT artefacts are intra-organizational, the third one is inter-organizational, and the fourth one is web based and open to public visitors, but also an example of inter-organizational collaboration. The fifth inquiry is situated in an environment which differs clearly from the first four, and it is also by far the largest inquiry in the research process. Further, the inquiries differ in methodology: The means for assessing each situation has varied, since the backgrounds of the inquiries are different, and driven by a continuously emerging research interest, and sometimes also influenced by external assignments. The access to empirical data differed between the inquiries. Chapters 4 – 8 includes more detailed discussions about the character of each case.

The inquiries provided qualitative empirical data, which have been interpreted and abstracted into theoretical concepts related to the research questions. These concepts have emerged through several cycles of refinement based on theory, empirical data, and peer-reviews leading to academic publications. The issue on how to represent each inquiry within the thesis has been addressed as follows. Each inquiry is presented in detail through five views: 1) Overview, 2) Theory base and theoretical concerns, 3) Inquiry details, 4) Inquiry results, and 5) Contributions to theory development. The *overview* shows an overview of the inquiry process. *Theory base and theoretical concerns* view explains how the inquiry was theoretically informed, and motivates why the theoretical perspective at hand was relevant to adopt in the evaluation. The theoretical concerns – i.e., the research interests motivating the inquiry – are also presented here. The *Inquiry details* section provides more detailed insight into the inquiry<sup>5</sup>. The *inquiry results* show the outcome of the inquiry, which in some cases is an evaluation (or systemic hypothesis, to paraphrase Dewey) of the post-inquiry situation. Finally, the *contribution to theory development* aspect includes reflections on how the particular inquiry has contributed to the development of theory in the thesis.

## 3.6 Inquiry Processes

This section shows the activities performed in the research process. The main principle for the research stems from a pragmatic perspective on knowledge

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<sup>5</sup>The detailed descriptions vary between the inquiries due to the significant differences between the inquiry situations.

development: We need to apply a concept in order to determine its usefulness. Consequentially, this work is empirically informed by studying the use of IT systems in their social context. That is; by inquiry into various situations we learn about the impact of IT artefacts on social interaction in different settings. This way; we gather empirical data that may be used to reason about the first research question (concerned with understanding the IT artefact as a concept). In addition, the inquiries render empirical data that can be used to reason about various use qualities of IT artefacts (corresponding to the second research question).

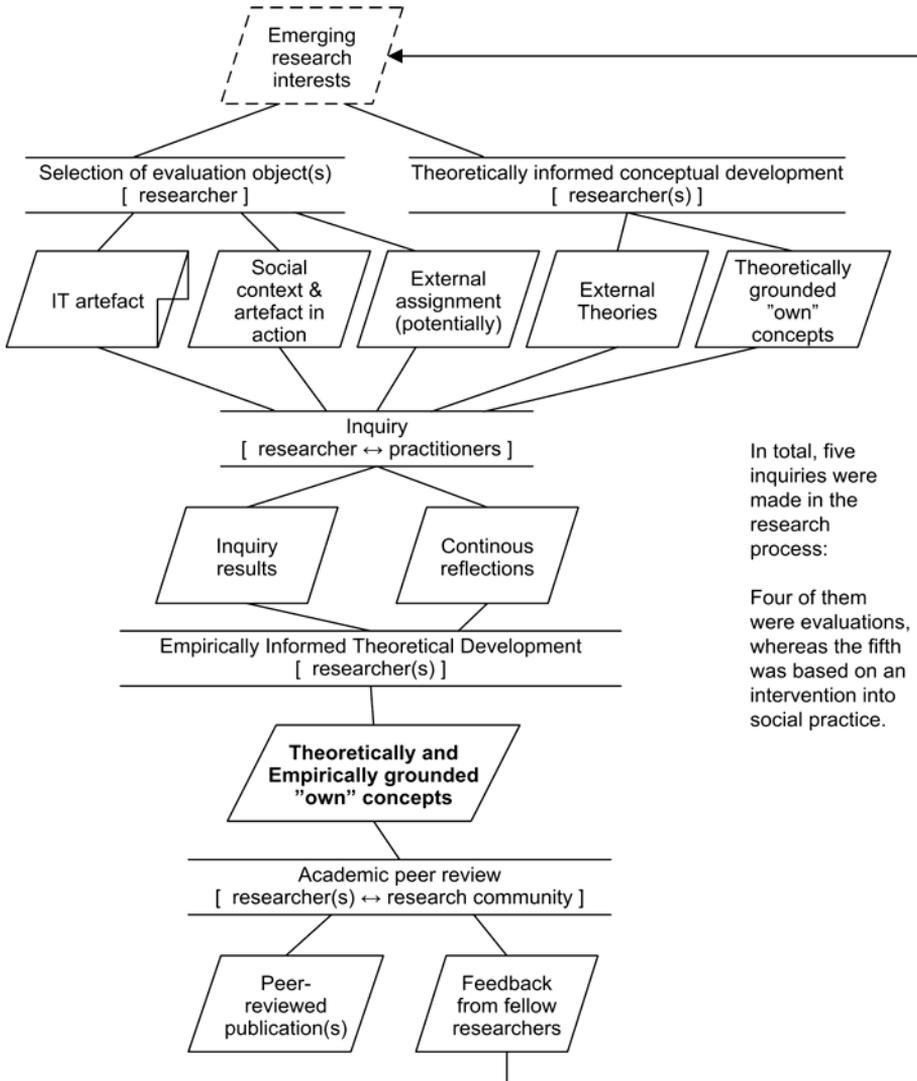


Figure 3.4: A pragmatic research process based on evaluations

The inquiries are embedded in an overarching research process, as depicted in Figure 3.4. Appendix A explains how to interpret action diagrams.

It would be wrong to state that this thesis is the result of one, original research design. Rather, the path to a complete thesis has been unpredictable and opportunistic in a number of ways. The publications referred to (see section 1.6) have been written at different times, focusing single points. The research design for each paper has been partially driven by opportunity (what has been interesting and available at that particular time). The funding for my research has been irregular and originated from different sources. This does not mean that the thesis is the result of random activities – all previous publications share some characteristics: A pragmatic approach to understanding the world, both in terms of ontological and epistemological matters. All the publications produced in this research process lead to concepts that in some way relate social action to (the design and use of) information technology. By working with this perspective over a period of time, the aim and research questions in this thesis have evolved. It is fair to state that the research questions have been subject to continuous revision. These emerging research interests, as depicted in figure 3.4, have grown more stable over time.

The research interests have guided both the theoretically informed conceptual development and the selection of evaluation objects. Two inquiries (#3 and #5) were externally funded, and the work in inquiry #3, as a consequence, was explicitly guided by a clear assignment from the sponsor. Furthermore, each inquiry has been preceded by theoretical work, where external theories and the emerging research results were influential in guiding the inquiry process.

Based on the inquiry results, the continuous reflections, and the theoretical framework in use, the emerging research results have been analyzed and improved through 'empirically informed theoretical development', as well as internally grounded in resonance with the principles for multi-grounding (see section 3.3). Apart from such reflection-*on*-action, there has also been a continuous reflection-*in*-action throughout inquiry (Schön, 1983).

At different stages of the research process, the results have been substantial enough to write research papers, which have been peer-reviewed and published. This has also resulted in feedback from fellow researchers, both from the review process as such and from the events where those publications are presented.



Part II:

Five Cases of Inquiry



## 4. Evaluation of the Scheduling System

This chapter describes the evaluation of a scheduling system – an IT artefact used for coordination of shared resources (such as rooms, computers, and video projectors) in a university environment. This evaluation and the abstractions made from it have previously been published by Sjöström and Goldkuhl (2002, 2004).

### 4.1 Overview

Figure 4.1 shows an overview of the inquiry process. Section 4.2 shows the theory base and the theoretical concerns in this evaluation. Section 4.3 shows a selection of empirical data. The evaluation results are presented in section 4.4, and the contributions to theory development are discussed in section 4.5.

### 4.2 Theory Base and Theoretical Concerns

In this evaluation, the theoretical starting point was the set of evaluation heuristics defined within ISAT (table 2.2). Information Systems Actability Theory was introduced in chapter 2.3, but will be further elaborated here to properly introduce this evaluation. ISAT explains different actors' work with IT systems as performance of actions towards other actors in some social context. The actions performed by humans using the IS are considered social, since they are directed towards human beings – explicitly or implicitly. An actable IS should therefore ideally support a human to perform actions in a desired manner in some social context.

IS actability has been discussed at several levels: both as interactions between humans and machines, and as people performing actions using the IT artefact as an instrument in different use situations. The given information content of screen and paper documents can be analyzed from the user's point of view, to determine whether the information supports the performance of action in a satisfactory way. This raises questions about the illocutionary force of a message – what is done by the sender in relation to the recipient through communicating. According to speech act theory (Searle, 1969), the proposi-

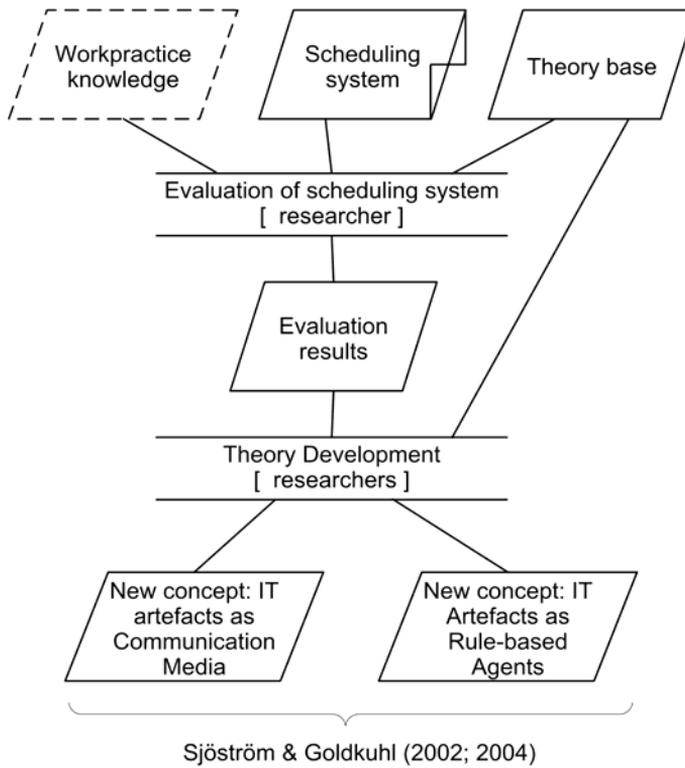


Figure 4.1: Process overview for the evaluation of the scheduling system

tional content – what is being talked about – is only considered to be one dimension of a message.

While ISAT as such is a reaction towards a limited focus on semantics, this evaluation was a reaction towards the strong focus on speech act theory in ISAT at that time, which arguably did not pay enough attention to the receiving actor who interprets a message. This evaluation aimed at understanding the human-to-human communication level, where further questions are raised, since this is the level where an actor actually receives and interprets a message, whereby social interaction takes place between actors – social relations emerge and are cultivated. By taking into account the interpretation, the social (or organizational) effects of a speech act through the information system could be analyzed. Previous ISAT publications mainly focused the interaction and action levels – the human to human communication level had not yet been thoroughly discussed. This is challenging, since most social action theories, including the theoretical foundations for ISAT, were developed without consideration to mediators as complex as information systems. Since the human-to-human communication level of action is most clearly related to social action theories, it should be further researched – we believe it is the main link between the IT system and the business processes in organizations. Thus, a theoretical concern in this study was to enable refinements of ISAT on the human-to-human communication level.

Much of the discussions concerning IS actability has been based on the division into three types of use situations (see section 2.3). Following this model, there seems to be a risk that evaluation of IS usage can be reduced to these use situations. The focus on these parts can move the focus away from the human-to-human communication. This division leads to a strong focus on the parts (which are closer to human-computer interaction) and not on the wholeness (the interaction between humans and the resulting establishment of social relations). This can partially be seen in the actability heuristics in Table 2.2. The heuristics are to a large extent formulated with a focus on usage of information systems as an action instrument. Human-to-human communication aspects can be found in some of the heuristics (e.g. in heuristic 2, 5 and 7). Many of the heuristics seem to have a narrower focus, being oriented towards the three types of use situations, especially the interactive use situation (see heuristics 1, 3, 5, 6, 8). The heuristics are mainly focused on analysis of screens, but they are not supposed to be used without knowledge about the users' work situations and the action the users wish to perform. An actability analysis should guide the evaluator to study and reconstruct the human-to-human communication. When screens are analyzed separately, the interventionist's view and the interpreter's view will be kept apart. In this evaluation, we suggested that sets of screens related to the same communicative act should be seen as a coherent whole, and be evaluated in relation to each other. This will give the possibility to see aspects of communication which otherwise can be disregarded in an actability analysis, according to the original heuristics (1-8).

While aiming at understanding different screens in relation to one another, there is still a need to adopt some theory to assess these documents. In this evaluation, Weber's (1978) definition of social action was situationally adapted to get guidance on how to more specifically assess communication action. Obviously, there are social considerations taken in a scheduling activity. Weber's concepts were used to derive some questions which were in turn used in the evaluation:

- What do the actors want to achieve (what are their goals and values)?
- Why do they want to achieve it? Why is it meaningful for them to achieve these goals and express these values?
- To what extent does the scheduling system help them achieve goals and express values?

Two different perspectives were used to evaluate the scheduling system in its social context. The first perspective was an evaluation of the screens in the scheduling system, based on the ISAT heuristics. The second perspective was based on the idea that we need to understand screens in relation to one another, to properly assess communication and social action. In order to assess social action, the three questions derived from Weber's social action theory was posed to perform the assessment.

### 4.3 Inquiry Details

In this study, there were two sources of data: The IT artefact as such, and my personal experiences from using it. Thus, the evaluation was focused on the IT artefact and anecdotal evidence of its use in the organization, as presented below.

#### Characterization of the IT artefact

The scheduling system is used at a university to schedule lectures and other types of teaching session. It is also possible to schedule extra equipment, such as computers and video projectors. Two views have been in focus in this evaluation: The screen for overview and searching, and the screen for scheduling a new teaching session.

Figure 4.2 shows the *screen for overview / searching* – an overview of the present schedule in the system. All the current bookings (future bookings including today) are displayed.

Each item in the schedule is a result of a previous action performed by some actor in the organization. When a teacher is about to schedule, he/she must interpret the current state of business by looking at this screen and by performing an interpretive act. Furthermore, the teacher has to navigate in the system (e.g. by searching in the schedule). These actions are navigational, in

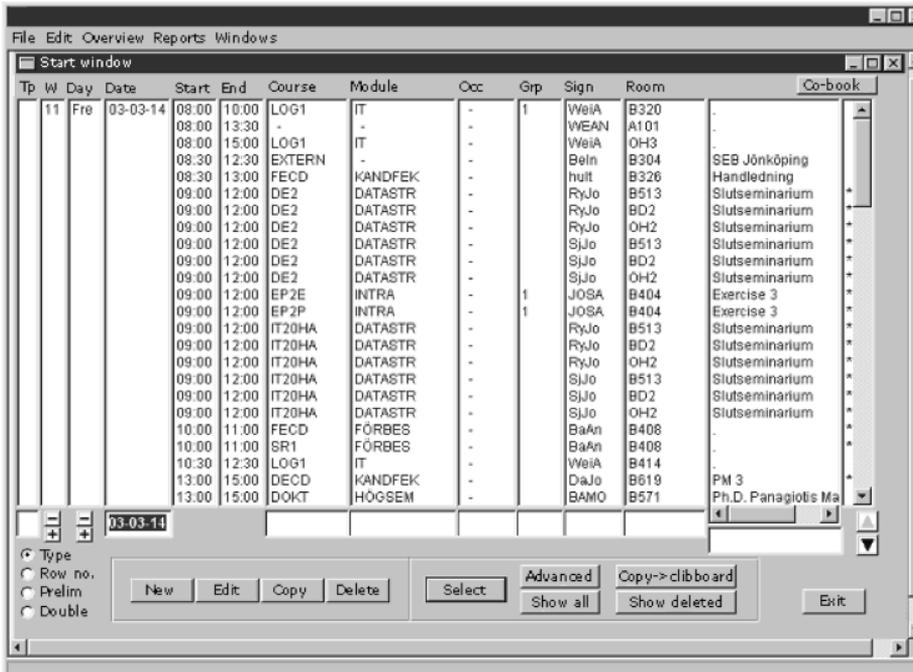


Figure 4.2: The screen for overview and searching

the sense that interactions take place, with the purpose of changing the current view of the system.

When the teacher has got an overview of the current bookings, he/she can create a new booking. This is done using the *screen for scheduling* (figure 4.3).

A set of interactions is needed in order to schedule the booking. This actual scheduling action is directed toward two groups of actors: Students and other teachers. The illocution is different with respect to these two groups. The purpose of communicating the message to the students is that the teacher wants them to show up at the lecture. The purpose of communicating it to other teachers is that the teacher wants to prevent them from booking that same room at the same time.

## Personal experiences of the scheduling system

The evaluation of the scheduling system was affected by my personal experiences of using the system. At the time of the evaluation, I had worked as a teacher at the University for a few years. It was impossible to overlook these experiences when performing a heuristic evaluation of the system. Thus, I decided to incorporate these into the evaluation process. This means that the

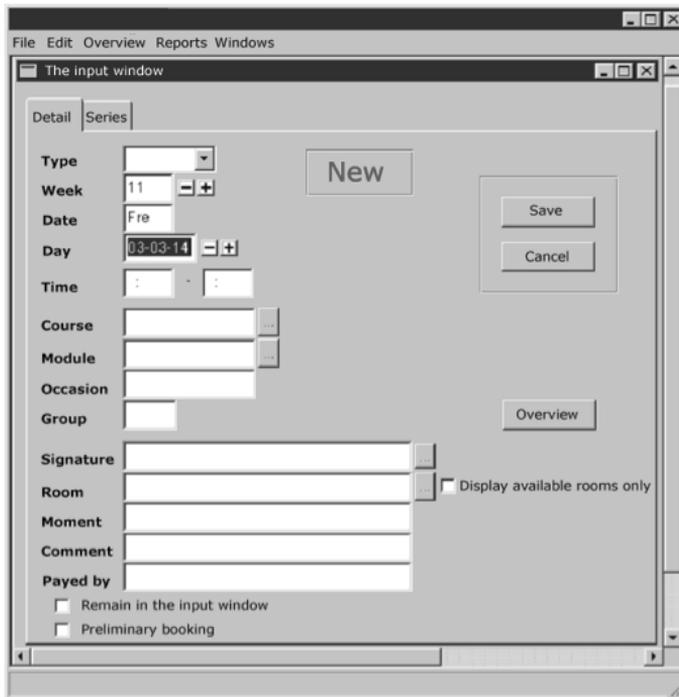


Figure 4.3: The screen for scheduling

scenario (next section) presented in the evaluation results is based on real events. In other words, I am the real world instance of the character “Adam” mentioned in the scenario below.

## 4.4 Inquiry Results

In order to put the evaluations in context, the scenario *last minute change* is used. The scenario has actually taken place and was experienced as very troublesome by the teacher. Several other teachers have expressed last minute changes as troublesome in collegial discussions.

Adam is a university teacher who - due to sudden illness - wants to perform a last minute change to the schedule. The system supports the re-scheduling, however there are several things left to do to ensure that his students receive this information. This is especially important to Adam, since many of the students commute to the university. Adam wants to make sure that the students receive this information as soon as possible – otherwise they might travel a far distance to the university in vain. This affects the students in several ways. The school’s image might change, their image of Adam might change and they might even

lose their motivation to complete the course. Only Adam knows the exact reasons why it's important to him to inform all the students. He takes several time consuming measures to notice them outside the IT system, since it does not support performance of these actions.

The main character is referred to as Adam, to provide referability to the discussions. The evaluation results will be presented in two parts. The first part is based on the assessment questions derived from Weber's social action concept. The second part is based on the ISAT evaluation heuristics.

### Evaluation informed by Weber's social action concept

In this evaluation, the last minute change was discussed from both the intervening actor's (the teacher's) and the interpreting actors' (the students') points of view. One way of illustrating how Adam performs the re-scheduling would be to use some visual aid. In this case we use action diagrams (Goldkuhl, 1996) to describe action logic in business processes. Action diagrams are explained in appendix A. Figure 4.4 describes Adam's action when performing a last minute change.

The ideal situation from Adam's perspective is that the students should gain knowledge of the change in the schedule in due time, i.e. quickly enough to avoid unnecessary inconvenience. The students have the option of receiving the message about the re-scheduling through different media: The Internet, the school's intranet or by watching TV-screens in different places at the school. The Internet site and the intranet site can be reached both from home and from school, and they look very much alike. Figure 4.5 illustrates how the student can check the schedule from the intranet, which is the most common way of accessing the schedule among the students.

These diagrams illustrate which actions the actors have to perform. Together, they tell us something about the action relationship that's formed between the actors.

What the teacher wants to achieve (the first question) can be derived from the scenario. He has made a last minute change in the schedule, and he wants to communicate this to his students. It is also important for him to be sure that they actually receive his message – he needs confirmation that his message has actually been communicated. An interesting reflection at this stage is that different teachers performing this action probably would have different goals. One extreme could be that just changing the schedule satisfies a teacher, thinking that it's up to the students to check for changes periodically. The other extreme would be that the teacher is not satisfied until every single student for sure has received and understood the message in due time. We argue that the goal varies with the individual; some shade of grey between the black and white extremes presented above. Sometimes the individual might be aware of his goals and sometimes they might be unconscious.

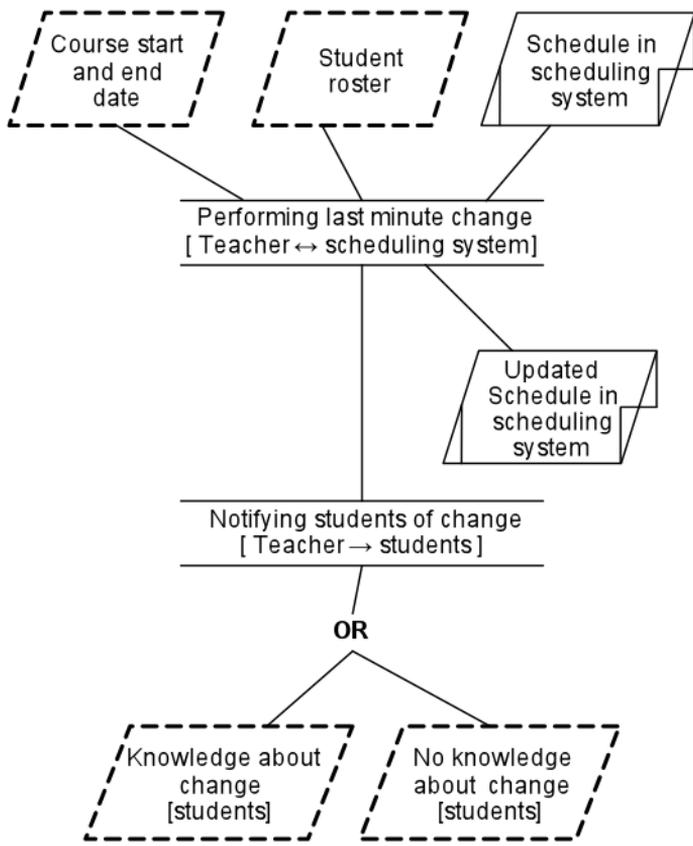


Figure 4.4: Teacher's actions in the last minute change scenario

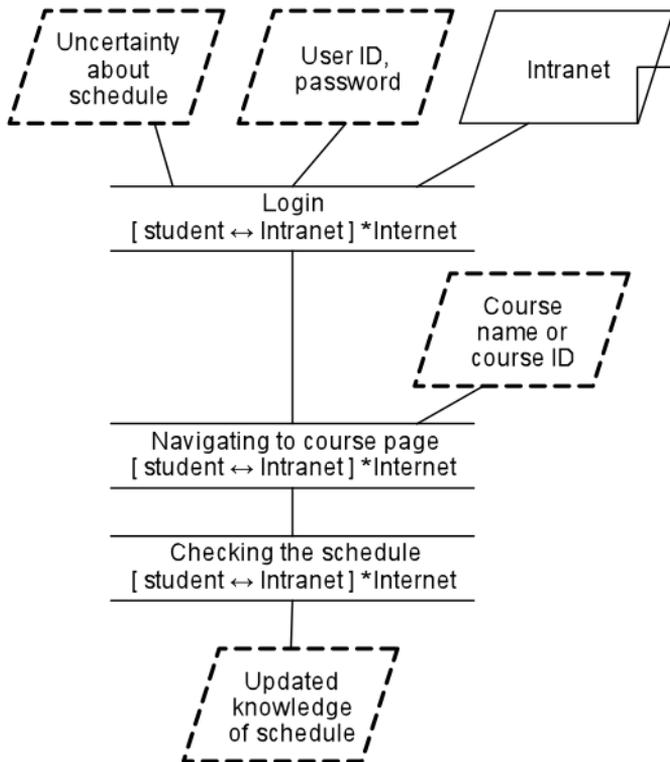


Figure 4.5: Student's actions in the last minute change scenario

The question why he wants to achieve these goals is not easy to answer, however inspiration from Weber can help us determine the orientation of this social action. Adam's wish to communicate the last minute change might have different reasons. If he wants to score high on the course evaluation, or if his goal is to maintain his favorable reputation among the students in general, his action would be characterized as goal rational. But if his only incentive to communicate his message were that he actually felt sympathy with the students that would have to commute to the university for nothing, his action would be value rational (it becomes an ethical issue). We could have a long discussion on this matter; how to describe Adam's action using other 'classes' of Weber's; the point is there can be many reflected or less reflected reasons and values that affect Adam when performing this action.

The third, and final, question is whether the IT system helps Adam to reach his goals - and express his values - when performing the last minute change in the schedule. In the case study, Adam can change the schedule in the system. But in order for him to fulfill his goals when performing this social action, he had to perform a number of additional tasks manually. A question that is interesting here is if the scheduling system at all should support Adam to achieve his goals completely - one could argue that it is not the intention that the system should solve such problems. We believe that the argument is valid to some extent, but it could also be an organizational problem that a teacher has to spend a lot of time on tasks that could have been supported by the IT system. This problem (from the teacher's point of view) also generates a question about the organization's goals with respect to service quality towards their customers.

The discussion above was mainly oriented towards the individual Adam; his goals and values. We may also attempt at discussing the organizational goals. What is the corporate policy when it comes to last minute changes? There may be no explicit norms and values concerning these matters. In the IT system there is no advanced functionality supporting dissemination of last minute changes. This can be considered to be one sign that this issue is not reflected or treated on an organizational level. It is left to individual teachers to handle such matters in their own ways. What is interesting here is that the concern about students from one single teacher (Adam), which should be seen as individual value rational actions, can be transformed to goal rational organizational action if the IT system is redesigned to include such functionality supporting quick dissemination. Think of the situation that Adam is very discontent about not being able to inform his students in ensured ways about last minutes changes. If Adam is bringing this concern to an open discourse with colleagues and managers, then this might lead to a change in the corporate policy followed by changes in the IT system. If the IT system now gives support to such actions (dissemination of last minute changes) this will be part of the organization's goal rationality (agreed upon by different actors within the university).

## Evaluation informed by ISAT heuristics

The ISAT heuristics were used as a tool to set focus on actability aspects of the system. The heuristics aided in identifying a set of problems in the current design of the scheduling system. Table 4.1 shows the results of the heuristic evaluation. Note that heuristics 9-11 were not in the list when the evaluation started – they emerged during the evaluation as they were needed to categorise some identified issues.

Table 4.1: Evaluation results based on actability heuristics

#	Evaluation results
1	<b>Situational context awareness.</b> There are several screens in the system where it is hard to understand which actions you can perform. Labels and headlines are unclear.
2.	<b>Good conditions for action in shown information.</b> A lot of knowledge about the organization is needed in order to perform a scheduling act, e.g. information about parallel courses and the number of students taking different courses. The IT system does not give this kind of support, which results in high cognitive load.
3.	<b>Good conditions for action in required information.</b> Some of the information the user provides to the system has an unknown meaning. For instance when the type of scheduled activity is chosen – there are options like ‘preliminary’, ‘exam’, ‘locked’ and others, but the meaning of these types is unclear (even with some experience from the workpractice). Further, at some points, the user has to provide information that probably could be automatically derived from the existing information in the system (e.g. connections between programs and courses).
4.	<b>Easily accessible and adequate action memory.</b> All previously scheduled activities can be found in the overview screen. Simple filtering (e.g. finding all scheduled activities for a specified teacher or class) is unproblematic once learned, but it is not fully intuitively afforded in the user interface.
5.	<b>Action legible IT systems.</b> A big problem is that different course codes are used in different contexts. The scheduling system uses one set of course codes, and the system where the students’ results are registered uses another set of course code. This is problematic for the teachers, who have to keep track of both versions of each course code during administration. Another thing that could confuse the user initially is that equipment (such as portable computers and projectors) is classified as rooms within the system. In order to book extra equipment, you would have to choose to book extra rooms.
6.	<b>Legible and relevant feedback.</b> Error messages are hard to understand due to the use of technology-oriented language. Sometimes there is no direct feedback – when an activity has been scheduled, there is no visible feedback whatsoever that this has happened. The user has to scroll through the bookings afterwards (or add a filter expression) to make sure that the activity has been successfully scheduled.
7.	<b>Visible actors.</b> There are visible actors in many parts of the system, at least to some extent. For instance, you can see who last changed a booking (who did it and when it was done). Since this is a scheduling system, actors like student groups and teachers are visible for the teachers when scheduling an activity. The teacher can thus see the intended recipients (interpreters) of the message.

(Continued on next page...)

Table 4.1 – Continued

#	Evaluation results
8.	<b>Restrictions and opportunities in navigation utilized.</b> Some screens in the scheduling system are modal, which means that no other screen can be accessed without closing the current one. There is no obvious reason for this design, and it's hard to tell if this makes the system more or less actable. More thorough user studies are needed to draw conclusions about the consequences of the modal design.
9.	<b>Accurate timing.</b> Time is an important aspect in the 'last minute change' example. During this study, we noticed that there was no heuristic that regards the time aspect, which led to the development of this new heuristic. The scheduling system does not give any indication to the teacher if the 'message' (that a lecture has been cancelled) has reached the intended interpreters (the students) in due time.
10.	<b>Interpretation initiative.</b> This heuristic was also developed during the evaluation. The conclusion in this case was that the scheduling system could have been more actable if the information about the 'last minute change' had been pushed to the students (e.g. via e-mail, or via SMS). As it is now, the student must take interpretation initiative to check the schedule.
11.	<b>Distribution of actions.</b> The third new heuristic concerns the distribution of actions – what should be done manually, and what should be supported by the system? In the evaluation of the scheduling system, there were several 'needs' that the teacher felt that, which led to a number of manual actions, that could have been supported by the system.

## 4.5 Contributions to Theory Development

This evaluation was a pilot study for this research. It was conducted as a heuristic evaluation, based on criteria 1-8 in the ISAT heuristics (table 2.2). However, as I had personal experience from the scheduling system, I was aware of certain issues with the use of the system, which were not satisfactory identified when evaluating the situation based on the ISAT heuristics. The issues at hand were apparently closely related to communication between humans and the social grounds and purposes governing this communication. Therefore, as a complementary theoretical source, Max Weber's social action concept was adopted and situationally adapted as an evaluation tool, in order to see how the use of the system and the issues at hand could be explained from that angle. The two assessment strategies rendered different evaluation results, which pointed out a need for a broader understanding of human-to-human communication within ISAT. This led to some conceptual development an addition of three new ISAT heuristics<sup>1</sup>. Further, two new concepts were developed, which may be used to identify and explain problems in other situations where IT artefacts are used as a medium for communication action:

<sup>1</sup>Ågerfalk (2004) suggested similar changes to the actability heuristics based on a comparison of face-to-face communication situations and computer-mediated human-to-human communication.

- IT artefacts as communication media – the pragmatic view adopted here means that IT artefacts are regarded as systems for technology mediated communication.
- IT artefacts as rule-based agents – the IT artefact does not only mediate representations, it also has the pre-defined ability to mediate and transform messages. This increases the complexity of IT as a mediator.

These concepts are further discussed in sections 9.1 – 9.2.

Additional conceptual development was made regarding the context of evaluation. By applying an actability perspective, based on the original actability heuristics, we set focus on certain aspects of the *last minute change* scenario. The analysis was mainly an analysis of screen and interactive use situations. Such an analysis points out a number of properties of the system that affect the user's performance of action when using the system. Some of these properties are related to human-to-human communication, but the heuristics as such only aid us in getting a scattered picture of the communication that takes place. The heuristic analysis has been performed from the interventionist's (the teacher's) point of view. We believe that the heuristics encourage an evaluation of *screens*, rather than an evaluation of the establishment of *action relationships* between actors. An important conclusion from this evaluation is thus that heuristic evaluation needs to be performed bearing in mind the overall communication goals in the social setting.



# 5. Evaluation of The Syllabus Database

This chapter presents the second evaluation, focusing IT-support for syllabi management in a Swedish university. A syllabus may be understood as a contract between the university and its students, specifying the goals, content, examination forms, literature, etc, of a particular course. Changes in a syllabus, and development of new syllabi, are important activities involving many stakeholders. This evaluation has been used as the empirical base for publications made by Sjöström and Ågerfalk (2003, 2005).

## 5.1 Inquiry Overview

Figure 5.1 shows an overview of the evaluation process. The theoretical base and theoretical concerns, including the assessment criteria used in the evaluation work, are discussed in section 5.2. Section 5.3 introduces empirical data that was analyzed in the evaluation. Section 5.4 contains the evaluation results, and section 5.5 addresses the theoretical contributions that were developed based on this evaluation.

## 5.2 Theory Base and Theoretical Concerns

This evaluation is part of the continued conceptualization of IT artefacts as instruments for communication action. The purpose of the evaluation was to further investigate the usefulness of the communicative perspective of user interfaces (section 9.1) and assess its practical usefulness for evaluation purposes.

The starting point for generating evaluation criteria was the four aspects of communication in the communicative perspective of user interfaces. These four types include 1) affordances (communicated from the designer to the users), 2) business communication to the user from other users (what I read), 3) business communication from the user to other users (what I say), and 4) navigation in the system (no communication takes place in this case).

Table 5.1 is a set of ISAT heuristics that are clearly focused on socio-pragmatic aspects of IT artefacts. See Sjöström (2003) for a more detailed motivation of this particular synthesis. Apart from the existing ISAT heuris-

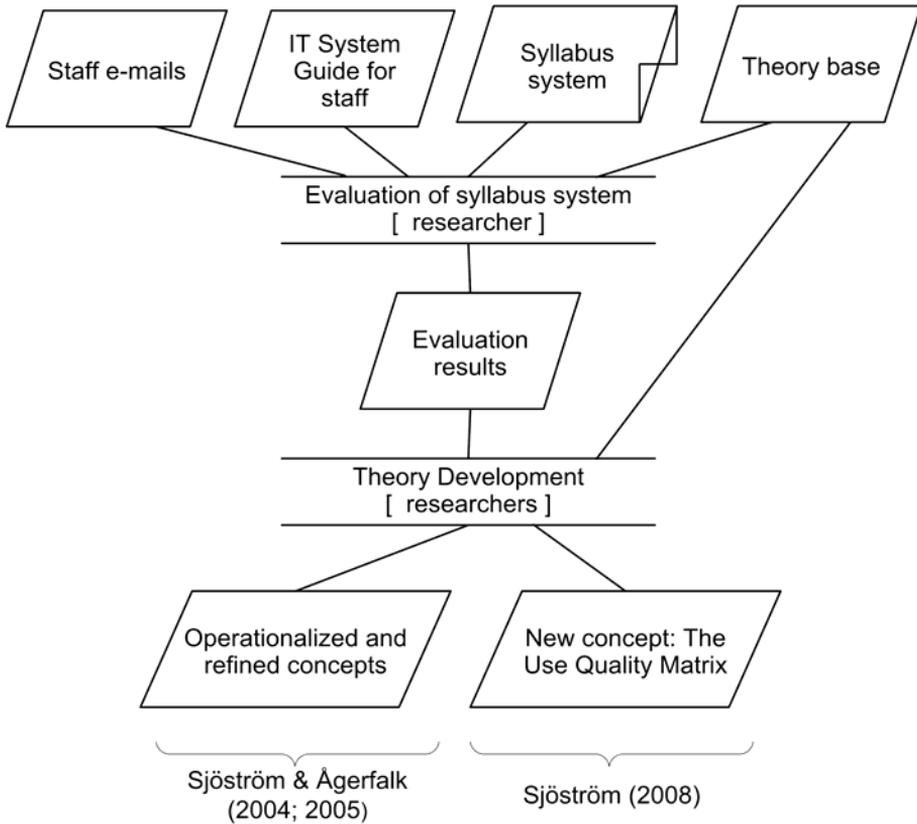


Figure 5.1: Process description for the syllabus database evaluation

tics, the criteria are derived from Weber's (1978) social action theory and the communication maxims of Grice (1975). Weber (1978) has been discussed previously in this thesis in different ways, and one of the implications of Weber's theory is that the manner in which a person acts in a social context is influenced by how others will interpret their action. Grice (1975) formulated a set of communication maxims, which capture parts of this influence in terms of the expectations one has on other people's utterances.

The set of criteria in table 5.1 is by no means exhaustive, but is sufficient for facilitating a discussion about action-related characteristics of IT systems. There are also some overlaps in the table. The reason for this is that we want to emphasize that some design advice are motivated in different ways; for example, keeping actors visible. It is also important to clarify that these criteria are not normative. Sometimes, for instance, there may be a point in *hiding* actors' identities. The criteria should be looked upon as an aid to focus communicative characteristics of the IT system, thus making well reflected design decisions regarding these issues.

Table 5.1: *Socio-pragmatic aspects of messages (after Sjöström, 2003)*

Criterion	Description
Visible Actors	Make the users understand the social context by making the actors visible in the IT system. This way, the users will be aware of the origin of messages, and whom they are sending messages to.
Timing	Allow the users to understand when other actors will interpret their messages. This can be done by making it transparent when messages reach their intended interpreters, and if messages are pushed to them or pulled by them.
Message Context	Promote qualitative utterances by 1) making information about previous actions available in the action memory and 2) making the actors visible in the IT system in order to make clarifications possible and promote users to trust the information.
Info Quantity	Promote a suitable quantity of information handling by 1) displaying and requesting an adequate amount of information in screen documents and 2) making the actors visible in order to allow users to retrieve more information if needed.
Action Affordance	Make sure that all required actions (business actions and navigation actions) are afforded and readily available by the IT system.

Table 5.1 directs attention towards social phenomena when analyzing a user interface, both from an *interpretation* and an *intervention* perspective: We may speak of two actions in relation to a sign: (a) the interpretation of messages and (b) the formulation/sending of messages. These are two different aspects of user-to-user communication enabled by the IT artefact as a medium. Table 5.1 provides specific questions concerning different properties in the user interface related to user-to-user communication. By combining these questions with the two actions towards a sign – interpretation and formulation/sending – we arrive at a set of questions<sup>1</sup> that facilitates the analysis of user interface features (see table 5.2).

These theoretically derived questions were used in this evaluation. The communicative perspective at hand worked as a progenitive theory, used to generate a new theoretical device to investigate an IT artefact in its use context.

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<sup>1</sup> According to the presented view of user interfaces (see section 9.1), the functionality afforded by an IT system is the result of a designer's work; i.e. a result of communication from designer to user. Therefore, the criterion *action affordance* is not discussed in relation to interpretation and formulation/sending, but in relation to action repertoire and user interface navigation alone.

Table 5.2: *Questions for analyzing communicative aspects of a user interface*

Question	Criterion	Part of UI
1. Who created each message?	[Visible Actors]	[Interpretation]
2. When were the messages created?	[Timing]	[Interpretation]
3. Are there other messages related to the interpretation of an existing message?	[Message Context]	[Interpretation]
4. Do I receive unnecessary information?	[Info Quantity]	[Interpretation]
5. Are the recipients of the information visible?	[Visible Actors]	[Formulation/ Sending]
6. When will the message reach its recipients?	[Timing]	[Formulation / Sending]
7. Are there other messages related to the formulation of a new message?	[Message Context]	[Formulation / Sending]
8. Do I have to supply unnecessary information?	[Info Quantity]	[Formulation / Sending]
9. Can I create this message that I need to communicate?	[Action Affordance]	[Action Repertoire]
10. Can I move to another part of the system as required?	[Action Affordance]	[UI Navigation]

### 5.3 Inquiry Details

As shown in figure 5.1, the empirical data consists of the syllabus system as such, the context of this system in terms of the organization's description of their use of syllabi, and a selection of e-mails related to the use of the system and to syllabi management issues. The data sources – described in table 5.3 – served as a basis for discussing the communicative features of the user interface of the syllabus system. The discussion is structured according to the set of derived evaluation questions.

Table 5.3: *Empirical sources and corresponding domains of interest*

Domain of interest	Empirical source
The role of syllabi in the organization	Excerpts from staff handbook
Characterization of the IT artefact	Access to the syllabus system
Business communication	Selected e-mails, concerning the work with the syllabus system

A further investigation of user experience would be interesting, but was beyond the scope of the study at the time. We would argue that the e-mail examples clearly indicate problematic issues and are sufficient to substantiate the points made in the evaluation.

#### The Role of Syllabi in the Organization

The teachers' guide, available in the staff handbook on the university's intranet, is intended to explain the role of syllabi in its business context. The teacher's guide shows that syllabi constitute an important part of the organizational communication, as indicated by the following examples:

- Syllabi are linked with the bookshop and the library.
- Confirmed courses are the basis for student registration
- The university's intranet contains course information that is imported from the syllabus system
- The syllabus system is linked to the class scheduling system
- The syllabus is used in the production of the ECTS catalogue, which is sent to partner universities to inform exchange students about courses given in English
- The short versions of the course description are used to produce descriptions of optional courses and elective courses
- The short versions of the course description are used to produce the descriptions of courses that are not part of a programme

Course descriptions are also published on the website [www.studera.nu](http://www.studera.nu), which is a national Swedish service for students to find information about programmes and courses at all Swedish universities.

The syllabi are used to map each course to a programme. This is also linked to Ladok – the Swedish national system for registration of credit points from Swedish universities. When a syllabus is changed and re-confirmed, a new Ladok ID is generated for each link between the course and its programme(s).

The syllabi are used by the administrative staff to design the examination plan, which is a schedule of written exams

Apart from the direct consequences, as briefly presented above, there are indirect consequences – a revised syllabus triggers various processes in the organization.

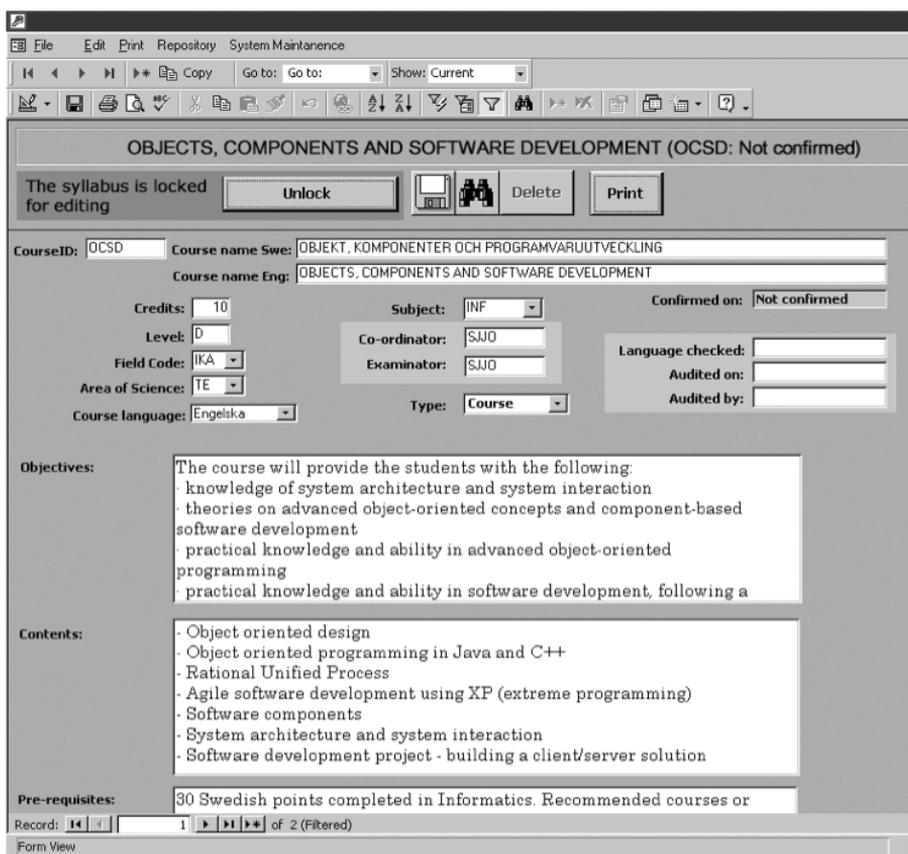


Figure 5.2: Snapshot from the syllabus system's user interface

## Characterization of the IT artefact

This section illustrates and describes the user interface of the syllabus system. The screenshot in figure 5.2 shows the part of the system focused in this study – the screen document where users can find and edit syllabi. This screenshot illustrates the syllabus system’s user interface and parts of the content of a syllabus.

The course described in this screen document has a set of attributes, such as name, ID, number of credits, level (A – D, where A is basic level and D is masters level), field code (e.g. *informatics* or *business administration*), area of science (e.g. *social science* or *technology*), and course language. Furthermore, the description of a course includes course objectives, course contents, examination type, literature, a short description of the course in Swedish and English, *et cetera* (there are more text fields in the window which appears when scrolling down – the scrollbars have been cut off from the right side of the picture in order to save some space). Each course has a course co-ordinator, who is responsible for the administration and planning of the course, and an examiner, who is responsible for the overall quality of the course. The syllabus is either *confirmed* or *edited but not confirmed*. The syllabus may also be audited to secure the quality of the language. In order to edit the contents of a syllabus, it has to be unlocked. After finishing editing, the syllabus is supposed to be locked again.

## Business Communication

This selection of e-mails illustrates communication situations that are related to the development of syllabi.

From:	Joe the Administrator
To:	Ben the course-coordinator
Date:	2003-05-28 15:19:36
Subject:	Syllabus for course X
Hi Ben!	
There is a copy of the syllabus for course X [in the syllabus system], but I can't find any changes from the syllabus that was determined 2001-06-11. Are you editing the syllabus or should we remove the copy?	
Greetings	
Joe	

Figure 5.3: E-mail 1 – From an administrator to a course coordinator

The real names used in the e-mails have been replaced with fictional ones. English text has been retained, including spelling errors<sup>2</sup>.

The e-mail message from an administrator, depicted in figure 5.3, is a question to a course coordinator regarding why a syllabus has been copied<sup>3</sup>. The course coordinator has created a copy – a measure that could have been taken for several reasons, e.g. that the course coordinator had plans to make some changes in the near future or that the creation of the copy was unintended.

From:	Karen the Administrator
To:	All staff members
Date:	2003-11-18 09:29:49
Subject:	Course syllabi – important information
To Course Coordinators	
For every course syllabus there must be a short description in the database ("kursplanedatabasen") [the syllabus system]. The course syllabi for spring 2004 will be confirmed (and locked) tomorrow the 19th of November. Please make sure today that you have included a description in the syllabus. Please also check that you have given a date under "Granskad datum" [audited on].	
Regards Yoda, responsible for undergraduate programmes	

Figure 5.4: E-mail 2 – From administrator to the entire staff

In figure 5.4, we see a high priority e-mail stating that course-coordinators should make sure that the courses they are responsible for are described shortly (Short description is an input field in the user interface). Note that the deadline for this update is the day after the mail is sent.

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<sup>2</sup>Text originally in Swedish has been translated to English by the authors.

<sup>3</sup>In order to edit a confirmed syllabus, you have to make a copy. The revised copy has to be confirmed by the undergraduate council.

From: Yolanda the marketing manager  
To: All staff members  
Date: 2001-11-28 09:34:20  
Subject: Swedish and ECTS Course Catalogues

Hello, As a reminder I would like to inform you all who are course co-ordinators/course-responsible that today we are sending out the Swedish and ECTS Course Catalogues for fall 02/spring 03 to all subject responsables. Old course summaries should be revised and new should have be written into the course plan database at this time. If you for some reason haven't done this yet (deadlines according to earlier messages this fall were 15 November (ECTS) and 1 December (Swedish)), please do so now.

The ECTS course catalogue's deadline is 7 DECEMBER! (All changes should go to Usagi Yojimbo).

For the swedish course catalogue there is a need to revise the short short texts versions in the catalogue and make them even shorter. The summaries of single subject courses from the course plan database will be published on the Internet and will be referred to from the catalogue for further information.

Deadline for the swedish course catalogue: 12 DECEMBER. (All changes should go to Yolanda the Marketing Manager)

Regards  
Yolanda and Stephanie

*Figure 5.5:* E-mail 3 – From the marketing manager to the entire staff

The e-mail depicted in figure 5.5 is yet another reminder, this time from marketing staff to course co-ordinators (it is sent to all staff members, though). It is revealed that earlier messages have been sent to remind the course co-ordinators to update the short descriptions of the courses. The term course plan is used instead of the term syllabus in this case. Information about several deadlines is revealed in the message.

## 5.4 Inquiry Results

The questions proposed in table 5.2 were used to evaluate the syllabus system. Each question was addressed based on the three parts of the empirical study: the documentation, the user interface, and the e-mail communication. One assumption was that university employees are familiar with the semantics of the syllabus information. Therefore, the semantic meaning of individual input fields was not discussed in this analysis.

Many of the answers to the questions posed in the analysis signal that users of the system are in a situation where they cannot validate the consequences of their actions or the expectations others have on them in the process of working with syllabi. This creates a need for a discursive conversation outside of the IT system in order for actors to obtain clarifications or remind their co-workers about their obligations. These reminders are typically communicated using e-mail. Sometimes mailing lists are used, which sends the messages not only to the intended interpreters, but also to other actors who are not really related to the issue at hand. As referred to above, five types of problem were identified: the temporal problem, the action transparency problem, the documentation problem, the mixed message problem, and the communicator problem. These problems have been formulated as generalized abstractions as discussed below.

- **The Temporal Problem.** This problem class concerns timing in the organization. E-mails are sent out by administrators, reminding course coordinators what has to be done. These reminders are sometimes sent out with a short notice. A re-design advice would be to allow administrators to communicate important dates through the system. Deadlines for course-coordinators' editing of syllabi, dates for language checks and for syllabus confirmation dates should be visible in the system. These types of reminders could even be implemented in the system itself and sent automatically to remind course co-ordinators to check the syllabi at given times before the deadline. This way the communication would be directed towards (and only towards) the intended interpreters. This would also help course co-ordinators understand what they are supposed to do, and when they are supposed to do it.
- **The Action Transparency Problem.** This problem concerns the fact that the effects of action are sometimes unclear to the user. To overcome this problem it would be necessary to make sure that each action performed through the system is clearly presented to the actor, with respect to what is being done, and to whom it is being done. This may be hard to include fully in the design of the system, but at least vital parts of the documentation (Figure 4 7 - The teacher's guide illustration of the syllabi context) could be communicated to the user through the syllabus system's user interface. It would also be possible, for instance, to make it possible for course co-ordinators to decide whether books should be ordered or not.

- **The Documentation Problem.** We argue that the need for a major illustration of the syllabus system's relation to the business context is a sign of a problematic user interface design – the documentation problem. The illustration helps users to understand that a syllabus is an important document, involved in a large communication process. The user interface and the documentation help us picture parts of the use of syllabi. However, it is not fully transparent what the process really looks like. Parts of this could be communicated to users through on-line help, instead of (or as a complement to) being communicated through the staff handbook.
- **The Mixed Message Problem.** An important and problematic issue is that only one screen document (view) is used, even though there are several different actors involved, who have different roles in the process of developing, confirming, and acting on basis of syllabi. The implication of this 'mixed message design' is that the one and only screen document affords the functionality needed in all actions and for all users, which makes it hard for users to understand their obligations and action possibilities when they are using the system. Users are forced to communicate and to make sense of several unrelated messages in one screen document. A re-design advice would be to create multiple screen documents that are tailored for different actors. One view for course co-ordinators, one view for language checkers, and one view for administrators. This would make it easier to design each screen document to suit the needs of the group of actors who is to work with it, and it will be possible to remove (or de-activate) parts of the screen document that currently confuse users.
- **The Communicator Problem.** Sometimes, it was unclear who communicated what to whom and with what intentions. A feasible re-design suggestion would be to allow course-coordinators to communicate informally with other actors (e.g. by using a text field). This text field would give the course-coordinator the possibility to comment what is done, for example: "This copy of the syllabus is still under construction and should not be confirmed yet!" This would make the status of each syllabus more understandable to administrators and the language check department. This would probably reduce confusion among the different actors working with syllabi, and hence reduce the need for clarifications through e-mail communication. The actual use of this text field (which would emerge over time) could also be valuable input to designers in future re-design activities. An alternative re-design measure is to perform a business process analysis and re-design the syllabus system, in order to better formalize the workflow aspects in the IT artefact.

The following subsections show the analysis more in detail based on the evaluation questions. The problem types above are further discussed and explained through empirical illustrations.

## Who Created Each Message?

It is not possible to see who created each message by examining the user interface; the pieces of information in the screen document are of unknown origin. However, the text fields indicate that actors with different roles process different parts of the syllabus. Someone has to design it initially, someone has to check the language (particularly important when courses are given in English), and someone has finally to approve the syllabus. It is transparent who audited the course, and who performed the language check (at least there is support for communicating this information).

The documentation does not explicitly identify the individuals or roles responsible for editing and creating a syllabus. However, it is indicated that inputs needed to make a syllabus comprises the budgeting process, the supply of courses, and the study places in programme courses and single subject courses. Still, the actual meaning of these inputs remains unclear.

The first e-mail (figure 5.3) is directed towards an individual (Ben the course coordinator) which seems to imply that Joe the Administrator presumes that Ben created the copy of the syllabus. The second and the third e-mails are also directed towards course coordinators. This indicates that several people who interpret the syllabi interpret the course coordinators as the origin of syllabi.

The analysis above indicates that it can be problematic for course coordinators to understand who edited a syllabus, but the people who use the syllabus for different purposes (i.e. the ones to confirm them, and the marketing people) seem strongly to believe that the course coordinators are the originators of the messages. It is worth pointing out that the e-mail communication is directed towards others than the intended recipients; one interesting follow-up on this is that IT system design (at least in this case) causes a need for communication also outside the system, sometimes to people who are not involved in or concerned with the current issue. This can be referred to as the *communicator problem*.

## When Were the Messages Created?

It is possible to find out (approximately) when the most recent changes were made. By searching for earlier versions of this syllabus, we can deduce that this version has been created after the previously approved version (since this version is a copy of the syllabus that has not yet been approved). So far we know that someone made changes to a syllabus, sometime after the previous version was approved. Some aspects of time are thus made transparent in the system: the course coordinators are supposed to communicate that they have audited a syllabus by entering their name and signature. There is also an input field where the confirmation date of the course is revealed.

The documentation does not present any time aspects of the use of syllabi. The workflow of the organization, including important dates, is not part of that model.

The first e-mail (figure 5.3) reveals that Joe the administrator has compared the confirmed syllabus and the copy of the syllabus in order to draw the conclusion that they are identical. Joe cannot determine if the copy was made yesterday or last year, so he needs to contact the course coordinator in order to get a clarification.

A reflection at this point is that the time aspect is sometimes considered important, while at other times it is not. The e-mail indicates that undisclosed time aspects (and the fact the Joe the administrator is not aware of the course coordinator's intentions) might give rise to extra labor – in this case, the comparison of two documents, and additional communication in the organization. This can be referred to as the *temporal problem*.

## Are There Other Messages Related to the Interpretation of an Existing One?

Different versions of the syllabus can be retrieved in the system. Except that, there seem to be no more messages of interest accessible from the user interface.

The entire documentation can be looked upon as a message that is related to all syllabi. This document is not actually a part of the system, but it indicates a need for complementary information when working with course plans.

When a course coordinator receives an e-mail, such as the ones presented above, it is likely that this causes them to open the syllabus system to see if something is supposed to be done. In that sense, the e-mails are indeed related to the messages in the IT system.

On an abstract level, the e-mails imply that the syllabus system does not support the process of working with syllabi – it only supports the semantics related to them. Studying the communication that arises as a consequence of IT system use seems to be one way of understanding the communication characteristics of the IT system. It could hence be one valuable input for system re-design and maintenance. Once again, we see an instance of the temporal problem.

The same type of reasoning is applicable on the documentation part. Since the documentation can be considered as related to system use, it should be easily accessible from within the system. This can be referred to as the *documentation problem*.

## Do I Receive Unnecessary Information?

The three input fields *Language checked*, *Audited date* and *Audited by* constitute one example of this in the current user interface. These three text fields are

directed towards different actors. The language check is supposed to be performed (and entered into the system) by a language expert, and the auditing information is supposed to be handled by course coordinators. It is possible, though, to interpret the text fields in the wrong way, as they all seem to be related to the language check.

The documentation tells us that several actors are updating the syllabus, and several actors are affected by these changes. These actors are working with the same screen document in the user interface. Thus, the amount of information displayed on the screen is generic; no matter which action you are supposed to perform (e.g. copy or edit the syllabus, confirm it or perform a language check, or perform some actions based on the contents of the syllabus) you are confronted with the same view of the business messages. This can be referred to as the *mixed message problem*.

The second e-mail 5.4) is possibly partly a consequence of the receipt of unnecessary information – not in the system, but related to the nature of the system. All staff members receive messages that are really meant for course coordinators (indeed, some of them are course coordinators, but certainly not all of them).

## Are the Recipients of the Information Visible?

There is no way to find out with whom you are communicating by looking at the user interface alone. There are some indications that others will view a message, such as language experts and some authority that will confirm (or deny) changes made in the syllabus. Still, it is unclear who will actually make use of the information I put into the system, and what I am accountable for in respect to these people's future actions.

The documentation indicates that the screen document will be the subject to other people's actions, but it is still presented at an abstract level (you cannot see the roles or individuals that will be affected by your actions). Some recipients can be derived from the user interface and the documentation.

The bookshop and the library receive information about syllabi. This indicates that books are ordered when a syllabus is approved. The user interface does not reveal this. It seems fair to specify the person who decides on whether the assignment of literature should affect the ordering of books or not (there might, for instance, be freely available online versions). The course coordinators are neither able to understand that books may be ordered based on their changes in a syllabus, nor are they able to communicate to other actors that books are not supposed to be ordered<sup>4</sup>.

The syllabus will be visible on the intranet, but it is unclear exactly whom it is directed towards. Will it be published immediately, or after it has been

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<sup>4</sup>According to one user of the system, this has actually happened. The teacher planned to use the free PDF-file version of the book; still the books were ordered by the bookstore without the teacher's knowledge.

confirmed? Since this is some kind of workflow situation, where the syllabi can have different states, there is a relation between time aspects and possible recipients of the actions. This is concealed in the system.

The first e-mail (figure 5.3) is an example of unintentional communication, since a course coordinator has created a copy of the syllabus without knowing what consequences it would have for someone else. This is an example where the nature of the artefact causes people to communicate something without being aware of it; causing confusion and a need for clarifications. This can be referred to as the *action transparency problem*.

## Are There Other Messages Related to the Formulation of a New Message?

Whether or not there are other messages related to the formulation of a new message proves to be hard to answer without greater knowledge of how actual users work with the system. One clear answer to this question is that messages viewed on the screen (constituting the syllabus that is being managed at the moment) are required when formulating new messages (e.g. confirming the syllabus or editing its content).

The documentation also seems to be related to the formulation of syllabi, since knowledge of the use of the syllabi in the organization probably affects the way they are formulated. If, for instance, the material were to be for internal use only, the formulations would probably be different.

E-mails number 2 and 3 (figures 5.4 and 5.5) are likely to trigger course coordinators to start working with the syllabi. In this sense, the e-mail messages are related to the work of the system. E-mail 1 (5.3) might also trigger a course coordinator to start formulating a message in the syllabus system. It seems important to compare the answer to this question with the answer to the question concerning other messages related to the interpretation of messages. In a system like this, where we are working with one screen document only, messages required for interpretation are the same as the messages we are formulating (at a type level, that is). This makes the answers to the two questions similar. In situations like this, the rational choice might be to try to answer both questions at the same time.

Arguably, this is related to two other problems – *the temporal problem* and *the mixed message problem*.

## Do I Have to Supply Unnecessary Information?

There are input fields that are meant to be used by different actors, all in one screen document. This could confuse the actors working with the system, since they may be led to believe that they should input something that is actually supposed to be done by someone else. This, together with the reception of unnecessary information, indicates that there should be more screen doc-

uments in this system, each one adapted to the needs of a specific actor role. This is another instance of the *mixed message problem*.

The documentation describes the complexity of syllabi, which may be interpreted (by the individual actors working with the system) as if they are supposed to write everything. The obligations of each role are not well defined. What is the course coordinator supposed to do, what is the examiner supposed to do, what are the marketing people supposed to do, et cetera?

One sign of this problem, as seen in e-mail 3 (figure 5.5), is that the course coordinators are reminded to write short descriptions of the courses, in two languages. Note specifically the remark about short versions already supplied, which are requested to be cut down even more.

### Can I Create This Message That I Need to Communicate?

We cannot say what the users need to communicate only by studying the user interface, and the documentation does not help us much either. It does indicate that a lot of communication is needed, since a syllabus is interpreted in different ways (and for different purposes) by different actors. When the course coordinator creates a copy of a syllabus, there seems to be a need to provide an explanation (e.g. "this syllabus will be updated by me shortly – do not use it until it has been audited by me"). There is thus a need to communicate informally using the IT system. This is also related to *the communicator problem*.

For the users, there might be a problem to understand exactly what they are supposed to do and when they are supposed to do it. We consider these two issues as strong candidates to be included in the battery of questions we use for analysis. At this point, the obligations of the users are not transparent in the system. The system supports of the semantic contents of syllabi, and to some extent there is a workflow support (auditing and confirmation of course plans). However, a lot of the workflow is managed outside of the system, resulting in communication sometimes directed towards other people than the relevant recipients (e.g. "all staff members" instead of the course coordinators who have not performed actions which they are obliged to perform).

### Can I Move to Another Part of the System as Required?

In the analyzed user interface, there is only a minimal amount of navigation possible: You can navigate the contents of the screen document by using the *go to*, the *show* and the *search* (the binoculars) components of the interface. Our analysis so far has discussed the problems of having one screen document only, since each syllabus is actually developed in a workflow where several actors are involved in formulating, auditing, language checking and confirming each syllabus. Furthermore, when the syllabi have been developed and confirmed, they are used for a number of different purposes. This indicates that the syllabus system might support the users' work better if it consisted of a

set of screen documents, supporting the workflow and the actions that the different actors are obliged to perform. That is, there is a need for more screen documents, hence a need for enhanced navigation in the system. Once again, this is an instance of the mixed message problem.

## 5.5 Contributions to Theory Development

In this evaluation process we have derived a set of theoretically grounded questions for user interface evaluation. These questions, derived from the communicative perspective of user interfaces, social action theory and communication pragmatics, have proven useful in identifying problems with the user interface of a syllabus system. The recognition and analysis of these problems are based on the notions of communication and social action. This way of understanding (and evaluating) user interfaces emphasizes problems related to organizational action, which the IT system is supposed to support. This is not a substitute for traditional human-computer interaction approaches to user interface evaluation. Rather, it is a complement which can support evaluators (and/or designers) in keeping the bigger picture in mind: human beings are social by nature, and human behavior is strongly linked to the social setting in which they act.

Information technology is designed by humans, for humans, and in many cases for a specific purpose (such as coordinating syllabi work at a university), which is emphasized in the proposed evaluation model. This way, the suggested approach complements established usability evaluation criteria by specifically addressing what is actually to be meant by "task match" (Nielsen, 1993). It is worth noting that some of the problems identified, and the corresponding re-design suggestions, would likely have been pointed out also by traditional usability evaluation approaches (e.g. the suggestion to improve the on-line help). However, our design advice includes the *work activity* and the *users' relationships with other actors* in the organization, which is typically not focused in usability design guidelines.

The evaluation shows that the users' lack of understanding of the business process is one source of the problems, as illustrated in the e-mails. Consequently, one could argue that the IT system as such is not the problem; that the problem is that the actors in the organization just need education. However, a different system design, revealing the communication context, is likely to reduce the risk of misunderstanding, and to increase users' understanding of how the organization works as a whole.

In short, the evaluation has been useful for theory development in several ways:

- As part of the evaluation, we formulated a set of theoretically justified evaluation questions, bringing together ISAT heuristics and the previously proposed communicative perspective of user interfaces. These evaluation

questions have guided us in a way that revealed a number of problems with user interface design in this empirical context.

- In the evaluation, the communicative view on user interfaces was operationalized, and its analytical power was tested in an additional evaluation situation.
- Related to (1), we also tested the progenitive power of the communicative perspective of user interfaces, by applying it to derive new theory.
- Five types of communication-oriented problem have been identified which are likely to occur in other situations.

This inquiry was also the starting point for formulating a new concept – the use quality matrix – that is presented in detail in section 10.3.

## 6. Evaluation of The Library Search System

This evaluation focused the qualities of the search application Metalib/SFX at a Swedish university library. Researchers at Jönköping University in collaboration with the Jönköping University Library formulated an evaluation plan and sent an application for funding to the National Library of Sweden. The evaluation was documented in an evaluation report (Sjöström et al., 2007), available from the National Library of Sweden.

### 6.1 Inquiry Overview

Figure 6.1 shows an outline of the inquiry process, which was based on an assignment from the National Library of Sweden, which granted funds for performing an evaluation of Metalib/SFX, which at that time was in use by 43 libraries in Sweden. The evaluation – depicted in figure 6.1 – was performed at the local academic library at Jönköping University.

The detailed characteristics of the assignment were specified in a dialogue between the researchers and the local library. The result of the dialogue was the formulation of the following questions:

- What does the search application mean for the library's clients? Is the clients' *information demand*<sup>1</sup> satisfied?
- What does the search application mean for the library as a workpractice?
- What will an evaluation from an *ISAT perspective* and a *usability perspective* reveal about the quality of the search application?
- What are the implications of the first three questions for user training and future development of the application?

This evaluation differs from the other three, in the sense that it was based on an external assignment. Table 6.1 further clarifies the evaluation process shown in figure 6.1 by presenting the connection between evaluation questions, theoretical and empirical sources, and strategy for data analysis.

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<sup>1</sup>The part of the question based on the concept of information demand was formulated by a fellow doctoral student based on their research interest; therefore it will not be explicitly addressed in this thesis. However, the concept of information demand intersects with both usability and actability issues, which means that the first evaluation question will still be part of the thesis.

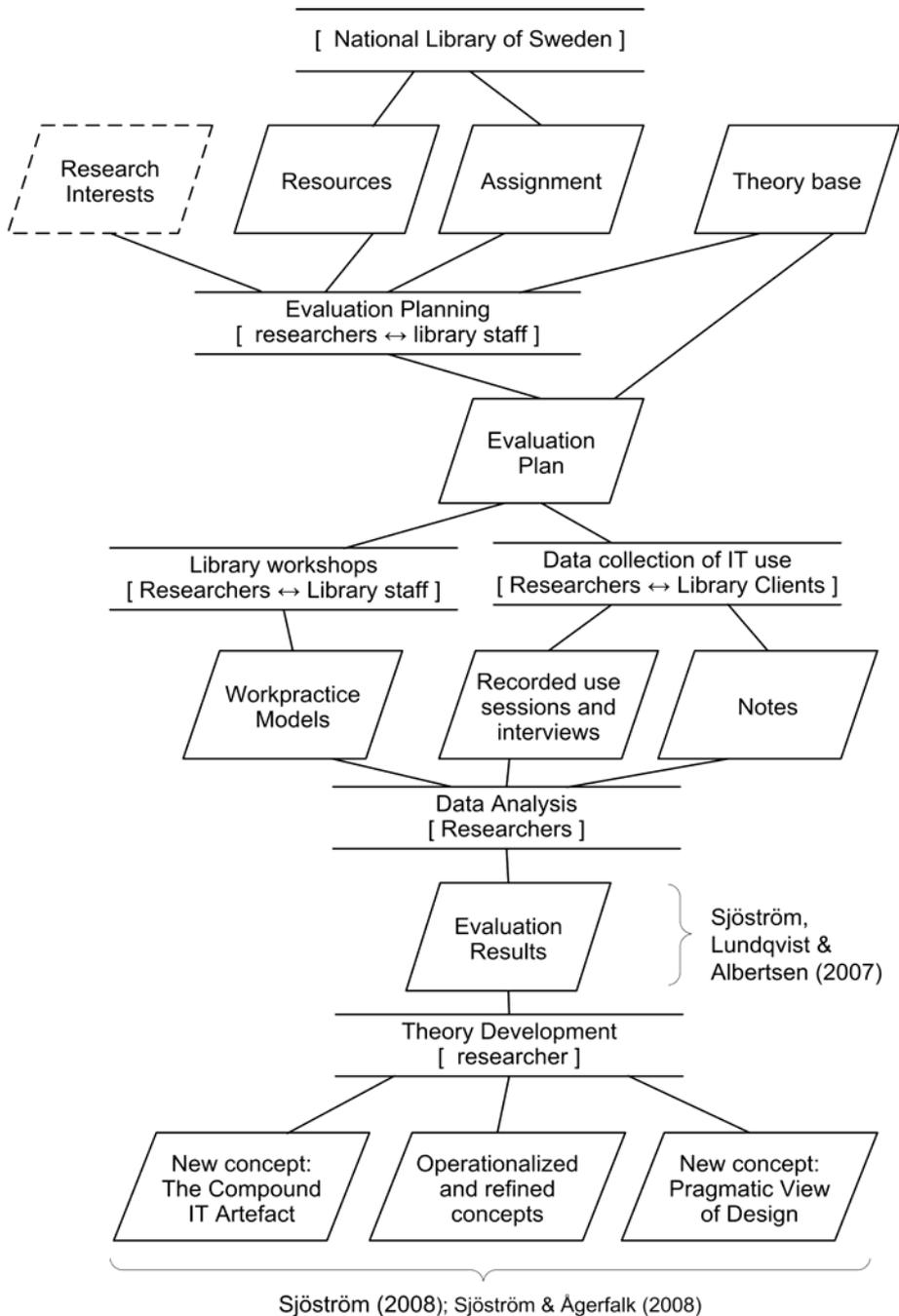


Figure 6.1: Evaluation process for the academic library system

Table 6.1: *Data collection and analysis in the evaluation of the search application*

#	Question	Strategy for analysis	Sources
1	What does Metalib/SFX mean for the library's clients? Is the clients demand for information satisfied?	A deductive process, client-oriented evaluation of the search application based on information demand theory and a quality in use for all approach.	<u>Empirical sources</u> Client interviews, observations of use of the artefact <u>Theoretical sources</u> Information demand theory and quality in use for all
2	What does Metalib/SFX mean for the library as a workpractice?	An inductive process, inquiry into the library's processes and its interactions with its clients, and the characteristics of these changes.	<u>Empirical sources</u> Library workshops <u>Theoretical sources</u> Change analysis concepts, communicative view on user interfaces
3	What will an evaluation from an ISAT perspective and a usability perspective reveal about the quality of the application?	An inductive process, where empirical data is abstracted into categories and problematic issues with respect to the use of the search application.	<u>Empirical sources</u> Library workshops, client interviews, observations of use of the artefact <u>Theoretical sources</u> Usability and actability
4	What are the implications of questions 1 – 3 for user training and future development of the application?	An abductive process, analysis informed by the results from the first three evaluation questions. Theoretical categories (from usability and actability) were used to structure the analysis and generate change suggestions.	<u>Empirical sources</u> All empirical data <u>Theoretical sources</u> Information demand, usability and actability <u>Other sources</u> #1 - #3 above.

It should be noted that the description above is a simplified way of representing the actual analysis. It *does* outline the evaluation process in a representative manner, but in practice the work was iterative, and the work with the different evaluation questions informed the work with other ones. A more thorough presentation of the theoretical and empirical sources can be found in the following subsections.

This chapter proceeds as follows: Section 6.2 is a further elaboration on the theories involved in the evaluation. Section 6.3 presents details on the inquiry, i.e. the library work practice, its clients, and the search application. Inquiry results are presented in 6.4, and section 6.5 discusses theoretical findings from the experiences from this evaluation.

## 6.2 Theory Base and Theoretical Concerns

This evaluation did not start out with any well-defined theoretical concerns. The strategy was rather to evaluate the search application in accordance with the assignment, and collect and extensively document empirical data throughout the evaluation process. In doing so, there is an opening to make theoretical reflections retrospectively, by making post-evaluation analyses of the empirical data. The evaluation approach was shaped by the research interests of the participating doctoral students. Despite the lack of specific questions, there was a clear framing of the theoretical domain: Evaluation through practical inquiry, usability, information demand and actability.

The theory in use was directly based on the evaluation questions as depicted in 6.1. A number of theoretical sources were mentioned in the table. These will be described a bit more in detail here. Important aspects of the evaluation work will be presented, and motivated theoretically. This way, the theories and their application in the evaluation process will be presented.

The concept of information demand (e.g. Lundqvist, 2005; Lundqvist and Sandkuhl, 2004) is in the core of the first evaluation question. Information demand is a concept which (among other things) is useful when developing user stereotypes, in order to make it possible to adapt a user interface for different classes of users. A user's current context (the task at hand) can also be used to tailor the user interface, and remove unnecessary and confusing elements. Stereotyping or user profiling is common in design and systems development, and the concept of persona (Laurel, 1991) can be related to this by defining it as a made-up character, representing a user stereotype. A brief example, taken from this evaluation context, is that the need for information and search support differs significantly between an engineering student and a business administration researcher. In this sense, the concept of context in information demand research does not differ from established usability approaches (e.g. Bevan et al., 1991; Bevan, 2001), in which an understanding of user tasks is an important part of design and evaluation. Further, profiles based on infor-

mation demand analysis should not be used to limit the possible actions and behaviors of the user.

Bevan's (2001) concept of quality in use for all influenced this evaluation in several ways. The evaluation was centered on users of the search application (although they were conceived in a broader way; as clients of the library). The evaluation process aimed at including clients of different types. The choice of clients in the study was based both on the client's role (student, teacher, or researcher) and their domain of interest (engineering, philosophy *et cetera*). All clients were novice to this particular application, although their experience in using computers and web pages varied heavily. As a whole, the process was user-centered – the strategy was to assess the search application from a multiple-stakeholder angle to obtain a rich understanding of its qualities in action. The evaluation results were the primary input for re-design of the search application and development of tutorials.

There was a need to ask relevant questions about the clients' impressions of using the search application. In order to make the collected data well-structured, we decided to make a semi-structured interview to follow up each observation (see appendix B). These interviews were made immediately after the observations. One important decision to be made in the evaluation process was which questions to ask. In order to find these questions, there was a need to start out from some set of theoretically informed quality ideals. The project schedule was tight, which made us accept a satisficing (Simon, 1969) rather than fully informed set of questions to include in the interview. The first theoretical source to inform us was a usability evaluation questionnaire named QUIS, Questionnaire for User Interaction Satisfaction (Norman et al., 2010). A number of questions from the QUIS framework were selected. This was done by narrowing it into only such areas of design which were applicable and relevant in this situation. The QUIS framework contains evaluation questions for many facets of the user interface (screen factors, terminology and system feedback, learning factors, system capabilities, technical manuals, on-line tutorials, multimedia, teleconferencing, and software installation). QUIS as such is clearly based on established usability evaluation concepts such as Nielsen's (1993) heuristics and Shneiderman's (1998) golden rules. The adoption of QUIS in this evaluation is thus a way of indirectly taking into account a fair amount of established criteria for usability in the evaluation work. The second theoretical source to inform us was the ISAT evaluation heuristics (as presented in section 2.3, complemented by the heuristics derived from the evaluation described in chapter 4). By combining these, we ended up with a number of questions which were relevant and applicable in the situation at hand. Furthermore, the interview templates (Appendix B) were revised after the first two observation sessions, which were "pilot observations" with the goal of improving the latter observation sessions.

The study of the library aimed at understanding the new search applications impact on the internal processes, and the impact on interactions with the

clients. Parts of the change analysis method CA/SIMM (e.g. Goldkuhl and Röstlinger, 1988; Goldkuhl, 1996; Goldkuhl and Rostlinger, 2006) were applied to perform this part of the evaluation. Based on a goal of the library – to deliver a high service level towards the clients – there was a need to incorporate some service-oriented theory in the evaluation process. One aspect of quality in service delivery is to avoid communication breakdowns with clients – in order to do so, they need to anticipate the clients’ communication needs and try to establish processes which meet those needs. Furthermore, given the emerging communicative perspective in this research process, the search application as such was considered new communication medium, which will affect the clients’ impression of the library’s services. Basically, the library expressed three overarching goals with the search application: (i) A higher internal efficiency, (ii) improved communication with their clients, and (iii) an improved level of self-service, allowing the clients to solve their needs. Thus, the communicative perspective on the IT artefact was a steadily present instrument in the evaluation process. It was applied as a means of conceiving the world, rather than a theoretical instrument with a specific function.

### 6.3 Inquiry Details

This section depicts the inquiry, following the categories in table 6.2.

Table 6.2: *Empirical sources and corresponding domains of interest*

Domain of interest	Primary empirical sources
The user interface	Access to the search application
Client perspective on the search application	Interviews with users, observations of system use
Library perspective on the search application	Workshops with library staff

The role of these empirical sources in the evaluation process was introduced in the previous section. The following sections describe the sources more in detail.

#### The User Interface

As evaluators, we had full access to the search application, and knowledge about it was an integral part in preparing and performing the evaluation work. The most relevant parts of the user interface are described here.

The quicksearch of the user interface (figure 6.2) of the search application is designed in line with a typical Internet search engine. The idea of the design is



Figure 6.2: Quicksearch view of the MetaLib/SFX search application

to allow users to easily submit keywords (or Boolean expressions) to perform a search. During the library workshops, the staff stated that a goal with the search application was to be as simple as Google, while still rendering high quality search results based on credible sources. The search application allows the users to select which group of databases to include in the search using the radio buttons below the query input field (e.g. Articles, English and Articles, Swedish). By selecting one of those, the user limits the search to the databases associated to this choice.

When a query expression has been formulated, the application starts searching for hits<sup>2</sup>. These are presented in an ongoing search view in the search application (figure 6.3). This view shows the number of hits from the underlying databases, e.g. Oxford Journals and ScienceDirect.

At any time during the search, the user can click the link to see the retrieved hits. This causes the search process to pause, and the Quicksearch Results view (figure 6.4) is shown to the user. It should be noted that the search process is interrupted when the user clicks the "view retrieved hits" link.

<sup>2</sup>The search is powered by the Metalib index server, which in turn has access to a number of databases.

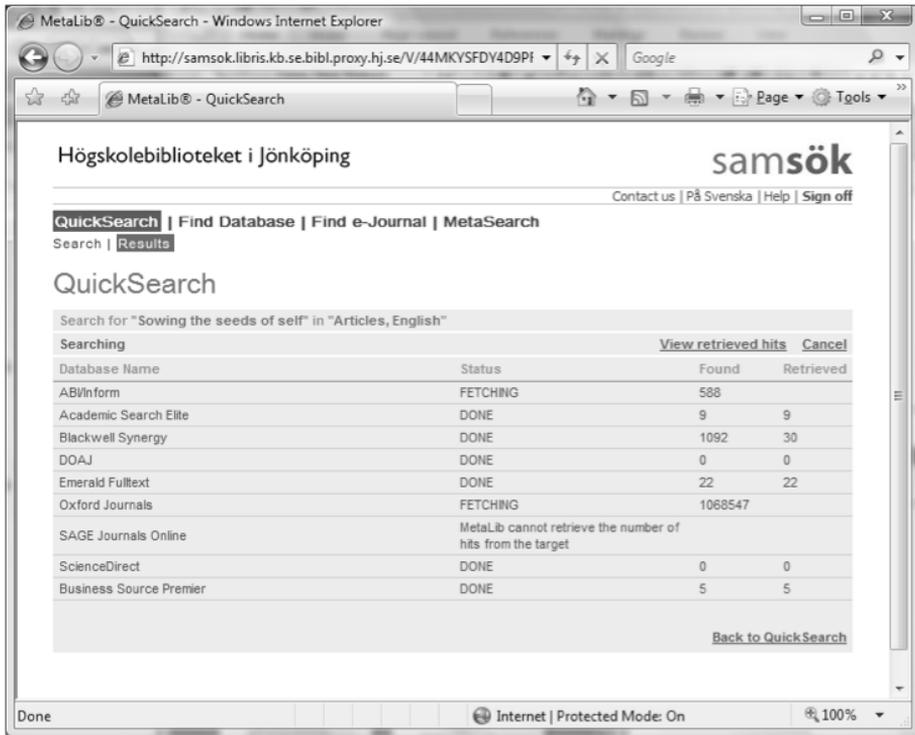


Figure 6.3: Ongoing Search view in the Metalib/SFX search application

At this point, the user can change the view of the search results (brief list, extended list, or full view). There is also an option to "retrieve more" – if this link is clicked, the search process will continue where it was interrupted, and deepen the search. When this is done, publications with a higher rank (higher relevance according to the search algorithm) may show up in the list. It is also possible to narrow the search using the links in the right column, by topic, dates and authors.

The user interface also contains a metasearch part, which allows the user to further tailor the search, e.g. to choose exactly which databases to include in the query. The users in this evaluation mainly worked with the quicksearch, with a few minor exceptions; hence the metasearch user interface is not presented here.

## Client perspective on the search application

The client-oriented study was conducted in a three-step manner. First, an interview was made in order to determine the client's needs and expectations on the library. During this session, a number of search tasks were defined per-

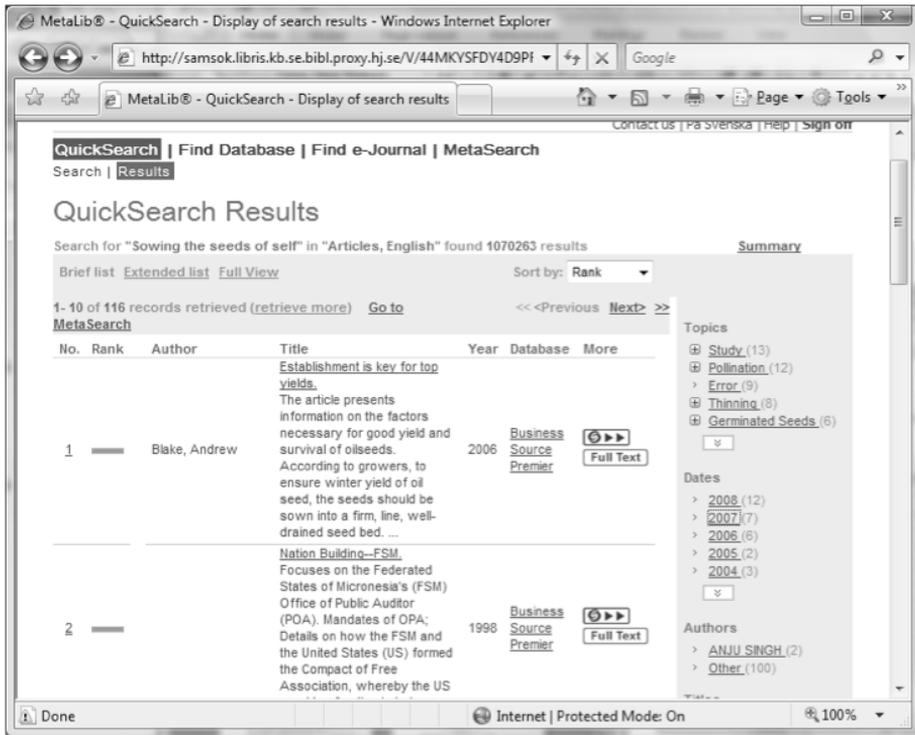


Figure 6.4: Quicksearch Results view of Metalib/SFX

sonally for each user to facilitate the next step. The interviews were recorded (audio only) and later transcribed. Second, the user was observed while using the search application to solve the tasks. A thinking-aloud strategy was used, to find out about the users thoughts, and to make sure that the use session showed progress when major obstacles were encountered. The user was asked in advance to continuously comment what was being done during the observation.

Four stages of intervention from the observer were set into play when the user became passive: 1) A question of the type "what are you thinking about right now". 2) The observer hinted to the user to look into into the help section to solve the current task 3) The observer hinted at how to solve the problem, without explicitly saying how to do it and 4) The observer said exactly what needed to be done to solve the task at hand. This was a way of trying to avoid intervention insofar as possible, allowing the user to attempt to solve all tasks without interference, still making sure that there was some progress in the observation session. The observations were recorded both as video (screen events were captured) and audio (everything being said was recorded). The final step in the client-oriented study was a post-observation interview, where

the client was asked a number of questions regarding their impressions of using the search application. The complete template used for the interview can be found in appendix B. 14 clients were studied, and the average session lasted approximately one hour. The main part of the time was used for the observation of system use.

## Library perspective on the search application

The evaluation included two workshops with library staff, aiming at discussing and documenting the library staff's understanding of the impact of the new search application on the organization. *Interaction diagrams*<sup>3</sup> (Goldkuhl and Röstlinger, 1988; Goldkuhl and Röstlinger, 2006) were used to investigate the library perspective. Such diagrams are part of the change method CA/SIMM (Goldkuhl and Röstlinger, 1988; Goldkuhl, 1996; Goldkuhl and Röstlinger, 2006), which in turn is part of the framework of socio-instrumental pragmatism. While belonging to the same ontological framework, interaction diagrams are coherent with the communicative view on user interfaces. Briefly explained, an interaction diagram is a way of identifying actors (e.g. organizations and organizational units) and the way they interact. An example from the evaluation is shown in figure 6.5. During the workshops, future (post-implementation) business interactions were modeled, and parts which were expected to be affected by the search application were discussed in depth. The business goals were discussed and documented. A number of issues (new activities, problems, and strengths) were elaborated upon, based on the change analysis method CA/SIMM (ibid). For the evaluators, these two workshops greatly increased the understanding of the situation-in-view, in the sense that it contextualized the search application, and also added the goals and concerns of important stakeholder groups. The workshop participants represented all functions in the library. The workshops focused how the library's processes would be affected; still it was a methodological decision to include representatives from the organization's functions, to be able to understand the business processes across functional borders.

The workshop discussions were documented as interaction diagrams and in natural language. These documents were validated at the beginning of the second workshop, and in subsequent discussions with a smaller selection of library staff. The library staff also continuously reviewed the emerging evaluation report, and provided feedback to the evaluators when some part of the documentation was unclear or incoherent with the workshop discussions.

It is also worth pointing out that the library staff will also be using the search application, thus the inclusion of them into the evaluation is in line with the quality in use for all approach (Bevan, 2001) – the workshops also included

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<sup>3</sup>Not to be confused with UML interaction diagrams!

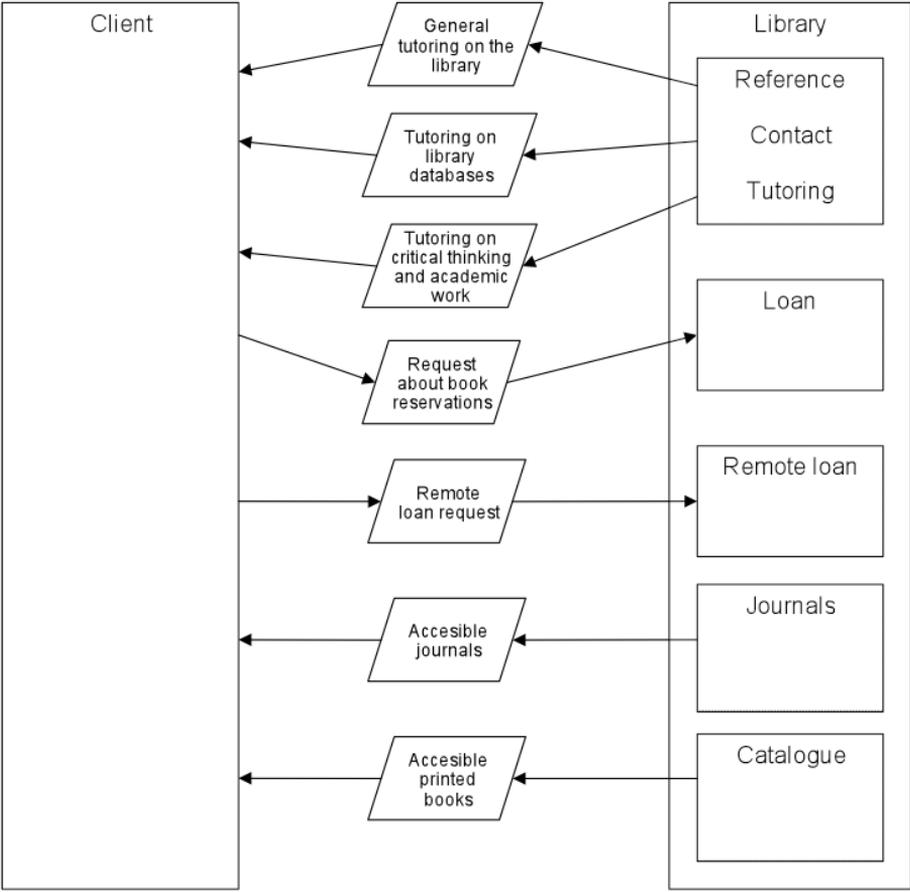


Figure 6.5: Interaction diagram showing library-client interactions

discussions about the staff's impression of the application. Some members of the staff had been introduced to the application, and expressed their opinions about it.

## 6.4 Inquiry Results

The evaluation rendered a number of problems related to the current design of the user interface, and some unresolved issues concerning the impact on the organization. A number of suggestions for re-design and tutorial development were formulated. Figure 6.6, a "populated" version of Cronholm and Goldkuhl's (2006) model, summarizes and categorizes the evaluation results.

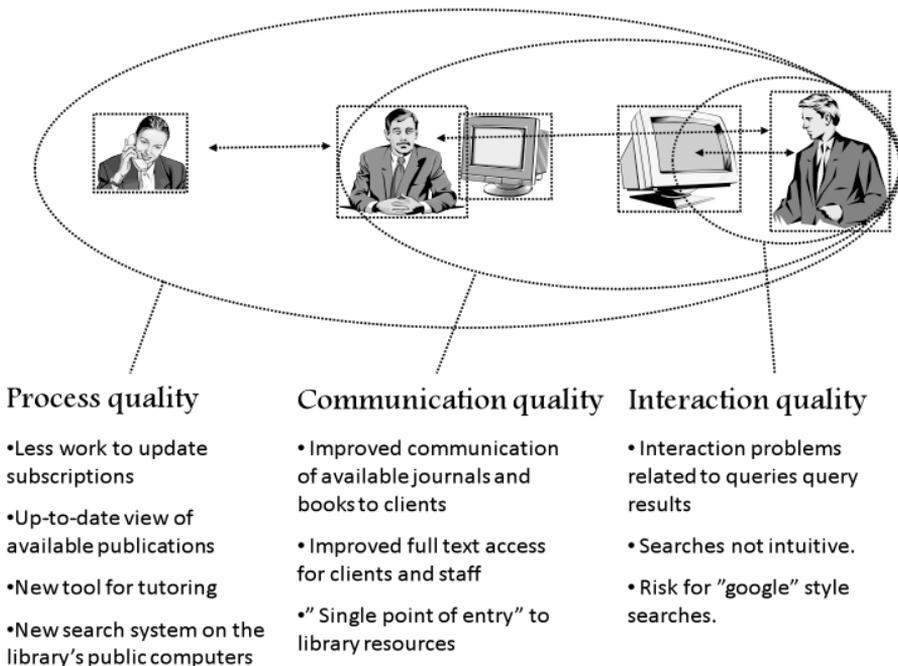


Figure 6.6: Overview of MetaLib/SFX evaluation results

The results are briefly mentioned here, and will be further discussed in the following subsections. The purpose of the figure is to provide an overview of main conclusions drawn in the evaluation work. It is also an illustration of the relation between user interface design issues and the fulfillment of business goals. The conclusions regarding interaction quality is primarily based on the client study, while communication quality and process quality mainly stems from the library workshops.

It is probable that clients who experience interaction problems do not share the library's view about the increased level of service. An important conclusion is therefore that the interaction quality problems need to be addressed in order to achieve the increased quality on the other levels. The evaluation led to a set of suggestions on how to re-design the user interface, and suggestions how to design tutorials for the application (a less preferred, but more feasible solution). This line of reasoning is not completely backed up by evidence, but the evaluators identified a risk that the current design does not contribute to the library's business goals of increased internal efficiency and improved level of service. However, it should be pointed out again that the clients who participated in the study were novice users and that the identified interaction problems may become less problematic over time, as the clients experience from using the search application increases.

### Library perspective

The workshops with library staff revealed a positive attitude towards Metalib/SFX, basically due to the increase in efficiency in administrating journal subscriptions, especially package subscriptions and keeping track of open access journals. It will also be easier for the library to keep track of available books in their library, and in other libraries. The search application also facilitates remote loans from other libraries through a web based loan application form, which is believed to make clients more aware of the option to loan from other libraries, and reduce the library's and clients' effort in performing such loans.

The library staff states that it is a great improvement to have an up-to-date view of available journals and books. Basically, instead of updating subscriptions on their own, these updates will be made at a higher level by specialized staff at Libris and ex-Libris . The staff also stated that the search application will be an everyday tool for them, to find answers to requests for clients. The intention is to replace the existing application (JULIA) on the public computers in the library, in order to offer more powerful search opportunities for the clients.

From a communicative perspective, we may explain these changes in the following way: The library will improve their ability to communicate available books and journals to their clients, and to offer access (e.g. full text PDFs) to these publications. This communication is improved both through the active use of the search application by the staff, which empowers them to better answer the clients questions, and by making the search application directly available to the clients on the Internet to facilitate self-service to search and download full text publications. From the library perspective, it is also considered important to offer a single point of entry to its clients, to reduce the clients' need for extensive knowledge about different data bases and query

languages. We may thus conceive the search application as an *agent* that performs searches in the underlying databases on behalf of the user.

However, the library also acknowledges that the implementation of these changes will generate a need for new types of support, and new types of questions from the clients. One important issue which was addressed by several users in the user study was that it is hard to evaluate the quality of the information that was found. It was expressed as a need to better learn how to evaluate different sources of information, such as academic journals, books, and conference proceedings. There seems to be a risk that students perform a search, find a satisficing number of publications for their essay, and base their argument on those publications without critically assessing if these were the most relevant publications to use. The library needs to prevent this type of behavior, where the frame of reference is heavily framed by technology, and continue their work on how to properly navigate information sources to find what is needed to pursue credible discussions which meet the requirements of academia.

## Client perspective

The user interviews and observations were analyzed, and six categories were inductively generated based on the statements from the users (figure 6.7). Three of those (*make selection*, *interpret search results*, and *get full text*) are search process oriented - directly connected to different phases of the search process. The three others (*general impressions*, *reasons to contact the library*, and *explicit re-design suggestions*) are general concerns, which may concern any or all phases.

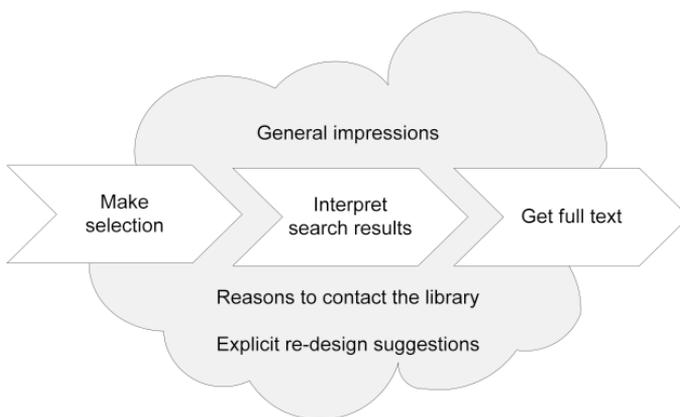


Figure 6.7: Problem categories concerning the search application

These issues are strongly related to a number of design principles which are known within academia. The rest of this section shows a selected part of the issues found in the use observations, and some theoretical motivation connected to these issues.

Several scholars (e.g. Nielsen, 1993; Cronholm and Goldkuhl, 2003) state that users of a system need to understand the terminology (vocabulary) in use in the system. Also, following the communicative view of user interfaces, and based on the work on semiotic engineering (e.g. de Souza et al., 2001) we need to acknowledge system design as a communication from designers to users; hence the designer needs to do things in a way which is possible to make sense of by the users. In this evaluation, many users had none or too little knowledge about academic data bases to properly understand the search results. As an example, one user stated that the databases might as well be named A, B, C et cetera, since the database names didn't mean anything to her anyway. Several other users also expressed a lack of knowledge concerning the underlying data bases. Users also stated that other terms in use in the system, such as "meta search", were not easily understood. The library's internal language has spilled over on the terminology in the design of the IT artefact, which makes it hard to understand for the users.

The users of an IT system should easily understand what is afforded by the system (Gibson, 1979). In ISAT, it is prescribed that a system's action repertoire needs to be transparent, which means that the user should understand what can be done and how it is done when using a system (Ågerfalk, 2003; Cronholm and Goldkuhl, 2006). An important conclusion regarding affordances in the library context is that the user interface requires knowledge about Boolean search expressions to be really useful. Most users in this study did not have sufficient knowledge about Boolean operators<sup>4</sup> to write efficient, composite search expressions. There is also an infrastructure problem that creates confusion when Boolean search expressions are applied – some of the underlying databases accept such queries, others do not. The result is that the relevance/rank in the search results is based on different criteria, depending on which underlying database the publication is stored in. It should be noted that there exists some user interface components to refine a search, e.g. filtering it for a certain year. This reduces the need to write complex queries. Still, some users suggested more support to come up with relevant search results, e.g. allowing the users to add additional search criteria to refine hits within the previous search.

There is much theory on how to design the navigation within an IT system. It is sometimes stated that the user should have the option to freely move between different parts of the user interface, and always understand where they are at (Cronholm and Goldkuhl, 2006). A high degree of flexibility and efficiency of use is recommended by Nielsen (1993), which means that it should

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<sup>4</sup>Boolean operators are logical operators, such as *and* and *or*.

be clear to novice users how to use the system, while advanced users also need to be able to work efficiently (e.g. using shortcuts to certain functions).

Furthermore, the user should always understand what is going on (Nielsen, 1993): When a user does something, there should be feedback about ongoing and/or completed system activities. This feedback should be clear and provided within reasonable time. The search application caused some confusion due to the possibility to interrupt an ongoing search, and see the results so far. Many users did not understand that the search was still going on. The implication of this is that they believe that they found the most relevant publications given their query, which I consider to be very problematic. The users believe they did something, but in practice they did not.

ISAT (e.g. Ågerfalk, 2003; Cronholm and Goldkuhl, 2006) suggests that a system sometimes needs to be designed so that the user has knowledge about previously performed actions. This is important when the user needs to follow up actions performed, and sometimes to improve the accountability of what has been done.

The use of the IT system should empower the users in acting, both while using the system and after using the system (e.g. Ågerfalk, 2003; Cronholm and Goldkuhl, 2006). This is also in line with the usability concept of task match as presented by among others Nielsen (1993). Another observation made in the user studies was that the users had severe troubles to download full text (PDF) documents, which may be seen as the users' ultimate goal when using the system. The user interface is different, depending on where the full text document is stored. A common situation is that the webpage of a journal is shown in a new browser window. The user then has to navigate within the journal's web page to find the PDF file. There are a number of other situations which causes different views for the user, which leads to a lot of confusion, and often the users failed to actually download documents. This may also be explained by the usability heuristic consistency, stating that concepts and design elements should mean the exact same thing in different parts of the user interface (Nielsen, 1993; Cronholm and Goldkuhl, 2006). The design should also be in line, as much as possible, with common conventions and de facto standards, to avoid confusing the user (Nielsen, 1993).

An important characteristic of IT systems, especially those that are web based, is that the response times do not distract or annoy the users (Nielsen, 2000). During a number of use observations, the system was very slow, which annoyed the users.

Prece et al. (2002) discuss user experience qualities: a number of use qualities related to the users emotions when using a system. This may be conceived as a more thorough way of discussing the usability goal satisfaction (ISO 9241, 1994). Examples of emotions caused by system use may be frustration, joy, motivation, et cetera. Ideally, the use of the system renders positive emotions rather than negative ones. The search application was considered boring and inflexible most users. This may be explained by the fact that they

were novice users of the system, and they weren't fluent enough in using it to fulfil their needs for information. On the other hand, there may be a risk that users avoid using (thus learning) the system if the first impression is that it is boring and hard to use.

## 6.5 Contributions to Theory Development

This inquiry served to operationalize and refine the concepts developed in inquiries #1 – #2. This evaluation concerns an IT artefact with a quite high degree of agency built into it. Using the terminology in this thesis, we may say that the users of the search application need to understand what that agent is doing on their behalf, in order to assess properly the results presented by the agent. In this particular case, the users are poorly informed about the characteristics of their searches, as a consequence of this agency. I interpret this as a tension between the human action awareness (what is being said; and by whom) and the agency properties of the search application. This is an example of a *design tension* between agency properties of an artefact and its properties as a communication medium. The idea of this tension is empirically grounded in this inquiry, and further elaborated upon in section 9.2. The inquiry also provides more evidence that this way of understanding the IT artefact – as both a medium and an agent – provides a great deal of explanatory power when investigating the role of IT artefacts in a social context.

Further, the application of interaction diagrams in combination with the communicative view has been useful to identify changes in communication patterns in the workpractice. This has not been highlighted in the two initial inquiries. First, the library is no longer updating their databases with up-to-date information about available publications. Available publications are now communicated directly from *Libris* and *ExLibris* level to 43 libraries, and consequentially also directly to the libraries' clients through the *MetaLib/SFX* as a communication medium. This empirical insight supports the that a pragmatic view of design needs to acknowledge this interplay between the social world and technology. This inquiry is thus the origin of the concept of a pragmatic view of design, as presented in section 10.1. Further, the library strives for a larger degree of self-service among their clients. They attempt at providing an IT artefact which can help the clients find what they are looking for, i.e. the responsibility of finding publications based on the clients' expressions of their needs is delegated to the artefact. The implementation of the IT artefact is likely to change communication patterns (and the library's readiness to respond to new requests) from their clients. Thus, a very important conclusion following from the proposed view on IT artefacts is that the design of IT needs to be accompanied by a reflection on the impact on other communication channels, and how the interplay between those channels should be designed. At large, the inquiry is an example of how the IT artefact affects so-

cial settings: Both the internal library workpractice, and the clients' practices. It also shows how the IT artefact has an impact on the interplay across these organizational boundaries. We may speak of this as the interplay between various communication channels; or "channel interplay".

Interestingly, the qualities of the user interface may be crucial in achieving the intended positive effects for the library: A design which meets the needs and the language of the clients, and which is easily understood by them, may very well lead to a number of positive effects from the library's point-of-view. Conversely, a poor user interface design may be counterproductive, and increase the clients' need to communicate with the library, without actually providing a better total level of service. This indicates the need to reason about the relation between different use qualities, and how they can be conceived in relation to each other. Thus, this inquiry informed the development of the use quality matrix (10.3).

Further, there is a need to reflect about the theoretical basis for this evaluation. How could a truly "good" design be achieved? The theoretical framework which has been used here is based on some theoretical sources, such as usability and actability. However, we may need to look beyond those theories. As an evaluator, one cannot resist speculating in other design trends while performing an evaluation. We must, for instance, take into account the potential of social software to produce more relevant search results in this type of applications. A simple example is the possibilities opened up by harnessing the user's behavior and data. An example of how this may be used in IT design is shown in the evaluation of the web shop/community (inquiry #4). The current design of the search application is based on a top-down structure, where the catalogue of publications is handled at a higher organizational level, and shared between libraries. Conclusively, by adding the "Web 2.0" (O'Reilly, 2005) ingredient to this type of application, a door to new functionality and search support is opened, which may lead to a new era for the role of local libraries in the academic world. From a communicative perspective, this may be explained as horizontal communication: In the "Web 2.0" user actions are logged in different ways, which creates representations which may be used to build new types of services. Such artefacts mediate representations between users; which may be seen as 'horizontal' communication. The evaluation of the search application was focused on 'vertical' communication, i.e. the sharing of representations from ExLibris and Libris to the local libraries and their clients. The consequence of this reasoning is twofold: First, the evaluation points out a need for support to reflect about design ideals in an inquiry situation. Second, the evaluation contributed with empirical data that allowed for relevant reflections regarding how such support could be formulated. In summary, this is another way in which this inquiry contributed to the development of the idea of a pragmatic view of design (section 10.1) and to the use quality matrix (10.3).

Finally, this evaluation concerned an IT artefact that is based on interaction with other artefacts – a 'meta-search' system that produces a result by forwarding search queries to a large number of other search systems. This had a large impact on the design of the system. It enabled certain features, and implicated constraints. As an example, the query languages of the underlying search systems do not share the same syntax. Still, the user is offered to define search expressions through one specific query language, which is not translatable to the query languages of the various underlying systems. This gave birth to the concept of the *compound IT artefact* - implying that the inquirer needs to understand an IT artefact in its technological context. The compound IT artefact is discussed further in section 9.3.



## 7. Evaluation of The Social Web Shop

This evaluation was a study of 'hidden' communication patterns occurring while accessing Amazon.com, which is characterized as a 'social web shop' in this inquiry. The inquiry was the basis for research presented by Ågerfalk and Sjöström (2007, 2008)

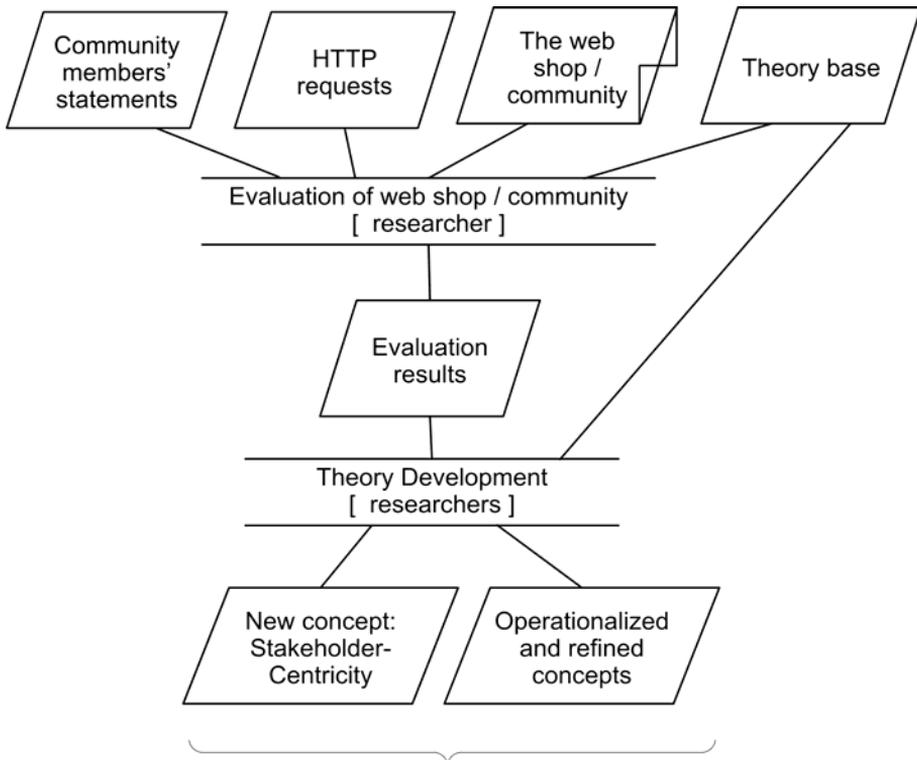
### 7.1 Inquiry Overview

The evaluation process is shown in figure 7.1.

The theoretical starting points and concerns are discussed in 7.2, followed by a section with empirical data 7.3. Section 7.4 shows evaluation results, and section 7.5 accounts for the theoretical contributions stemming from this inquiry.

### 7.2 Theory Base and Theoretical Concerns

The way we use the Web has changed dramatically since its inception in the mid 1990's. As users have changed from passive consumers of information to active contributors, much of the content on the Web today is the result of individuals' knowledge sharing and exchange of ideas. O'Reilly (2005) conceptualized this emerging information infrastructure and referred to it as Web 2.0; a term now widely used when describing the business models, tools and technologies that facilitate and leverage such global interaction and communication on the Internet. He suggests that network effects arising from user contributions are key to market dominance in the Web 2.0 era and that in order to be successful; companies must learn to trust users as co-developers. This insight is a key factor also in the success of the open source software movement, which has proved that communities of volunteer developers are even capable of threatening the dominance of some of the world's leading software companies. Conforming to the old "if you can't beat them, join them" mantra, many commercial organizations are also entering the open source arena in an effort to build active communities around their products (Fitzgerald, 2006). A fundamental question in relation to the success of these emerging "gift cultures" (Bergquist and Ljungberg, 2001) is what motivates people to contribute time and knowledge without any apparent payback, at least not in the immediate



Sjöström (2008); Sjöström & Ågerfalk (2007; 2008)

Figure 7.1: Evaluation process overview for the social web shop

monetary sense. Lerner and Tirole (2002) argue that the two major motivations are career concerns and ego gratification, which they collectively refer to as the signaling incentive.

By contributing to a Web community, such as an open source project, people gain reputation and status within that community, which thus appears to be the main driving force. Interestingly, well before the coining of the term Web 2.0, Flores (1998) analyzed the emerging networked society and came to the conclusion that Web systems are primarily identity creating systems. Drawing on Heidegger's *identity* concept, he suggests that identity requires "both an intense Kierkegaardian total commitment to some cause or person that discloses a new world for an individual and a Hegelian working out of that commitment so that others recognize that new world as making more sense than their former world, so that they see the individual who brought it about as a leader and that new world as their world." (Flores, 1998, p 364). According to Flores, this is central to both personal and corporate identity on the Web. A successful company has to show commitment and build strong corporate identity to

attract people (i.e. visitors) and an individual has to commit fully to a community in order to build a strong personal identity, motivated by the signaling incentive. Hence, while personal identity is important to oneself, it is also important to others in order for them to recognize one's contributions. In a similar vein, personal identity is important to corporations in order to recognize their users and customers and to tailor their own Web presence, thus building their own identity. However, while identity and recognition is important on the Web, the flipside of the identity coin is that of privacy. Consider, for example, the following: A few years ago a team within AOL released search data of more than 650,000 users. Although actual user names were replaced with random numbers, all the search terms of single users were possible to trace and by using these search terms it was possible to track down an individual (Barbaro and Zeller, 2006). Apparently, No. 4417749 conducted hundreds of searches over a three-month period and eventually the data trail led to Thelma Arnold, a 62-year-old widow in Lilburn, GA, who confirmed the searches were indeed hers (Barbaro and Zeller, 2006). Shortly after this report, AOL removed the search data from its site and apologized for its release, but the detailed records continued to circulate online. The story does not tell whether or not Ms. Arnold benefited from her strengthened identity in this particular community. However, the example clearly illustrates that some of the traces we leave on the Web are less intentional and probably less ego gratifying.

According to Flores (1998), the speech act theoretical insight that institutions are constituted by their commitment structures is essential to understanding identity creation on the Web. We can, for example, use these structures "to determine whether we are witnessing new institutions or just different versions of old ones" (Flores, 1998, p 357). Hence, actors' intentions and the way these are used to coordinate interaction with other actors are essential for identifying institutions, such as corporations, communities and individuals' on-line presence. However, a focus on intentions alone seems to limit our analysis of social interaction through IT to what the actor is aware of and purposively chooses to do. This is also mirrored by Weber's account of social action, which identifies such action with behavior to which the actor attaches meaning (Weber, 1978). Arguably, it is hard to attach meaning to something of which one is unaware. In an ideal speech situation – the casual face-to-face setting (Clark, 2002) – two communicating parties rely on many subtle cues besides the spoken word. Body language and other "give offs" are central in our day-to-day interpretation of social life, and these are often unintentional. Goffman (1959, p 2) writes, "The expressiveness of the individual appears to involve two radically different kinds of sign activity: the expression that he gives, and the expression that he gives off". According to Goffman, what we give are the things we communicate through verbal signs, such as spoken language. The things we give off, on the other hand, are the often non-verbal signs that help to situate and verify the things we say. Goffman (*ibid*) defines interaction as "the reciprocal influence of individuals upon one another's actions

when in one another's immediate physical presence." An interesting aspect of communication through IT artefacts, such as through the Web, is that this casual face-to-face setting changes into a more structured computer mediated one. In this new setting, participants are typically not in one another's immediate physical presence; they may in fact neither see nor hear each other, and may recognize each other's action at considerable delay (Ågerfalk, 2004). In this context, there appears to be another form of "give off", the kind that made it possible to track down Ms. Arnold in Lilburn, GA.

The traces she left while using the search engine helped to situate and verify her identity to the extent that even though the AOL employees' intention was to anonymize the users, she was still very much identifiable. It thus seems that Dietz' 2001 distinction between essential (realization independent) issues and their realization becomes central to understanding communication action on the Web. While the essential aspect of Ms. Arnold's actions was to find information, her incidental traces, or "technology embedded give offs", were essential for other stakeholders in the Endeavour of establishing her identity.

### 7.3 Inquiry Details

In line with the discussion on give versus give off above, the distinction between what users purposively intends to do and the sometimes unintentional traces they leave behind, indicates a need to distinguish between different types of contextual information related to the performance of actions at Web pages. It is generally acknowledged that data is a valuable asset in the Web 2.0 philosophy (O'Reilly, 2005) and that there are different types of data available: what users intentionally communicate to others and the traces of action that are gathered by the Web infrastructure as such (primarily through the content of HTTP requests and responses). Therefore, to understand Web communication we need to analyze both essential and incidental communication. In our study, essential communication action was manifested as screen documents and incidental communication action was collected and logged using a browser extension<sup>1</sup>. For this study, we chose the well-known web site Amazon.com since it embraces many characteristics of Web 2.0.

The **essential action** data is information that is revealed in the user interface when performing action, documented in the evaluation as screen shots from the web site. Figure 7.2 shows two aspects of essential action; an anonymous reviewer ("a reader") and his statement about a book. It is also shown in the example that nobody assessed this review as being helpful.

The **incidental action** was studied by looking at the HTTP requests sent from our web browser to web servers. The mechanism by which HTML (Hypertext Markup Language) pages are retrieved from a Web server for display

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<sup>1</sup>The browser in use was Mozilla Firefox and the extension is called Live HTTP headers.

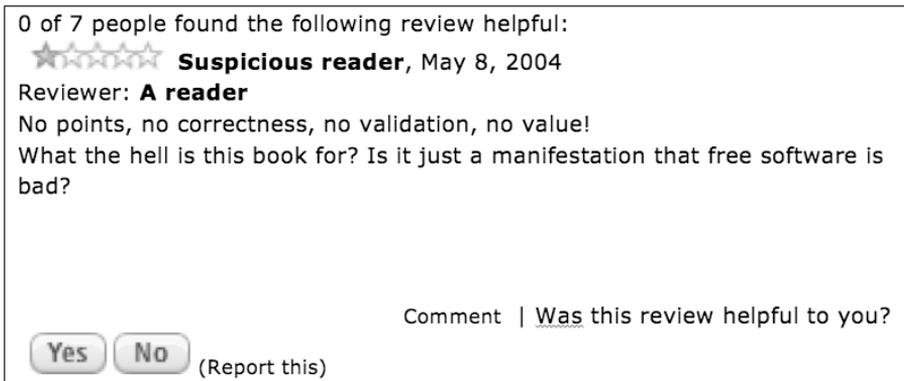


Figure 7.2: An unknown user's comments on a book on Amazon.com

by a browser is the HTTP (Hypertext Transfer Protocol) request command (W3C, 2007). An HTTP request contains a certain amount of information sent when a user accesses a page on a web server. We expect that users of a Web application are aware of the parts of a message that are visible on the screen. If a user, for instance, writes a book review, they are probably aware that the entered information is communicated to someone through the browser, over the Internet, to a Web server. In addition to this visible part of the message, there are some "hidden" pieces of information added to the HTTP request, as defined in the HTTP standard (W3C, 2007). This information is part of the communication context, and reveals some information about the user and the technology in use.

The request contains technical information such as the user's operating system (and version), the language in use, and the browser used and its version. Furthermore, the message contains the user's IP address<sup>2</sup>, which can be used to identify the current user, at least indirectly. Using the Domain Name System, it is possible to map an IP address to a country, region, or even to a company and sometimes to an individual user. In addition, the HTTP request contains so-called "cookies". These are small pieces of information that are stored on the user's hard drive. Whenever a Web page in a certain domain is accessed through the browser, the browser sends the cookies associated with that domain to the web server. The web server then returns new (or changed) cookies, which the browser stores and sends again in the next request. Cookies are a common mechanism for maintaining state in longer transactions or for personalizing a context for a user (Krishnamurthy and Wills, 2006). Finally,

<sup>2</sup>Technically, the IP address is not part of the HTTP request but is communicated through the underlying TCP/IP protocol stack. Hence, all HTTP requests can be traced to a certain IP number.

the request contains information about "referring page" – if a user follows a hyperlink from site A to site B, site B is told that the visitor came from site A.

## 7.4 Inquiry Results

This section contains the evaluation results, divided into essential actions and incidental actions at Amazon.com.

### Essential Action at Amazon.com

The perhaps most obvious essential action at Amazon.com is the purchasing of products, e.g. books. An interesting aspect of Amazon.com, however, is that it facilitates users' sharing of experiences and opinions about the various books on offer. In the following we will focus on this community-oriented activity. Specifically, we will focus on the visible results of user actions as represented by the Amazon.com website.

Figure 7.2 illustrates a review of a book, communicated by an anonymous user ("A reader"). Seven people have valued this review and unanimously stated that the review wasn't that helpful to them (perhaps as a result of its lack of argumentation).

Figure 7.3 shows another review, provided by an individual who has chosen to identify himself as Mark Tarrani. It is even possible to follow the hyper-linked name and find additional information about this individual, including a personal photo. This person has apparently written many other reviews (hence the "Top 100 Reviewer" badge). 29 out of 30 people report they have been helped by the review, which thus signals that this reviewer is appreciated by the community. (It is perhaps not too far-fetched to assume that "A reader" was the one person out of the 30 who did not find Mike Tarrani's review very helpful.)

29 of 30 people found the following review helpful:

★★★★★ **Balanced and business-focused, March 26, 2002**

Reviewer: **Mike Tarrani** "[www.tarrani.com](http://www.tarrani.com)" (Deltona, FL USA) - See all my reviews

TOP 100 REVIEWER   REAL NAME™   COMMUNITY FORUM 04

This may be the perfect book about open source software because it places open source within the context of business value and does not promote it as the great panacea that characterize the message of far too many books on the subject.

[...]

Figure 7.3: An identified user's comments on a book on Amazon.com

## Incidental Action at Amazon.com

In addition to the essential actions, we revealed quite a lot about ourselves when searching for a book on Amazon.com. We told them, not only that we were interested in the particular book, but that we were using English versions of Windows NT 5.1 and the web browser Firefox 1.5.0.11. We also told them that the search string "Fitzgerald Open Source" was entered from Amazon.com, and that we had visited the site before (a cookie was sent). Furthermore, we revealed our IP address, which in turn gave away that we were located at Jönköping University in Sweden at the time of the query.

Interestingly, when requesting the start page a large number of HTTP requests are performed in the background (see table 7.1). These requests would typically go unnoticed without the special analysis software. The anticipated requests (the page itself and the include files it needs to display properly) are marked with grey. The other requests will be discussed below.

Table 7.1: *HTTP Requests when entering http://www.amazon.com*

#	Host	Explanation	Purpose	Performer
1	sb.google.com	The request is forwarded to Google's safe browsing service.	Verify host safety	Google toolbar on behalf of user
2	www.amazon.com	The request to get a web page is sent to the Amazon web server.	Request action from server	User action through browser
3	[...]s- amazon.com	Request for images are sent to another Amazon web server.	Request images from server	User action through browser
4	sb.google.com	Multiple requests are sent to Google's safe browsing service.	Verify host safety	Google toolbar on behalf of user
5	[...]bleclick.net	A request is sent to some advertisement host.	Espionage	Web application on behalf of Amazon
6	[...]vertising.com	A request is sent to some advertisement host.	Espionage	Web application on behalf of Amazon
7	[...]eries.google.com	A request is sent to Google's page ranking service.	Contribute to page ranking	Google toolbar on behalf of user
8	m1.2mdn.net	A request is sent to some advertisement host.	Espionage	Web application on behalf of Amazon

Requests #1, #4, and #7 are addressed to two different Google services: Safe Browsing and Page Ranking. These requests are sent by the Google Toolbar, a popular plug-in to the web browser. When installing this plug-in, the user is asked whether they want to activate these services or not. It is probably safe to assume, however, that many Internet users are, just as the authors were, unaware of the whereabouts of this plug-in. Effectively this means that every time a page is requested with this configuration, such requests are fully or partially forwarded to Google (possibly without the user knowing).

Requests #2 and #3 are the "essential" requests: The requests sent to retrieve the actual web page and its included files (e.g. images, style sheets, and JavaScript include files).

Requests #5, #6, and #8 are sent to various (commercial) advertising services. The purpose of these appears to be to keep track of users' browsing across different Web sites. Krishnamurthy and Wills (2006, p 4) explain, "Cookies are also used by tracking servers to more accurately identify a user as the user navigates between different Web sites. If pages from these Web sites cause objects to be retrieved from the same tracking server and this server has a cookie associated with it then the server receives this cookie on each retrieval." Martin et al. (2003) refer to such series of HTTP requests as "click-streams", which can be used to, for example, maintain unique visitor counts, understand web usage patterns, assess the diffusion of advertisements, delivery of personalized offers, and general tailoring of web site content. Series of HTTP requests can thus be monitored through tracking cookies, which are stored, and used for various commercial purposes. It should be noted that there is information available about the use of cookies, both from Amazon and their partners in the advertising business. Also, the Google toolbar provides a reference to a privacy statement detailing what information is collected and what it is used for.

Apart from the recipients of the requests, it is also likely that there are additional logs of the requests, i.e. by the organization responsible for providing access to the Internet.

## 7.5 Contributions to Theory Development

This evaluation has led to some valuable insights about how the web can be understood from a communicative perspective. The concept of identity has been used as a complement to understanding the ongoing communication – both communication that is evident to the users and the underlying communication taking place in the background.

Some abstractions have been made based on the evaluation. First, navigation on the web always leaves traces. This means that navigation and communication are inseparable based on the semiotic foundation in this thesis. This is based on the semiotic foundation that we leave representations which

others may interpret. This has implications for the understanding of the IT artefact as a communication medium – what appears to be pure 'navigation' acts actually need to be understood as communication acts. This challenged and contributed to is the view of IT artefacts as communication media (section 9.1), and also discussed further in section 9.3.

Second, we may look upon web based IT artefacts as emergent artefacts, which evolve through actions by a number of stakeholders with different and sometimes conflicting interests. This empirical insight has led to refinements of the two concepts *pragmatic view of design* (section 10.1) and to the birth of the concept of *stakeholder-centricity* (section 10.2). In addition, the notion of the compound IT artefact is related to this issue, since the design of the Amazon site is clearly based on a number of interactions between different IT artefacts, which do not make sense until we interpret the interplay between them. In other words, this inquiry has contributed to the conceptualization of the *compound IT artefact* (section 9.3).

The concept of identity has been useful as an explanation of relations between stakeholders. The ongoing communication in the particular evaluation situation has led to a model (figure 9.4) that explains the relations between different actors as being part of identity cultivation for these actors, and provides some insight into the political dimension of design. Furthermore, four principles for understanding web based IT artefacts – which are examples of compound IT artefacts – have been formulated. The theoretical contributions from this evaluation are presented more in detail in section 9.3.



## 8. The LSS Inquiry

This chapter describes a practical inquiry into the administration of personal assistance in the Swedish municipal sector. This inquiry was a design-oriented action research project that rendered a number of publications intersecting with this thesis (Sjöström and Ågerfalk (2008, 2009); Sjöström and Goldkuhl (2009); Sjöström (2010)).

### 8.1 Inquiry Overview

This inquiry differs from the others in that it is in a larger scale, and also includes intervention into social practice, including the design and construction of an IT system implemented in a Swedish municipality. This section provides the historical context of the inquiry, and shows the process of inquiry in three action diagrams (figures 8.1, 8.2 and 8.4). Section 8.2 elaborates the theory base and the theoretical concerns. Section 8.3 accounts for the primary data. Section 8.4 discusses the manner in which the designed IT artefact has been evaluated, and section 8.5 shows the theoretical contributions sprung from this inquiry.

In Sweden, the *Act concerning Support and Service for Persons with Certain Functional Impairments (LSS)* regulates ten types of services provided by the municipality to the individuals. The intention of the law is to enable persons with functional impairments full participation in everyday life, insofar as possible. One of the services regulated in LSS is personal assistance. In October 2006, 3698 persons received personal assistance (The National Board of Health and Welfare, 2007). A personal assistant may be assigned to a person belonging to a group of people entitled to special services. The legislation has gone through a series of changes over time, and as a consequence, the municipalities have updated the way they work in order to comply with these. In addition to the municipalities, The Swedish Social Insurance Agency is a major stakeholder in the LSS-administration. Given the legislation, municipalities and the Social Insurance Agency have different responsibilities with regard to decision-making and funding of personal assistance. An overview of this work practice is found in figure 8.6. The figure outlines interactions between different parties with respect to both the regulation of operations and the regulated operations<sup>1</sup>. The figure is an instance of the *Generic Regulation*

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<sup>1</sup>The figure is a result of the business modelling efforts described later in the following pages.

*Model* (GRM), which is a theoretical concept sprung from the research project (Goldkuhl, 2008a). Another aspect of this development is that the number of people entitled to support has increased over time. A large part of these costs are administrative overheads. As a result of this development, these stakeholders currently face a complex and costly administrative situation. The prognosis in Sweden is that the costs for LSS-related activities will increase drastically over the next few years. The policies governing these processes require accountable documentation of these tax-funded processes, both to assure the legal rights for citizens, but also to make it possible to take legal action if some party has violated the legislation, i.e. received funds by misleading the authorities in some way.

In January 2007, the *LSS Inquiry*<sup>2</sup> was initiated, aiming at finding ways of improving the LSS-administration. The project team consisted of representatives from 14 municipalities, the Social Insurance Agency, and project management from the non-profit organization *Municipalities for Joint Development of e-Services* (Sambruk) – a Swedish non-profit organization which primarily supports collaborative e-government development projects in the Swedish public sector. Sambruk, in association with Linköping University, received grants from the Swedish research foundation VINNOVA<sup>3</sup>, which contributed to the funding of the LSS inquiry.

The following subsections focus important aspects of the performed inquiry. First, the section *workpractice diagnosis* shows how processes, goals, and problems in the workpractice were analysed. Second, the section *information system design* reveals the early stage of the design process – finding new ways of working; and designing information technology to support that new workpractice. Third, the section *agile development* depicts the continued design and construction of information technology.

## Workpractice Diagnosis

In the LSS inquiry, a project group was formed, consisting of 20 persons, representing 14 municipalities and the Swedish Social Insurance Agency. The two researchers and the project manager had a joint responsibility to lead the project towards its goals. The group has been challengingly large to work with. We had a participatory intent from the start aiming at involvement and collaboration. The work practice diagnosis (which was the first part of the project work) was from its inception performed through modeling seminars (e.g. Conklin, 2005). The two action researchers used practical theories and modeling methods in order to create different models of the work practice together in the project group. One action researcher drew and presented models in active

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<sup>2</sup>Give the full name of the project here. The project is called *the LSS inquiry* throughout the thesis for convenience.

<sup>3</sup>Briefly describe the two VINNOVA grants and the overarching goals of research here.

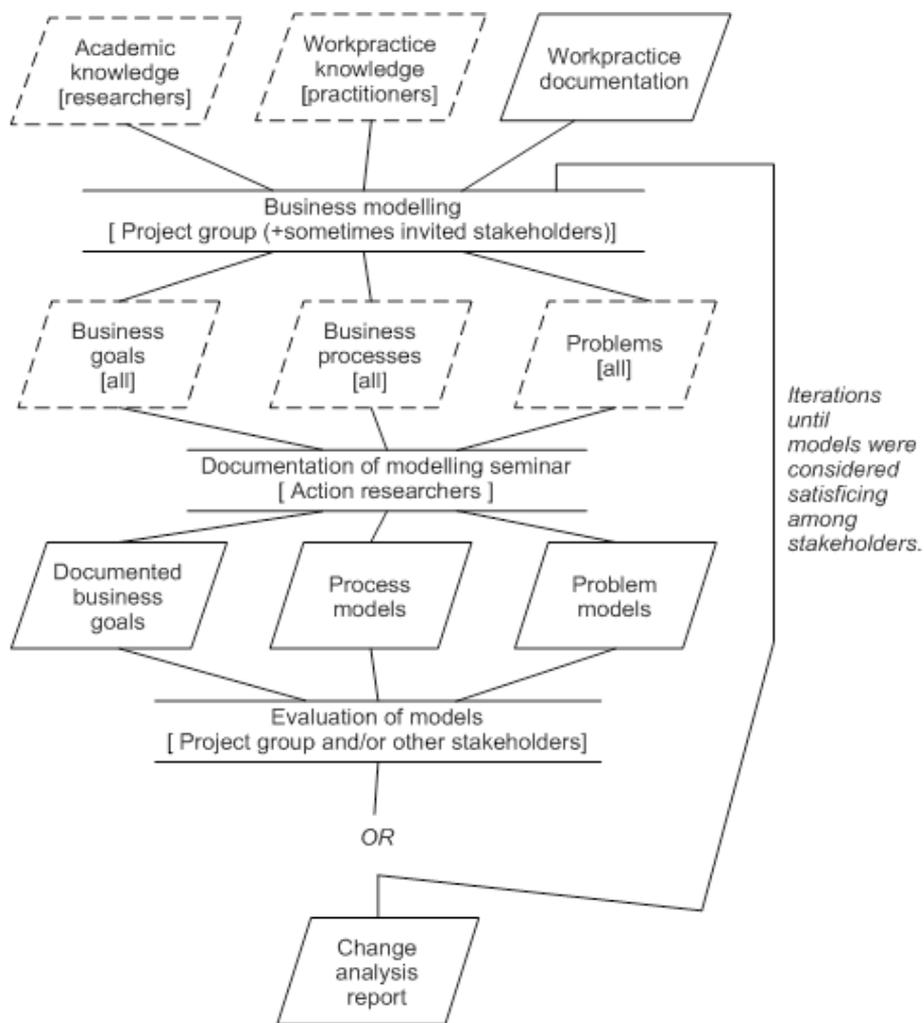


Figure 8.1: The LSS Inquiry: Change Analysis

dialogues with the group on a shared display (a whiteboard or a computer projected screen).

The project group had frequent meetings where workpractice issues were discussed and modelled, complemented with 'homework' between the meetings. Both practitioners and researchers were given assignments to stimulate activity. The practitioners gathered documents and other information, and reviewed models from the modeling seminars, and had these models reviewed by colleagues in their home municipality. In the mean time the researchers refined models produced during the seminars and sometimes they also created some new models based on seminar notes and existing documentation from the municipalities. The researchers also conferred external sources of knowledge, such as research publications, and legislation<sup>4</sup> governing the workpractice. New models were presented and discussed at the subsequent modelling seminar in the project group.

The models have been important communicative instruments to create commitment and a shared<sup>5</sup> understanding in the group. We have also used the models when presenting and discussing the results with other stakeholders that have not participated in the project. The proposed solutions and the two rival strategies for accountability (individual certifying vs social transparency) have been presented to other important stakeholders like managers and experts at the Swedish Social Insurance Agency and representatives of a government official investigation that are working with refinement of the legislation. There have of course been disputes and controversies both in the project group and in meetings with these other stakeholders. The active use of models has, however, contributed to make these discussions conceptually clear and avoid unnecessary confusion.

## Information Systems Design

A prototyping approach was adopted to ensure a continued stakeholder-centric process. Non-functional prototypes were designed and evaluated in workshops, as shown in figure 8.2. Figure 8.3 is an example of a non-functional prototype showing part of the clients' view of the system. Feedback from these workshops were used as input to the designers to further improve the prototypes, and helped the project group to understand the characteristics of the future IT support in a less abstract manner. The three first prototype evaluations were performed within the project group, generating feedback from stakeholders within the local government administration (middle management, operative work managers, and a few representatives from accounting and IT staff).

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<sup>4</sup>Actively dealing with legislation is an important part of design in e-government. Confer Goldkuhl (2009) for more information on this particular topic.

<sup>5</sup>One may argue if there is such a thing as *shared* understanding. The point here is that the models – representations of various aspects of the workpractices in the municipalities – provoked and facilitated detailed discussions, allowing for everyone to better understand each other.

In addition, there was one prototyping session with personal assistants, one session with clients, and two sessions including among others a Swedish special interest group for functionally impaired. The last session was also opened up for virtually any stakeholder by open invitations to a number of local governments in southern Sweden. In total, an estimated number of 150 persons – representing a number of stakeholder roles – attended the sessions and contributed to the design process through these discussions.

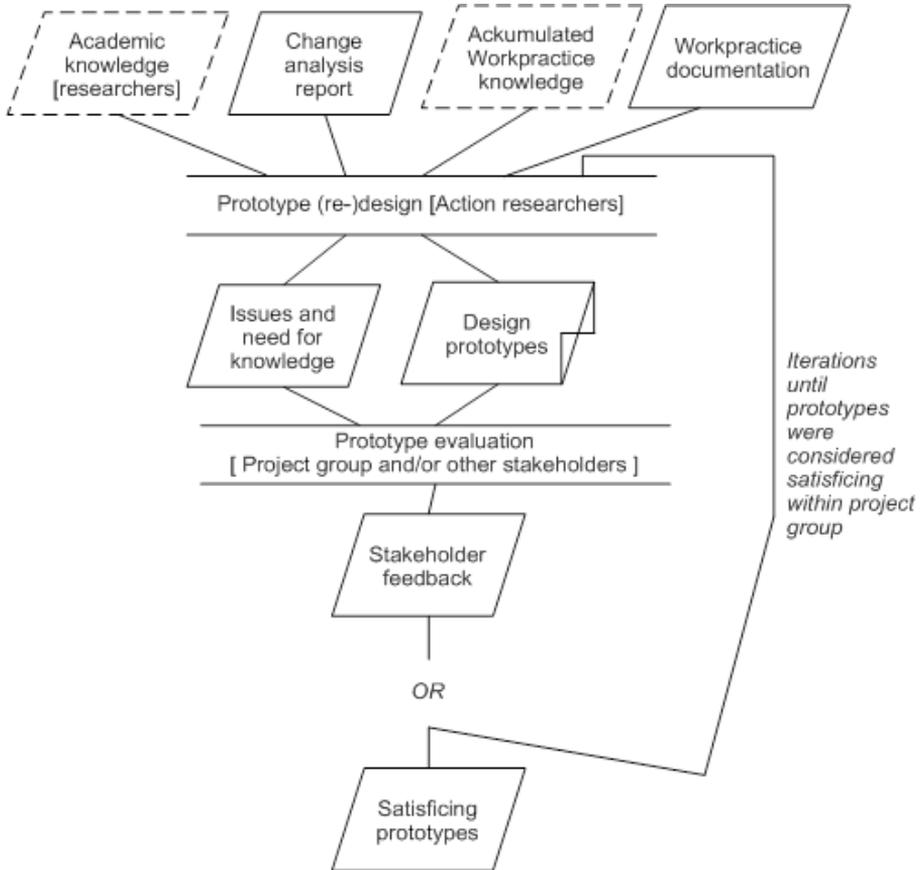


Figure 8.2: The LSS Inquiry: IS Design through Prototyping

The design activities mentioned above mainly focus business issues and user views of new IT support. Design, however, also needs to take into account technological issues, such as IT system architecture and IT system interaction. Thus, there is a need to involve additional stakeholders to promote that these issues are properly addressed. With the backdrop that the target groups for the design products is virtually *any* municipality in Sweden, we need to understand and take into consideration the feasibility for this variety of existing

IT artefacts to interact with the one we are designing. Thus, the members of the project group were given the assignment to forward a number of questions to their IT strategists/architects and work actively to make sure that answers to the question were brought back to the designers in the project group. The answers to these questions were imperative to come up with a design matching the needs of an arbitrary local government (from an architectural point of view).

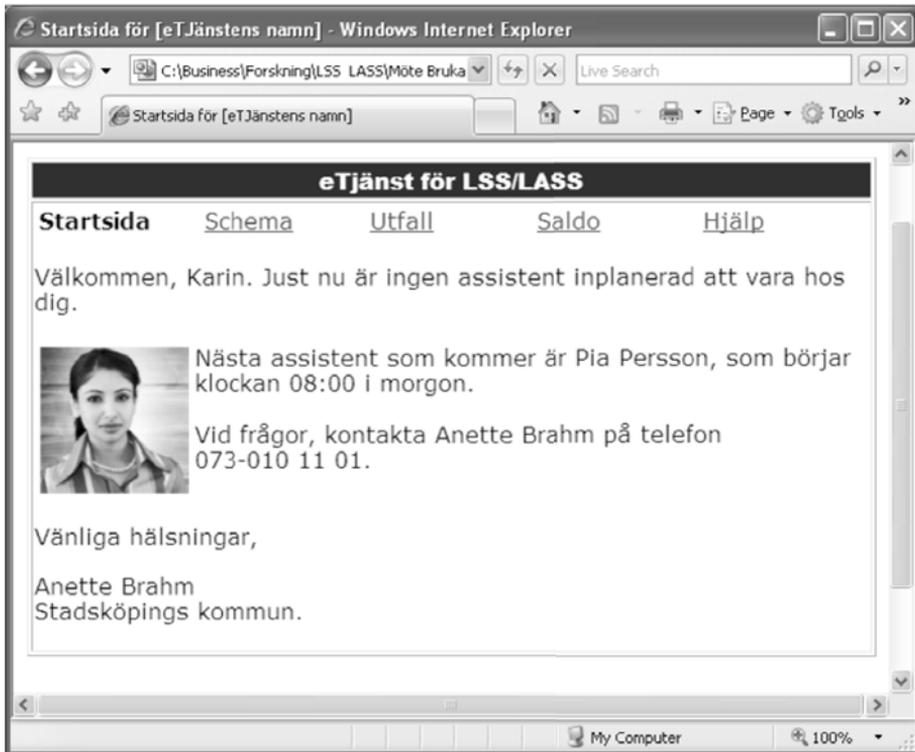


Figure 8.3: Example of early design prototype in the LSS Inquiry

When the prototypes were deemed 'satisficing' – that is; when the project group agreed that the representation of their needs was sophisticated *enough* to move on – the researchers were given the assignment to formulate a requirements specification, as a basis to procure an actual IT system. Knowledge from the previous phases needed to be formulated in the form of a requirements specification for a new IT system. Since the project group was distributed throughout Sweden, we decided to create a web application<sup>6</sup> where

<sup>6</sup>The design and use of the web tool for distributed requirements engineering turned into a delimited design-oriented research project of its own that has been partially reported by Sjöström and Iqbal (2010).

all the requirements and related documents are accessible. The project group, and other actors, were invited to log in to the web site in order to analyze and comment on the requirements. The web site provided a number of features, such as revisions of requirements, workflow support, delegation of work to people with different roles, and some other aspects of collaboration. By promoting an active discussion about requirements in this community, we had the ambition to minimize the so-called requirements engineering gap (Ågerfalk, 2003), having the project group involved in actively questioning the formulation of requirements. The idea was to continue this work until there was a consensus in the requirements elicitation process, that the requirements are 'complete' (*satisficing* to all parties is likely a more appropriate expression). At that point, the requirements specification could be exported from the web site. Unfortunately, the project group did not use the tool the way we anticipated.

More importantly, at this point in time, the action researchers challenged the chosen approach. It was argued that there are many risks with a plan-driven approach, and that a requirements specification and a conventional procurement process may lead to undesirable results. The researchers argued that an agile approach should be adopted in the continued project work. The main argument was that several other projects in the Sambruk context had problems with the discrepancy between requirements specifications, and the IT artefacts actually delivered on basis of those specifications. Another important rationale to continue in an agile manner was that the project group would otherwise risk losing control over development – since there were some innovative ideas in the design, it was imperative that those ideas were actually implemented in the IT artefact. Further, Sambruk was pursuing the idea that all designs emerging from their projects should be licensed under a community license, that would allow the municipalities to stay in power of future design. The idea of an agile approach was embraced in the project group, and work proceeded as described in the next section.

## Agile Development

After the initial designs, the project faced some problems. The financial crisis of 2008-2009 made it hard for the members of the project group to get their municipalities to invest in the development of the IT system. In April, 2009, only three out of 15<sup>7</sup> were willing to invest in the project. There was a clear risk that the project would halt completely<sup>8</sup>. Therefore, the author offered to start developing the IT system. The idea was that a fairly sophisticated version,

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<sup>7</sup> 15 municipalities participated in the workpractice diagnosis.

<sup>8</sup> It should be noted, that up to this point, the municipalities had not invested any resources except from their time and expenses to participate in the meetings, and time for the 'homework' between meetings. Thus, there was only a small commitment to the project so far – at least in terms of resources spent.

implementing the core features, would work as a 'proof-of-concept', which in turn would attract funding from more municipalities.

During prototyping work, a fairly sophisticated conceptual database model had emerged. The available funding also made it possible to employ a computer science master student to contribute as a developer on the project during the summer. After the emerging IT system was demonstrated in August 2009, a total of seven municipalities contributed with funding, making it possible to continue development. The master student continued working on the project part-time during the autumn, as did the action researcher. However, in early 2010, it proved impossible for the researcher to continue developing the IT system as part of his employment (due to the funding situation and the researcher's personal situation). The objective to develop a proof-of-concept was achieved. As a consequence, during the latter part of the development process, the researcher assumed double roles, taking part of the project both as an action researcher, and as a consultant working with development of the system.

One of the municipalities, that had been very active in the project, was selected as a pilot. That way, it would be possible to initiate an actual development process in one of the workpractices. The agile development process was consistent with earlier stages of inquiry, in that it was *stakeholder-centric* and *iterative*. Based on the previous findings, a number of iterations were performed to carry out development. Each iteration was performed by the developers, followed by a workshop with the pilot municipality. Each workshop consisted of a demonstration of the status of the IT artefact, followed by design discussions. Thus, each meeting may be conceived of as an evaluation of the emerging design. Changes were integrated into the production environment in the pilot municipality, which means that practical systems development problems (such as security issues) needed to be addressed continually. In parallel, new versions of the IT artefact were also installed on a test server, accessible by all the municipalities that originally took part of the project. This way, everyone was informed of progress, and had an opportunity to provide feedback to the developers through an online commenting function, available for each page in the web-based part of the system, and each form in the desktop part of the system. Periodically, meetings were also arranged in the large group of stakeholders, allowing for face-to-face feedback concerning design features and project issues.

In May, 2010, *version 1* of the IT system was released and implemented in the pilot municipality. The pilot municipality has been using the system since November, 2009, to handle administration of some of their clients – the system emerged incrementally during that period. As a next step, three additional municipalities intend to install the system in order to assess whether or not to implement it fully in their organizations. Evaluations are planned to take place in the future, to acquire more knowledge about the design ideas and

to which extent it actually contributes to solving the problems it was designed to solve.

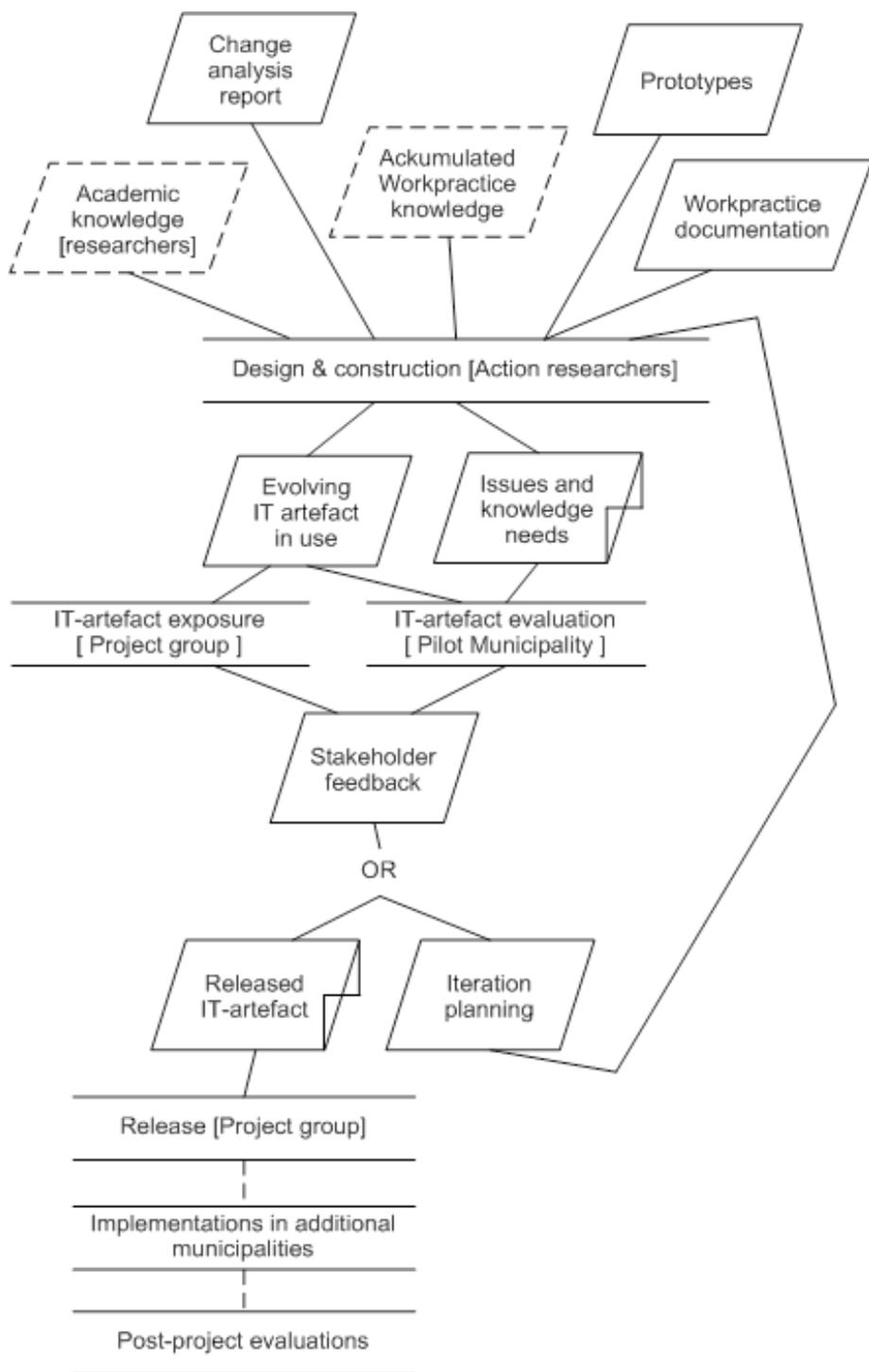


Figure 8.4: The LSS Inquiry: Agile Development

## 8.2 Theory Base and Theoretical Concerns

This section outlines the use and role of theory in the LSS Inquiry. Figure 8.5 depicts how the pragmatic design approach constitutes a rationale for the three inquiry phases (workpractice design, IS design, and agile development). The following three subsections address the guiding principles for the three phases: *Design as a search process*, *stakeholder-centricity*, and *communication action focus*. The picture further shows that these guiding principles were operationalized through the activities in the inquiry. These activities made possible a test and development of the guiding principles, as discussed in the theoretical concerns subsection below. A very brief summary of the inquiry is that the development process was strongly based on social interaction among a variety of stakeholders – in the workpractice diagnosis, in information systems design, as well as during the agile development of the IT artefact.

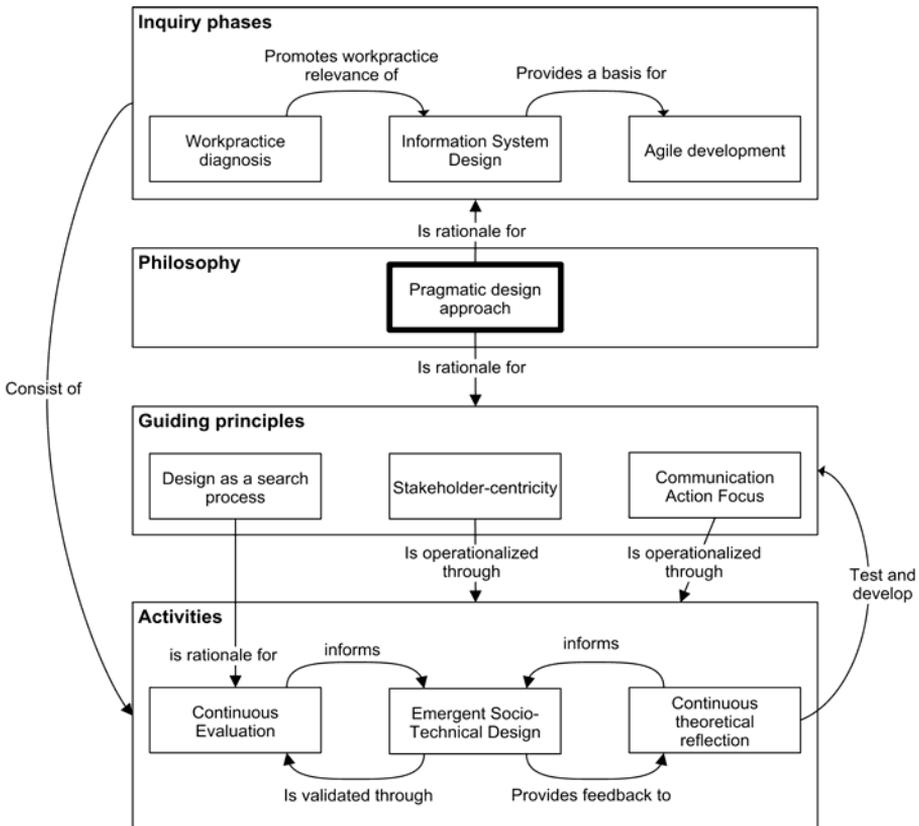


Figure 8.5: A Design Process based on Pragmatism

## Design as a Search Process

The notion of design as a *search process* (e.g. Cross, 2001; Fallman, 2003; Hevner et al., 2004) was embraced throughout inquiry. It should be noted that we do not adopt this term without hesitation – the notion of a 'search' process reflects our view of development as an iterative process. However, we conceive of design as a process of social *construction*, rather than a process of disclosing 'existing' ideas. A *prototyping* approach was adopted, followed by an *agile* development process. Prototyping as a technique for design has been long discussed in the IS field as a means to design IT systems that meet user requirements (e.g. Naumann and Jenkins, 1982; Budde et al., 1984). In the words of Hirschheim and Klein (1989, p 1205):

"Any system that meets with the approval of the affected parties is legitimate. To achieve consensus or acceptance, continuous interaction among all parties is critical. Through interaction, objectives emerge and become legitimized through continuous modification. Systems cannot be designed in the usual sense, but emerge through social interaction. The mechanism of prototyping or evolutionary learning from interaction with partial implementations is the way technology becomes embedded into the social perception and sense-making process."

The concept of agile software development (e.g. Schwaber, 1995; Fowler and Highsmith, 2001; Schwaber and Beedle, 2001; Beck and Andres, 2004; Larman, 2004) is ambiguous. The development process in the LSS inquiry was not following any agile methodology in detail<sup>9</sup>. However, the core values (Fowler and Highsmith, 2001; Schwaber and Beedle, 2001) of agile development were embraced, as a contrast to a plan-driven approach:

- Individuals and interactions over processes and tools.
- Working software over comprehensive documentation.
- Customer collaboration over contract negotiation.
- Responding to change over following a plan.

A note about these values is that agile methods recognize the need for processes and tools, documentation, contract negotiation, and following a plan. However, it is argued that we need to acknowledge that these issues are not important *per se* – they should be subordinate to the left-hand issues, and used only when there is a clear argument to use them (as shown in the item list above). Conboy (2009, p 340) defines agility as "the continual readiness of an ISD method to rapidly or inherently create change, proactively or reactively embrace change, and learn from change while contributing to perceived

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<sup>9</sup>The intention was to work in a more 'pure' agile way, following Scrum (Schwaber, 1995; Schwaber and Beedle, 2001) as a process model and eXtreme Programming (XP; Beck and Andres (2004)) to promote good software engineering practices. Due to the lack of resources, it was unfeasible to setup such a development process.

customer value (economy, quality and simplicity), through its collective components and relationships with its environment.", based on a comprehensive literature study.

## Stakeholder-centricity

Contemporary IT system development efforts are typically part of a change process, where the aim is to improve a social setting (e.g. establishing inter-organizational business processes or enabling a community of people to interact with each other in new ways). In the view of socio-instrumental pragmatism, IT development enables – and is part of – induction of change in a social context<sup>10</sup>.

In their Multiview model, Avison and Wood-Harper (1990) promote the idea that system developers need to take into account the view of different stakeholders in order to improve acceptance of a new IT system. Other authors (e.g. Mumford and Weir, 1979; Checkland and Scholes, 1990) claim that the extent of stakeholder participation has an impact on the success of projects dealing with business and IT development. Krippendorff (2006) expresses that only the *users* of the artefact tend to be considered in information systems development. This is consistent with Lyytinen and Hirschheim (1988), who state that IS research tends to provide a simplistic view of the IT system and how it affects stakeholder interests. Lyytinen and Hirschheim argue that it should reveal the actors' interests with regard to the IT system (and possible conflicts of interest). The notion of "failure" of IS projects needs to be understood from different stakeholders' viewpoints – *failure to one may be success for another*. From a change management point of view, it is imperative to identify *sponsors* and *blockers* of a project, and take into account these political circumstances to improve the feasibility and chance of success (Hayes, 2002).

The LSS Inquiry is an investigation into a social context, and must thus be understood as a "moral inquiry", to paraphrase Dewey (1938). A moral inquiry takes into account the viewpoints of different stakeholders in order to determine the situation-in-view, and to change that situation into a more desired one. There are several reasons, found in multiple academic disciplines, to centre a design process on its stakeholders. *First*, it is a means to understand the work practice and its problems. We need to focus business problems initially in order to come up with change measures that solve the actual problems in the workpractice. There is also a need to be open for different kinds of innovative changes, and avoid the trap of just creating IT support for the current processes in the organization. *Second*, there is a need to make sure that the requirements for a new IT system are based on the actual needs of the organization. The requirements thus need to be evaluated by the practitioners who will use the IT system (this is further discussed in the *IS design*

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<sup>10</sup>It should be noted that this inquiry contributed to an elaborated view of socio-technical change, as shown in figure 10.1 in the results section.

section below). *Third*, from a change management perspective, the strategy of engaging people at an early stage in a change process increases the chances that they actually accept and adopt the changes (e.g. Kotter, 1996). A user-centered design process has also proven to increase the chance of building usable IT systems (e.g. Bevan, 2001; Preece et al., 2002), which are usable to all stakeholders, in line with Bevan's (2001) discussions on quality in use for all.

In summary, one may consider an inclusive approach to stakeholders important both with respect to the *usability* of the product-to-be-built, the *acceptance* and *utility* of that product and the accompanying organizational changes. In addition to this, authors propose that emerging *open innovation* business models offer new and powerful ways to make innovation happen through the delegation of idea generation (and other areas of product development) to actors outside the own organisation (e.g. Chesbrough, 2003). Such business models do not only promote innovation, they also resonate well with democratic values, and should thus be further elaborated upon in e-government projects (i.e. the inclusion of citizens and businesses in the development of public administration).

On top of the view of stakeholders discussed above, one must also acknowledge the technological aspect when discussing stakeholders. One may speak of an *ecology of artefacts* from a technical perspective, in a similar manner as interaction designers speak of an ecology of artefacts from a user perspective (e.g. Gibson, 1979; Krippendorff, 2006). An important starting point in this inquiry was that in order to design something that functions well within this existing 'technological ecology', one must manage the relations with architects and vendors of existing systems. This calls for architectural decisions in IS development, which further adds to the complexity of stakeholder management. As expressed by Smolander and Paivarinta (2002, p 132):

"Whereas only designers emphasized architecture as a basis for further design and implementation, the other stakeholders emphasized it rather as a means for communication, interpretation, and decision-making. [...] The primary focus of the software architecture research should be shifted onto the non-technical rationale and common understanding of technical complexity of software in relation to the relevant organizational and business environments."

This discussion on stakeholder-centricity constitutes a rationale to embrace a stakeholder-centric approach to design in a wider sense than a narrow focus on users of the IT artefact to be. The adopted notion of stakeholder-centric design – where the design process is characterized by social interaction between stakeholders – is clearly a pragmatic account of design<sup>11</sup>

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<sup>11</sup>Fallman (2003) distinguishes between three accounts of design: The *conservative*, the *pragmatic*, and the *romantic*.

## Communication Action Focus

In addition to the principles of *design as a search process* and *stakeholder-centricity* (as outlined above), there was also a focus on *communication action* throughout inquiry. Socio-instrumental pragmatism and several of its descending theories and models (Goldkuhl and Röstlinger, 1988, 2003) have been used as practical theories in the LSS inquiry. SIP includes a set of generic work practice models, which have been used as conceptual instruments for investigating and diagnosing the existing practice. The change method CA/SIMM (Goldkuhl and Röstlinger, 1988) was the starting point for the workpractice diagnosis. Work processes were studied in terms of the structure of the (formal) social interaction between different actors. Based on insights from this inquiry, new work processes were proposed, and an IT artefact *enabling* these new processes were designed. An important theoretical base for this study was the communicative view of user interfaces (section 9.1), which (along with the SIP perspective) triggered us to start designing by identifying social actions in the workpractice. Section 8.3 shows a number of design results based on techniques found in socio-instrumental pragmatism and information systems actability theory.

## Theoretical Concerns

The way this inquiry is presented in this chapter emphasizes certain aspects of the action research project as a whole. The overarching theoretical concern in the project was to learn more about the characteristics of development in this type of e-government projects, and to develop methods adapted for the particular e-government context (which we roughly could summarize as *IT-enabled change in public administration, with a specific emphasis on municipalities in network collaboration*). However, the theoretical concerns in this specific inquiry also included an investigation of various concepts from socio-instrumental pragmatism and information systems actability as *sensitizing concepts* (Blumer, 1969) for inquiry. The situation offered an opportunity to *test theoretical concepts as design instruments*, both with regard to pragmatic characteristics of the *design process* (stakeholder-centricity) and pragmatic features of the *design product*. The latter means a focus on the way the IT artefact supports social interaction in line with the definition of information systems actability (section 2.3). In specific, the perspective on the IT artefact as it evolved through inquiries #1 – #4 were of concern for the thesis work. This is further illuminated in the inquiry details section (below), where several of the models from the first two result chapters (chapters 9 – 10) were used to enable a focus on social interaction in the IS design process.

Given the contemporary discussion on design-oriented IS research (see sections 1.3 and 3.3), an emerging theoretical concern in this inquiry was how to conduct this type of design-oriented action research, and how to represent the results of such research.

As stated by Goldkuhl and Lind (2010), design-oriented action research may be characterized as explorative. This was the case in this inquiry, where the theoretical concerns pointed out a domain of interest, rather than specific research questions. The theoretical concerns thus emerged into more specific issues – as outlined above – as inquiry proceeded.

### 8.3 Inquiry Details

This section reports on the details of the inquiry and the interventions made in inquiry. The emerging research has been documented in a number of ways:

- Evolving workpractice models using CA/SIMM modelling techniques, iteratively exposed to stakeholders and re-designed on basis of their feedback
- Prototype evaluation workshops including feedback
- Agile meetings including feedback
- Field notes (e.g. minutes from meetings, and reflection notes)
- Evolving prototypes and other design documents, including the emerging IT artefact
- Data from actual use of IT artefact (Pilot municipality + others) – database contents, web logs
- Email communication between researchers and practitioners

Given the amount of data, this section consists a *summary* of – and concrete examples of data from – the three phases of inquiry: *Workpractice diagnosis*, *Information systems design*, and *agile development*, presented in the subsections below.

#### Workpractice diagnosis

The work practice diagnosis revealed a number of issues in the administration. These issues were categorized into the problem areas *decision making*, *time reporting and auditing*, and *citizen information services*. Setting out from the diagnosis of the work practice, a brainstorming session was performed in the project group, aiming at formulating change proposals. This resulted in 14 change proposals – most of them related to the problem area *time reporting and auditing*; specifically the administrative complexity that follows from the requirement that citizens certify invoices through signatures. An abstract view of this type of work practice – focusing interactions between actors – is shown in figure 8.6.

There is a schedule for each client. Each time a personal assistant assists a client, the time for the work session needs to be documented and signed by the assistant. Today, it is required that this is done using a form from the Social Insurance Agency. The form is handed over to a team leader at the local government. At the end of each month, the team leader has to create an

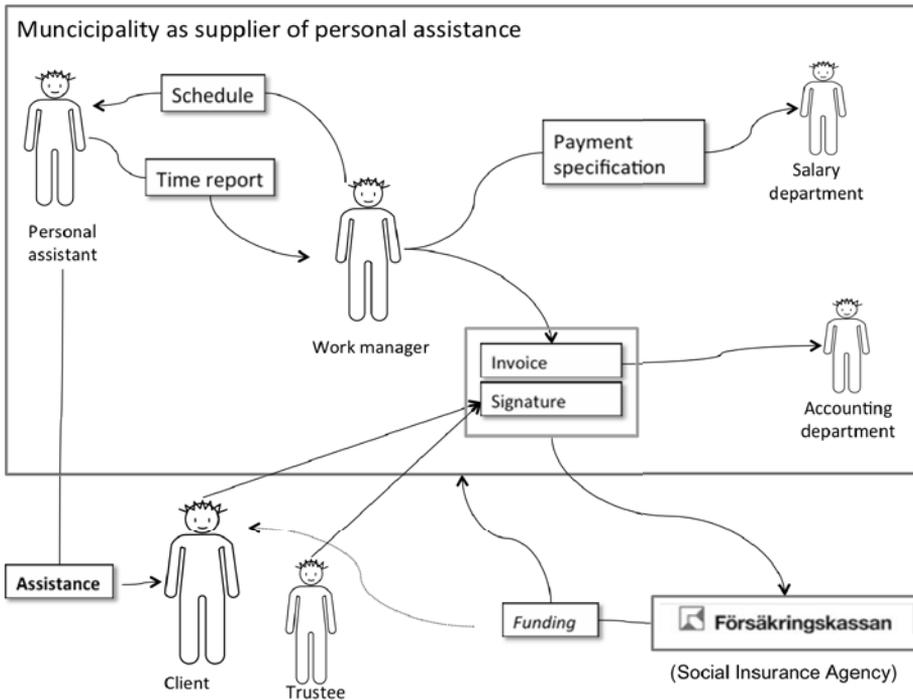


Figure 8.6: An abstract view of the studied type of work practice

invoice, by aggregating all the time reports from all the assistants, and sum the time spent on each client. This is one of the problematic steps – the assistants' forms are often missing, incomplete, or hard to interpret due to ambiguity or low quality hand writing. These invoices need to be signed by the clients – in order to fulfil this, the invoices need to be delivered (e.g. by mail) to the clients, then signed, then delivered back to the team leader. The team leader then sends all the invoices to the Social Insurance Agency – a government agency responsible for co-funding personal assistance.

The Social Insurance Agency requires these signatures, as a means to achieve accountable invoices. The strategy where individuals certify documents through signatures is strongly rooted in the norms in local governments, as well as in the Social Insurance Agency. The idea is that the client *accounts* for the content in the invoice, and can be held responsible for erroneous information. The complexity of the workflow causes many consequential problems, such as i) intensive paper work, ii) erroneous payments due to incorrect or incomplete information, which in turn causes iii) the need to adjust payments back and forth between local governments and the Social Insurance Agency.

In the very first project meeting, all participants were asked what they expected from the project. Their answers signalled that the (seemingly simple) process shown in figure 8.6 was characterised by problems. An LSS unit manager stated that there is a *"Madness in the paperwork, I'm looking forward to less complex administration in any possible way, and to have better control over the costs."* One of the administrators agreed, stating an expectation to *"simplify this - it is incredibly time consuming and messy."* Another unit manager expressed a need for *"increased responsibility (with respect to the signatures on the invoices) and accountability"*. An accountant expressed a need for *"improved accounting and better control than today. We should do the right things and get paid accordingly."* Figures 8.7 – 8.8 show the results of a detailed analysis of the experienced problems and their relations.

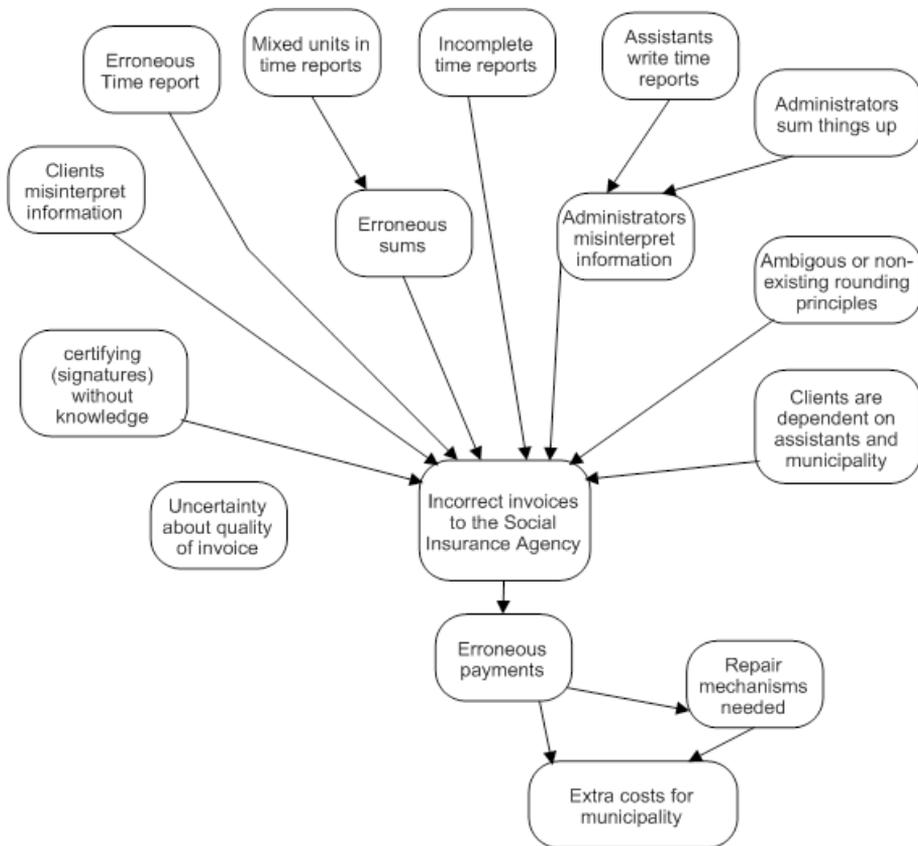


Figure 8.7: Problem diagram concerning invoice quality

Without going into all details, it can be concluded that the existing (paper-based) time reporting process contains a number of problems, which boil down to delayed and erroneous invoices to the social insurance agency, and a

lack of control of the administrative resources. The problem analysis provided insight into the meaning of the expectations that were expressed in the initial project meeting.

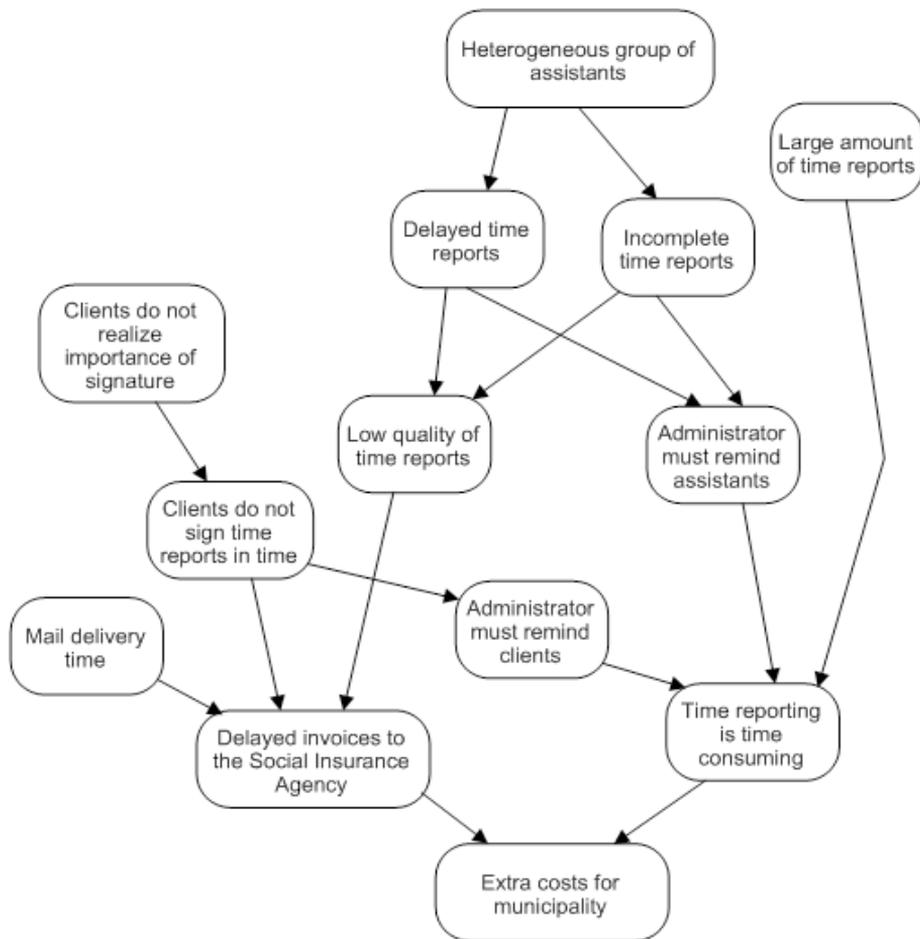


Figure 8.8: Problem diagram concerning invoicing efficiency

The assertion that problems need to be understood in relation to ideals (see 1.2) leads to the implication that an important part of workpractice analysis is to elicitate the *goals* of the municipalities' LSS units - these goals may be conceived of as ideal outcomes in the workpractice. Table 8.1 shows a subset<sup>12</sup> of the result of a CA/SIMM goal analysis (Goldkuhl and Röstlinger, 1988) in the workpractice.

Table 8.1: *A subset of goals for municipal LSS work*

<b>Goal</b>	<b>Description</b>
#1	High quality documentation to support invoicing and payment.
#2	Correct payments - should correspond to performed work.
#3	Payments from the Social Insurance Agency should in due time.
#4	Efficient administration with respect to both funding from the Social Insurance Agency and salaries for personal assistants.
#6	Respect for the clients' [sjalvbestammande] and integrity – provide them with the biggest possible influence and [medbestammande] on assistance
#7	The municipality should inform about goals and means within personal assistance.

Based on the work practice diagnosis, the project group embarked on an idea generation process in order to propose remedies to the problematic situations. In a brainstorming session 15 change proposals were generated. The change proposals were categorized into three domains: 1) *From application to decision*, 2) *time reporting*, and 3) *offers and agreements*. Domain 1 – dealing with applications for personal assistance and the following decision making process – is out of the scope of this study and will not be further discussed. The change proposals found in domains 2 and 3 are summarized in table 8.2. Notably, one idea was to skip the clients' signatures on invoices. The project group agreed that there is a need for accountable processes, however there was also a consensus that we may achieve this goal in different ways. The idea to skip signatures was quickly adopted within the project group. The continued work was based on this decision. The change proposals pointed out change needed in the workpractice, and gave the first input for design of an IT system to support the LSS administration. In summary, the change proposals aim at designing and implementing quality assured workpractice processes, supported by information technology for time reporting and invoicing, and providing the clients' with better information to allow them more flexibility in their lives.

<sup>12</sup>Only the goals related to the design of a new IT artefact are shown here.

Table 8.2: A subset of change proposals in the LSS Inquiry

Change proposal	Summary of ideas
Time reports should be filled in at the time of providing assistance, not retroactively.	The new IT system should be mobile – the idea is that there is always a mobile device where the client is, which is used by the assistants to time report. The data collected offers an opportunity for many types of analyses with respect to the plan in comparison to the actual work performed. The IT systems must be able to differentiate between assistance time and other types of work performed by the assistants.
The municipality receives power of attorney from the client to certify time reports.	The signatures today – from the client or their trustee – is in practice a pure formality. They do not have the information necessary to audit the time reports. This has been criticized by a number of stakeholders, such as the Swedish Association of Local Authorities and Regions.
The future IT systems should interact seamlessly with existing systems for scheduling, payrolls, and accounting.	[No further explanation documented.]
The social insurance agency requests establishes a process to audit the municipalities through samples, rather than requiring the clients to sign all invoices.	The project groups finds it odd that the social insurance agency presumes that the municipalities will misbehave – they should rather presume that they do things correctly.
The IT systems should allow the municipalities to produce a complete, quality assured invoice 7-10 days after the end of a month.	The invoices will address the actual work performed, and the need for invoicing repair mechanisms will be removed.
The municipalities should develop a strategy for communicating with their clients, and the new IT system should take this strategy into account.	The municipalities are obliged to provide clients with certain information. This was highlighted by the action researchers as a problem in the current workpractice. The researchers actively advocated a stronger service orientation towards the clients, and the idea was adopted by the project group.
The municipality should provide information to their clients about interest groups for functionally impaired	(This is part of the increased service-orientation)
The municipality as a provider of personal assistance should seek to be part of the comparisons of providers conducted by interest groups for functionally impaired.	Again, this is part of the service-orientation towards the client.

In addition to the change proposals, some strategic design principles emerged in the shift from a diagnosis phase to the design phase. These principles are clearly coupled to the stakeholder-centric approach. One prominent principle was that *design should benefit all stakeholders* (at

least those directly affected by changes). This was discussed both in terms of improving the situation for all (an ethical point-of-view) and to avoid resistance towards development (a feasibility point-of-view to pro-actively manage the value-ladenness of design).

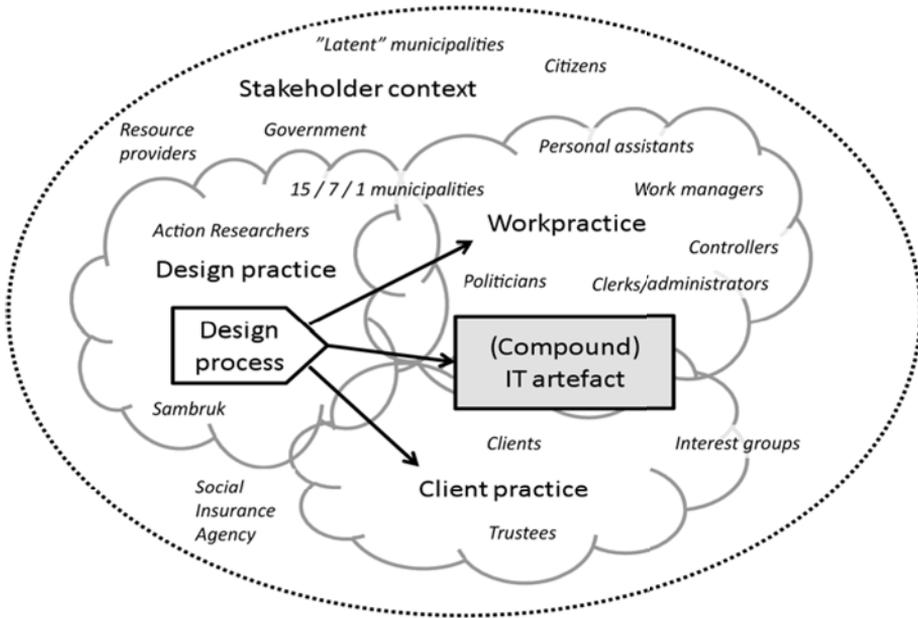


Figure 8.9: A 'business stakeholder map' from the LSS Inquiry

Initially, there was no systematic mapping of stakeholders for the project. Some stakeholders were identified in early project discussions (such as the social insurance agency, agents of the work practice in focus and their clients, and special interest groups for the clients). It was considered necessary to form good relations to those groups by including them in the project work in some way. The business stakeholder map (figure 8.9) is a re-construction of stakeholders that emerged in the inquiry. The figure is based on the contextual view of a design process shown in 10.2.

Note that only a subset of the identified stakeholders is mentioned in the following examples. However, these examples serve well to illustrate the political complexity of the inquiry.

Example 1: The **social insurance agency** is an important collaboration partner for the municipalities, since it provides a rather large part of the funding for personal assistance. Municipalities deliver personal assistance, and invoice the social insurance agency. This stakeholder was considered an important sponsor to ensure feasibility of a number of innovations in the municipal

administration. Although the insurance agency was represented in the project, and their representative was positive towards the ideas brought forward in the project, the social insurance agency turned into a "blocker" of some changes that would have saved the municipalities a lot of effort (thus money). In a critical meeting, other representatives of the agency were reluctant to embracing the ideas from the project. The key lesson learned here was that the representational issue is crucial – there is a need to form relations to *true decision makers* in the stakeholder organization to ensure that perceived sponsors do not turn into blockers at a later stage in the project. An alternative explanation is that the business process analyses were conducted at the municipal side – which may have had the consequence that the social insurance agency did not perceive these problems as relevant in their organization. The fact that this stakeholder turned out to be a blocker, rather than a sponsor<sup>13</sup>, indeed had an impact on the project (discussed further in the IS design subsection below).

Example 2: The clients join forces in strong **interest groups** for functionally impaired. In this project, it was deemed important to come up with results that were appreciated by the clients. First, the municipalities exist to serve the citizens by carrying out activities as stated in legislation. Second, if the interest groups form a negative opinion about the project, they may communicate this through media, making it hard (or impossible) for **politicians** in the municipalities to support the project financially. Typically, the participating municipalities finance projects in the Sambruk context. In this case, representatives from 14 municipalities were part of the project initially, and ideally all 14 would have contributed financially to committing changes (e.g. developing or procuring IT systems). Thus, it was both desirable and necessary to establish good relations with interest groups. This was done through communication between project management and management representatives of the main interest group, and (in the IS design phase) by demonstrating prototypes of the planned IT system at two conferences arranged by this interest group. This generated both valuable feedback for IT system design, and helped turned the interest group into a sponsor of the project.

Example 3: While this project work was conducted, there was an investigation going on by the **LSS committee**. The committee was given an assignment (by government) to assess the current legislation concerning personal assistance, and come up with a proposal for changes in the legislation. Some ideas for change in the project were innovative, and could not be implemented without changes in legislation. Thus, it was imperative for the project to initiate a dialogue with the committee, to influence their work; consequently make ideas in the project feasible. This was successful to some extent; one could even identify certain formulations committee proposal being identical to formulations that the project communicated to them. The LSS committee

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<sup>13</sup>Hayes (2002) speaks of 'sponsors' and 'blockers' among stakeholders, and outlines strategies to turn blockers into sponsors.

should be regarded as a sponsor of the inquiry, since their proposals turned out to be in line with the changes proposed in the LSS inquiry.

The information systems design section provides discussions on stakeholders from the workpractice, the client practice, and the design practice, and their roles in the inquiry.

## Information Systems Design

As a consequence of the action-focus, the first design step was to outline the role of the new IT artefact as an instrument for business communication. This work was initiated in the brainstorming session, and resulted in a collaboration diagram (figure 8.10).

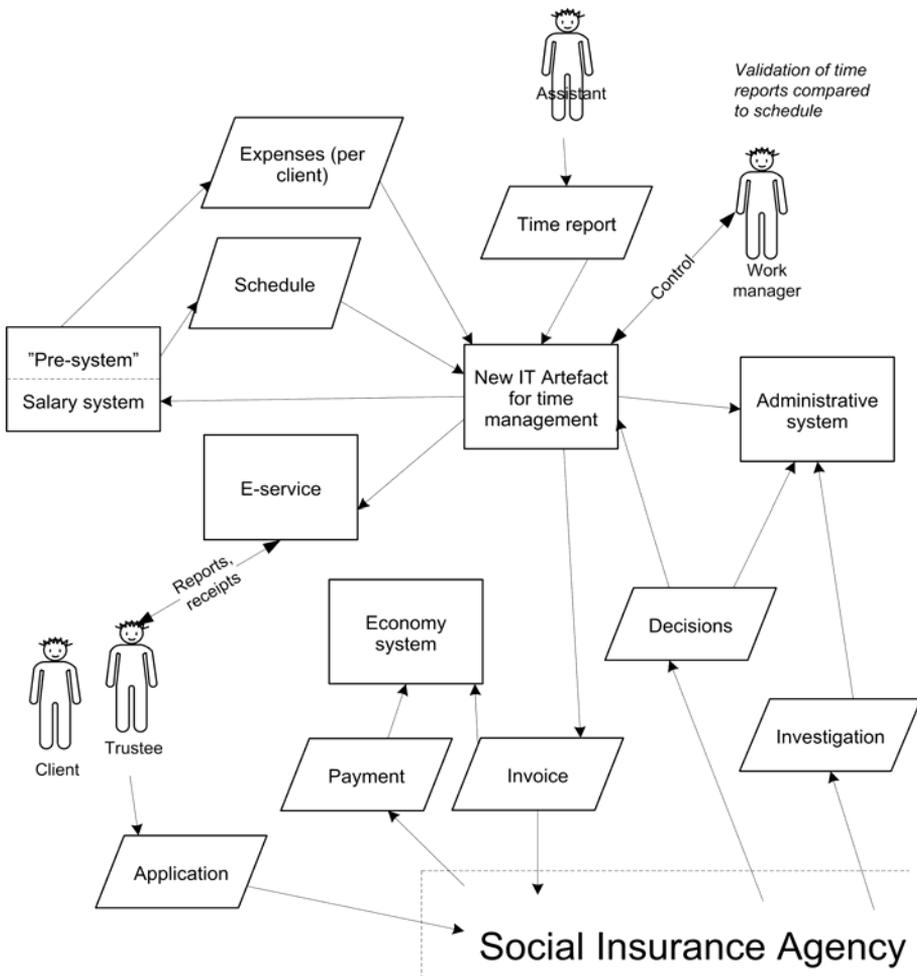


Figure 8.10: An early representation of the information system to be.

Figure 8.10 depicts the desired relations between assistants, clients (and their trustees), administrators, and other actors through the use of the new IT system. The centre node is the IT system to be built. This implies that there are (at least) three different user interface *views* of the IT system, one for each role, to support the scheduling of work sessions, time reporting, and confirmation of time reports. The collaboration diagram was the starting point for prototyping the IT system, where we aimed at designing support for core actions performed by different actors. The prototypes and the collaboration diagram were useful in the design process, to receive feedback on the design ideas and allow them to emerge in a number of iterations. The following core actions were identified in the process:

- Scheduling – the work manager sets up a plan for personal assistance, which needs to be communicated to clients and assistants.
- Time reporting – the assistants report the actual work done in the start and the end of a work session.
- Time confirmation – the work managers confirm time reports, and follow up incomplete reports; or reports that deviate from the plan.
- Commenting / complementary communication – The stakeholders need to be able to write comments when scheduling, reporting, and confirming, to support other to interpret what has been done.
- Objections – given the goal to skip the clients’ signatures on time reports, there needs to be some other mechanism to ensure accountability in the process. The design process informed us that the option to complain is a proper substitute for signatures, in the sense that it is appropriate and time-saving for the administration in the local government.

A leading design idea was that, as far as possible, *all these acts should be made visible*<sup>14</sup> to all other stakeholders in order to enable a *fully transparent dialogue* and thorough *documentation of actions*. These core actions were to be supported by the IT system, complemented by a high degree of action transparency revealing who said what. The concept of social transparency refers to transparent action-oriented design in combination with an option to communicate: comment and complain. This allows for generating reports, revealing what has been done, by whom it was done, and when it was done.

The project group considered this social transparency as a fully adequate alternative to individual certifying (signatures) to achieve the goal of accountability, and advocates this solution since it will reduce the complexity of the administrative work and increase the quality of their actions – and allow for audits of those actions. The main features of the design (promoting social transparency) are collective re-construction and quality assurance through making all actions visibility for all stakeholders. The design addresses the workflow in a ‘conventional’ manner – i.e. scheduling, reporting, and audit/confirmation – and adds action transparency as a complement, allowing

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<sup>14</sup>corresponding to the actability design principle visible actors, discussed in section 2.3.

people to *comment* their actions, and, in some cases, *object* to what has been said by someone. Thus, (representations of) others' actions can be reviewed and criticized by others stakeholders. The IT system should work as a socio-pragmatic instrument to create social transparency concerning the work practice – as compared to the current situation, offering poor instruments for control and communication of what has been done<sup>15</sup>.

The elicitation of core actions through prototyping triggered a number of discussions concerning design challenges. These challenges include, among other things:

- Capturing data when things are done (e.g. reporting at the client's place when a work session starts and ends). This principle reduces the risk of missing, erroneous or incomplete reports. This also allows for some monitoring which increases the safety for the client. If no assistant has reported that a work session is initiated, the manager is informed about this (it may be a safety problem, since the clients are functionally impaired).
- Time confirmations may be problematic to work with for managers, since there are a large number of a work sessions each month. Therefore, there is a need for multiple views in the manager's user interface, such as "deviating reports" or "incomplete reports". The manager also needs to be able to define the concept of "deviation" by specifying time tolerance levels. Based on the manager's definition, the IT system acts as an agent, helping the manager to filter information which is necessary to make proper confirmation decisions and follow-ups.
- There are different types of user interface media: The manager can do his/her job using a desktop application. The client needs a web interface. The assistant needs a mobile device, and/or a web interface. Each stakeholder group in relation to the medium in use implies its own challenge in the design process, e.g. designing inclusive web interfaces for functionally impaired or designing small device interfaces for assistants.

The design ideas above informed the design of the first prototypes of the IT system. The prototyping initially focused on three system views: The clients' web application / e-service, the assistants' mobile application, and the work managers' desktop application. The prototypes emerged through a stakeholder-centric process as shown in figure 8.2.

Design prototypes as such are clearly design products in this project. A design product can also be conceived in a broad sense – all artefacts that have been created in the project are products of design, and meaningful in different ways to the project members. We do not consider these different design products as valuable per se, but rather as important representations that help the various stakeholders make sense of different phenomena, and consequentially be able to participate in important conversations, thus communicate their

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<sup>15</sup>The current approach, individual certifying, approach relies totally on personal notes and memory.

work practice knowledge. In the IT system construction phase, an elaborated requirements specification including design prototypes is essential, in order for system developers to interpret the documentation in a proper way.

## Agile Development

The agile development process continued in a similar manner as the prototyping. The first step was to outline an architectural design for the new IT system. The architecture was based on principles of service-oriented architecture (SOA). More specifically, Sambruk has developed the 'Open Technological Platform' (OTP)<sup>16</sup>, a SOA-compliant framework for IT architecture, which was an important foundation for the architectural design. The current version of the architecture is depicted in figure 8.11.

The prototypes further informed the designers in the creation of a product backlog (figure 8.12) – the basis for time estimation, prioritization and development in agile projects. The product backlog defines the desired features of the new IT system, which are subject to continuous change. Between development sprints, the backlog is discussed, and the features to work on in the next sprint are planned and prioritized. The product backlog presented here illustrates core features of the system. Each feature should bring value to someone – in the figure, it is shown to *whom* a feature brings value, and how the feature is part of workpractice and client *processes*. This view of a product backlog was created to ensure value creation for the different roles, and to keep a process perspective in focus. Many features and details were known in advance (due to the workpractice diagnosis and the prototyping approach), still, many details needed to be discussed throughout the construction process. The assistants' web application were not in focus during prototyping, thus it needed to be addressed more than the other features. Even though preceded by a workpractice diagnosis and a prototyping approach, the agile development lead to a number of clarification of the features of the IT system.

It should be noted that all screenshots in this section are from the test server, due to the integrity of the clients in the pilot municipality.

Only a few aspects of the IT system are shown here, due to its size and complexity. Appendix C shows more examples from the IT system, and short annotations explaining the features comprised in the various screen documents and reports.

The IT artefact helps the work manager to identify deviations (the planned schedule in relation to the corresponding time report). The design idea is that it should not be allowed to confirm a time report that deviates from the plan without commenting the rationale for the deviation. The application further helps the work manager by suggesting the details of a confirmation, based on the corresponding time report. Also, it should be noticed that the phases

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<sup>16</sup>Translated from Swedish: *Öppen Teknisk Plattform (ÖTP)*

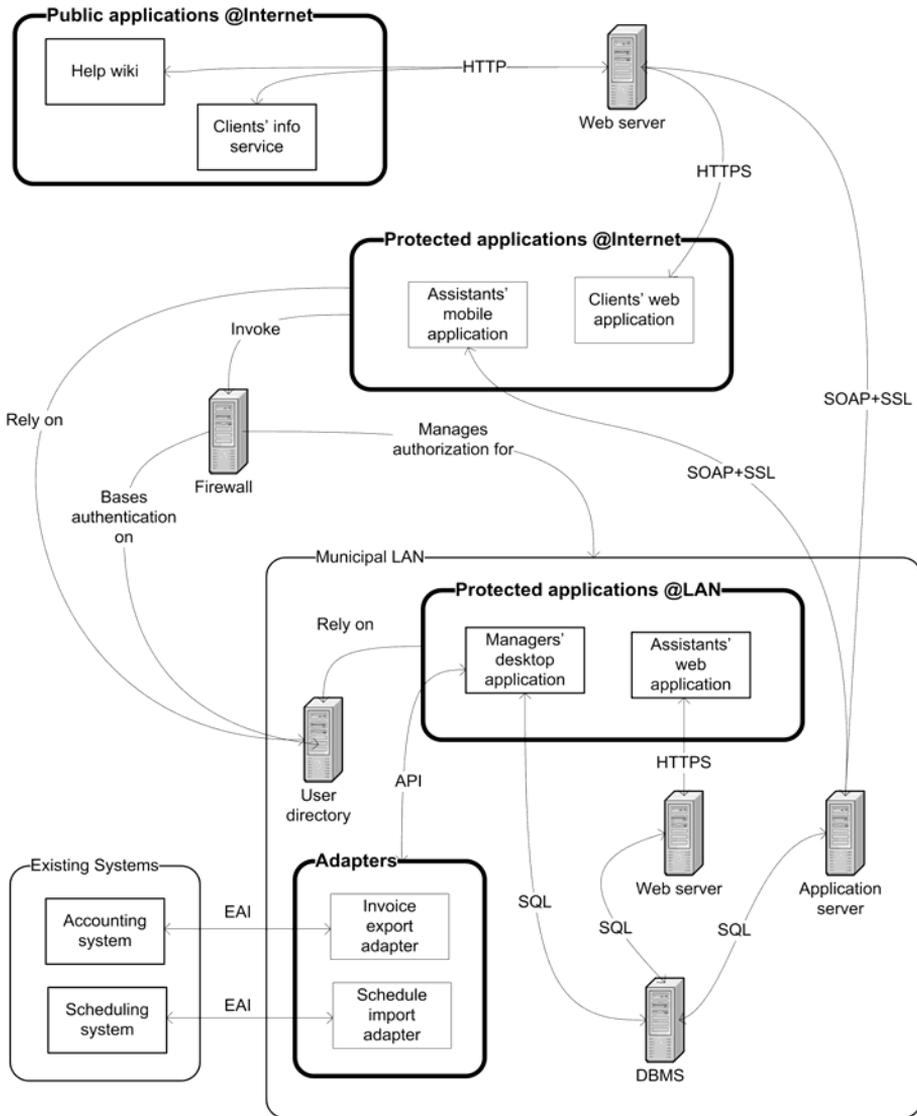


Figure 8.11: Architectural overview of the *compound IT artefact* in the LSS inquiry

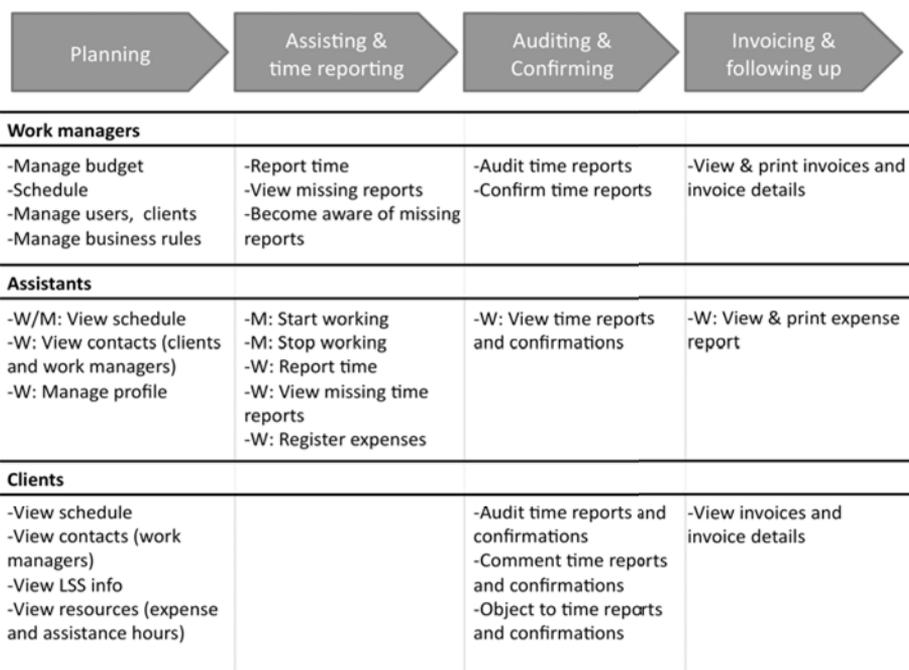


Figure 8.12: Product backlog overview – features for actors in the assistance process

of the assistance process are visible in the design of the main menu of the application, and that the user interface is designed with the aim of clearly revealing communication and action characteristics to the users.

During development, the need for collaboration with technological stakeholders was apparent. The stakeholder 'types' had been identified in advance. However, at this point it boiled down to *actual* organizations and people, rather than *types*.

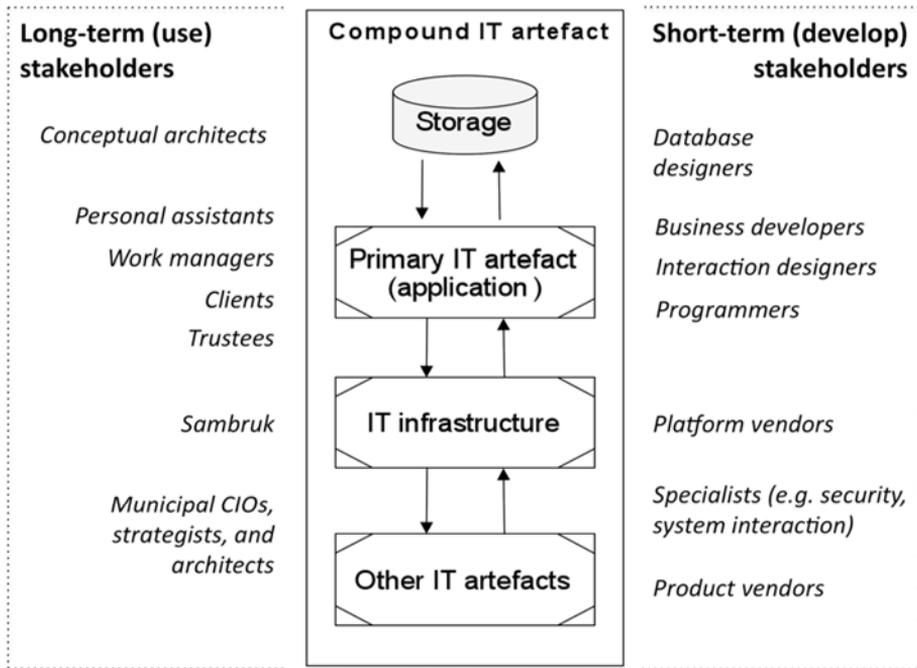


Figure 8.13: Stakeholders of the LSS Inquiry from an IT artefact development and use point-of-view

Figure 8.13 shows an overview of technological stakeholders. On such stakeholder, as mentioned above, was **Sambruk**, aiming at improving municipal IT investment in the long-term. The use of OTP in the design process was strongly endorsed by the OTP group in Sambruk. Another important type of stakeholder, with a lot of power, is the **product vendor** – the developer of an IT system in use in the pilot municipality. Collaboration with vendors of systems-in-use needed is often desired when developing new applications, in order to satisfy the need for applications to interact with the old ones. System interaction may be desirable to avoid work redundancy and inconsistencies in information structures. In the case of the pilot municipality, the vendor of the existing scheduling system turned out to be unwilling to support the project in importing schedule data to the new IT system. After

contacting the company with a request to import well-defined scheduled data, they responded after five weeks. This was their response (translated into English by the author).

Hi [developer name],

sorry that the answer was delayed, but that might be a symptom of the answer as such. Our development team does not have the time to help you with this request right now. They need to prioritize version upgrades and other maintenance, at least within the foreseeable future. There is no simple solution to your needs ([according to the developers] this is stored in binary form in the database, which makes it more complex), so we have to turn your request down.

Best regards

[Representative of the company]

At the time of writing, all core features, except from (i) adapters for system interaction, and (ii) the clients' e-service, have been constructed and implemented in the pilot municipality. The product backlog has been continually revised, and contains a set of prioritized features to implement or revise. The product backlog will be an important instrument for maintenance and continued development of the IT system. In practice, the IT system as is today supports the pilot municipality in scheduling assistance, doing mobile time reporting, auditing and confirming time reports, and invoicing the social insurance agency.

## 8.4 Inquiry Results

Evaluation, as argued in this chapter and depicted in figure 8.5, is an inherent part of design, when design is conceived of as a search process. The workpractice diagnosis is in itself an evaluation – including an inquiry into the current state of the workpractice and proposals on how to change the workpractice to meet its goals and overcome its problems.

Hevner et al. (2004, p 85) state that "A design artefact is complete and effective when it satisfies the requirements and constraints of the problems it was meant to solve". Although there is need for more systematic evaluations of the impact of the design product on the workpractice when put into full-scale use<sup>17</sup>, there are several *pieces of evidence* pointing at the relevance and value of this design, such as *affirmed commitment among stakeholders* to develop and test the design product. In addition to the pilot municipality, three municipalities indicate that they want to evaluate the IT artefact for potential use this autumn. Krippendorff (2006) proposes that such commitment can be regarded as evidence for the value of a design product. Further evidence of the value of the design can be traced to the fact that several municipalities com-

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<sup>17</sup>Such evaluations are not possible to perform within the timeframe of the author's PhD studies.

mitted to development of the IT artefact – both financially and with respect to other resources – on basis of the design prototypes. Hevner et al. (2004) propose various evaluation methods, categorized as *observational*, *analytical*, *experimental*, *testing*, and *descriptive*. The evaluation performed throughout this inquiry appears to intersect (to a varying extent) with all these categories. The categories provide structure to the presentation of evaluation results as follows.

## Observational Evaluation

Hevner et al. (2004) define case studies and field studies as observational evaluation approaches. A case study is an in-depth study of an artefact in its business environment, whereas a field study concerns a study of an artefact in multiple projects. Action research may be seen as a subset of case study research (Galliers, 1991). Given the action research approach, there has thus been an ongoing evaluation of the emerging design product.

The inquiry process (both with respect to workpractice diagnosis, information systems design, and agile development) consisted of a number of cycles of design and evaluation. These continuous evaluations may be briefly described as follows:

- **Workpractice models** that were discussed in a number of occasions within the project group and in sessions with other stakeholders.
- **IT system mockups** (prototypes) that were exposed and generated feedback in numerous occasions and with varied audiences
- **Agile development deliverables** that were demonstrated at meetings with the pilot municipality, and with the other municipalities in Sambruk – this is further discussed as *experimental* evaluation below.

The feedback resulting from frequent exposure of work has guided the design process, which makes it possible to state – with some confidence – that the emerging design product provides relevant and usable support to the studied type of work practice, and help them avoid the problems revealed in the workpractice diagnosis.

## Analytical Evaluation

An architecture analysis is an example of analytical evaluation (Hevner et al., 2004). Such an analysis is a study how well the designed artefact fits into the existing technical IS architecture. Such a fit has been a deliberate strategy throughout the design process. The artefact has been tested in the pilot municipality environment, but it has also been designed to be easily adapted to other environments using a service-oriented architecture approach, designed based on needs expressed in the practical (municipal) context. Figure 8.11 is an architectural overview of the application, illustrating the *compound IT artefact* that has been designed:

- There are two *public applications* in the compound IT artefact: The help system (in the form of a wiki), and the clients' information service. These parts are intended to be purely informational, supporting both municipal staff in using the IT system, and supporting the clients with information regarding LSS/LASS and the e-service. These system parts are typical web applications enabled by a publicly accessible web server.
- There are two *protected applications* which may be invoked over the *Internet*: (i) One is the assistants' mobile application used for time reports (signing in to and signing out of sessions). The assistant needs a mobile device where the application is installed, and logs in using an employment number and a pin code. The municipalities firewall is invoked in the background using a specific login account, which allows for the application to access web services powered by an application server in municipality's LAN (under condition that the login credentials were correct). (ii) The other is the clients' web application, which allows the clients to login using a username and password over a HTTPS<sup>18</sup> connection. The web server may access web services on the application server in the municipal LAN to provide the web application with data. Both these applications require that a specific user with specific credentials is defined in the user directory (thus they rely on the directory).
- The *protected applications in the LAN* cannot be accessed without first gaining access to the local network. This is done either by logging in to a computer physically connected to the LAN, or by establishing a virtual private network (VPN) connection over the municipality's firewall. The firewall needs to be connected to a user directory service (such as Active Directory) to be able to authenticate users. After authentication, the user is authorized to access the LAN in accordance with the settings in the user directory.
- The two applications that require LAN access are the work managers' desktop application and the assistants' web application. Both of them offer a single-sign on by looking up information about the current user in the user directory, thus they rely on the directory. The managers' desktop application uses an adapter principle for interaction with existing systems – this facilitates implementation of the designed artefact in different municipal 'ecologies of existing systems' through development of adapters. The assistants' web application.
- The services of the DBMS are requested from several parts of the compound artefact. All these parts share common code elements – a set of data objects generated automatically in the development environment. Although there are access to the DBMS from multiple places, there is thus still a high degree of maintainability in the system – e.g. adding a few columns to a

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<sup>18</sup>HTTPS is a combination of protocols allowing for secure web page requests.

database table – since a new automatic creation of the data objects will be reflected in the different system parts.

The architectural design is the result of discussions with several stakeholders (as discussed above), including a special network of municipal IT strategists aiming at improving architectural design in municipal IT development. Special attention has been paid to the pilot municipality, to ensure that the system works properly in that specific environment. Design decisions based on those needs have been continually exposed to the other participating municipalities, which has led to a design that is adapted to the pilot municipality, still possible to adapt to other municipal IT infrastructures without too much efforts. The experience from the design effort, however, is that there is a need to compromise between the architectural ideal of seamless integration into new environments on the one hand, and progress in feature development on the other. As a designer, there has been an attempt to strike a balance between the two. The current security solution is designed to be applicable without revisions in other settings, but the need for adaptation is unclear until such attempts have been made.

The current version is based on a Microsoft platform (a decision made in dialogue with the municipalities). Internet Information Services (IIS) 7.0 is used as web server and application server. The DBMS is an SQL Server 2008, the managers' desktop application and the web applications are .NET version 3.5 applications, and the mobile application is written for Windows Mobile Basic 6.0. The firewall solution in the pilot municipality is a Microsoft ISA server. Thus, a Microsoft platform is a foundation for the IT artefact. Dialogues with IT representatives of municipalities indicate that most – if not all – Swedish municipalities already have an installed base of this kind.

In summary, the architectural design is aligned with the existing infrastructure in Swedish municipalities in general, and in the pilot municipality in specific. It allows for adaptation to different municipalities through the development of adapters to their existing systems. Once an adapter has been developed for a specific system (accounting/scheduling), it can be re-used by other municipalities using the same system.

## Testing Evaluation

Hevner et al. (2004) proposes *black box* testing and *white box* testing to ensure functional qualities of the IT artefact. A test case is defined by providing input for the test and anticipated output. The output is correct if the actual output corresponds to the anticipated value. There are different strategies to define test cases<sup>19</sup> – black box tests can be defined without having access to source codes, while white box tests are *based* on the source code. To date, there has been no large scale testing of the IT system using well-defined test cases.

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<sup>19</sup>See Goodenough and Gerhart (1975) for an overview of test case identification strategies.

Instead, beta testing has been performed. The pilot municipality has been running the emerging artefact in its future production environment, running in a small scale in parallel with their old process. The approach has generated a continuous stream of feedback and re-design proposals based on real-world experiences. In addition, the test server has been used as a means to both test the emerging artefact, and to invite others to provide feedback about its qualities (the facilitation of a meta-discussion on design has been elaborated upon by de Souza et al. (2001)). Usability issues, bug reports and other comments from stakeholders have been continuously addressed in the iterations.

There has also been feedback into design through analysis of the contents of the database. Certain user behaviors were noted studying database table contents, such as the lack of support to the assistants to report non-action, i.e. that work was *not* performed in a planned work session. Another finding was that the assistants appeared hesitant to fill in time reports – instead of changing the values of the fields to the actual time they worked<sup>20</sup>, they left the values unchanged, and used the comment field to report deviations. This led both to re-design of the application to make the expectations on the assistants more clear, and to more information from the work manager concerning how to report time using the web application.

In summary, to paraphrase Sein et al. (in press), the main focus so far has been *authenticity* of the IT artefact from a workpractice perspective, rather than a rigorous effort to guarantee the technical qualities of the IT artefact. At this point the system appears to be running stable, with a minimum of disturbances and known errors. However, a number of systematic tests should be planned and performed before the new IT artefact and corresponding work processes *replace* the old process.

## Descriptive Evaluation

The final type of evaluation suggested by Hevner et al. (2004) is descriptive evaluation. One type of descriptive evaluation is an *informed argument* about the quality of the design. This overlaps with other sections of this chapter, where I argued that (i) the theoretically informed characteristics of the design product promotes the qualities of the design product, and (ii) that the iterative and stakeholder-centric approach has guided design in the right direction continually.

Another type of descriptive evaluation in this inquiry occurred both in workpractice diagnosis and in prototyping – the construction of *scenarios* of the IT system in use in the future workpractice. In the workpractice diagnosis, this was done through the modelling of action diagrams. In the prototyping efforts, the design prototypes were typically presented to the users along with narratives, explaining the situated use situation. Through these scenarios, the

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<sup>20</sup>when time reporting, the assistants were confronted with a pre-filled form, based on the schedule for the work session.

stakeholders that took part of the design process continuously evaluated not only the IT system as such, but its role as a tool in their future workpractice.

## 8.5 Contributions to Theory Development

This inquiry was by far the largest and most complicated one in the thesis. It provided an opportunity to explore various concepts from socio-instrumental pragmatism and information systems actability as instruments for design. The inquiry has led to a retro-actively generated conceptualization of the relation between underlying philosophy, inquiry phases, guiding principles in the work, and the iterative nature of each phase (figure 8.5). This conceptualization is a clear contribution to the pragmatic view of design (section 10.1), and valuable food for thought for other researchers to reflect about how one's philosophical assumptions affect one's actions in design situations.

The notion of the compound IT artefact was clearly relevant in this inquiry. The relation between the new IT artefact and old ones turned out to be one of the more complex design issues, especially since several municipalities participated in the project, each one having their own unique and heterogenous structure of existing IT systems. Thus, this strengthens the idea that a conceptualization of the IT artefacts needs to acknowledge that artefacts tend to belong to a larger compound of artefacts. The compound IT artefact is further discussed in section 9.3.

The concept of the IT artefact as a communication medium (section 9.1) strongly influenced design. The idea of social transparency as a means to achieve accountable workpractice processes was based on the communicative view; especially the actability heuristic *visible actors*. The design process made it necessary and possible to reflect thoroughly on the meaning of transparency in this particular context, and it adds evidence to the claim that a communicative view of the artefact is useful for design.

Another theoretical development stemming from this inquiry was a deeper knowledge about stakeholder-centricity (section 10.2). The inquiry has led to both a theoretical grounding and a strong empirical grounding of stakeholder-centricity. The need for such an approach is especially obvious in an e-government context (see figure 8.9), but there is no apparent rationale not to adopt such an approach in other contexts.

Further, this design-oriented action research project has generated a need for a meta-theoretical reflection about such research. This is further elaborated upon in sections 11.1 – 11.3, by presenting an analytic framework for design-oriented IS research, and in section 11.4, discussing particulars about pragmatic design theory. The analytic framework and the notion of pragmatic design theory were thus formulated on basis of the empirical experiences in this inquiry.

A final reflection to be made from this inquiry – one that is not further elaborated upon in the results chapters – is how the degree of commitment increases through the design of the artefact. In this context, the *design concept* for a new IT artefact was not sufficient to convince the municipalities to invest in this type of system. Although their representatives, who actively participated in the project group, were satisfied with the design concept, it appeared infeasible to convince decision makers in their home workpractices to invest in development. It should also be noted that a pre-study, performed in 2005, concluded that there could be a number of financial benefits from implementing changes in the LSS administration – changes that were clearly in line with the change proposals in this LSS inquiry. Still, there was a need to actually build a working IT artefact as a proof-of-concept, in order to convince decision makers about the business value of the design concept. This clearly goes in line with Iivari (2007), suggesting that design knowledge resides in the design product, and that the design product is an efficient means to communicate a design concept to stakeholders. This type of communicative power was also found in the early design prototypes – when we approached the decision makers in the pilot municipality, the design prototypes were used to communicate the design concept. These examples support the idea that design artefacts are important to include in theory descriptions, as further discussed in section 11.1.



Part III:

Theory Development



## 9. Pragmatics of the IT Artefact

This chapter presents theoretical contributions providing an answer to the first research question. A conceptualization of the IT artefact as a medium for communication is presented, theoretically grounded, also empirically grounded by being related to the inquiries presented in the previous chapters. In section 9.1, it is proposed that we should conceive IT artefacts as human-to-human communication media. Section 9.2 elaborates on the agent properties of IT artefacts, and the implications on communication that follows from those properties. Section 9.3 proposes a web-based extension of the conceptualization of the artefact, focusing its role as a communication medium in a multiple stakeholder context, and the increased complexity of IT artefacts in general following the networked society.

### 9.1 IT Artefacts as Communication Media

This section introduces the concept of *IT artefacts as communication media*. The concept emerged in inquiry #1, and has been operationalized and refined in the subsequent inquiries. The concept was introduced by Sjöström and Goldkuhl (2002, 2004).

As discussed in section 2.1, we may consider a sign as either a prerequisite for action or a result of action. This way, all parties involved in creation and interpretation of the sign are acknowledged, which illustrates the pragmatic and social aspects of semiotics and results in a richer picture of communication. This line of reasoning can be transferred to user interfaces. The concept of *user interface* is often used, but it is rare to find thorough definitions of the meaning of the term.

The concept of user interface is typically implicitly defined through its context; the medium for user-system interaction; or the part of the IT artefact that constitutes the intersection between the user(s) and the artefact. As a consequence, it should be noted that we use the term *user interface* a bit reluctantly. On the one hand, the term is appropriate since we are talking about a part of the system's software and hardware; the parts with which the users interact. On the other hand, communicative features of user interfaces are not a property of the IT system alone. Following Gibson (1979), actions afforded by a system are not pure system properties. Affordances emerge in use and so depend on the reciprocal relationship between a human and an object acted upon

(Baerentsen and Trettvik, 2002). Therefore, we picture the interface between the system and the human as something that belongs neither to human nor to machine and, at the same time, both to human and to machine. Although aware of this ambiguity, we find the term user interface appropriate, since it is established in both practice and academia.

From a semiotic perspective, de Souza et al. (2001) elaborate on three different types of communication taking place through the user interface:

- User-system interaction
- User-user interaction
- Designer-to-user communication

In order to understand and define user interfaces from a semiotic perspective it is necessary to take all these communication situations into account. In their paper (ibid) they emphasize the communication in a user-interface from its designers to its users. They describe the user interface of an IT system in this respect in the following way: "They are one-shot messages sent from designers to users about the range of messages users can exchange with the system in order to achieve certain effects" (de Souza et al., 2001, p 462). This can be compared to the concept of action repertoire (or *action potential*) within ISAT (e.g. Goldkuhl and Ågerfalk, 2002; Sjöström and Goldkuhl, 2002). The action repertoire of an IS is the possible actions which the system affords to its users. This action potential is a result of the designers'<sup>1</sup> work.

In their discussion, de Souza et al. (2001) focus designer-to-user communication, while we argue that it is more important to focus human-to-human communication: Users of the IT system actually communicate with each other, using the artefact as a medium for communication. This is actually pointed out by de Souza et al (ibid), but it is only discussed in relation to specific types of multi-user applications (e.g. groupware).

We want to stress this kind of communication since we find this to be the core of an information system. A communicative perspective means that ***IT artefacts are regarded as systems for technology mediated business communication***. In figure 9.1 we have described user interfaces contextually, not only in relation to the actual user, but also in relation to other human communicators. We distinguish between three different types of actions: *Business communication*, *user interface navigation* and *IT system design*, following the division by de Souza et al. (2001).

We divide a user interface into four parts. One part is the action repertoire. This is to be seen as communication from the designer to the user. By interpreting the user interface the user may hopefully understand what kind of actions it is possible to perform. This part of the user interface is thus signs from designers telling the user what possible actions to perform.

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<sup>1</sup>It is important to have a broad conception of IT designers in this kind of discussion, including those who are responsible for the design of the IT system. Designers may be individuals with various roles, participating in the design process. This is further elaborated on in section 10.1

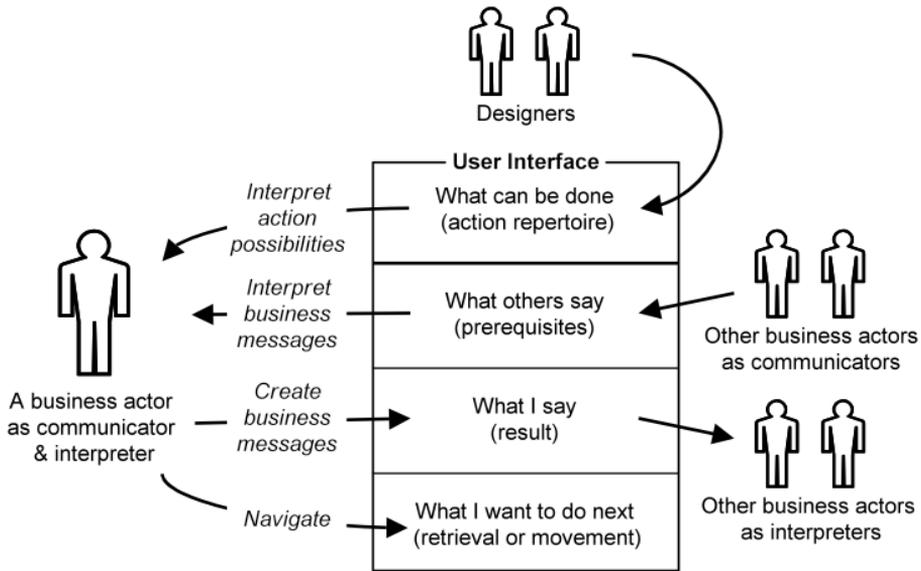


Figure 9.1: A communicative perspective of user interfaces (After Sjöström and Goldkuhl, 2004)

In order to communicate something, through the system, to other people, it might be necessary to read what others have said/done earlier. Within IS actability theory, the concept of *action memory* relates to this (e.g. Goldkuhl and Ågerfalk, 2002). An action memory consists of messages about earlier performed actions and other important action circumstances. Before communicating something to other people, the actual user may read parts of the action memory of the system. These presented messages are thus prerequisites for the user's action – signs from other people within the business and mediated by the IT system. To obtain such messages on the screen, the user probably performs some acts of retrieval. We consider this as a part of the UI navigation; which is described below.

After reading such messages, the user may act by expressing something. He or she may input something through the keyboard and then through a mouse click on some screen button. The screen content is a result of this input – a message formulated as part of performing a communicative act. Through some user action, for example through a mouse click on a button, this message will be taken care of by the system and possibly – at some time – mediated to other users. The screen, at least before the concluding clicking, contains representations: results of a communicative act, with the intention to be forwarded to other people.

The fourth and last part in our principal description of user interfaces is the UI navigation part. We include here instructions to the system to retrieve

messages, besides instruction to move to some other part of the system. Possible navigation actions to perform is part of the action repertoire. This means that there is a reference from the action repertoire part not only to business communication actions, but also to possible navigation actions. Note that this part of the description does not have the same communicative character as the previous three parts – the only interpreter of UI navigation is the locutor performing the navigation. Interestingly, in a web setting, user navigation leaves traces (further discussed in section 9.3), and it may also be logged in other types of applications. In such cases, the user actually communicates something to someone through navigation – others might, for instance, study what pages someone visited while logged on to a web site. Thus, even though navigation sometimes 'leaves no traces', we find it important not to leave out the user navigation in this communicative view.

In order to explicate this further we have described four types of communication taking place using IT the user interface in table 9.1.

Table 9.1: *Types of communication in different parts of the user interface*

Part of user interface	Type of communication and communicators
Action repertoire / affordances	A user interprets possible action types afforded by the system. (communication from designer to user)
Business communication (interpretation)	A user interprets messages from other users. These messages are mediated through the IT-system. (Communication from user to user)
Business communication (intervention)	A user creates messages to be mediated by the system to other users (Communication from user to user)
UI navigation	Interaction between user and IT system (No communication between human actors)

This socio-pragmatic perspective of user interfaces enhances communication aspects. A user is seen as both an interventionist and an interpreter. An IT user is taking part in communication with other business locutors and interpreters in some social context.

All these four parts of user interface can be described according to Bühler's (1934) basic semiotic definition. Each part is 1) an expression of a human acting (symptom) and 2) is directed towards some interpreter (signal) and 3) refers to something (symbol). The user interface is an interactive action medium. It contains messages (signs) both directed to the user and from the user. This is of outmost importance to acknowledge. The user interface contains signs to be interpreted and signs, as results of user interventionist action, to be handled by the artefact and possibly forwarded to other humans.

Based on the above, we argue that the UI designer needs to treat the matters of business communication and UI navigation separately – one issue is to make sure that human-to-human communication is supported in a proper way (e.g. in relation to work tasks and business processes), another issue is to make sure that the navigation works properly. We may relate this to usability, which is one out of many attempts to clarify what is to be considered important when designing (or assessing) IT systems<sup>2</sup>. Usability, once introduced by Shackel (1984), is an attempt to strike a balance between human factors and technological issues of IT systems. The concept of usability has evolved in different research communities, and the focus of research has varied. Bevan (2001) points out that it is possible to discuss usability in at least two different meanings. One stream of usability research focuses ease-of-use issues (e.g. Nielsen, 1993), thus separating usability from utility (Grudin, 1992). Another stream conceives of the concept in a broader sense, including the issue of achieving specified goals with effectiveness, efficiency and subjective satisfaction in a specified context of use (ISO 9241, 1994). The latter conception of usability puts matters of social action and organization in focus (Maguire, 2001). Navigation, in our conceptualization, may be defined as an ease of use issue, which should be designed to support business communication, which is clearly relates to the utility aspect of the IT artefact.

This model, resonating with the perspective of communication shown in chapter 2, acknowledges interactions on three levels: user-system, designer-user and user-user. The user-user level is made explicit in our view, making it a tool to understand socio-pragmatic aspects of IT-system use.

The proposed conceptualization of the user interface highlights a **pragmatic duality** in human-computer interaction. The prevailing perspective in HCI is that this kind of interaction is to be seen as a user interacting with an IT artefact. The socio-pragmatic perspective is critical towards this view on HCI and suggests that the user should be conceived of as taking part in communication with other human actors and that the role of the IT artefact (and its user interface) is a mediator and an agent in this human-to-human communication. However, the socio-pragmatic perspective should not be interpreted as a rejection of the view that a human is interacting with an artefact. That would be naïve. Instead we suggest a view on the human-computer interaction as mainly a dual interaction. A user is interacting with the artefact and other humans at the same time. The IT artefact has the ability to interact in pre-defined ways with a user. The user must be able to understand how to manage the artefact, for example how to enter information into certain fields and click buttons on the screen etc. When performing such actions, the user is not only maneuvering the artefact. At the same time, s/he is actually communicating with other actors. One can say that s/he (through acts of reading and writing) at the same time is instrumentally managing the artefact and com-

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<sup>2</sup>The discussion on 'the scattered notion of design ideals' in section 1.2 clearly shows that usability is just one out of many ideals on how to perceive and assess quality-in-use.

municating with other humans<sup>3</sup>. In the same act s/he is doing several things simultaneously. An interpretative act (when reading information presented on the user interface) means both recognition of what other humans may have said and also finding out how to utilize the artefact. An act of intervention using the IT artefact as an instrument means both an informed act of managing the interface and a communicative act directed towards other humans.

Our view on the pragmatic duality of user interfaces is also a foundation to understand the relation between IT system use and business processes. Speech acts and action pairs have been proposed as a low-level unit of analysis in business process modeling (Lind, 2001), while – as proposed here – the matching concept of interrelated speech acts (intervention and interpretation) as a core unit of analysis in IT design and IT evaluation. Thus, the pragmatic duality of user interfaces is a socio-pragmatic and semiotic explanation of user interfaces, which corresponds to both social action theory and offers a conceptual bridge to business process modeling concepts. This conceptualization is useful in order to understand IT use as social action and how IT artefacts can be seen as communicative instruments in such social action.

## 9.2 IT Artefacts as Rule-Based Agents

This section introduces the concept of *IT artefacts as rule-based agents*. The concept originated in inquiry #1, and has been operationalized and refined in the subsequent inquiries. The concept was introduced by Sjöström and Goldkuhl (2002, 2004).

As discussed in the previous section, there is a distinction between navigation and business communication. This distinction highlights that there are different phenomena that need to be acknowledged when reasoning about the characteristics of an IT artefact. The socio-pragmatic meaning of a sign is clearly related to communication between actors in some social context. So far we have discussed this issue mainly as one actor (a "user") as an interventionist and interpreter of representations. However, as demonstrated in the inquiries, communication through an IT system is typically more complicated. The notion of IT artefacts as rule-based agents embraces a view that an *IT artefact is a mediator, with the pre-defined ability to mediate and transform messages*. As discussed in section 2.3, we propose that IT systems perform *mimeomorphic* actions – rule-based processing implemented as algorithms in computer software. While adopting this perspective, there is a need to take into account the increased complexity caused by the *agency* properties of the artefact. We must acknowledge that IT – unlike less sophisticated mediators – does more than merely mediate messages. It also typically transforms mes-

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<sup>3</sup>Ågerfalk and Eriksson (2006), drawing on Habermas' 1984 concepts of instrumental and communicative action, present similar ideas in their discussion on instrumental and communicative rationality in relation to usability.

sages based on rules defined by humans in the system design process. We have identified six types of mediation/transformation that need to be acknowledged when conceptualizing IT as a mediator for human-to-human communication. These types are derived from the illustration of communication complexity shown in Figure 9.2. Note that the concept of the compound IT artefact will be further discussed in section 9.3.

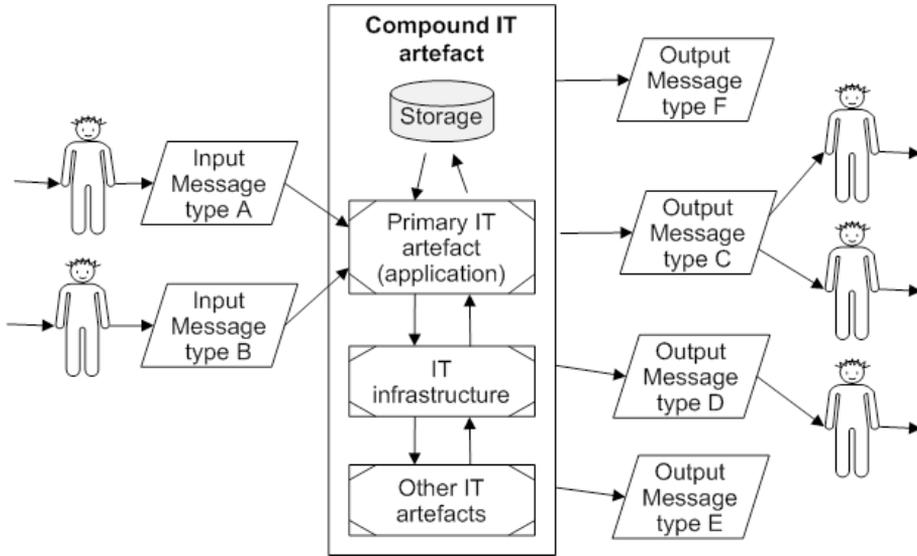


Figure 9.2: Six types of mediation/transformation

First, there are one-to-one situations, where one person "speaks", thus creates a message. This message is mediated and/or transformed by the IT artefact, and later interpreted by another person. A typical example of this is an e-mail sent from one person to another. Another example is where a person orders some product through a web site, and the order is received and interpreted by one recipient. In the figure, this could correspond to message input message *type A* connected to output message *type D*.

Second, we may identify one-to-many situations: One individual could intervene using the IS, and several individuals could receive the message, or an automatically transformed version of the message. This corresponds to someone creating a message *type B* which is distributed to several actors interpreting message *type C*. A basic example of this can be picked from the evaluation of the scheduling system, where one person schedules a lecture. The IT artefact stores this message, and later mediates it (directly and via other IT artefacts) to students, administrators and other teachers. Different views of the scheduled session are presented depending on the choice made (what *artefact* and what *feature* of that artefact) to access the schedule.

Third, we may spot many-to-one situations. An output message in this case is aggregated from many input messages. Messages of *types A and B* may be aggregated into a message of *type D*. An example of such a situation is a number of salesmen who register sales in the system, which are later aggregated into a sales report used by a manager. In practice, very few reports are likely to be viewed by one sole actor.

Fourth, there are many-to-many situations. Several actors speak, and their messages (which may be of different types) are stored in the IT artefact. Based on this, several people receive and interpret a message which is constructed by the artefact as an aggregation of what has been said. This would correspond to input messages of *types A and B* which are aggregated into output message *type C*. Examples are available from all inquiries. In the scheduling system, several teachers schedule lectures which are aggregated into a schedule for a class. In the Amazon evaluation, the web visitors' behaviour is stored and aggregated into clickstreams, which are used to profile users. In the library's search application, each message describing a publication is aggregated into search results. In the syllabus system, different views of the university's courses are available, through selections of information from the syllabi which is assembled in course catalogues and on web pages. In the LSS inquiry, confirmed time reports are aggregated into invoices which are sent to staff at the book-keeping department, and to the social insurance agency.

Fifth and sixth, we may also identify additional situations which may indicate bad design: The one-to-zero and the many-to-zero scenario (*types E and F* in the figure). If such situations occur, it means that people use the artefact in vain, i.e. by saying things which are sent into void (or stored forever) and never interpreted. I state that this *may* indicate bad design, because the reasons for this could be multiple. If the rationale behind the design is that things need to be stored for legislative reasons, for instance, it may be a valid solution. This type of situation, where there exists functionality which is not used, has been further theorized by Ågerfalk and Eliasson (2003) in the so-called D.EU.PS model, which is a means to reason about different aspects of functionality in the use of an artefact: the *desired*, the *existing*, the *utilized*, the *perceived*, and the *satisfactory*. Ågerfalk and Eliasson (2003) start out from these categories and construct a Venn diagram with 18 classes of functionality, derived from possible intersections of the categories, and show through empirical examples that they all exist in practice<sup>4</sup>. This makes it reasonable to include one-to-zero and many-to-zero scenarios in this conceptualization, since they belong to the class of existing but not utilized functionality of an IT artefact.

The categories presented above show communication types which may occur when the IT artefact is a mediator. Thus, some *consequences* of the artefact as an agent are shown. As discussed in section (section 2.2), Collins and Kusch (1999) promote the concepts of mimeomorphic versus polimorphic ac-

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<sup>4</sup>Some of their examples are based on the evaluation of the scheduling system.

tions. They state that polymorphic action is intentional action performed by humans and that a basis for performing such action is being part of a society, thus being able to adapt to the activities and relations therein. This is clearly in line with socio-instrumental pragmatism, stating that social action has social grounds and purposes. Based on these grounds and purposes, humans act in a polymorph and unpredictable way within a social setting. Mimeomorphic action, on the other hand, is repeatable, predictable and formalizable, and can be performed by machines. Collins and Kusch (1999) state that humans also perform mimeomorphic action, although they point out a difference: In a 'machine' context, mimeomorphic action is governed purely by well-defined rules, and completely without social considerations. This separation of action types is important when regarding the character of action when using IT artefacts: A person has a need to act in a certain way towards a community, i.e. expressing certain things while acting or directing their action towards specific people.

The mimeomorphic character of the IT artefact constrains actions performed by the person. As actions performed by the IT artefact grow more complex, especially with regards to mediation and transformation of the messages expressed by the user, the less aware the user of the artefact becomes of the social consequences of the actions performed. Thus, there is a steadily increased challenge in designing IT artefacts that provide to the user a transparency of communication and social aspects of use. Contemporary IT artefacts, e.g. web applications and other networked applications, apparently imply a greater complexity with respects to those issues (as shown in the next section). A major task for the designer is how to visualize this communication to the user, if this is considered an important design goal. There is a tension between the agency built in to the IT artefact and the potential to present the ongoing communication to the user in a transparent manner. This claim is further elaborated on in the next section through further theoretical discussion and examples from the inquiries.

### 9.3 The Compound IT Artefact

This section introduces the concept of *the compound IT artefact*. The concept emerged in inquiry #3, and was significantly developed through inquiries #4 – #5. The concept was introduced by Sjöström (2008).

Figure 9.3 illustrates the compound artefact. The concept allows us to distinguish between the *primary* artefact (the one in focus in a specific situation); its *storage*, and the *IT infrastructure* that connects the primary IT artefact with *other* IT artefacts (which may be the 'primary' ones in other situations).

In contemporary IT artefact development, characterized by various concepts for architectural design and system interaction (e.g. *Enterprise Application Integration* and *Service Oriented Architectures*), it is likely that com-

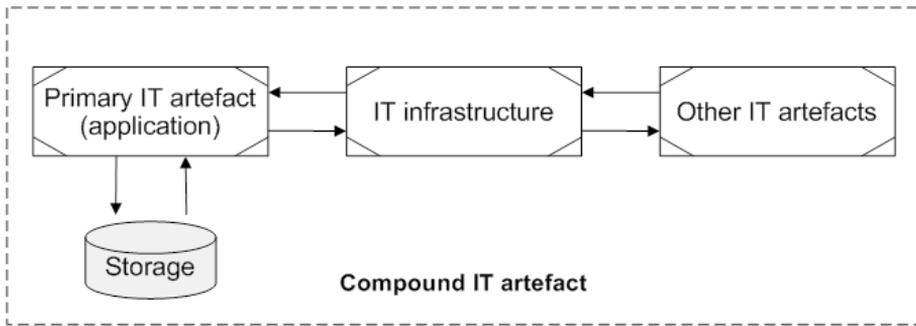


Figure 9.3: A compound view of the IT artefact

munication that we are unaware of as users takes place. As a user, it is not apparent *what* is being logged, by *whom* it is being logged, or *why* it is being logged (*how* it is going to be used). Thus, we suggest that we always need to aim at understanding the impact of the underlying IT infrastructure on communication and agency, and bring this understanding to action when designing new IT artefacts.

This is not a recommendation to *always* design for full social transparency. However, a designer should be well aware of what is being designed, and actively decide in what way the communication taking place should be transparent to the users of the system through the user interface. This is an ethical issue, and as such it should be on the agenda in a design situation. A designer thus needs systematically to reflect about the social role of the IT artefact in relation to its technological context. The way things are stored, the IT infrastructure, and interacting IT artefacts impact communication (figure 9.3). The designer needs to take this into account, in order to improve the actability of the new IT artefact – it is unlikely to design an actable IT artefact in isolation, since its communication properties need to be well understood by its users in order for them to perform meaningful social action. We need to understand the artefact as embedded both in a social environment and in a technological environment. The change of the social environment will be a result of the *compound* IT artefact, not the new application in isolation. See figure 9.2 for a view of the compound IT artefact in a communication context.

The notion of the compound artefact was also an important issue in inquiries #3 (the library search system) and #5 (the LSS inquiry). In the case of the library, it was shown that the heterogeneity of the compound of artefacts constrained the development of a usable query language. In the case of the LSS inquiry, system interaction features were desirable in the IT system in order to achieve the desired workpractice changes. The implementation of such features turned out to be constrained due to (i) the unwillingness of the Social Insurance Agency to support electronic invoicing, and (ii) the unwillingness

of vendors of existing systems to develop system interaction functionalities. The lack of control of the compound artefact - that is; the infeasibility to design interaction with other artefacts – was an apparent constraint in the design process. Thus, the understanding of the compound artefact (including its components, and the power and politics required to design new IT artefacts or redesign old ones) is important in an inquiry situation. It enables and constrains design, and it needs to be known to assess the feasibility of change.

The evaluation of Amazon.com (chapter 7) led to additional reflections about the IT artefact; which may be characterized as a 'web extension' of the previous concepts. These reflections also serve as an example of the discussion in the previous paragraphs. The web is special – not only in the sense that the underlying technology is highly standardized and typically different from desktop application technology. Flores (1998) suggests that action taking place on the World Wide Web needs to be explained using theories of identity cultivation. The identity issue will be further elaborated below, since it shows great potential in explaining the social actions triggered by web artefacts. Figure 9.4 is an illustration of stakeholders in the study of the Amazon.com community. It shows the multiple interests for various stakeholders in relation to the IT artefact.

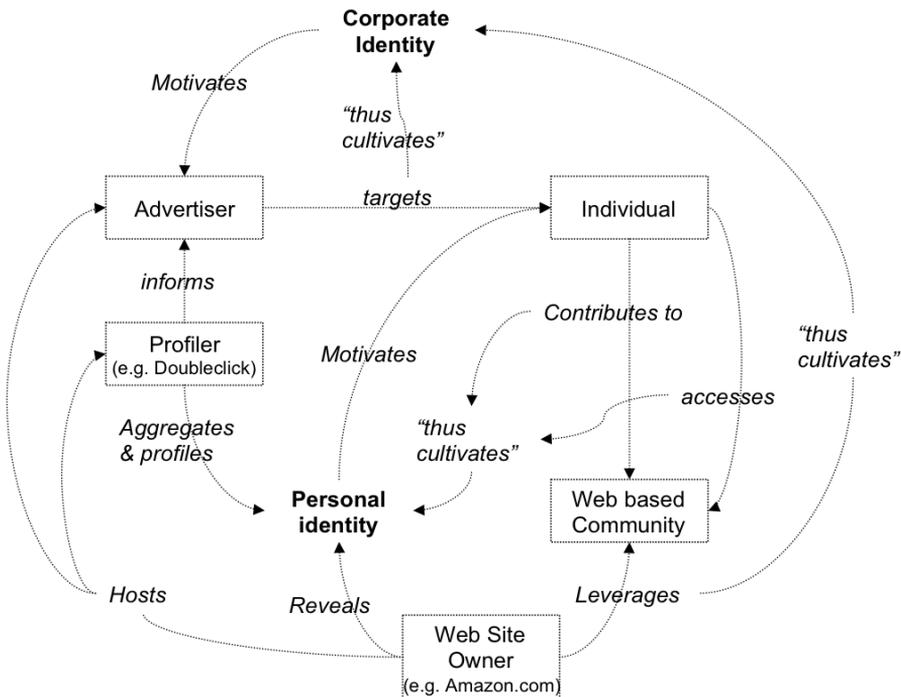


Figure 9.4: The IT Artefact in a Web Context (Ågerfalk and Sjöström, 2008)

For an individual accessing the web based community on Amazon.com, we identified two types of messages that affect the identity of that individual: The *essential* ones (which the person aims at communicating by contributing to the web site community) and the *incidental* ones (which are given off when the person navigates and performs action on the web site, e.g. information about their hometown). The web site owner (Amazon, in this case) leverages the community as a means to increase sales and attract advertising companies, which are attracted by a large number of visitors on Amazon's web. The web site owner reveals information about their users' identities to profilers (such as Doubleclick) and to advertisers, thus increases the advertisers' ability to target individuals who are likely to be interested in their products. In doing this, they leverage their corporate identity. The profilers gather information from several web sites (not only Amazon.com) in order to create compound profiles of users. These profilers even further improve the aim of the advertisers' targeted advertising. Conclusively, there is a great deal of communication going on, which the user may be more or less aware of when engaging within the community on Amazon.com or similar sites. Given the frequent occurrence of targeted ads on WWW (Martin et al., 2003), it is likely that other instantiations of the relations shown in Figure 9.4 will be shown in other studies of the World Wide Web.

The IT artefact in a web context shows some characteristics that distinguishes it from more conventional views of the IT artefact, i.e. in intra-organizational settings where users' tasks (as part of a pre-determined business process or similar form of institutionalized context) are often in focus. Based on the Amazon.com case we have identified four principles concerning the web artefact's communicative and agency characteristics, with consequences for the conceptualization of the IT artefact as presented in section 9.1.

First, *navigation actions need to be recognized as user-to-user communication*. Even though the primary intention of the user may not be to communicate, there are multiple recipients of the "message"(HTTP request) that is sent to the Web server when a user requests a new page. In the technical implementation of HTTP requests, there is no differentiation between navigation and other types of action. No matter what type of request the user makes to a web server, there is a certain amount of personal information which may be logged and used by the server application for a number of purposes, e.g. profiling the user. On the social side, however, there are many parties apparently interested in the moves we make on the Web. Thus, we need to take into account the communicative dimension of navigation on the Internet. This way, our conceptualization of IT artefacts allows for future studies where, for instance, social or ethical issues of the Web can be addressed. We refer to this as **the principle of communicative navigation**.

Second, in a web context, we need to handle user's primary intentions and the more or less incidental representations that are the results of user actions.

The incidental representations – the "technological give offs" – are put in place by commercial actors as instruments for positioning themselves or their partners. While O'Reilly (2005) speaks of data as the next "Intel Inside", this commercial interest in information about people as a vehicle to position themselves is also a part of building a corporate identity (Flores, 1998). Flores' identity concept also explains the behavior of people who actively share their opinions or experiences on the web. Take, for instance, the case of the identified reviewer on Amazon.com (section 7.4), Mike Tarrani. Apparently, his actions as a reviewer is an endeavor connected to the institution of identity. The Amazon.com web site can be explained as an instrument, which is used by parts of the user community to create and maintain their identity. From a commercial perspective, this information, contributed by the users, enhance the commercial value of Amazon.com and their services, in line with the Web 2.0 ethos. There appears to be huge incentives for individuals and companies to create and collect data in these continuously ongoing communication processes, supported by the great number of Web applications that are out there. We would argue that any useful conceptualization of the Web artefact needs to take into account these communicatively oriented issues related to people, corporations, and the Web as an arena for identity building activities. People sow seeds of themselves when acting on the Web. The traces of action that we leave behind, essential and incidental, are the foundation for the establishment and maintenance of our Web identity. In order to leverage the signaling incentive, Web sites then need to provide users with instruments to develop a proper understanding of the ongoing conversations and their contribution to the development of their own identity. We refer to this as **the principle of identity cultivation**.

Third, there is a risk that many users install plug-ins such as Google Toolbar, and activate features such as "safe browsing" and "page ranking" without actually understanding the consequences – with respect to communication and privacy. These are examples of unreflective delegation of tasks to the IT artefact, which is unlikely to occur when communicating through some other medium. Therefore, issues of delegating actions to the IT artefact, and the ways in which such delegation is presented by designers and conceived by users, is an increasingly important issue from an ethical standpoint. This is also related to the more or less hidden communication, taking place in the background in inquiry #4, as a result of commercial interests. The scattered information about privacy policies raises the question if the users are really aware of the ongoing communication, which can be thought of as a type of surveillance of web site visitors (Martin et al., 2003) et al, 2003. We refer to this as **the principle of reflective delegation**.

Fourth, in relation to the distinction between essential and incidental action, it seems that some features of an IT system are configured once and then used for a long time. Over this period of use, the awareness of the particular configuration may fade. For example, consider the case of the Google Toolbar

plug-in. A user may have had an understanding of, and an intention to actually share their surfing behavior with Google. However, it appears this intention will become weaker or completely forgotten as time passes by. In a sense, then, the essential action emerges into an incidental one over time. We refer to this as **the principle of maintained intentionality**.

The web is clearly a system of IT artefacts, continuously being shaped by the interests of a heterogeneous group of stakeholders. Sometimes these interests are conflicting. Thus, the communication taking place while traversing the web becomes more complex than communication issues in a non-web environment. An understanding of – and ability to describe – this complexity may aid inquirers in designing and evaluating web applications to support the users' actions, and fulfill their needs and desires as social beings.

# 10. Pragmatics of Information Systems Design

This chapter primarily addresses the second research question: How can existing IS use qualities be described, interrelated and well understood based on the proposed concept of IT artefacts? Section 10.1 discusses a socio-instrumental view of IS design and use quality. Section 2.2 elaborates on the concept of stakeholder-centricity. Section 10.3 introduces the use quality matrix. Based on the proposed concept of pragmatic duality, it is argued that use qualities may be conceived at different pragmatic levels: Interaction-oriented qualities and communication-oriented qualities. Both these orientations of qualities may be either generic or specific to some genre of applications. Section 10.4 provides an example of how to conceive and relate existing use qualities based on the use quality matrix.

## 10.1 A Pragmatic View of Design

This section introduces the concept of a *pragmatic view of design*. The notion of what a pragmatic view of design may be has been elaborated upon throughout the inquiries, but the conceptualization as depicted here emerged during inquiry #3. The formulation of the proposed view of design (as described below) has been developed with all five inquiries in mind. The concept was introduced by Sjöström (2008) and Sjöström and Ågerfalk (2008).

This thesis, in line with many IS scholars (e.g. Goldkuhl and Lyytinen, 1982; Orlikowski, 1992; Orlikowski and Iacono, 2001; Ågerfalk, 2003) proposes a view of IT artefacts as embedded in a social setting. The idea of problem solving as a social process is also in harmony with usability research: building IT artefacts with a high quality-in-use (e.g. Bevan et al., 1991; Bevan, 2001; Preece et al., 2002). This is typically achieved through a user-centered design process and through the application of techniques (such as mock-ups, scenarios and prototypes) to promote learning and communication between users, designers, and other stakeholders (Preece et al., 2002). On a more generic level, the idea of *participative* design as a means to achieve high quality in the end result is coherent with the Scandinavian IS tradition (Bansler, 1989) and the idea of socio-technical design (Mumford, 1993, 1995).

Moving back to the pragmatist roots of this thesis, Dewey's (1938) view on inquiry is that it is an endeavor to change an indeterminate situation into a determinate one. This may be translated into a problem solving context. Inquiry is about understanding the situation-in-view (i.e. problems), and finding solutions, i.e. changing the situation to accomplish some goal or meet some ideal. Dewey's (ibid) definition of a situation is that it is a contextual whole consisting of objects and events. The IT artefact may be considered an object, and the use situation is characterized by a number of events (or actions) where the IT artefact is an instrument for action.

The concept of use quality is tightly connected to the idea of ideals. Löwgren (2006, p 384) defines use qualities as "[...] properties of digital designs that are experienced in use and the designer is in a position to influence at design time." A quality is always implicitly or explicitly related to some ideal, i.e. a statement that something is bad or good needs to be understood in the context of an ideal. A claim that the weather is bad requires knowledge of the locutor's perception of ideal weather to make sense. Bevan (2001), as an example, simply describes usability as a "user's view of software quality".

More elaborated definitions of usability include users, having goals, performing tasks using the artefact in some context (ISO 9241, 1994) 9241-11. Interaction design approaches emphasize the need of a user-centered design process, in order to come up with a design which is based on the variety of needs within different user groups (Bevan et al., 1991; Bevan, 2001; Preece et al., 2002). Understanding tasks and users is often highlighted as two important aspects of design for usability.

In the five inquiries, ideals have been present in different forms, e.g. as business goals (in the library evaluation and in the LSS inquiry) and as evaluation criteria (e.g. in the scheduling system evaluation). From a design perspective, we may work towards improved quality in different ways. First, solutions how to meet design ideals may reside in certain artefact properties (i.e. improving the ease-of-use through re-design of the user interface). Second, solutions may be discussed in terms of what to do – and what to focus – in the design process, such as adopting a user-centered process. Third, the solution to a problem may reside in organizational change. The IT artefact thus needs to be conceived in a broad sense, as an IT artefact as part of a social context, rather than being limited to the artefact as such.

Figure 10.1 shows relations between important concepts connected to design and evaluation of IT artefacts. Although the terminology in the figure is focused on design, one may easily adopt the model to an evaluation context. Or, more generically, we could use the concept of inquiry in a Deweyan sense, which encompasses both design and evaluation. The figure is created through the merging two existing models: Orlikowski's (1992) structural model of technology and Ågerfalk's (2001) A3 model (explaining the relations between action, actor and artefact). On top of synthesizing these two theories,

the concepts of design practice, design ideal, and use quality have been added to the model.

The 'A3' (Action, Actor, Artefact) model, which is part of Information Systems Actability Theory, is represented in a different way compared to the representation by Ågerfalk (2001) – the relations between action, actor, and artefact have been named, the social setting has been related to them, and the encapsulation of these four concepts has been named "IT artefact in context". The A3 model states that an actor performs social action using an IT artefact, which thus is an instrument in the performance of action.

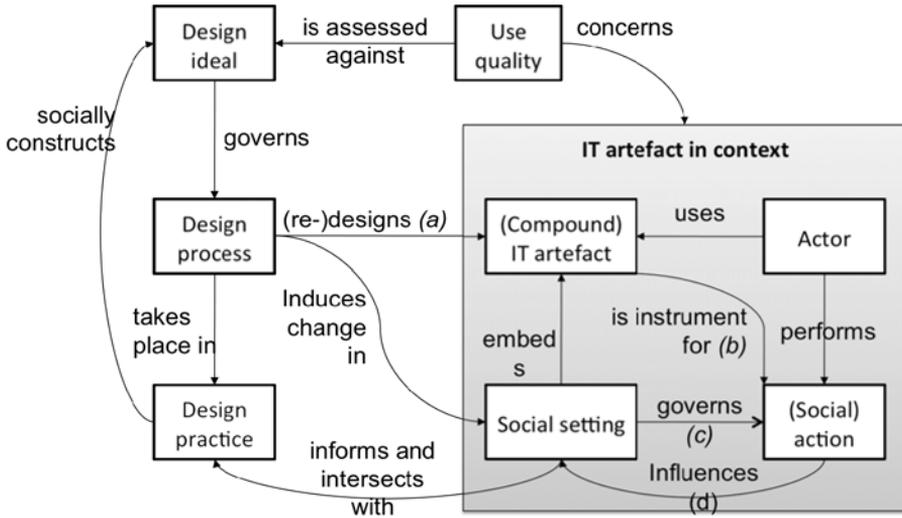


Figure 10.1: A socio-instrumental contextualization of IT design

The integration of Orlikowski's (Orlikowski (1992)) structural model of technology is transparent through the letters (a) through (d). Orlikowski states that we need to understand *technology as a product of human action* (a), which is shown above as the IT artefact as a result of a design process, taking place in a design practice. In Orlikowski's (1992, p 410) words, "Technology is an outcome of such human action as design, development, appropriation and modification." Further, Orlikowski's (ibid) view is that *technology is a medium for human action* (b): "Technology facilitates and constrains human action through the provision of interpretive schemes, facilities, and norms." This view clearly resonates with the actability view of the IT artefact.

IT artefacts are designed in certain ways and their properties are institutionalizations; constraining and enabling certain actions in the particular social setting. Orlikowski (1992, p 410) explains the *institutional conditions* for interaction with technology (c): "Institutional properties influence humans in their interaction with technology, for example, intentions, professional norms,

state of the art in materials and knowledge, design standards, and available resources (time, money, skills)." Orlikowski (1992, p 410) explains the *institutional consequences* of interaction with technology (d), still based on Giddens's reciprocal relationship between agency and structure, in the following way: "Interaction with technology influences the institutional properties of an organization, through reinforcing or transforming structures of signification, domination, and legitimation." Giddens' 1984 structuration theory treats the matter at a more abstract level, where action in general is influenced by – and reinforces or transforms – social structures.

Figure 10.1 further explains the IT artefact as *embedded* in a social setting. The notion of a design practice, which informs a design process and intersects with it in a user-centered design manner, is part of the model. A design process is governed by design ideals, which are socially constructed by the actors in the design practice. Those ideals may be sprung from various sources, such as experts/consultants proposing a certain quality framework or best practice approach, or representatives from the workplace who proposes business goals or values as a form of design ideals. In this view, a design ideal is always socially constructed, thus it is influenced by stakeholder values, and the ideals may differ between stakeholders. Design ideals – as well as use qualities – concern the IT artefact *in context*. A use quality is a way to perceive a certain use characteristic within a particular social context. The quality can be assessed, but we can only make a statue in relation to some ideal of what 'good' is. A consequence of adopting this perspective is that one should be careful not to adopt a narrow view of use qualities in a design or evaluation situation – the union of ideals that govern inquiry actions need to acknowledge the context of the IT artefact *in use, in action, and within a social setting*.

A design process *induces change* in the social setting in which the IT artefact will be put into use. Sometimes, designers have limited opportunity to induce such change in the social setting (e.g. when designing off-the-shelf products, or when the development effort is an "IT project", i.e. the development of technology without mandate to make changes to the social or organizational realm). However, in some situations, the designers also have access to proposing changes to business processes or attempt to influence the norms and roles in the social setting where the IT artefact will be embedded. People's experience of the quality of the IT artefact will be formed as a consequence of both the properties of the IT artefact and by other experiences. For instance, a user-centered process will affect both the artefact as such, but also the users' willingness to accept the changes at the workplace (see the next section for a more elaborate discussion on stakeholder-centricity).

Apart from the introduction of a new IT artefact, there may be other organizational changes accompanying the introduction of a new artefact, such as new roles, workgroups and assignments. We need to conceive the use qualities of an IT artefact in the light of such changes to the organization. If particular individual states that an IT artefact is useless, it may indicate that the artefact as

such should be re-designed, but it may also indicate that the particular individual (or the group which he/she represents) has not been adequately introduced to the artefact. It may also indicate that the person needs more knowledge of the social context. A concrete example from the evaluation of the library search system clarifies this reasoning: Some interviewees found the application difficult to use due to a lack of knowledge of academic databases. However, one of the goals of a university education is to gain knowledge on how to do research within one's field and how to assess the relevance and scientific quality of information in general. Therefore, it might be desirable that the students learn about the academic databases and how to critically assess the value of different types of publications, rather than designing a more sophisticated IT artefact that abstracts such knowledge, although the latter solution might be more useful for the students on a short-term basis.

## 10.2 Stakeholder-centricity

This section concerns the concept of *stakeholder-centricity*. Although there has been an inclusion of multiple stakeholders in all inquiries, the concept was poorly elaborated upon in inquiries #1 – #2, which focused only users of the IT artefacts at hand. In inquiry #3, the need to take into account other stakeholders was actualized, which was the starting point to develop this concept. The concept was further developed through focused theoretical and empirical work in inquiries #4 – #5. The concept was introduced by Sjöström (2008); and further developed in Sjöström and Goldkuhl (2010).

A rationale for stakeholder-centricity was accounted for in section 8.2 (in the theory base for the LSS inquiry). The proposed pragmatic view of design – which forms a foundation for stakeholder-centricity through its recognition of social issues and the idea of design ideals as being socially constructed – is in line with Dewey's concept of moral inquiry: It is relevant to speak of both desired IT artefact properties and changes in the social setting which are needed to change an *indeterminate* situation into a *determinate* one. The empirical findings support this claim, and call for further conceptualization of the concept social setting: There are different social settings that are affected by, or concerned with, the qualities of artefacts. The library evaluation (inquiry #3) shows us how the artefact induces changes in both client activities and library (organization) activities. The social web shop study (inquiry #4) shows us a number of stakeholders that pay an interest in the emergence of that artefact. The other inquiries also highlight various stakeholder groups, such as teachers, students, and administrators.

Figure 10.2 illustrates the multitude of social settings which embed the design and use of an IT artefact. Another empirical example – from the LSS inquiry – of how the model has been used to identify and position stakeholders was shown in figure 8.9. The example illustrates the value of adopting

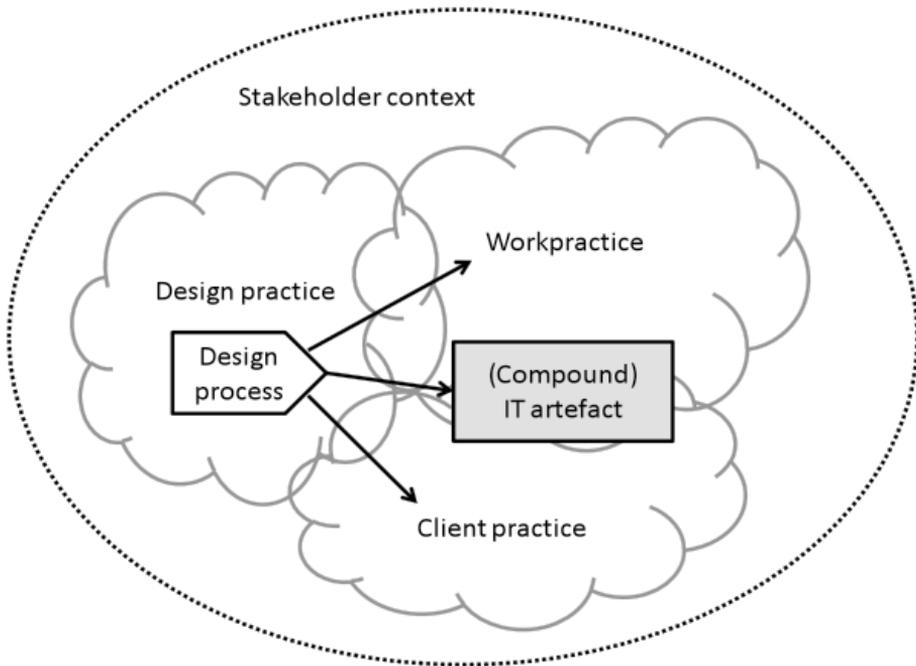


Figure 10.2: Social contexts embedding the IT artefact

this perspective on the social context of the IT artefact and its design, and the value of the model as an instrument for stakeholder analysis. Other examples from the empirical work are included in the discussion below. We may speak of a social context as a *source setting*: The design practice which brings to existence the IT artefact. The process of designing an IT artefact takes place within a design practice, and it may be conceived as an endeavor to design an IT artefact *and* induce changes in the social settings in which the artefact will be put into action. These social settings – *target settings* – may be viewed from (at least) three different and equally important perspectives:

The core workpractice, such as Amazon.com, taking the initiative to start the design process, and which is typically the owner of the artefact.

One or more client workpractices, such as the visitors of Amazon.com, who are affected by the IT artefact in different ways. In the Amazon example their clients experience a modern way of finding literature, and share experiences of literature, making them better informed before purchasing books.

The stakeholder context – a "grand" social setting including other stakeholders that may be identified in relation to the development of the IT artefact. This may include partners, investors, legislators, competitors, environmentalists *et cetera*. This must not be overlooked, since it both constrains

and at the same time enables the design process. In the Amazon case, there are various commercial actors such as advertisers and profilers. These actors are partners, which both enable and constrain the design of the web shop/community.

Based on this view of IT artefacts as being embedded in multiple social contexts, one may reason further about the concept of use quality. Such qualities belong in use situations; in the relation between actor and artefact. Moving back to Dewey's (1938) definition of a situation, we need to understand a contextual whole consisting of objects and events. In such situations, the users experience the artefact and the users' impressions of its qualities are shaped. However, in a broader sense, there are a number of stakeholders from the social settings mentioned above who are not users of the IT artefact, still important in the design process, and who may be affected by the outcome of that process. A broader conception of use qualities may need to incorporate the view of all these stakeholders. A conclusion is that we need to reflect about the immediate social settings where the IT artefact is used *and* the "grand social setting" in order to determine the ideals that are the basis for evaluating or designing the IT artefact and its context. This bulk of ideals, stemming from the various stakeholders, will be a relevant basis for assessment of the qualities of the IT artefact.

### 10.3 The Use Quality Matrix: A Typology Of Use Qualities

In this section and the following one, the *use quality matrix* is accounted for. The concept originates in inquiry #3. The concept has not been explicitly operationalized in the subsequent inquiries, but it has been part of the perspective, thus worked as a sensitizing concept in inquiry. The main idea, that a use quality may be understood using the two polarities interactive v. communicative and generic v. genre-specific, have been part of the inquirers' mindset. The experiences from all inquiries appear to strengthen this way of reasoning about use qualities. The concept was introduced by Sjöström (2008).

As discussed in the introduction chapter, many efforts have been made to develop concepts of IS use quality, which may aid evaluators and designers in their work. The relation between these quality concepts – however – is typically implicit or non-existing. In this thesis, a number of inquiries have been performed in different social contexts. Three of the inquiries targeted systems embedded in collaboration-oriented business environments (#1, #2, #5). One evaluation (#3) was performed in a service-oriented environment, where a library attempts at improving their communication of available information to their clients through a new search facility powered by IT. Evaluation #1 may also be categorized as service-oriented, if we conceive of students as the uni-

iversity's clients. The fourth inquiry concerned a web shop, complemented by a community where people exchange experiences about the available products. In HCI terms, one could say that these artefacts belong to different genres, thus we need different theoretical frameworks to understand them, and the artefacts need to be evaluated based on ideals that are suited for their respective genre. In accordance with the conceptualization of the IT artefact in chapter 9, we propose that IT artefacts in any genre need to be understood through the lens of "pragmatic duality", i.e. that we need to understand both the technology and its affordances, and how people's use of some technology is affected by – and affects is interpreted by – others. That is; what is the role of the IT artefact as a medium for communication. The understanding of the communication that takes places is a pre-requisite to understand the role of the artefact from a socio-pragmatic perspective: What commitments we make, how others expect us to do things, or how identity and other social driving forces are essential to understanding the adoption and use of technology.

The inquiries have given rise to three categories of quality, explained as follows:

- Interaction-oriented qualities, which can mainly be found in Human-computer interaction research. These qualities are often formulated in a generic and prescriptive manner.
- Communication-oriented qualities, which concern communication and social consequences of the use of IT. Given the presented perspective (pragmatic duality of user interfaces) this category is also categorized as "generic" use qualities, although they tend to aim at guiding our focus in the design process rather than being prescriptive.
- Genre-specific qualities, which are less generically applicable than the two categories above. As an example, designing an online community could include qualities based on Flores' (1998) concepts of identity, strategies for technology use in e-learning (e.g. Keller and Hrastinski, 2008) or social qualities such as the concept of sociability (e.g. Lazar and Preece, 2002; Preece, 2000; Preece et al., 2002). As a contrast, the design of a task-supporting artefact such as an internal system for salesmen may be designed with a different set of use qualities in mind (e.g. the ISO usability goals of effectiveness, efficiency, and satisfaction). Löwgren (2006) provides a rich overview of use qualities which are related to different genres.

Figure 10.3 – the Use Quality Matrix – may be helpful to represent use qualities, in order to make it easier to reflect about the appropriateness to put them into action in a specific design or evaluation context. The use quality matrix is based on the notion of pragmatic duality – the idea that we always need to understand an IT artefact both from an interaction perspective (how the human understands the machine) and a communicative and social perspective (how the human interprets the social aspects of doing something using the artefact).

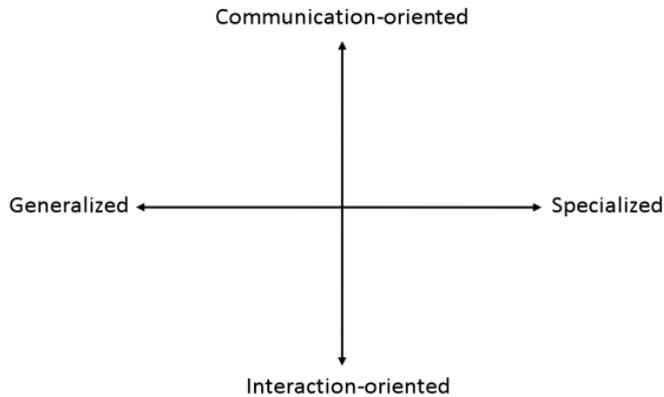


Figure 10.3: The Use Quality Matrix

The vertical axis of the matrix thus consists of two polarities: A use quality may be roughly represented by a vertical line along this dimension. The function of the horizontal axis is to explain whether a use quality is generically applicable, or if it is genre-specific – only relevant in some specific context. The four categories which emerge in the matrix are ideal typical – a use quality may intersect all categories. The use quality matrix aids a researcher in considering these two aspects of a quality, thus it helps to develop clearer conceptualizations. As such, it may be seen as a progenitive theoretical instrument for researchers, but it may also be helpful to practitioners, since it will aid them in determining the applicability of a use quality with respect to whether it is interaction-oriented or communication-oriented, and in which genre(s) of IT artefacts it is applicable. The need for genre-specific theories is stressed by several authors in the general IS field (e.g. Orlikowski and Iacono, 2001), design-oriented IS research (e.g. Gregor and Jones, 2007a), and human-computer interaction (e.g. Ihlström and Lundberg, 2004). Such theories aim at generalizing at a credible level, rather than being prescriptive for *all* types of IT artefacts in *all* contexts.

The use quality matrix help focus attention towards suitable quality concepts in design and evaluation situations: It helps determine which quality frameworks to adopt to ensure that we highlight both user-system interaction issues and human-to-human communication (and social) issues, and issues which are especially relevant given the genre of IT system at hand. By incorporating such focus on desired qualities at an early stage in a design or evaluation process, we are more likely to base our work on a well-reflected set of ideals. We may say that the matrix provides a rationale for determining ideals in a particular inquiry situation. Three evaluations (#1 – #3) performed in this research process show IT artefacts which do not fulfill ideals of com-

munication and social action; and the consequential problems in the studied workpractices. Evaluation #4 is built upon communication issues, but may be criticized from an ethical perspective: It does not clearly show its users how their statements are part of a user profiling endeavor. At the same time, the commercial idea of the web shop/community, and a number of the design features, depend on the user profiling. Inquiry #5 points out how the design ideal accountability is desired in the studied workpractice, and how the perspective brought forward in this thesis aids us in designing towards that ideal.

The use quality matrix should be conceived as an instrument to understanding and interrelating IS use qualities. This is readily applicable for practical purposes – it helps us ask certain questions in a well-structured manner, whether it is in the context of design or evaluation of an IT artefact in its context:

- What ideals govern this inquiry, and which use qualities are relevant for the IT artefact at hand?
  - Are there generic theoretical frameworks for communication quality which are relevant and useful in this situation?
  - Are there generic theoretical frameworks for human-computer interaction which are relevant and useful in this situation?
  - Given the genre of application we are evaluating/designing, are there specific relevant and useful frameworks?
- How do we achieve the use qualities we strive for?
  - In what way do we need to adapt the the design process?
  - In what way is it a matter of the characteristics of the IT artefact as such?
  - In what way is it a matter of the characteristics of the social settings which embed the IT artefact?

## 10.4 The Use Quality Matrix in Action

This section presents a small exercise where the use quality matrix is operationalized, in order to determine the relations between a set of use quality concepts. We may populate the use quality matrix with such concepts (from now on referred to as *X-abilities*) in order to relate them to one another. Doing this comparison extensively would be a major undertaking – in this context it should only be conceived of as an exercise to point out the difference in focus between different quality concepts. It also stresses the need to work with combinations of existing theory, adapted to the current design or evaluation context. Three X-abilities have been selected for this exercise. The first one is *usability*, which is included due to its impact on research and practice. The second one is *actability*, which is included since it belongs to the same ontological domain (socio-instrumental pragmatism) as the concepts presented in this thesis. The third one is *e-service quality*, which is included due to the increased interest in customer-oriented applications on the World Wide Web

(e.g. Santos, 2003). These three concepts of quality are further discussed in the three following subsections. A use quality matrix representing these three quality concepts is depicted in figure 10.4. The positioning of these concepts into the matrix is not intended to be completely accurate – it is rough, still accurate enough to inter-relate these X-abilities to one another in order to better represent their meaning.

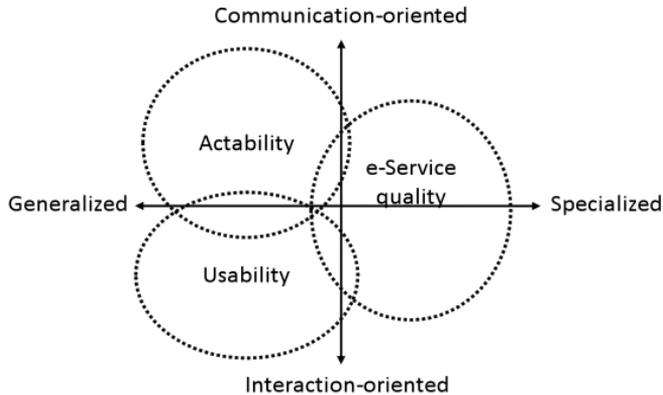


Figure 10.4: Usability, Actability and e-Service Quality

These different types of quality allow us to assess of the use of an IT artefact in relation to different ideals. However, depending on which perspective we adopt, we will perceive the quality of the IT artefact under scrutiny in different ways. There is a risk that the most well known quality concepts, or the ones which are applicable with a minimum of effort, are the ones chosen to determine the quality of an IT artefact (Rogers, 2004). I stress the importance of actively discussing qualities in context – every designer (or evaluator) needs to base their work on relevant qualities in the current situation. There is also a need to be aware of both generic quality frameworks (such as usability and actability) and genre-specific frameworks (such as e-service quality), and be able to determine how to combine these to come up with a useful and situationally suitable framework. The application of the matrix is also important to motivate the role of Information Systems Actability Theory. While usability and actability are concerned with the quality of the artefact, they stem from different theoretical roots, and focus different phenomena. The work on ISAT is a struggle to theorize how human-to-human communication aspects, and the social structures governing such communication, should be understood and put into practice in IT design and evaluation situations. Usability, on the other hand, evolved from cognitive psychology and human factors, and is still largely influenced by those roots. This is further elaborated upon in the following three subsections.

## Usability

In this section we address a set of common usability principles (Keinonen, 1998): *consistency, user control, appropriate visual presentation and task match, error handling and recovery, and memory-load reduction*. These principles are derived from Shneiderman (1998), Norman (1988), Nielsen (1993), and ISO 9241 (1996), four commonly cited sources for user-interface design (Keinonen, 1998). The conclusion about these principles is that they are interaction-oriented and formulated in a generic manner, as depicted in figure 10.4. It should be noted that this is a small analysis; only focusing design guidelines from the usability field. The field of interaction design as a whole is a much broader topic, providing other instruments to come up with high quality designs. One such instrument is the adoption of user-centered methods (e.g. Preece et al, 2003), which clearly improves the odds of addressing issues other than purely interaction-oriented.

**Consistency** The usability principle of consistency is primarily related to the learnability of the IT-system; i.e. new things should only have to be learned once (Keinonen, 1998). The principle of consistency can be applied to various phenomena: the terminology in use in the system, the sequence in which things can be done, and the consistency in the design of different applications (Keinonen, 1998). Visual consistency also increases the perceived stability, thus promoting user confidence. Nielsen (1993) also states that platform conventions should be followed. This principle basically states that the user should be able to understand the terminology and design of the system effortlessly, which is a matter of the instrument's consistency.

**User control** The idea of supporting users' internal locus of control (Shneiderman, 1998) relates to the user's subjective feeling of first person participation and engagement in the interaction. It is also related to the design principle of direct manipulation interfaces. The rationale for this principle can be summarized as: "...interaction is more rewarding if the users feel they can themselves directly influence the objects, instead of merely giving them instructions to act." (p 26 Keinonen, 1998). This may be seen from a strict interaction perspective: we could try to give an explanation to why users prefer to be in control only by looking at user-system interaction. We could also conclude that there is a need to make users understand the rationale behind possible sequence restrictions (what can be done in what order) as well as to the allocation of actions between users and systems (what can be automated and what cannot). This principle is basically related to interaction styles and cognitive matters.

**Appropriate visual presentation and task match** Appropriateness of visual presentation is a concern that has arguably so far dominated the research on user interface design (Keinonen, 1998), and by implication research on usability (Holmlid, 2002). It is emphasized that users have to be provided with sufficient and not inadequate (irrelevant or rarely needed) information. "To be in control, the user has to be provided with all necessary information"

(p 26 Keinonen, 1998), where 'necessary' means that "the dialogue should present the user only with information related to the completion of the task" (ISO 9241, 1996, p 3). Furthermore, it is assumed that the user should explicitly be made aware when operations have been completed successfully; the system status should be visible (Nielsen, 1993; ISO 9241, 1996). One of Shneiderman's (1998) golden rules of design is to offer informative feedback, which states that there should be system feedback for every user action. It also states that the response should be more substantial for actions that are infrequently performed and for 'major' actions. The principle of task match is the idea that information systems should present exactly the information that users need (Keinonen, 1998). The principle 'appropriate visual presentation and task match' is thus related to how information is presented and how well this information integrates with the business task at hand. This is a way of stating that there are genre-specific qualities of an application, which are summed up in the generically formulated criteria task match and appropriate visual presentation – a call to designers to make an effort to understand the users' tasks and the users' needs when it comes to visual presentations, and adapt to those requirements. The principle as such, though, must be conceived as generic rather than genre-specific.

**Error handling and recovery** The principle concerned with error handling and recovery deals with how the IT-system should respond to the user in various critical situations. Nielsen (1993), for example, points out that it is better to express error messages in plain language (instead of error codes). Error handling includes warnings given by the system before hazardous commands, information about irrevocable user actions, error prevention strategies, detection of errors made, easy reversal of actions, and possibilities for the users to correct errors without re-performing the whole task. Error recovery is claimed to relieve anxiety and facilitate learning by doing (i.e. 'trial and error'). Critical situations thus include, for example, those where hazardous commands and irrevocable actions can be performed. This design principle also treats how to avoid that errors occur in the first place, and how to handle situations where errors have occurred. Another aspect of this principle is how to facilitate the possibility to correct errors easily, without having to go through the entire task from the beginning. Shneiderman (1998) proposes that actions, insofar as possible, should be possible to undo, since this encourages the users to explore the system (without taking any major risks). This principle is interaction-oriented.

**Memory-load reduction** The notion of memory-load reduction addresses a basic principle of human cognition: people tend not to remember unrelated pieces of information accurately. It is expected that many errors will occur where precise recollection is required, which is why interaction should rely more on recognition than recall (Nielsen, 1993). It is argued that recall is prone to error, while people are good at recognizing objects (Norman, 1988). The system should therefore present alternatives and patterns so that people can select among given options Shneiderman (1998). Therefore it is important

that information is meaningful and easily provided. Nielsen (1993) states that objects, actions and options should be made visible, and that the user should not have to navigate between different dialogues when formulating a message. Nielsen further states that instructions on how to use the system should be easy to retrieve when this is appropriate. This principle is purely cognitive and interaction-oriented.

## Actability

ISAT has already been presented in this thesis (section 2.3 and continuously), but a brief discussion is required here to motivate the positioning in the use quality matrix. This will be done through a short discussion about previous research which compares actability to usability.

Ågerfalk (2004) provides an analysis of usability principles from a communicative perspective. Keinonen's (1998) categorization of common usability principles is approached from a language/action perspective. Ågerfalk concludes that usability principles are typically focused on human-computer interaction phenomena, while social qualities are only peripherally included in typical usability evaluation criteria. Socio-instrumental aspects are not currently made explicit in common usability principles, even though some principles may be interpreted (or perhaps re-interpreted) as related also to business communication (c.f. Ågerfalk and Eriksson, 2006).

Usability principles originate from cognitive theories rather than from theories on human behavior, human communication and an understanding of the organizational context in which IT-systems (mostly) are designed. It should be noted that the field of usability shifted dramatically during the 90's – scholars in the field explored a number of approaches to understanding phenomena concerned with the use of IT in organizations. ISAT, which may be conceived as one such reaction towards the interaction-focus in usability research, proposes that social action theories can be used to understand organizations, and hence explain the use of IT systems as socio-instrumental action within some wider action context. ISAT recognizes that interaction-oriented concepts are important to understand certain qualities of an IT-system, such as the learnability and the system's ease-of-use. However, this should be seen in relation to the communication and social action that takes place in the business context. The ISAT evaluation heuristics capture various aspects of communication action which are supported by IT as a medium and as an agent, and prescribe how to visualize such aspects in the user interface to make the users more aware of the social actions they perform while maneuvering the IT system. At the same time, some of the ISAT heuristics also incorporate what has "already been said" by usability researchers.

This brief example illustrates the overlap that sometimes occur between ISAT heuristics and usability principles. The combination of usability principle of *task match* and *visibility of system status* (Nielsen, 1993) and the con-

cept of affordances (Gibson, 1979) may very well be seen as similar to ISAT principle *situational context awareness*, which states that the user should always be aware what they are doing and what they are supposed to do. Such similarities may often be found when comparing usability and actability, but a closer look at them reveals that the underlying philosophies are different. There is a risk, though, that the underlying philosophies of this type of "checklists" are not adopted by those who put the checklists into action in practical design or evaluation work (Rogers, 2004).

Sjöström (2003), in an attempt to demonstrate the distinction between actability and usability, presented a re-formulated version of the ISAT evaluation heuristics, highlighting parts which were directly concerned with social action aspects of user interface design:

- Make the users understand the social context by making the actors visible in the IT system. This way, the users will be aware of the origin of messages, and whom they are sending messages to.
- Allow the users to understand when other actors will interpret their messages. This can be done by making it transparent when messages reach their intended interpreters, and if messages are pushed to them or pulled by them.
- Promote qualitative utterances by (1) making information about previous actions available in the action memory and (2) making the actors visible in the IT system in order to make clarifications possible and promote users to trust the information.
- Promote a suitable quantity of information handling by (1) displaying and requesting an adequate amount of information in screen documents and (2) making the actors visible in order to allow users to retrieve more information if needed.
- Promote users to understand what they are supposed to do by (1) using expressive user interface components, (2) making information about previous actions available in the action memory and (3) allow focus and work task changes.

Clearly, actability design principles are biased towards communication action aspects of user interface design. This is surely a consequence of the theoretical roots. However, as shown by Ågerfalk (2004), there is a tight connection between interaction-oriented properties and communication-oriented properties of IT artefacts, which has led to a formulation of actability heuristics that incorporate both interaction-oriented and communication-oriented aspects. To some extent, actability guidelines overlap usability guidelines. It is also evident when studying actability heuristics that they are formulated in a generic manner, rather than being limited to a well-specified category of IT artefacts.

## e-Service Quality

In accordance with the semiotic perspective in this thesis, I claim that there are always different subjective interpretations of signs. Contemporary buzzwords such as "e-Service" and "e-Service quality" appear very likely to be interpreted in different ways by different individuals. In this context, I consider an e-service in a broad sense: it is a web site designed as a means to leverage communication with an organization's clients. The concept of pragmatic duality is highly relevant in this context, since communication and social relations are vital for the consumer's experienced service quality (e.g. Edvardsson, 2005). Edvardsson concludes that there are two categories of service quality clues: clues of experience related to functionality and clues of experience related to emotions. According to Edvardsson, negative emotions affect the customer's perceived service quality more than positive emotions.

Edvardsson emphasizes the importance of responsiveness towards customers; especially in relation to customers' negative emotions and complaints, and that it is important to have repair mechanisms to compensate customers who are not satisfied with the service(s) offered. In order to facilitate such reading of customer emotions, and to facilitate repair mechanisms, one can conclude that there is a need for bi-directional communication channels between the service provider and its customers. An IT artefact – typically a web site – may be conceived as one such communication channel; however it should be seen in the context of other means of communication.

Johansson (2007) discusses how customers perceive different communication channels in relation to different actions (orders, cancellation of orders, complaints et cetera). The study concludes that companies with a heterogeneous group of customers should offer their customers a variety of communication channels, to prevent them from being shut out from the services offered. The study also shows that formalized communication channels (such as a web site) are often preferred for orders and cancellation of orders, while other communication channels (such as the telephone) are preferred for complaints. From Johansson's (2007) work, it can be concluded that there is a risk in launching an e-service to replace existing communication channels. One should see the e-service as a complementary service to customers; an additional communication channel suited for certain purposes. Usability of the interactive product that facilitates the e-Service is an important quality aspect, but it needs to be regarded in the light of the service context as a whole. An e-Service needs to be part of a service context, where the design of other communication channels between service consumers and the service supplier are part of the customer's experience of the company. Potential usability problems need to be backed up by other working communication channels in order to prevent the service consumer from developing negative emotions towards the service as a whole. One e-service quality might thus be its support to guide

its users to other communication channels, and other means of consuming the service.

In order to include a broad range of quality aspects into this chapter, it is interesting to analyze some group of use qualities that does not stem directly from the information systems discipline. The following discussion is based on a framework for e-service quality proposed by Santos (2003), who performed a large empirical study and generated a number of quality categories through a grounded theory approach. Her theoretical influences are mainly found in service management and marketing, although some references to human-computer interaction are included in her work. Santos concludes that we need to separate between an incubative dimension of qualities and an active dimension of qualities. Both these dimensions are described with a finer granularity as a number of use qualities. As discussed below, these qualities are *specialized* (they concern the domain of e-services), and they span between *interaction-oriented* and *communication-oriented* qualities. Santos uses the term e-service quality. Santos' definition of e-service is unclear – it appears to be derived from a broader concept of service quality, applied in a web context. The empirical data includes web sites for e-commerce.

Santos' *incubative dimension* matches the "designer-to-user" view of the communicative view on user interfaces. It may be seen as static parts of the web site with respect to aesthetics and how content is formalized - a number of characteristics of a web site which are determined during its design: Ease of use, appearance, linkage, structure and layout, and content. The first four issues are clearly interaction-oriented, while the content of the web site is oriented towards communication from the organization to its client.

Santos' *active dimension* matches the "user-to-user" views of the communicative view on user interfaces: it deals with a number of qualities that require *organizational activity*, for instance that a representative of the service provider answers an e-mail. Given the conceptualization of the IT artefact's agency characteristics, I conceive of organizational activity in a broad sense, including both human action and action performed by the IT artefact as an agent. The active dimension is divided into several qualities: *Reliability, efficiency, support, communication, security, and incentive*.

First, Santos' (ibid) work shows that *reliability* is an important matter – an organization's clients need to be able to trust that the expectations that come into existence while using the web site are fulfilled through a proper service delivery. This is oriented towards communication: If an actor says something, a social relation (an expectation) is established. This social relation needs to be properly addressed to avoid communication breakdown between the parties.

Second, Santos' mentions *efficiency* as an important quality. This incorporates aspects such as download speed, and the web site's functionality for search and navigation. This is clearly interaction-oriented.

Third, Santos discusses *support* from both an interaction-perspective and from a communication perspective. In order to achieve e-service quality, there

is both a need for help sections on the web page (such as FAQs), and functionality that puts the client in contact with the organization (e.g. through e-mail or telephone). The offering of free advice and suggestions (e.g. home-improvement advice) are also considered as quality improvements.

The quality of *communication* is described by Santos in the following manner (Santos, 2003, p 242): "Communication in e-service consists of online communication [...] and traditional communication methods (telephone, fax, and postal mail). A good-quality Web site must offer many contact methods". From a service perspective, we need to speak to the customer on the customer's terms. The web site should reveal contact options other than e-mail or web forms to allow the customers to rapidly get in contact with the organization when needed. This is purely communication-oriented.

Furthermore, Santos' study shows that the users' perception of the *security* of the web site influences their overall impression of web site quality. Technical solutions (such as encryption) and social solutions (such as online card guarantees) may be used to enhance client confidence in security. Santos' description of security is primarily concerned with the users' trust of the technological solutions, which is communication-oriented – it is a matter of communicating to the user that the web site is secure.

The final category concerns *incentive*, which Santos defines as "the encouragement given by the Web providers to consumers to browse and use the Web site, including rewards for doing so" (Santos, 2003, p 242). The web is often the preferred communication channel from the organization's perspective due to the low transaction costs. Incentives – such as discounts and special offerings to web customers – may be created to attract and retain online clients, and is therefore an important quality issue when designing commercial web sites. This is clearly socially oriented: The organization communicates the incentive to the customer. This may be communicated on the web site and using other communication channels.

# 11. Design-oriented IS Research

This chapter discusses the results in relation to research question #3. Sections 11.1 – 11.2 are results of this study, but they may also be conceived of as a manifestation of the methodological reflection triggered by the ambition to represent design knowledge based on design-oriented action research. Section 11.3 elaborates further on how to work with the framework in practice as part of the research process. Section 11.4 shows the author's view of what a design theory is, and includes a formulation of a pragmatic design theory that emerged from inquiry #5 (chapter 8).

## 11.1 Representation of Design Knowledge

This section is a theoretical foundation for the analytic framework for design-oriented IS research (section 11.2). A review of literature on design-oriented research in IS reveals three different strands, which are sometimes depicted as being quite distinct or even incommensurable: (a) Information Systems Design Theory (ISDT), (b) Interaction Design Patterns (IDP) and (c) IS Design Science Research (DSR). While (a) and (c) correspond to the two 'schools' mentioned in the introduction chapter (section 1.3), (b) has not attracted the same attention within IS as in the field of human-computer interaction<sup>1</sup>. We would argue that, although different, these three strands share similarities but highlight different ideals, and that they – when viewed together – represent a large number of design-oriented IS research concepts. This section contains a brief introduction to the three strands, since they constitute a theoretical foundation for the framework presented in section 11.2.

### Information Systems Design Theory

In their award winning article on *the anatomy of a design theory*, Gregor and Jones (2007a) deal with how to represent theory in design-oriented research. Although the use of the word theory is debated in design-oriented research. Gregor and Jones (2007a) propose that a design theory should be described using the following eight aspects.

First, a design theory must address its *purpose and scope*. Said Gregor and Jones: "[...] The set of meta-requirements or goals that specifies the type of

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<sup>1</sup>This particular topic is investigated further by Sjöström (2010).

artifact to which the theory applies and in conjunction also defines the scope, or boundaries, of the theory." (2007a, p 322). A design theory should inform the reader of the type of problem to which it provides a solution. This part of the theory description is a contextualization: a definition and demarcation of the applicability of the theory.

Second, *constructs* – core concepts – of a design theory should be defined. Gregor and Jones (2007a) propose that the entities of interest should be clearly stated within a design theory in order to avoid ambiguity and clearly communicate the theory to its addressees.

Third, a design theory consists of *principles of form and function*, addressing the conceptual solution to the problem: "The abstract 'blueprint' or architecture that describes an IS artifact, either product or method/intervention" (Gregor and Jones, 2007a, p 322). In accordance with the discussions in section 10.2, we argue that such principles may focus a combination of (a) the characteristics of the IT artifact, (b) the design process – a 'source' social setting where the IT artifact is brought to existence, and (c) the 'target' social setting(s) where the IT artifact will be implemented.

This distinction makes clear that different types of measures may be described in a design theory: (a) artifact design principles, (b) principles for adaption of the design process, and (c) principles for induction of change in the organization where the IT artifact will be put into action. Gregor and Jones propose a specific category (*principles of implementation*, see below), to describe the implications of the theory on the design process.

Fourth, since the IT artifact is viewed within its emergent social setting (Gregor and Jones, 2007a; Orlikowski and Iacono, 2001), *artefact mutability* should be addressed in a design theory. (Gregor and Jones, 2007a, p 322) suggest that an IS design theory should address "[...] what degree of artifact change is encompassed by the theory".

Fifth, a design theory should specify *testable propositions*. Walls et al. (1992) propose that an IS design theory for a product should consist of meta-requirements (a class of goals for the theory), and a meta-design (the conceptual solution to the problem class). A product hypothesis is used to test if the meta-design satisfies the meta-requirements. Further, a design theory for a design process would comprise a design method. Such a design method should result in an IT artifact that is consistent with the meta-design. A design process hypothesis is used to test this. Gregor and Jones' (2007a) distinguish between quantifiable and measurable algorithmic propositions and more qualitative heuristic propositions. The latter were discussed – as technological rules – by van Aken (2004, p 227) in terms of, "If you want to achieve Y in situation Z, something like action X will help." The idea of clearly and distinctly stating design goals at a meta-level provides a basis for evaluating what is achieved when applying the design theory. Such evaluation may be conducted in different ways; for example, through building an artifact, imple-

menting it in some social context, and then evaluating the results in light of what the theory predicted.

Sixth, some scholars argue that *justificatory knowledge* is needed to explain why the design theory prescribes specific principles of form and function and principles of implementation, which is important in order to build a cumulative research tradition (Gregor and Jones, 2007a). However, the necessity of theoretical justification in a design theory has been questioned (Hevner et al., 2004; Venable, 2006) and some scholars propose that too much focus on the existing body of knowledge may counteract innovation (Iivari, 2007). Gregor and Jones, however, argue that there is always some type of justificatory knowledge in design situations.

Seventh, design theory may optionally include *principles of implementation*. To increase its usefulness and credibility, design theory should include advice on how to apply the theory in a practical design situation (Gregor and Jones, 2007a). That is, there is a need to explain how the design theory impacts the design process. Gregor and Jones use a well-known example, linked to the relational model of databases. Normalization of databases is shown as an example of principles of implementation. Normalization consists of a number of steps in which well-defined rules are applied to increase the quality of the data model.

Finally, an ideal put forward in IS design theory (Gregor and Jones 2007; March and Smith 1995; Walls et al. 1992) is to provide *expository instantiation(s)* of the theory. An instantiation is a step towards providing evidence supporting the theory (since an instance is required to perform an evaluation in a real setting). Gregor and Jones put forward the idea that an instantiation of an artifact is optional in a design theory, although it may clearly strengthen the credibility of the theory. The design product as such is also a carrier of design knowledge (Iivari, 2007) – an actual IT artifact is an important means to communicate knowledge among stakeholders such as researchers, designers, and managers.

## Interaction Design Patterns

An interaction design pattern defines its purpose and scope through descriptive categories such as *use when*, *context*, *problems*, and *forces*. Borchers (2001) draws on computer science design patterns (Gamma et al., 1995) and suggests that an interaction design pattern description should include a discussion of *forces* and *counter-forces*. This is to inform its interpreters about necessary conditions for successful application of the pattern and obstacles that may mitigate against its application in particular situations. The presentation of these forces may be conceived of as an additional service to the reader, allowing them to make sense of the circumstances under which the pattern is applicable.

The literature on interaction design patterns suggests several ways of representing the solution to the problem in terms of *principles of form and function*. Solutions are commonly presented as narratives (Tidwell, 2005). Borchers (2001) proposes the solution to be shown in several ways: as diagrams (depicting the main idea), as opening illustrations (to allow the reader to quickly get an idea of the pattern), and as detailed solution descriptions.

Interaction design patterns are typically focused on user interface design. However, some researchers increase the scope of principles of form and function to address also *architectural consequences* of the proposed design – Folmer et al. (2005) argue that the gap between user interface issues and technological solutions need to be bridged, and that this can be done by providing a detailed account of (principles for) a technical solution. This will allow for interaction designers to understand better the consequences for implementation of their design suggestions – such as implications for *IT artefact mutability*.

Interaction design patterns typically include some form of *justificatory knowledge*, albeit typically not linked to theory. The human-computer interaction literature is permeated with various types of design guidance. The concept of claims (Sutcliffe and Carroll, 1998, 1999; Sutcliffe, 2006) addresses the need for a sound theoretical grounding in addition to empirical design examples. Dearden and Finlay (2006, p 86) state that "patterns emphasize their grounding in multiple examples of successful designs, whereas claims emphasize grounding in theory." However, although practical utility is mentioned as a means for grounding design patterns, Dearden and Finlay (2006, p 86) also propose "one of the most obvious weaknesses in HCI research on patterns to date is the lack of substantive evidence of their benefits for actual design practice."

Finally, an interaction design pattern typically includes design examples that reveal a complete a solution to the problem (Gamma et al., 1995; Borchers, 2001; Van Welie and Van der Veer, 2003; Tidwell, 2005).

## Design Science Research

Although others have proposed alternative ontological and epistemological positions (Iivari, 2007) and suggested that design science research in IS – given the youth of the paradigm – needs to be open to epistemological pluralism (Niehaves, 2007; Puroo et al., 2008), we would argue that Hevner et al. (2004) represent this strand well due to the high impact of their 2004 *MIS Quarterly* publication. We select their view as a representative of this strand. It should be noted that this it is not our intention to advocate this particular view of IS design science research; it is used here for being well known and for presenting the topic extensively. Hevner et al. (2004) advocate seven guidelines for IS design science research as follows.

The first guideline concerns *design as an artifact*. Hevner et al. (2004, p 82) explain their view by stating that "[...] we include not only instantiations in our definition of the IT artifact but also the constructs, models, and methods applied in the development and use of information systems." This view of the artifact is clearly in line with March and Smith (1995) who propose that the result of design science research should be expressed as design science artefacts – constructs, methods, models, and instantiations. Hevner et al. (2004) point out that the IT artifact as such does not include people or organizations, but that IT needs to be designed and evaluated in some social context. Design science research may deal with a mix of technology-based artifacts (e.g. user interface properties), organization-based artifacts (e.g. incentives) and people-based artifacts (e.g. consensus building) to provide solutions to some class of problems.

The second guideline, *problem relevance*, promotes the ideal that design science research should focus on problems that are relevant to practice and also innovative. Researchers should "acquire knowledge and understanding that enable the development and implementation of technology-based solutions to heretofore unsolved and important business problems." (Hevner et al., 2004, p 84)

The third guideline advocates *design evaluation*; that is, a design artifact should be evaluated in a rigorous way in order to show its qualities. Various evaluation methods from the knowledge base may be used to assess qualities of the artifact. However, a point is made that some form of relevant and well-executed evaluation is necessary in order to determine when the design process has found a solution to the problem; and to what extent that solution solves the problem.

The fourth guideline, *research contributions*, promotes that the product of design science research may be a design artifact (as discussed above), additions to the knowledge base (constructs, models and methods), and methodologies for evaluation.

The fifth guideline advocates *research rigor*. This is imperative in order to differentiate between IS research and the practice of IS development. Said Hevner (2007, p 88), "Success is predicated on the researcher's skilled selection and application of the appropriate theories and methods for constructing and evaluating the artifact." It must be noted that design science research cannot rely solely on the knowledge base, since such an ideal would be counter-productive to innovation. A multitude of sources may complement the knowledge base; for example, existing artifacts and creative insights (Hevner, 2007).

Further, a sixth guideline characterizes *design as a search process* with inherent iterative characteristics. The solution to a problem is to be found in a design cycle where design proposals are produced and evaluated until a satisfying solution to the problem at hand is found (or rather agreed upon by the stakeholders involved).

Finally, the seventh guideline deals with *communication of research*. Design science research should be communicated both to technology-oriented and management-oriented audiences. A number of guidelines for how to 'package' research results in a practically useful way are proposed.

## 11.2 An Analytic Framework for Design-oriented Research

This section introduces a *framework for design-oriented research*. The need for such a framework emerged in inquiry #5, in which a need occurred to reflect about design-oriented research and representation of results from such research. The framework was originally introduced by Sjöström and Ågerfalk (2009), preceded by a publication by Sjöström and Ågerfalk (2008) on *socio-instrumental design patterns* – a less elaborate and differently focused conception of knowledge representation. Another related publication (Sjöström, 2010) adopts a critical stance towards interaction design patterns from both an IS perspective and an interaction design perspective.

The categories used in understanding design-oriented research within the three strands, as presented in section 11.1, deal with different phenomena and exist at different levels of abstraction. As shown below, these can be further elaborated using three orthogonal polarities as follows.

Hevner et al. (2004) point out that design research is inherently concerned with both research activities and design activities. From the perspective of inquiry as a theory of knowledge (Dewey, 1938) these are necessarily intertwined but are still possible to distinguish for analytic purposes. While design activities are primarily concerned with the design of artifacts and their properties and social contexts, research activities are primarily concerned with understanding those artifacts and contexts and the design process; and supporting design through representations of design knowledge. Thus, we make a conceptual distinction between *research* and *design* in design-oriented IS research.

When speaking of design, it is possible to distinguish between the process of design and the product of that design process (Walls et al., 1992). In ordinary speak, both are commonly referred to as design, but distinguishing the two types of phenomena are important in any scholarly discourse on the subject. Thus, we make a conceptual distinction between *process* and *product* (outcome) in design-oriented IS research.

Finally, as pointed out by Argyris and Schön (1978), it is possible to distinguish two different aspects of theory: espoused theory and theory-in-use. The former relates to how we express a theory of action and the latter to how such expressions are used to inform our actions in practical situations. Hence, espoused design theory corresponds to generalized theoretical notions about design and design research that are put into practice during design research

and design activities, producing certain outcomes. Accordingly, we make a conceptual distinction between *abstract* (espoused) and *concrete* properties of design theory in IS research, where the latter includes both theory-in-use and the concrete results (instantiations).

The remainder of this section uses the three polarities as an instrument to construct a framework of design-oriented research categories. The design-oriented concepts from the three strands can be mapped onto these as shown in table 11.1.

Table 11.1: *An ideal-typical framework for design-oriented research concepts*

<b>Phenomena</b>	<b>Abstract</b>	<b>Concrete</b>
<b>Process of design</b> (Practical utility)	Principles of implementation (ISDT, IDP) Design as a search process (DSR)	Actual design process that resulted in an expository instantiation / design as an artifact.
<b>Product of design</b> (Practical utility)	Purpose and scope (IDP) Constructs (ISDT) Principles of form and function (ISDT, IDP) Artifact mutability (ISDT) Architectural consequences (IDP)	Expository instantiation (ISDT) Design example (IDP) Design as an artifact (DSR)
<b>Process of research</b> (Relevance, rigor, innovation)	Research rigor (DSR) Problem Relevance (DSR) Design evaluation (DSR)	Actual research process governed by and expressed in fidelity to the abstract process of research.
<b>Product of research</b> (Cumulative research tradition)	Purpose and scope (ISDT) Communication of research (DSR) Research contributions (DSR) Testable propositions (ISDT) Justificatory knowledge (ISDT)	Actual research results, expressed in fidelity to the abstract product of research (e.g. a design theory).

The positioning of design-oriented concepts from different strands within the framework allows us to understand better their meaning in relation to one another. However, it should be noted that the categories in the framework are not part of the framework as such – they are merely represented there in this context, to illustrate how they may be conceived from this point-of-view.

The framework in 11.1 allows for a synergistic understanding of design theory in IS. While recognizing the anatomy of a design theory as proposed by Gregor and Jones (2007a), we argue that that such theory (the concrete product of research) should ideally meet the following criteria:

- It is represented in accordance with the *abstract research product*. The ideal of a cumulative research tradition is promoted this way; scholars and practitioners will recognize the structure and content of design theories. When actually enacted in-use it will of course diverge from the abstract espoused theory.
- It contains a representation of the *process of design*. The ideal of practical utility is addressed by providing prescriptions on how to work in the design process. The process of design may be expressed both in abstract (i.e. prescriptive instructions how do work; method advice) and concrete (i.e. a well-documented example of an actual design process, based on the abstract espoused theory).
- It contains a representation of the *product of design*. Here, at the abstract level, the ideal of practical utility is met through prescriptions for how to design the IT artifact and how to induce change in the social setting(s) where the IT artifact will be embedded. At the concrete level, design knowledge resides in the instantiation, which consequently is a pedagogical means in communicating the design theory to others.
- The *process of research* is represented in a transparent way to address how ideals in design-oriented research – such as relevance, rigor, and innovation – have been addressed. The abstract process of research is concerned with epistemological and methodological issues, while the concrete research process shows the actual research process. These aspects of the theory, how it came into being, is also important in order for other scholars to assess its contribution to research; that is, to its position in the cumulative research tradition within some paradigm of design-oriented research.

We may also discuss the concept of interaction design patterns in terms of the framework: They are clearly oriented towards the *product of design*, providing designers with both abstract knowledge (principles of form and function of the IT artifact, with an emphasis on the human-computer interface) and concrete knowledge (design examples). The ideal of practical utility appears dominant interaction design patterns.

IS design science research, highlighting rigor, relevance and well-executed evaluation of artifacts, is clearly focused on *the process of research*. In addition, there are guidelines for both the *process of design* (design as a search process), and on the *product of design* (design as an artifact). The product of research (i.e. design science artefacts) is also addressed through the guidelines communication of research and research contributions. Design science research is clearly the one most concerned with the ideals of rigor and relevance in design-oriented research.

### 11.3 Guidance for Adopting the Analytic Framework

The analytic framework (table 11.1) provides a structure of concepts at a level that is not limited to a specific set of ontological and epistemological presumptions. Thus, the framework at hand allows us to understand design-oriented concepts based on different value-orientations or ideals, which resonates with recent calls for epistemological pluralism in design-oriented research (Niehaves, 2007; Purao et al., 2008). The framework calls for reflection about espoused theory (linguistically expressed abstractions) in four categories, however *it does not prescribe what that theory should be*. Further, it allows for structured reasoning about the relationship between espoused theory v. the results of the use of such theory; and its use as such. In essence, it is a response to the challenge to "bridging the inherent multi-disciplinarity with a common language" (Purao et al., 2008, p 18). Another implication for research is that the framework may be used for unfolding theories to make them more accessible to stakeholders due to reduced complexity, as suggested by Sutcliffe (2006). The idea is that a research result – a representation of knowledge – is multi-faceted: We may reveal or conceal different aspects of it depending on the intended target group or the fulfillment of selected ideals for theorizing. The framework provides a structure for communicating research results to different audiences in a structured and well-reflected manner, an idea that is also promoted by Hevner et al. (2004). As such, it may be food for thought for scholars striving to meet the challenge of disseminating results to multiple audiences (Purao et al., 2008).

The three strands, which appear to be guided by partially divergent ontological and epistemological assumptions, highlight different scholarly ideals. In line with Niehaves (2007) as well as Purao et al. (2008), we argue that such pluralism is both unavoidable and desirable in the emergence of a tradition of design-oriented IS research. However, to paraphrase Iivari (2007), this is not an attempt to advocating a Gyro Gearloose style of research. On the contrary, the framework is meant to aid in systematically reflecting about ideals, and it also points out some directions toward an ontological and epistemological positioning. Such a positioning is a starting point for design-oriented research, and the basis for making important decisions about how to address methodological issues in each category in the proposed framework.

### 11.4 Pragmatic Design Theory

In this particular context, attempting to establish a pragmatic account of information systems design, it is clearly motivated to provide a view of what pragmatic design theory is. Although – or maybe more accurately *since* – such an undertaking is highly likely to raise a multitude of objections, it is the responsibility of the author to propose a definition of the concept in this thesis. This

section elaborates on *pragmatic design theory*, and introduces one such theory as an example of this meta-theoretical concept. The notion of pragmatic design theory is – in addition to its theoretical justification – informed by all five inquiries, but its most prominent influence is the LSS inquiry.

As a general principle, and with regard to the design *product* – which corresponds to the IT compound artefact and its social context<sup>2</sup> – and the design *process*, I argue that such theory must acknowledge the pragmatic characteristics of the IT artefact (as discussed in chapter 9) and the pragmatic characteristics of IT artefact design (as discussed in chapter 10). Further, like any design theory, a pragmatic design theory should be based on meta-theoretical reflections. In this case, the obvious choice for such reflections is the analytic framework for design-oriented IS research presented in section 11.2. These desired properties of pragmatic design theory are illustrated in figure 12.1 in the conclusions chapter. The remainder of this section is divided into two parts: (i) The analytic framework from a pragmatic perspective. This subsection elaborates on the meaning and applicability – from the perspective of pragmatism – of the design ideals and the abstract categories from the framework. (ii) The pragmatic design theory *social transparency for accountability* (SoTA), originating from the LSS inquiry, is presented. A presentation of the theory on the basis of three aspects serves as an example of how the framework may be used to 'unfold' theory to different stakeholders.

## The Analytic Framework from a Pragmatic Perspective

The proposed analytic framework for design-oriented IS research appears to resonate with pragmatism. However, given the aim to develop a framework with a minimum of ontological and epistemological assumptions, there is a need for a few reflections on how to adopt the framework from a pragmatic point-of-view. A pragmatic design theory should strive to fulfil the five ideals found in the analytic framework: *Cumulative research tradition*, *relevance*, *rigor*, *innovation*, and *practical utility*. The philosophy of pragmatism is thoroughly discussed in chapters 1 – 3, but needs to be briefly re-visited here to comment on these five ideals. Design-oriented research approaches all share a pragmatic underpinning, which is sometimes explicit, sometimes not. A cumulative research tradition can, for instance, be traced back to William James' assertion that new concepts should be anchored in older truths. A pragmatic approach further embraces relevance – if the usefulness of a concept is purely hypothetical, it could not be assessed. It needs to be operationalized in some context. In my interpretation, a pragmatic approach does not seek to solve

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<sup>2</sup>The notion of *design product* is not limited to the IT compound artefact and its social context. Other artefacts, such as design prototypes, technical documentation and tutorials, may also be conceived of as design products. However, the ultimate goal in a pragmatic view is to change an undeterminate situation into a determinate one, which typically puts changes of the social setting through the introduction of new technology in focus.

problems without practical relevance. Further, Peirce's pragmatism promotes rigorous inquiry and the use of scientific method. The other great names in pragmatism partially disagree with Peirce's view of inquiry – e.g. Dewey's view of moral inquiry that is a criticism towards Peirce – but do not question the ideal as such. As a pragmatist, one seeks new ways of conceiving the world that serves one's actions better than the old ways, thus innovation is a positively laden ideal. Finally, regarding practical utility, it is one of the core values of the entire philosophy of pragmatism.

The **research product** in pragmatic design theory may be conceived of as the instruments the researcher puts into play to fulfil the ideal of a *cumulative research tradition*. There is no rationale to question the categories in the analytic framework as being part of a pragmatic design theory. However, one would expect part of the *justificatory knowledge* in such a theory to be oriented towards pragmatic issues, and that it would build clearly on a pragmatic philosophy. A few reflections are appropriate here. First, a reflection concerning communication of research is that the use of the analytic framework reduces the need for this category. The framework leads to a 'modularised' representation of design theory. By selecting suitable 'modules', different views of a theory are created. Different views target different audiences, which simplifies communication of research. Second, a reflection concerning justificatory knowledge is that it appears to focus on theoretical grounding. As discussed in chapter 3, this thesis adopts a multi-grounded approach to justification, that has also been suggested for use in design-oriented IS research (Goldkuhl and Lind, 2010). Multi-grounding is a combination of three justification strategies: theoretical grounding, empirical grounding, and internal grounding. This concerns both the abstract research product, which should address how to represent these three types of grounding as part of the research results, and the abstract research process, which should clarify how these justification processes should be implemented in practice. Further, the interpretive field study was conducted in keeping with principles for such studies (Klein and Myers, 1999).

The **research process** in pragmatic design theory should be designed to embrace the ideals of relevance, rigor, and innovation. These ideals may sometimes be conflicting, which gives the researcher responsibility to clearly demonstrate the rationale for prioritization of ideals when theorizing. The most apparent influence of pragmatism here is that the process of research needs to lean on an interest in action. Such an interest could be manifested in different ways. This thesis, as accounted for in chapter 3, constitutes one example of pragmatically oriented research design.

Regarding the **design product**, it should clearly be aimed at the ideal of practical utility. The abstract representation of design knowledge should be actionable. This points out a relation between pragmatic design theory and Cronen's notion of practical theory, which serves well to support scholars in formulating practically useful theory. This ideal is a core value of pragmatism

the needs to be embraced in a pragmatic design theory. The categories proposed in the analytic framework to deal with the abstract design product intersect with Cronen's criteria for practical theory, and point out a few specifics for the IS context (artefact mutability and architectural consequences). Further, principles of form and function, as discussed within the ISDT and IDP strands of design-oriented research, help IS researchers formulate in abstract characteristics of the design product.

Regarding the **design process**, figure 8.5 shows a rationale for a design process grounded in pragmatism and in the empirical context of the LSS inquiry, acknowledging the notion of design a search process. The proposed design process in a pragmatic design theory may diverge from this particular view. The rationale for the design process, however, should be explicit, and clearly rooted in pragmatism.

### Social Transparency for Accountability

This subsection shows an example of pragmatic design theory. The design theory – a **concrete research product** – is named *social transparency for accountability* (SoTA). Since the theory is presented as part of this thesis, it is partially represented through references to previous sections. Were the theory to be presented in isolation, selected parts of the referred sections would be inserted into the theory description<sup>3</sup>.

The representation of actual design knowledge is of course of interest for scholars as well as designers. However, given the aim of representing design knowledge in a way that is readily applicable by designers in design situations, there is a need to separate more design-oriented aspects of theory from research-oriented aspects of theory. Table 11.2 shows aspects of SoTA that are primarily design-oriented. The analytic framework proposes that the **abstract design product** is represented on basis of the categories *purpose and scope*, *constructs*, *principles of form and function*, *artefact mutability*, and *architectural consequences*. The framework further suggests that a representation of a **concrete design product** is part of theory, in order to show a *design example / expository instantiation*<sup>4</sup>.

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<sup>3</sup>This is not desirable in this context, since it would create redundancy in the thesis.

<sup>4</sup>The DSR principle of *design as an artefact* is not included in table 11.2, due to the slightly different meaning of the category. In this particular case, the design product is conceived of as an induction of change in a social setting and an IT artefact, which does not correspond fully to the idea of constructs, models, methods and instantiations as design science artefacts.

Table 11.2: SoTA - Practical Design Aspects

Aspect	Description
Purpose and scope	<p>This theory suggests <i>IT-enabled social transparency</i> as a strategy to achieve accountability in business processes. The theory has been developed in a Swedish e-government setting. The theory can be adopted in other e-government settings as an alternative to individual certifying of documents through signatures. The requirement of signatures may create bottlenecks in the administrative workflow, i.e. the process halts while awaiting validation of content from some actor(s). This theory outlines how the strategy of individual certifying may be substituted by a social transparency in workpractice processes, through the introduction of information technology supporting such transparency.</p>
Constructs (key terms)	<p><b>Accountability</b> – Accountability may be conceived as the feasibility for a person to make sense of the social grounds and purposes of their actions, thus act in a well-informed, responsible, and auditable manner.</p> <p><b>IT Artefact</b> – A manmade piece of information technology with some information processing and mediating capabilities.</p> <p><b>Social transparency</b> – Contemporary work practices and information technology sometimes make it hard for people to understand the social grounds and purposes of their actions. Social transparency means that people ideally make sense of the following questions with respect to some performed action: <i>Who did what? When? Why? How? To whom?</i> Further, when an actor is about to perform action, they should be able to 1) answer the questions above in a future tense and 2) make sense of previous actions related to what they are about to do.</p>
Principles of form and function	<p>First, there is a need to recognize that the type of change proposed in this theory requires a change of norms in the workpractice. With respect to the IT artefact, it should be designed for social transparency: It should support communication between actors, and allow the different parties to <i>object to erroneous information</i>. The IT artefact should clearly represent the current state of affairs, and actions performed in the social setting; allowing the user to understand the situation and its historical context. The IT artefact should also afford the possibility to comment upon and pose objections to previous actions performed in the workpractice. It is recommended that design recognizes the pragmatic characteristics of the IT artefact (chapter 9), and that it is informed by information systems actability design principles (2.3).</p>
Principles of implementation (design as a search process)	<p>The SoTA theory provides some general recommendations for form and function, but at the same time it asserts that that characteristics of the design product may not be determined in a 'generic sense' – the meaning of social transparency is situated. We propose the use of the guiding principles of stakeholder-centricity, design as a search process, and communication action focus. The LSS inquiry is an example of a design process fulfilling these three guiding principles 8.3.</p>

(Continued on next page...)

Table 11.2 – Continued

Aspect	Description
Artefact mutability	There are no specific design prescriptions for artefact mutability as a direct consequence of this theory. However, a general advice to design for maintainability is in its place. As workpractices emerge over time, both with respect to organisational issues and the technological infrastructure, there will be a need to re-design the IT system in which social transparency features are implemented.
Architectural consequences	Design for social transparency has a set of implications for conceptual modeling, i.e. the way we represent data in the IT artefact. Basically, it creates a need to deal with pragmatics in conceptual models, to keep track of issues like ( <i>Who said what to whom? When? In what context was it said? Why?</i> ). This is likely to increase the complexity of conceptual models compared to models focusing only semantic issues.
Design Example (Expository Instantiation)	The LSS IT system serves as a design example. The result of the principles of form and function are demonstrated in various screenshots (see section 8.3 and appendix C). Artefact mutability has been addressed in the architectural design through adapters and a modularised internal structure of the IT artefact. These design decisions simplify re-design of the artefact when needed.

A pragmatic design theory goes beyond a description of design-oriented issues. A deeply rooted norm in research is to critically assess theory. Based on this, the research process is important to represent as part of theory. The **abstract research process** in this the analytic framework suggest that pragmatic design theory should strive for the ideals of relevance, rigor, and innovation. Three categories are suggested to describe the research process: *research rigor*, *problem relevance*, and *design evaluation*. The ideal of innovation does not belong intuitively to any of these categories. Instead, a remark on this matter is made here. Innovation is not easily formalized and put into methods. In the development of SoTA, the adoption of a stakeholder-centric approach has been partially motivated by the strive for innovation. The inclusion of a multitude of stakeholders into the process has been a strong force for idea generation, and the suggestion to 'skip the signatures' was the result of a workshop with the aim of finding solutions to the identified problems.

The final aspect of pragmatic design theory concerns additional aspects oriented towards scholarly audiences. Such aspects are expressed in fidelity with the **abstract research product** in the analytic framework, prescribing the use of the categories *purpose and scope*, *testable propositions*, *research contributions*, *justificatory knowledge*, and *communication of research*. It should be noted, that in this particular case the *purpose and scope* has already been expressed as part of the design-oriented aspects of the theory.

All in all, the SoTA theory (as represented here) consists of three views:

- The first view (Table 11.2) is oriented towards design, revealing aspects of the theory to guide designers in designing for 'social transparency for

Table 11.3: *SoTA - Research Process Aspects*

Research rigor	The SoTA theory has been constructed through an action design research approach, where the concept of multi-grounding was adopted to justify the results. The meta-theoretical aspects of this were discussed in section 3.3, and chapter 8 demonstrates the inquiry process more in detail. In summary, the theory justified through empirical evidence of its value and through internal grounding. The justification of the theory builds on the interplay of the three grounding processes (theoretical grounding, empirical grounding, and internal grounding).
Problem relevance	The strive for relevance is clearly demonstrated through the action research approach (section 3.3), in which a great deal of work has been focused on identifying, understanding and findings solutions to real-world problems. These problems are addressed throughout research.
Design evaluation	The LSS inquiry included a number of evaluation techniques to assess the emerging design of the IT system. A discussion on this is available in section 8.4.

accountability’. The main ideal for this view is to promote the *practical utility* of the theory.

- The second view (Table 11.3) reveals to what extent the process of research has promoted the *relevance and rigor* of the theory. The second view should also show an account of how *innovation* is supported through research design.
- The third view (Table 11.4) is specifically concerned with the relation between the theory and its knowledge base, both with respect to how it builds upon existing (justificatory) knowledge, in what ways it contributes to the knowledge base, and in what way knowledge is disseminated. This is governed by the ideal of establishing and maintaining a *cumulative research tradition*. The testable propositions are concise statements directed towards other scholars, that force the author of the theory to illustrate the prescriptive claims of the theory in a concise way. These claims are important, since the propositions made needs to be justified theoretically, empirically, and internally.

Depending on the audience, we need to shift focus between these three views. Sometimes, the first view may be sufficient. At other times, such as within this thesis, there is a need to provide all three views and allow the addressees to examine them in depth. Depending on the knowledge and interests of the audience, a researcher may have to adapt both the level of detail and the language use to communicate the theory in a manner that makes sense.

A final note about SoTA is that the theory still is tentative. There are several pieces of evidence supporting the idea of social transparency as a means for accountability *in the specific case*, but there is a need for more empirical

Table 11.4: *SoTA - Theoretical foundations, contributions, and propositions*

<p>Testable propositions</p>	<p>A business process based on IT-supported social transparency, as compared to individual certifying using signatures, will under certain circumstances (see <i>purpose and scope</i>) lead to:</p> <ul style="list-style-type: none"> <li>• An equal (or better) accountability in business processes, and</li> <li>• A more efficient administration.</li> </ul> <p>These propositions are heuristic: We may assess them in a qualitative manner, rather than ‘testing’ them through quantitative measures.</p>
<p>Research contributions</p>	<p><i>First</i>, this theory encourages innovation in e-government. By adopting the social transparency strategy – and abandoning the requirement of signatures – government agencies and municipalities may unleash the potential of technology to do things <i>in a new way</i>, and significantly improve productivity in administration. The alternative is more conservative: To keep doing things <i>the old way</i>, but make them more efficient through the use of technology. <i>Second</i>, the research process has contributed to local practice through change in municipal workpractice through the development and implementation of an IT artefact. The theory is also aimed at contributing to general practice through this design theory.</p>
<p>Justificatory knowledge</p>	<p>This theory is theoretically justified through ISAT (elaborated in section 2.3) and its extensions regarding the view of pragmatic characteristics of the IT artefact (chapter 9). ISAT elaborates on the importance of visible actors, a readily accessible action memory, and a clarity regarding the consequences of action. Further, the pragmatic view of design (chapter 10) is a theoretical justification of the suggested principles of implementation of the theory.</p>
<p>Communication of research</p>	<p>Research is communicated to different audiences using several strategies. First, the formulation of theory is governed by a sensitivity to stakeholders. This is apparent in the development of the analytic framework, and in the notion of pragmatic design theory. Second, throughout inquiry, researchers have taken an active responsibility in communicating with practice. The SoTA theory has been presented in numerous situations, e.g. the Swedish public conference <i>Offentliga Rummet</i> (in two occasions), at interest group conferences where several municipalities were represented, and in other practitioner conferences. Third, the theory has been represented in academic publications – including this one – in order to reach a scholarly audience.</p>

studies in order to refine the theory formulation, and to better delimit the purpose and scope of the theory. As with any theory, there is a need for the ones adopting it to make a situated assessment of its applicability. The representation of the theory here should provide others with enough information to make such an assessment, and possibly base their work on the theory, and refine it. Thus, there is adequate justification to propose the theory here, as part of a cumulative research process. And, in the spirit of internal grounding, the theory serves well in this context as a concrete example of pragmatic design theory. The formulation of SoTA shows that the analytic framework is helpful as an instrument for formulation of design theory.



Part IV:

Conclusions and Implications



## 12. Concluding Discussion

This chapter contains a discussion about the research questions and the corresponding results (section 12.1). Implications for practice are discussed in section 12.3. Implications for research are discussed in section 12.3, followed by an outlook into ongoing and planned research that builds upon the thesis (section 12.4).

### 12.1 Re-visiting the Research Questions

The purpose of this work was to develop a conceptualization of the IT artefact, which allows for a theoretically sound and coherent formulation of use qualities for such artefacts, and to theorize on the implications for design – and design-oriented research – when adopting the proposed perspective. In this section, the research questions corresponding to the purpose are re-visited, and the findings are summarized and related. Figure 12.1 shows these findings and their core relations. A discussion follows, which draws on the concepts and the relations in the figure to summarize the findings of the thesis.

Moving on to the first research question, concerning the concept of the IT artefact:

- How can the IT artefact be conceptualized to adhere to the scattered notion of design ideals and use qualities in the IS field?

I propose three concepts that, when conceived of together, provide a pragmatic view of the characteristics of the IT artefact. *First*, as discussed in section 9.1, the IT artefact is viewed as **a medium for communication**. This is based on a semiotic perspective of communication. *Second*, as asserted in section 9.2, a conceptualization of the IT artefact needs to acknowledge the **agency properties** of information technology: the IT artefact transforms representations in various ways on basis of pre-defined rules. The agency properties of the IT artefact distinguishes it from other, simpler media for communication, and may create a design tension – the more agency, the harder to represent the consequences of actions through the use of the IT system. Thus, agency increases the complexity of the IT artefact as a medium for communication. *Third*, the IT artefact needs to be delineated somehow, still recognized as part of a system. Section 9.3 elaborated on the notion of the **compound IT artefact** – and provided a definition of one artefact and its relation to other artefacts, which are connected to one another through a technological infras-

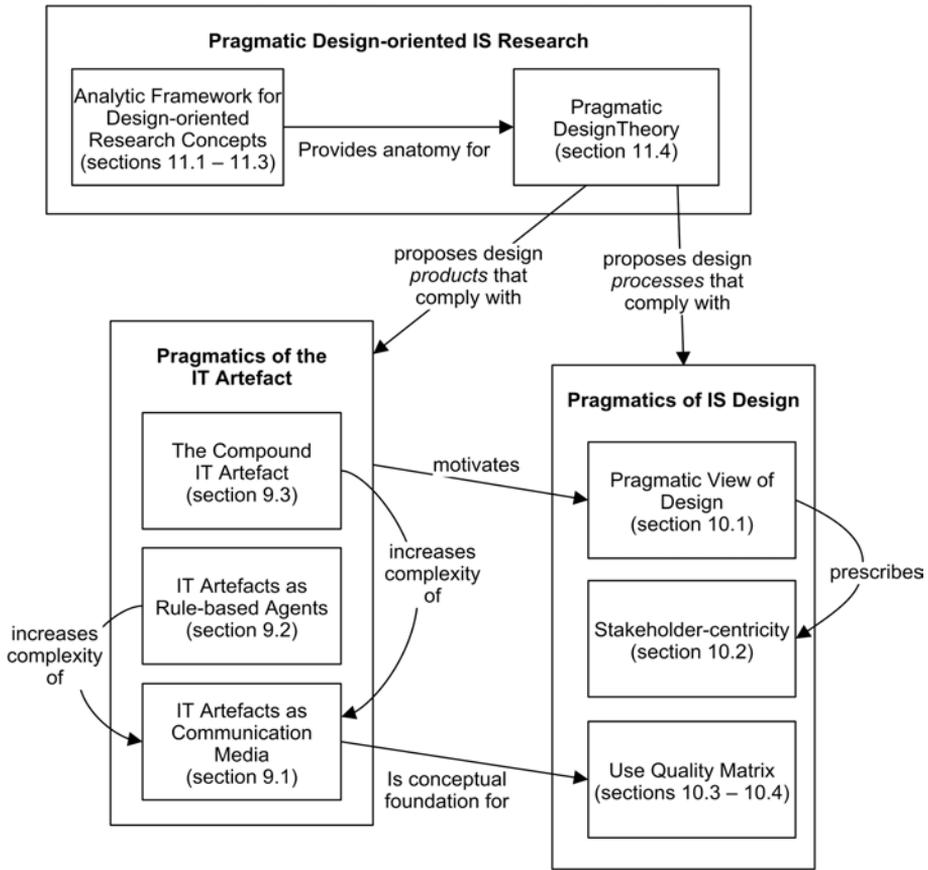


Figure 12.1: An overview of the findings in this thesis: categories, concepts, and relations

structure. This too adds to the complexity of the IT artefact as a medium for communication.

The second research question is focused on the concept of use qualities, and the way we may conceive such qualities given the presented conceptualization of the IT:

- How can existing IS use qualities be described, interrelated and well understood based on such a conceptualization?

The answer to this question is provided through a series of concepts. First, a **pragmatic view of design** was provided (section 10.1) and motivated by the pragmatic characteristics of the IT artefact. The pragmatic view of design relates a number of concepts to one another, thus serves as a perspective of how to conceive use quality. The perspective emphasizes the social characteristics of IT artefact use and design. Relations between IT artefact design, induction of change in the social world, and the social construction of design ideals are discussed, and a use quality was presented as some characteristic of use that may be assessed against design ideals. Second, the subjectivity of the concept of quality is discussed in the light of the concept of **stakeholder-centricity** (section 10.2). Third, a conceptual instrument to understand the characteristics of different use qualities, and relate qualities to one another, was suggested in sections 10.3 – 10.4: The **use quality matrix** was useful as a tool for reasoning about the relevance of qualities in a certain situation, both when it concerns design and evaluation of an IT artefact in its context. It makes us aware of both human-to-human communication issues and human-computer interaction issues. It assists a practitioner in reflecting about specific qualities for the genre of IT artefact to be designed or evaluated. The view of IT artefacts as communication media is an important conceptual foundation for the use quality matrix.

The third research question focused on implications for design-oriented information systems research:

- Based on the proposed conceptualization of the IT artefact, how can we conduct research on information systems design, and how may we represent our research results in a meaningful way?

The **analytic framework for design-oriented research concepts** (sections 11.2 – 11.3) is a contribution to the discourse within the IS discipline, and possibly thought-provoking for scholars from related disciplines. The framework provides an anatomy for formulation of **pragmatic design theory** (section 11.4). Such theory should be based on a recognition of pragmatic characteristics of the IT artefact and its design. An example of a pragmatic design theory is provided – to illustrate the concept, and as a test of both the analytic framework and the proposed concept of pragmatic design theory.

In addition to the findings presented above, which explicitly address the three research questions, this thesis contains the following related theoretical contributions:

- A **philosophical and ontological manifesto** was presented in section 2.4. This manifesto may be viewed upon as a theoretical construct that has been empirically justified through the performed inquiries. Although it originates from theory, the empirical work performed vindicated the value of adopting this perspective of people and information technology. I consider the manifesto to be an easily accessible and powerful condensation of the theoretical perspective in this thesis. As such, it is a helpful means to communicate the notion of semiotics and a rather complex pragmatic philosophy to people with none or little experience in such matters.
- A model of a **pragmatic design process** (figure 8.5), showing how pragmatism provides a rationale for certain ways of working.
- The thesis contributes to information systems actability theory. The **definition of actability** has been discussed and revised (section 2.4). Actability has been extended through **new actability guidelines and design principles**, and through the new concepts presented in the findings section.
- The combination of (i) a process-oriented workpractice diagnosis, (ii) stakeholder-centricity, and (iii) an agile approach lead to a conceptualization of a **process- and stakeholder-oriented product backlog** (figure 8.12). This conceptual instrument is a manifestation of the commensurability of the approaches, and practically useful for stakeholders to maintain awareness of processes and stakeholder-centricity throughout development. It helps clarify the meaning of value of IT artefact features in agile development.

## 12.2 Implications for Practice

This research process has led to immediate implications for practice. First, the evaluation of the library system was reported to the library. The consequence was a re-design of the local library's web site, which addressed a number of design issues pointed out in the evaluation. The evaluation was also reported to the National Library of Sweden, and may thus impact the future development of the search application. Second, the LSS inquiry, being a collaborate project involving representatives from many municipalities, is clearly an intervention into these municipalities. We do not yet know the full extent of this intervention. At the moment, it is being implemented in one municipality, while a few others are about to install it and assess it, and possibly adopt it for full-scale use. The IT artefact can be used by any Swedish municipality through a community source license, and the municipalities themselves have full rights to use and develop the artefact. I conceive of these immediate implications, which may develop into a larger scale, as a dissemination of pragmatic design concepts (i.e. the ones resulting from this thesis, and its theoretical underpinnings) into *local* practices in the Swedish public sector. An ongoing task is to develop presentations and brochures to present the ideas

and the IT artefact built in the LSS inquiry to other municipalities. The information will be adapted to the target group, e.g. as 'executive summaries' and presentations accessible to people with different roles in the organizations.

The concepts proposed in this thesis are arguably easy to understand for practitioners (both developers and others), as they were developed in line with the ideals of practical theory (see the next section). However, I believe that doctoral theses in general are unlikely to be read by practitioners. Further, the structure and the language in a doctoral thesis is not suited to all audiences. Thus, if one aims at affecting practice, one must also communicate results in other ways. A few such initiatives to address *general* practice have been taken. Apart from activities, such as participation in pedagogical workshops with the municipalities, several concepts have been presented at practitioner conferences, such as Offentliga Rummet<sup>1</sup>. I also find it important to publish results (e.g. Sjöström and Goldkuhl, 2010) at mixed audience-conferences, such as eChallenges, where academia and general practice meet. The ideas of social transparency and stakeholder-centricity are planned to be part of a practice-oriented anthology on public sector development. In general, my aim is to cultivate relations with practice, both to conduct further research and to disseminate theory.

## 12.3 Implications for Research

In this section, implications for research are addressed in three ways: First, the results are discussed with respect to Cronen's 1995; 2001 ideals for practical theory. Second, the results are discussed in relation to the five premises for theorizing the artefact (Orlikowski and Iacono, 2001). Third, the results are reflected upon as a result of a pragmatic approach to IS research.

### Developing Practical Theory

Rogers (2004) stated that research within the HCI field tends to be conducted and presented in a way which makes it inaccessible to practitioners, e.g. by being targeted solely to the academic community, thus being hard to make sense of as a practitioner. The same concern has been expressed repeatedly in the IS research community (e.g. Galliers, 1991; Robey, 2003; Goldkuhl and Lind, 2010). Cronen's (1995; 2001) concept of practical theory draws on American pragmatism and advocates that we need to evaluate a theory based on its qualities in action, i.e. applying the instrumentalities of a theory in an inquiry situation should assist the inquirer in at least one of the following activities:

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<sup>1</sup>Offentliga rummet is an annual conference where public sector representatives meet. E-government and public sector development are recurring topics.

- Identifying the situation-in-view
- Constructing judgments (systemic hypotheses)
- Taking action to improve the situation

Cronen (2001, p 30) suggest that a practical theory "[...] should lead to greater sophistication for all parties involved including the professional inquirer. Its use should make one a more sensitive observer of details in action, better at asking useful questions, more capable of seeing the ways action are patterned, and more adept at forming systemic hypotheses and entertaining alternatives." In this work, a number of instrumentalities (concepts, models, examples *et cetera*) have been presented, which may enhance the understanding of the characteristics of IT artefacts in their social context. These instrumentalities may be used in all three activities presented above.

The inquiries have shown that communication-oriented use qualities tend to be disregarded in the design of IT artefacts, which causes a number of communication problems in these IT-reliant workpractices. The concepts presented here may aid practitioners in identifying human-to-human communication issues related to the IT artefact, and helps explain such issues. Consequently, these concepts also aid an inquirer in overcoming such problems by pointing out the need for design (or re-design) of an artefact or the need for changes in the social setting embedding the IT artefact. And, as applied in the LSS inquiry, the concepts were used to aid the design process. This is in line with Cronen's (2001, p. 30) aim for richness in instrumentalities: "In practical theory [...] we look for richer, more useful ways to explore what is involved in [...] a client's 'story'" This view of theory is coherent with the concepts proposed in this thesis.

In Dewey's view, everyone is an inquirer. The view of inquiry as a social process thus needs to be based on instrumentalities that make sense to everyone, if they are to be useful in inquiry. My belief is that the concepts presented here are understandable for a broad range of people; however there is a need for the evaluation experts to present them in a pedagogical manner. As a participant in some inquiry situation, one shouldn't have to be too involved in the philosophical background and the socio-pragmatic terms of this thesis. As Cronen (2001, p 30) puts it: "A practical theory should provide instrumentalities for including the person using it as a part of the inquiry process. Practical theories reject both a subjective and an objective understanding of inquiry. Thus they need to be able to take account of the practitioner as participant when that is useful." Some of the concepts in this thesis are easy to understand for a large target group, others may require a re-packaging and an introduction to make sense to a people without an academic background. In order to fulfill Cronen's thought on practical theory; there is a need for guided inquiry process, where some actors properly introduce the instrumentalities presented here to include everyone in the process. Arguably, this type of guidance is needed in all inquiry processes involving the development of information technology.

Cronen (2001, p 30) states that "A practical theory should provide sufficient guidance for the use of its instrumentalities. Definitions, descriptions, models, and case examples all contribute to guiding its use. Meeting this criterion is not a matter limited to providing formal definitions with the form of analytic propositions." Guidance, in this case, is provided both through the presented concepts as such, but also through the case examples and the various evaluation questions presented throughout the thesis. These show how we may conduct evaluation activities. The four evaluations show a number of alternative evaluation approaches. A number of operationalizations of the communicative perspective have thus been provided, focusing different aspects of social interaction. Basically, in order to perform inquiry, we need a sociological complement to the communicative perspective.

Further, the use quality matrix (section 10.3) advocate a focus on ideals at an early stage in the process of evaluation and design: There is a need to (re-)construct design ideals, as they are essential to governing design and to making statements about the quality of an IT artefact in its social context. The use quality matrix provides practical guidance to inquiry. The relation between various use qualities may be structured using the matrix, which allows for a systematic broad approach to inquiry.

The matrix further suggests that we should start out an evaluation by posing the question of which ideals to strive for in an evaluation or design situation. Finding solutions to meet those ideals is considered a creative design process, conducted in interplay between parties from different social settings: The design practice, which typically intersects with target practices (through the participation of workpractice members and sometimes the clients of the workpractices). The use quality matrix suggests that the communicative perspective preferably should be used along with specific user-interface design guidelines (Nielsen, 1993, 2000) usability and web site usability heuristics), and genre-specific use qualities to help us judge the situation-in-view. Such genre-specific theory could, for instance, be design ideals and use qualities related to the development of e-services, on-line newspapers et cetera. I would not state that this perspective alone is enough to produce various systemic hypotheses about a situation, but it advocates and allows for multiple (and complementary) theories to aid in the social construction of such judgments. This is in line with another one of Cronen's criterion for practical theory (2001, p. 30): "A practical theory should allow for further development of old methods and creation of new ones.

As a practical theory is employed in a new and different kind of situation, methods may have to be developed or adapted in response. The communicative perspective is based on the principle that it should be used both broadly (as a perspective) and operationalized through a combination with sociological concepts. The results in this thesis call for – and allow for – integration with other theory in at least three explicit ways: (1) the communicative perspective *per se* needs to be complemented by sociological theory to un-

derstand the problems in the situation-in-view in depth. The characteristics of the complementary theory need to be determined in the specific situation. Several examples of such 'sociological complements' have been shown in action in the inquiries. (2) The pragmatic view of design defines the compound IT artefact in context, suggesting that our complementary theory should include explanations incorporating the social impact of the IT artefact, given its characteristics within its technological environment. (3) The use quality matrix points out various domains where we may search for design ideals which are suitable in a given situation: The two polarities generic v. specific and interaction-oriented v. communication-oriented.

Cronen (2001, p 30) adds another criterion for practical theory: "A practical theory should facilitate the creation of alternative systemic hypotheses. The details of experience are typically amenable to more than one coherent explanation. A single explanation blinds the inquiry process to alternatives and stymies an investigator when a particular line of inquiry is unfruitful." Due to the openness of finding sociological complements to the communicative perspective, there is not really a limit for creating "alternative systemic hypothesis" about the situation-in-view. Although I have proposed a number of instrumentalities to reason about how to select (or construct) ideals as part of inquiry, it is a creative and situation-specific process that – arguably – cannot be completely formalized. In the end, there is a tension in every inquiry between the resources available and the degree of sophistication of the theoretical frameworks used to identify the situation-in-view and construct judgments about it.

This discussion has illuminated the research results in relation to Cronen's criteria for practical theory (table 3.1), except for the first one, which I interpret as a more abstract formulation, which is implicitly represented in the formulations of the other criteria. Conclusively, my impression is that it is fair to classify the results in this thesis as practical theory. However, in order for it to be more useful for practitioners, it should preferably be represented in a more popularized way, with less philosophical terms residing in the instrumentalities, and in the form of method components to support various aspects of inquiry.

The SoTA (social transparency for accountability) design theory deserves a mentioning of its own here. The formulation of a pragmatic design theory is clearly an attempt at creating a practical theory, albeit in a way that is also informed by ideals from the ongoing scholarly discourse on design-oriented IS research. The SoTA design theory in itself contains design knowledge that is practically applicable to address problems defined in the *purpose and scope* of the theory.

## Theorizing the IT Artefact

Following a pragmatic philosophy, I claim that any social science concept is living tissue and that it will always be subject to change in future academic discourse. I subscribe to a Quinean view of a web of beliefs in constant flux. However, the concepts presented in this thesis constitute *one* answer to the call to theorizing the IT artefact put forward by Orlikowski and Iacono (2001). Ideally, the concepts presented here will be adopted (and refined) by other scholars, who wish to make an explicit statement about their perspective of the IT artefact as part of their research. I therefore claim that the findings in this thesis are progenitive, i.e. possible to adopt by other scholars as part of their research design and their theory generation endeavours. While the concepts presented here are in the intersection between social action theories and IS theory, there is a potential to incorporate this work with research in many academic fields, e.g. semiotics, sociology, information systems, service management, human-computer interaction, and interaction design.

The findings appear to be in line with the five premises for theorizing the IT artefact as explicated by Orlikowski and Iacono (see section 3.4). First, concerning that design is value laden, the proposed pragmatic view of design clearly embraces the value-ladenness of design, acknowledging its social character and prescribing a stakeholder-centric approach to design. This is also a response to their premise that "IT artefacts are not natural, neutral, universal or given [...] We need to recognize IT artefacts as products of human design, thus shaped by the "...interests, values, and assumptions of a wide variety of communities of developers, investors, users, etc." (Orlikowski and Iacono, 2001, p 131). Furthermore, they put forward the premise that IT artefacts are part of a socio-cultural context. The pragmatic view of design clearly lives up to this premise – Orlikowski's work on the duality of technology was an important foundation for the pragmatic view of design. The fourth premise states that IT artefacts are parts of a technological context. This is clearly addressed in the conceptualization of the IT artefact, which is partially based on the concept of the compound IT artefact. Orlikowski and Iacono (2001) also stress that IT artefacts emerge in human activity. This is recognized in the proposed conceptualization of the artefact – it is conceptualized in the pragmatic view of design, and it is also evident in the discussion on the compound artefact, which reveals a complex network of stakeholders whose interests influence the emergence of IT artefacts in a web context. Finally, in the view of Orlikowski and Iacono, IT artefacts are dynamic, and *need be* dynamic to meet new requirements in their emerging social and technological context. The findings in this thesis recognize this in several ways. It is addressed as an architectural issue in the LSS inquiry and in the SoTA design theory, where 'artefact mutability' is promoted through a service-oriented architectural (SOA) approach.

## Exploring Pragmatism in IS

On the one hand, the aim of research has been to create loosely coupled concepts that may be used in various contexts, e.g. incorporated into existing development methods. On the other hand, the concepts are also adding to the cumulative research within the theoretical frameworks Socio-Instrumental Pragmatism and Information Systems Actability Theory. As an example of this, the library evaluation showed the ease-of-integration between a workpractice analysis using both interaction diagrams (a SIP concept) and the communicative perspective of user interfaces. The LSS inquiry as a whole provided further empirical evidence that socio-instrumental pragmatism and information systems actability are commensurable with the concepts proposed in this thesis. Further, as stated in the previous section, this work has been based on ISAT and made some explicit contributions to it, such as the analysis and update of the actability definition and the addition of some evaluation heuristics. The various publications based on the inquiries have addressed ongoing research within communication-oriented communities such as AIS SIGPrag, LA/P, OS, and pragmatic web, and may thus be seen as a contribution to those communities as a whole<sup>2</sup>. Another obvious attempt at 'pragmatizing' IS research is the analytic framework for design-oriented IS research, and the proposed view of pragmatic design theory. These contributions are explicitly meta-theoretical, thus they aim at supporting future research. These contributions are readily available to (critically) adopt to support one's own research.

Attempting at understanding and acting in accordance with pragmatism is a major undertaking. My interpretations of any philosophical text, including Peirce, Dewey, *et cetera*, has varied over time. As explained by Polanyi (1966), sense-making is affected by cumulative experiences, thus an individual would interpret the same representations differently at different stages of their life. Throughout research, I had the feeling that no matter what I do I expose myself to criticism from some community. As time passed, I realized this is something any social scientist has to deal with. The interesting aspect of this is that any seminar may be interesting and challenging, although many discussions tend to be the result of a difference in terminology, rather than a fundamental difference in world-view. Still, in this thesis I have delimited myself from a number of alternative approaches that appear relevant, in that they conceptualize technology and human action in a social context.

First, *activity theory*, a product of the Soviet school of psychology, highlights the cultural and transformational issue of activity. Dewey's pragmatism has been criticized due to the view of humans in relation to *nature* rather than *culture*. In contrast, activity theory (Engeström, 1987) provides a number of concepts more clearly focused on understanding human action in its cultural context.

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<sup>2</sup>Ågerfalk (2010) provides an overview of the emergence of communities with an explicit interest in pragmatism in IS research.

Activity theory clearly constitutes an alternative approach to understanding information technology in its human context, and a number of such studies have emerged in the field of CSCW<sup>3</sup> (e.g. Bannon, 1991; Kuutti, 1991, 1996; Halverson, 2002). An influential interpretation and development of the concept of activity system (Leont'ev and Hall, 1978) was made by Engeström (1987), who presents an activity system (roughly) as a historically shaped, socially and culturally mediated system of people and things – for example a work community in some institutional setting. As stated by Miettinen (2006, p 17), "problems of activity are, in this view, not only situationally specific but instances and expressions of ongoing historical transformations of the capitalist society." Activity theory clearly emphasizes culture – both in terms of the *political* nature of activity and change, and through the acknowledgement of the *continuous transformation* of activity in communities.

The similarities, differences and commensurability of pragmatism (in particular the view presented in this thesis) and activity theory is a truly grand discussion, which I choose to delimit myself from in this thesis. I do not explicitly adopt concepts from activity theory. I do, however, make the assessment that the theoretical foundations outlined in this thesis appear to resonate well with an activity theoretical approach. This is supported by Broberg's (2009) comparison of activity theory and SIP. As shown in the inquiries in this thesis, additional theory has been adopted to describe and explain political and transformational issues of human activity. The research approach as such was an adoption of Dewey's concept of inquiry as an important foundation, but includes other research ideals and principles in order to overcome the – arguably – narrow view of a situation proposed by Dewey. The principles of interpretive research guided our attention to the cultural and historical aspects of a situation.

Second, *distributed cognition* (Hutchins, 1995) is another approach to understanding IT-reliant human activity, which may be seen as a criticism towards the absence of social phenomena in studies in cognitive psychology. Cognitive psychology has a tradition of research through empirical studies of how subjects respond to various challenges, e.g. solving some task, in a rather limited experimental, laboratory setting (Anderson, 2004). Distributed cognition seeks to extend findings from cognitive psychology to explain human cognition as part of (tool-supported) human social activity. Halverson (2002) reasons about the relation between activity theory and distributed cognition, concluding that both distributed cognition and activity theory are cognitively based theories that "operate very differently" (p 17). In my work, I have deliberately delimited myself from cognitive psychology, which, in my view, seeks to understand human cognition at a level of detail that does not contribute significantly to my work. However, given the developments in

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<sup>3</sup>computer-supported cooperative work

*distributed* cognition, I believe that there are similarities to my findings that are well worth looking into in future research.

Conclusively, there are a number of alternative theoretical foundations that may inform a study of this kind. Each of these foundations, in my view, require an excessive understanding in order to be meaningful. Therefore, although this thesis embraced a subset of ideas from these alternative theoretical foundations, pragmatism has been the main foundation. In a way, one may thus interpret this thesis as an exploration of pragmatism as a philosophy for conducting IS research, and for conceptualizing phenomena related to IT, collaborative human action and 'transformational processes' such as organizational change and IT design.

## 12.4 Research Outlook

In this thesis, a pragmatic philosophy was adopted to conduct design-oriented research, in order to develop concepts guiding our attention to IT in its social setting. Although the work was initiated a long time ago, the approach still appears relevant and promising. The approach to design-oriented research taken here may be further refined, e.g. through a systematic analysis of its relation to Action Design Research (Sein et al., in press). The interest in IT as a social phenomena is clearly getting a lot of attention in the current IS discourse, not least through the recent discussions on sociomateriality in IS (Orlikowski and Scott, 2008; Leonardi and Barley, 2008). On basis of the experiences and results reported in this thesis, I will doubtless continue to investigate the relation between pragmatism as a foundation for designing IS and relevant discourses within IS and its related disciplines. This will include further analysis of the LSS inquiry – several aspects of the case are out of the scope of the thesis, and have not been reported here.

In addition to the the vaguely formulated research outlook above, a new inter-disciplinary design-oriented project has already started, in which we will build web applications for cognitive behavioral therapy. IS researchers will collaborate with psychologists, economists, and medical doctors to assess the utility and meaning of such web applications. Quantitative and qualitative evaluations will be conducted to assess the impact of psychological interventions, health economics, work process changes, and other aspects of this type of technology in use. The findings in this thesis will be part of the theoretical framework to guide that research, to design and evaluate the web application, and to guide attention in the implementation of the web application into its (social) context of use. From an IS perspective, our preliminary aims are to develop design theory for the genre (web based cognitive behavioral therapy), and meta-theoretical insight into inter-disciplinary design-oriented research and evaluation methods.

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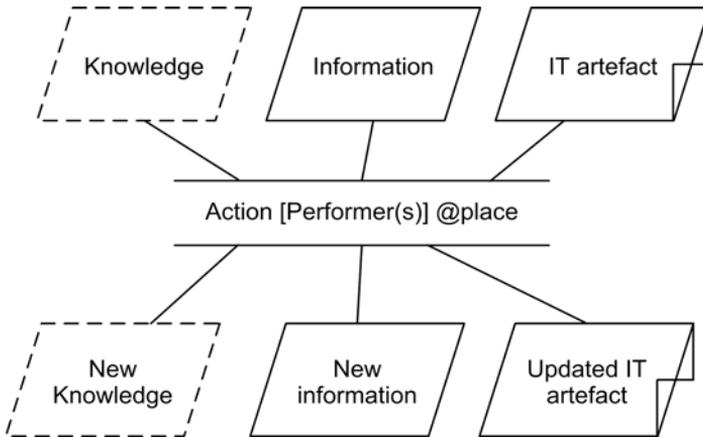
Part V:

Appendices



# Appendix A: Action diagrams

This appendix explains a few symbols used in *action diagrams*, a diagram type that is part of the change method CA/SIMM. See Goldkuhl and Roslinger (2006) for more details on CA/SIMM. Only a subset of action diagram symbols is described here. The diagram, describing a part of some process, is read from the top and downwards. There is an exception to this: An end arrow on a line may be used to illustrate a flow upwards or sideways in the diagram.



Action Diagram Legend



# Appendix B: Inquiry #3 Interview Template

This appendix shows the way interviews and observations were conducted in inquiry #3. The questions have been translated from Swedish to English.

## Stage one: Profiling the respondent

Ask the user about his/her:

- Background
- Role (at the University, e.g. "student")
- Institution
- Experience from computers and the Internet

Ask about information demand and task:

- How would you describe your need for information? Is it broad or narrow?
- What answers to you want? What are your questions?
- What activity/task are you working on?
- What tools and sources to you use normally to find the information you are looking for?

## Stage two: Adapting observation session to the respondent's situation

If the need for information is broad, e.g. "keeping track of what is going on in my field", the following tasks are given to the user in the observation session:

- Which databases are relevant for your field? How do you limit your search to those databases?
- Find a specific journal article that you know about [within your field]
  - Download a full text version of the article
  - If there is no full text version available using the IT system, what alternative way of finding it will you use?
- Find a journal article that you do *not* know about [within your field]
  - Download a full text version of the article
  - If there is no full text version available using the IT system, what alternative way of finding it will you use?
- Find journal articles from last year [within your field]
- Find a text book you know about [within your field]

- Is the book available in the local library?
- Is the book available through the remote loan service?

If the need for information is narrow, e.g. "finding a certain article" or "learning more about a specific theoretical concept", the observer asks the respondent to clarify the need for information by specifying authors, years, name of the theory and journal, and relevant keywords in the search. This is done to ensure that the respondent thinks about the search conceptually before starting using the IT system. In the observation, the respondent is asked to conduct searches based on the specification he/she made.

### Stage 3: Observation of respondent using the IT system

The observer describes how things will be recorded, and highlights that it is important for the study that the respondent talks during the observation, to reveal what is going on and what he/she is thinking.

If the user get stuck during the observation, the observer waits for a moment (approximately a minute), then asks these questions (in order, with some delay between dem):

1. What are you thinking right now?
2. Have you considered if there is another way to conduct your search?
3. There is a help function that maybe will help you forward.
4. *Last resort*: You could do it this way.. [The observer explains what the user can do to resolve the problem]

The observer should be careful to help the observer, since it influences the study. On the other hand, if the user gets stuck, the observer will not be able to see how the user solves all tasks. There is a need to strike a balance between these two issues during the observation.

### Stage 4: Post-observation interview

Questions:

1. Did you find what you were looking for?
2. Did the search session solve your need for information?
3. How will you follow up this search?
4. Were the search results relevant? Were they understandable?
5. Would you have preferred talking to a librarian, instead of using this IT system to solve your need for information?
6. Did you find any information you weren't really looking for, but that you found interesting enough to do a follow-up on in the future?

## Stage 5: Manners and exit

The observer thanks the respondent for his/her contribution to the study.



## Appendix C: LSS Inquiry Design Examples

This appendix shows screenshots and brief descriptions illustrating core features of the IT artefact designed and constructed in the LSS inquiry. Some screenshots included real world data from the beta testing environment. In those cases, names and other personal information has been crossed over to ensure anonymity.

## Workmanagers' Desktop Application



Workmanager application screen illustrating the main menu and the filter form, which transfers selected values between various screens in the user interface. The main menu options represent different phases in the municipal assistance process (planning, time reporting, auditing, invoicing, and following up).

**Boka Assistanspass**

Ange uppgifter för nytt assistanspass

Brukare: [Redacted] ▾

Assistent: [Redacted] ▾

Från: 2010-08-09 ▾ 08:00

Till: 2010-08-09 ▾ 21:00

Rast: 30

Information om brukaren

Information om assistenten

Genomför bokning

**Assistentpasset har bokats enligt nedan:**

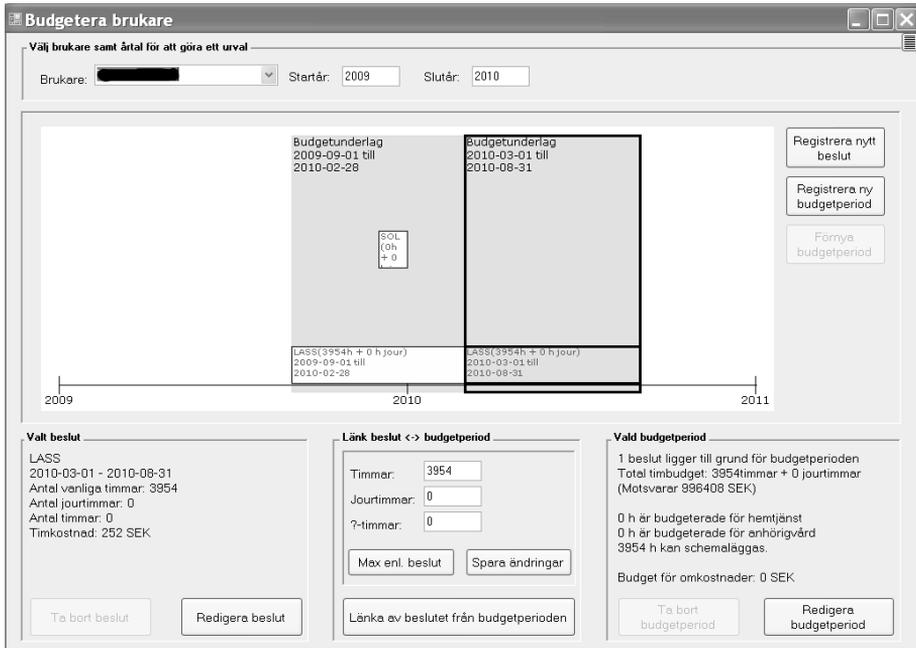
2010-08-09 08:00 - 21:00 : [Redacted] assisterar [Redacted] (30 min rast). [ID: 1006]

Boka assistanspass      Serieboka assistanspass

Nyligen bokade assistanspass

2010-08-09 08:00 - 21:00 : [Redacted] assisterar [Redacted] (30 min rast).

Illustration of a small screen allowing the work managers to schedule assistance.



This screen supports the work managers to work with assistance decisions and budget periods. Decisions determine the funded amount of assistance for a period of time. The relations between decisions and budget periods are rather complex, and the idea was to provide a visualization of these issues in order to better support the work managers.

**Registrera avvikelse...**

**Ange avvikelseregler**

Ansvarig arbetsledare:

Max avvikelse från starttid:  (minuter)

Max avvikelse från sluttid:  (minuter)

Max avvikelse totalt:  (minuter)

Tidrapporter som kommenterats av assistent skall betraktas som avvikande från plan.

Tidrapporter med invändningar från brukare skall betraktas som avvikande från plan

This screen allows the work managers to set up deviation rules, used by the IT artefact to determine whether or not a time report should be classified as a deviation from the schedule.

**Granska tidrapporter**

Underlag för urval

Brukare:  Assistent:  Från:  Till:

Grenskning av:

Planenliga tidrapporter

Avvikande tidrapporter

Tidrapporter att granska

Schemalagd tid	Utfört av	Kommentar	Avvikelser
2010-07-31 08:00 - 16:00	██████████		(0 / 0 / 30)
2010-07-02 08:00 - 15:00	██████████		(0 / 0 / 30)
2010-07-01 08:00 - 15:00	██████████		(0 / 0 / 30)
2010-08-26 08:00 - 22:00	██████████		(0 / 0 / 60)

The work managers use this screen to audit time reports. Reports that do not deviate from the schedule (according to the rules) may be confirmed 'in batch' by the work manager. Deviating time reports must be manually confirmed and commented.

### Fastställa ersättningsgrundande tid

Planerat arbetspass  
Schemalagt av [redacted]  
[redacted] assisterar [redacted]  
2010-07-31 08:00 - 16:00 : 30 minuter rast.

Tidrapport  
Tidrapport skapad av assistenten [redacted]  
2010-07-31 08:00 - 16:00 : 0 minuter rast.  
Kommentar: "

Fastställande

Bedömning: Arbetspasset är ersättningsgrundande ▼

Brukare: [redacted]

Assistent: [redacted] Lås upp

Från: 2010-07-31 ▼ 08:00

Till: 2010-07-31 ▼ 16:00

Rast: 0

Kommentar:

Fastställ ersättningsgrundande tid (8 timmar)

Avbryt

This screen is used to confirm deviating time reports. The work manager can study the plan and the report, and make an informed decision about the amount of working time to confirm. The confirmed times is the basis for invoicing.

**Skapa räkning**

Ange brukare och period

Brukare: [redacted] År: 2010 Månad: Juni Sök uppgifter

Budget för Mikael Tidlund (Juni 2010)

Typ	Andel assistans	Andel jour	Total (månad)	Assistans (månad)	Jour (månad)	Total (period)	Assistans (period)	Jour (period)
Alla beslut	100.0%	100.0%	645	645	0	3954	3954	0
LASS	100.0%	NaN%	645	645	0	3954	3954	0

Räkning (översikt) Tidrapporter (detaljer)

Fastställt tid för [redacted] (Juni 2010) [redacted] Underlag för LASS-räkning, Juni 2010

Assistanstid: 366.81666666667

Jourtid: 3

Beredskapstid: 0

Total tid: 369.81666666667

Assistanstid: [input]

Hemjänst: 0

Anhögvård: 0

Jourtid: 0

Beredskapstid: 0

Total tid: NaN

Hantera räkning

Status: Preliminär

Visa utkast till räkning

Fastställ räkning

Övrig tid? + Fritex/kommentar?

The work managers use this screen to generate invoices. The IT artefact supports different types of invoices to different funding bodies, based on the types of decisions that have been linked to a budget period.

**Skapa räkning**

Ange brukare och period

Brukare: [redacted] År: 2010 Månad: Juni Sök uppgifter

Budget för Mikael Tidlund (Juni 2010)

Typ	Andel assistans	Andel jour	Total (månad)	Assistans (månad)	Jour (månad)	Total (period)	Assistans (period)	Jour (period)
Alla beslut	100.0%	100.0%	645	645	0	3954	3954	0
LASS	100.0%	NaN%	645	645	0	3954	3954	0

Räkning (översikt) Tidrapporter (detaljer)

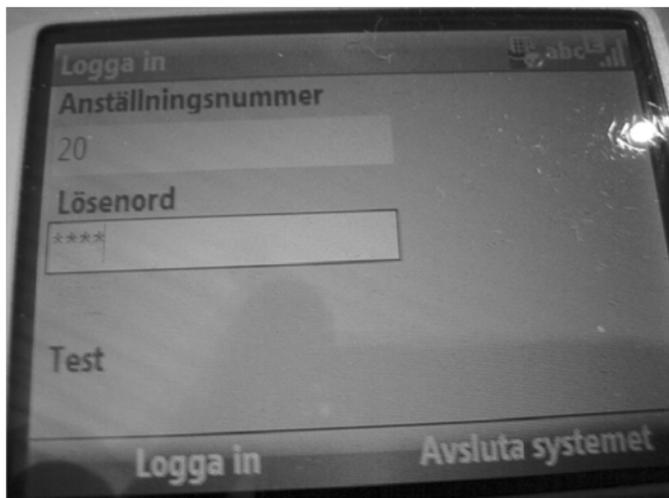
Detaljer för Mikael Tidlund (Juni 2010)

Insatsdatum	Assistent	Rast (min)	Total tid (h)	Assistanstid (h)	Jourtid (h)	Kommentarer
2010-06-01 08:00 - 15:00	[redacted]	30	6.50	6.50	0.00	
2010-06-01 08:00 - 15:00	[redacted]	30	6.50	6.50	0.00	
2010-06-01 15:00 - 21:00	[redacted]	60	5.00	5.00	0.00	
2010-06-02 08:00 - 15:00	[redacted]	0	7.00	7.00	0.00	
2010-06-02 08:00 - 22:00	[redacted]	30	13.50	13.48	0.02	
2010-06-03 08:00 - 22:00	[redacted]	60	13.00	12.98	0.02	
2010-06-03 08:00 - 15:00	[redacted]	30	6.50	6.50	0.00	
2010-06-04 08:00 - 15:00	[redacted]	30	6.50	6.50	0.00	

Visa detaljspecifikation

This screen allows the work managers to study the details about the confirmations that are used to create the invoice.

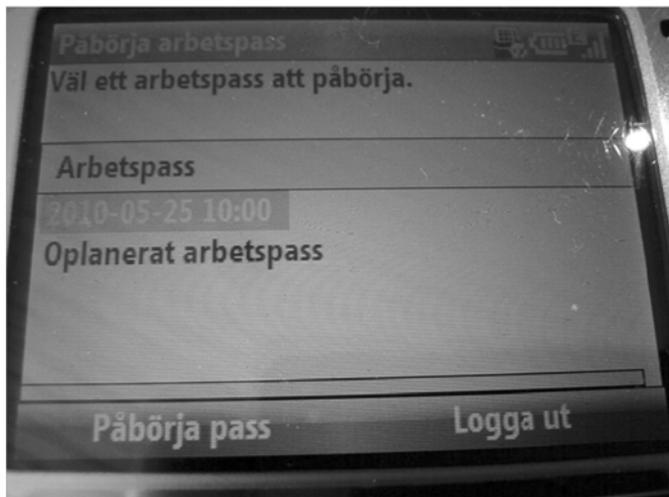
## Assistants' Mobile Application



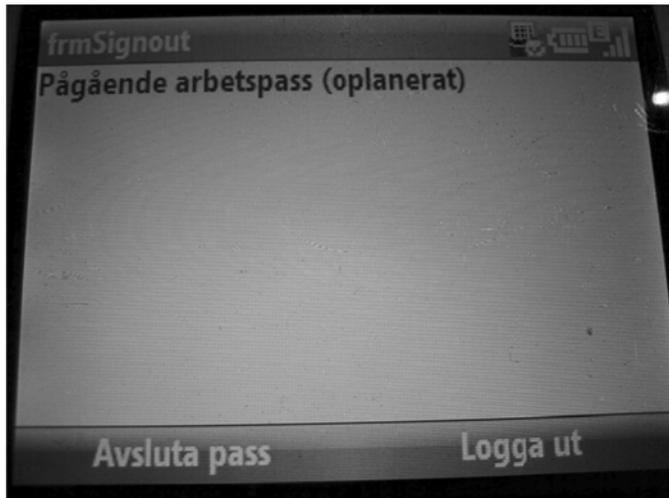
The client has a smartphone (supplied by the municipality) with an extractable mini-keyboard. The assistants use this smartphone to 'sign in' and 'sign out' from work sessions. This is the login screen, where the assistants log on using an employment number and a 4 character pincode.



Illustration of the Windows Mobile 6 feedback feature, signalling to the assistant that the application is busy.



After login, the assistant is given the option to start a planned (scheduled) session, or an unplanned session. This feature is necessary, since there may be circumstances where the schedule has not been updated.



After signing in to a session, the assistant gets feedback about the session. The assistant closes the application, which returns to the login screen to make it convenient for the next assistant to log on.

# Assistants' Web Application

## TidIT - E-tjänst för personliga assistenter

[Visa kommentarer](#)

Inloggad som [redacted]

**Planera**

[Visa schema](#)

**Rapportera**

[Rapportera schemalagd tid](#)

[Rapportera oplanerad tid](#)

[Rapportera utlägg](#)

**Följa upp**

[Visa utlägsräkningar](#)

**Kommunicera**

[Visa brukare](#)

[Visa arbetsledare](#)

[Min profil](#)

**Avsluta**

[Logga ut](#)

**Visa schema**

Här ser du dina planerade arbetspass. Välj år och månad och klicka på "uppdatera schema" om du vill se schemat för en annan period.

År:  Månad:

Datum	Brukare	Rast
<b>Vecka 35</b>		
Onsdag 2010-09-01 08:00 - 15:00	[redacted]	30 minuter
Fredag 2010-09-03 08:00 - 15:00	[redacted]	30 minuter
<b>Vecka 36</b>		
Onsdag 2010-09-08 08:00 - 15:00	[redacted]	30 minuter
Torsdag 2010-09-09 08:00 - 22:00	[redacted]	60 minuter
Fredag 2010-09-10 08:00 - 15:00	[redacted]	30 minuter
Lördag 2010-09-11 08:00 - 22:00	[redacted]	30 minuter
Söndag 2010-09-12 08:00 - 16:00	[redacted]	60 minuter
<b>Vecka 37</b>		
Måndag 2010-09-13 08:00 - 21:00	[redacted]	60 minuter
Tisdag 2010-09-14 08:00 - 15:00	[redacted]	30 minuter
Fredag 2010-09-17 16:00 - 22:00	[redacted]	

The assistants also have access to a web application, with features to view their schedule and contact information for work managers and clients. There are also features for time reporting and expense reporting. Those features were used in the early stages of beta testing, before the mobile application was implemented in the pilot municipality.

## TidIT - E-tjänst för personliga assistenter

Visa kommentarer

Inloggad som [redacted]

**Planera**

Visa schema

**Rapportera**

Rapportera schemalagd tid

Rapportera oplanerad tid

Rapportera utlägg

**Följ upp**

Visa utlägsräkningar

**Redigera din profil**

Anställningsnummer: [redacted]

Personnummer: [redacted]

Förnamn: [redacted]

Efternamn: [redacted]

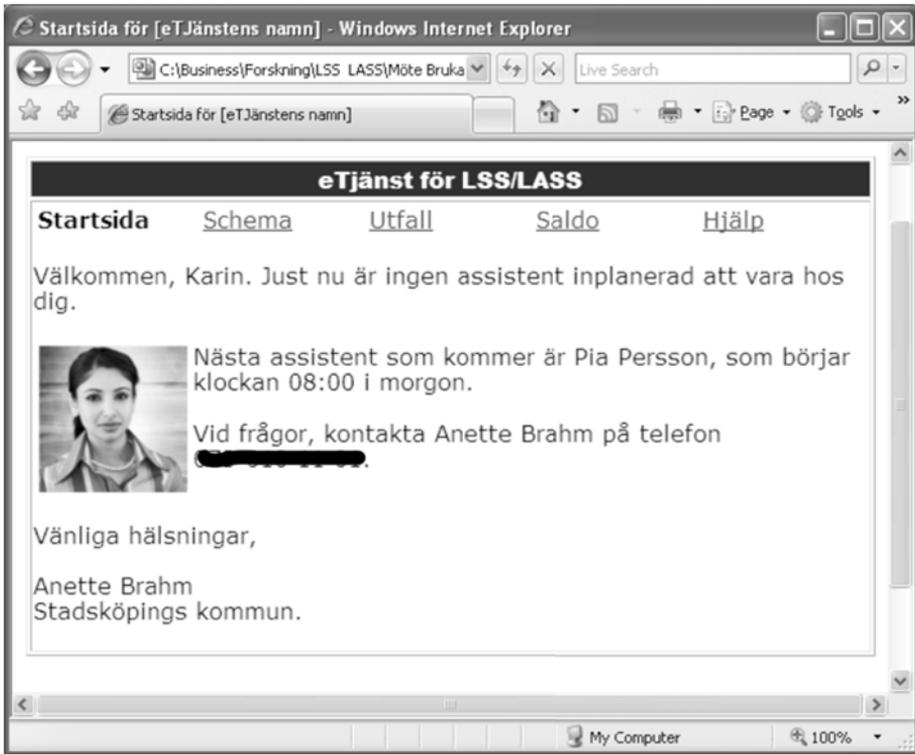
Adress: [redacted]

Telefon: [redacted]

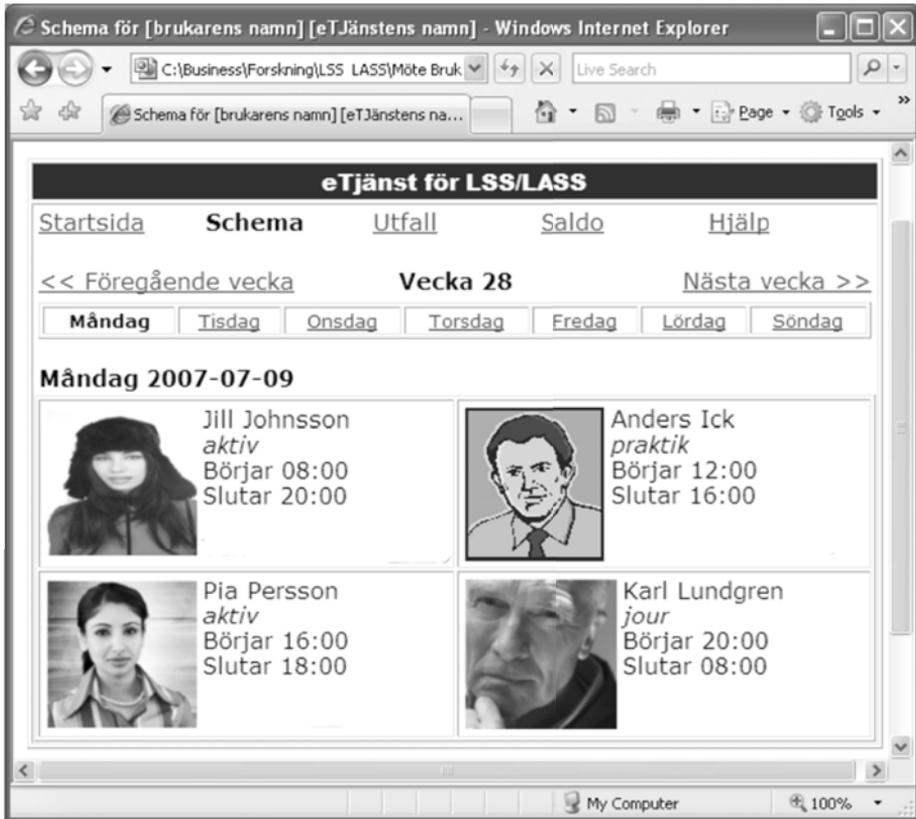
Bild: [redacted]

The assistants also have access to a web application, with features to view their schedule and contact information for work managers and clients. There are also features for time reporting and expense reporting. Those features were used in the early stages of beta testing, before the mobile application was implemented in the pilot municipality.

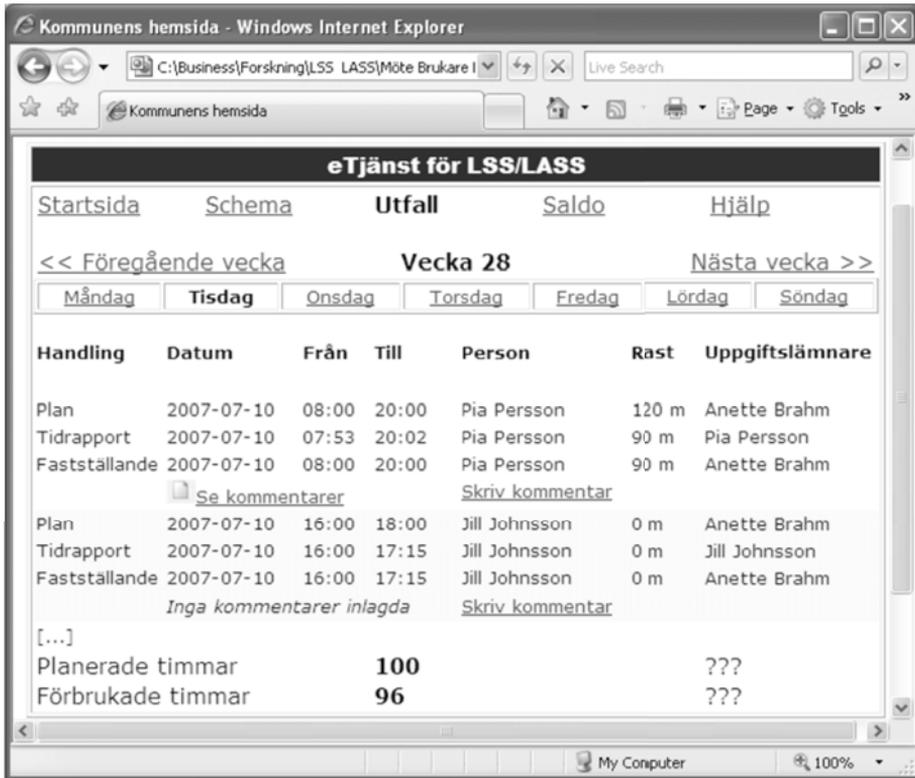
## Clients' Web Application



The assistants are available to update their profile, information that other actors may access in other views of the system. As an example, the assistants may (but do not have to) upload a profile picture that will be visible for the clients in their web application.



Early design prototype showing a schedule view in the clients' web application. This view is likely to be subject to major re-design in the future agile development process.



Early design prototype showing an 'audit' view in the clients' web application. The client will be able to study the schedule, the time reports, and the work manager confirmations, and **object** to erroneous time reports. This view is likely to be subject to major re-design in the future agile development process.

Kommunens hemsida - Windows Internet Explorer

C:\Business\Forskning\LSS LASS\Möte Brukare Kr Live Search

Kommunens hemsida

### eTjänst för LSS/LASS

[Startsida](#)   [Schema](#)   [Utfall](#)   **Saldo**   [Hjälp](#)

Välj år: 2007

Månad	Beslutade h	Använda h	Kvarvarande h
<a href="#">Juli</a>	420	400	20
<a href="#">Augusti</a>	420	390	30
<a href="#">September</a>	420	420	0
<a href="#">Oktober</a>	420	416	4
<a href="#">November</a>	420	460	-40
<a href="#">December</a>	420	380	40
<b>Total</b>	<b>2520</b>		<b>54</b>

- Ytterligare kolumn (planerade h)?
- Omkostnader bör också visas här, t ex resekostnader för assistent.
- Här visas information, t ex om brukaren har frågor kring förutsättningar för resande måste alltid diskuteras med arbetsledare.
- Länk till utförlig öppen information om LSS/LASS (annan del av e-tjänsten som inte kräver inloggning)
- Kontaktinfo till kommunen vid frågor

Done My Computer 100%

Early design prototype illustrating the way the clients will be able to study their 'balance'. This means that they have a decision from the Social Insurance Agency to receive a certain amount of assistance. Using this screen, they will get an overview of the decision, and the amount of assistance actually used.



# The Swedish Research School of Management and Information Technology

## MIT

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## DISSERTATIONS FROM THE SWEDISH RESEARCH SCHOOL OF MANAGEMENT AND INFORMATION TECHNOLOGY

### Doctoral theses (2003- )

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2. **Wang, Zhiping (2004)**, *Capacity-Constrained Production-Inventory Systems: Modelling and Analysis in both a Traditional and an E-Business Context*. IDA-EIS, Linköpings universitet och Tekniska Högskolan i Linköping, Dissertation No. 889
3. **Ekman, Peter (2006)**, *Enterprise Systems & Business Relationships: The Utilization of IT in the Business with Customers and Suppliers*. School of Business, Mälardalen University, Doctoral Dissertation No 29.
4. **Lindh, Cecilia (2006)**, *Business Relationships and Integration of Information Technology*. School of Business, Mälardalen University, Doctoral Dissertation No 28.
5. **Frimanson, Lars (2006)**, *Management Accounting and Business Relationships from a Supplier Perspective*. Department of Business Studies, Uppsala University, Doctoral Thesis No. 119.
6. **Johansson, Niklas (2007)**, *Self-Service Recovery*. Information Systems, Faculty of Economic Sciences, Communication and IT, Karlstad University, Dissertation KUS 2006:68.
7. **Sonesson, Olle (2007)**, *Tjänsteutveckling med personal medverkan: En studie av banktjänster*. Företagsekonomi, Fakulteten för ekonomi, kommunikation och IT, Karlstads universitet, Doktorsavhandling, Karlstad University Studies, 2007:9.

8. **Maaninen-Olsson, Eva (2007)**, *Projekt i tid och rum: Kunskapsintegrering mellan projektet och dess historiska och organisatoriska kontext*. Företagsekonomiska institutionen, Uppsala universitet, Doctoral Thesis No. 126.
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16. **Lövstål, Eva (2008)**, *Management Control Systems in Entrepreneurial Organizations: A Balancing Challenge*. Jönköping International Business School, Jönköping University, JIBS Dissertation Series No. 045.
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31. **Sjöström, Jonas (2010)**, *Designing Information Systems – a pragmatic account*. Department of Informatics and Media, Uppsala University.



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