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Frank Frößler

A Practice Theoretical Analysis of Real Time Collaboration Technology:

Skype and Sametime in Software Development Projects

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Abstract

Real-time collaboration (RTC) technology is a new genre of information and communication technology which has its roots in both the telecommunications and groupware market. So far, discussions surrounding RTC are rather undifferentiated and regard the technology as a universally applicable remedy for a broad spectrum of social, organisational, and technological issues. This thesis aims to contribute to our understanding of RTC by investigating the enabling and constraining capabilities of RTC, the implications of the technology on people's life world, as well as the implications of the socio-organisational dimension on RTC use.

As part of the research, two in-depth case studies were conducted to analyse the use of RTC within software development projects. Data collection included interviews, observations, documentation, and communication protocols of RTC conversations. The two companies did not only differ regarding their socio-organisational context but they were also examples of innovative and conservative RTC use.

Drawing upon a practice theoretical lens which explicates concepts such as knowledge, power, awareness, and materiality, the analysis seeks to develop a better comprehension of RTC. More specifically, the discussion conceptualises the dynamic element introduced by RTC into work practices. Furthermore, the argument is concerned with the role of RTC-mediated practices for the production of awareness and the sensation of co-presence in co-located and dispersed settings. Finally, broader socio-organisational practices are examined which either facilitate or impede an open and experimental engagement with RTC.

Informed by the empirical results and the analysis, the thesis gives some recommendations for practitioners. In particular, it describes the collaborative achievement of balancing organisational designing and constant opportunities for change as a process which needs to be continuously negotiated between management and users.

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Chapter 1

Introduction

Real-time collaboration (RTC) technology stands for a newly emerging genre of communication and collaboration systems which resulted from market convergence of the telecommunications and groupware market (Riemer et al. 2007a). Technology providers in the RTC market are currently pursuing two strategies which are partly overlapping. First, established providers from the telecommunication market (for example Alcatel, Cisco, Nortel, and Siemens) and traditional software companies (for example Microsoft, Oracle, IBM) are offering complex RTC solutions (cf. Elliot et al. 2005; Mohamed 2007). Such companies try to offer applications which encompass voice, instant messaging, presence status, e-mail, and audio/video conferencing. Most of the players are concentrating their efforts on their core capabilities and complement their service portfolio through the formation of partnerships and alliances (Burton et al. 2007; Musich 2007). Nortel is teaming up with Microsoft and IBM is partnering with Siemens, Avaya and Cisco Systems (Yedwab 2007). However, some of the established providers and also new competitors, such as Skype or Gizmo Project, are pursuing a second strategy and offering simple stand-alone applications which generally provide integrated VoIP communications, instant messaging, status information and conferencing (Lazar 2006). However, some of these formerly stand-alone applications, like Lotus Sametime, which started out as IM tools, have been revamped over time and resemble more and more complex and integrated RTC systems.

Irrespective of the scope of services offered by an application, RTC products contain at least one of the following four characteristics (Riemer et al. 2007a). First, unified communication refers to the integration of various information and communication channels, such as e-mail, telephone, instant messaging, or SMS (cf. Minifie 2007; Mohamed 2007). Second, the status information can give pre-dialling someone information on whether and how the person wants to be reached (Jennings 2006). Like in IM applications, the status information is provided in form of a buddy list. Third, contextualisation refers to the integration of RTC with existing information

systems, such as CRM or ERP. Users can initiate a communication act immediately from the software application in use. Finally, RTC applications can comprise features of groupware applications, such as team calendars or file sharing.

In the following, I shall limit the investigation to stand-alone applications, namely Skype™ [1] and Sametime™ [2]. To present a brief outline of stand-alone applications, I will succinctly describe the set of features offered by Skype (Riemer et al. 2007b; Riemer et al. 2007c). First, users can generate a *buddy list*, which is well-known from other instant messaging applications, by sharing their user ID. The buddy list shows the status information for every contact and access is generally limited to the members of the contact list. Second, Skype provides *one-to-one chat* and *group chat* functionalities, i.e. text based multi-person conferences. Text conversations can be archived and chat histories are retrievable to all chat participants even after closing the chat windows. Furthermore, chats can be bookmarked which allows re-opening of chat conversations. Third, the *VoIP functionality* provides the opportunity to place free voice or video calls to other Skype users and to initiate conference calls. Moreover, Skype allows users to place calls to (SkypeOut) and to receive calls from (SkypeIn) traditional landlines or mobile phones. Skype charges a fee for the two services as it also does for the voice box and call forwarding to landline or mobile phones. Finally, Skype allows users to customize parts of the application. For example, users can set up a personal profile and display to other authorized Skype users of the buddy list a photo, postal address, phone number, date of birth, a personal homepage, and a short personal message that is shown as a speech bubble. Furthermore, hot keys, sounds, or ring tones can be configured by the users.

The business press and technology evangelists alike are bullish about both the future growth of the RTC market and the impact the technology will have in organisations. They say that the "era of unified communications is here" (Rybczynski et al. 2005) and argue that UC and instant messaging (IM) already are or at least will prove to be equally successful in organisations than e-mail was in the 90's (cf. Caton 2006; Hutton 2001). Gartner, the technology research and advisory company, predicts that by 2011, IM "will be the de facto tool for voice, video and text chat with 95 percent

[1] Skype is a trademark of Skype Limited. Skype is registered in the United States Patent and Trademark Office, and with the Trademark Offices of the countries of Australia, Finland, Benelux, Hong Kong, Israel, Japan, Liechtenstein, New Zealand, South Korea, Switzerland, and Taiwan.
[2] Sametime is a trademark of International Business Machines Corporation in the United States, other countries or both.

of workers in leading global organisations using it as their primary interface for real-time communications by 2013" (Gartner 2007). Furthermore, Gartner forecasts the RTC market to grow from $267 million in 2005 to $688 million in 2010. Other surveys report that 79% of the interviewed enterprises were planning to deploy unified communication over the next two years (Lazar 2007). In line with these positive claims, RTC is regarded as a remedy for a suite of social, organisational, and technological issues, such as unmanageable communication volumes, a myriad of communication devices in a disintegrated communication landscape, or challenges related to mobile/virtual collaboration (cf. Brodsky 1999; Gilbertson 2007; Hutton 2001; Lazar 2007). Moreover, the application of RTC is associated with the re-design of existing business processes and service portfolios (Brodsky 1999; Burton et al. 2007; Lazar 2007; Oliva 2003). The promises are that RTC will function as the driver for increasing productivity, improving communication, and saving costs (cf. Gilbertson 2007; Hutton 2001; Rybczynski et al. 2005).

So far, the discourse on RTC has been dominated by rather undifferentiated discussions in the business press. In this thesis, I attempt to develop an empirically grounded understanding of RTC and the factors which influence its use. To position this research project and reveal the research tradition it emerged from, I will in the next section briefly mention different approaches of studying information systems. Thereafter, I shall set out the research questions and objectives before I will outline the structure of the thesis.

1.1 Different approaches of studying information systems

Together with its artefacts and services, the advent of each new technological trend brings with it promises and expectations about its potential value to address acute organisational problems of the era (Orlikowski et al. 2000). Technological trends can not be dissociated from the surrounding discourses (1) in the public domain which make a technology known to the wider audience and (2) in the communities of technology evangelists, business analysts, consultants, and academic cycles which form the core ideas of how the particular technology works (Iacono et al. 2001). In the domain of RTC, for example, experts hail the technology as a remedy for a myriad of social, organisational, and technological problems. As the previous discussion of the business literature showed, experts conceive RTC as an instrument for increasing productivity, driving business process redesign, and making a

significant contribution to the bottom line. However, some more critical voices are already starting to question the hype surrounding RTC (Burton et al. 2007). The problems of such uncritical discourses are twofold (Orlikowski et al. 2000). First, assuming a universally transformative nature of technology is not empirically supported by historical examples. Second, on a theoretical level such claims are misleading since technology may be treated like an external, independent object which automatically yields benefits for individuals, organisations and economies.

To reveal the implicit and explicit theoretical assumptions of discourses surrounding RTC and to theoretically position this research project, three different approaches of studying IS are briefly outlined. In their widely cited article, Markus and Robey (1988) distinguish theories according to their causal and logical structure. The causal structure identifies conceptions of causal agency, namely the technological or organisational imperative and the emergent perspective. The technological imperative (also often called technological determinism (cf. Woolgar 2002)) argues that technology is an exogenous force which determines the behaviour of individuals or organisations. The focus is then on measuring and modelling the changes caused by technological forces (Orlikowski et al. 2000). In line with the technological imperative, experts and consultants dramatized in the previously mentioned discussions outcomes of RTC use and offered certainties on the impact the technology might have.

In stark contrast to technological determinism, the organisational imperative implies almost unlimited choices over technological options and control over the outcome. Based on the presumption of rational agents, information systems are designed to satisfy organisational needs. The influence of broader socio-organisational constraints are almost neglected and treated as variables controllable by the main decision makers. The organisational imperative has informed studies on organisational change but has also been influential in the IS discipline. Lewin's (1959) model of group decisions and social change, propagating the three stages unfreezing-changing-freezing, has left a strong impression on stage-based models in the IS field. Following Lewin's model, researchers subdivided the implementation process in distinct stages and specified tasks and challenges for each phase which managers had to address with appropriate strategies (cf. Cooper et al. 1990; Kwon et al. 1987; Munkvold 1999). Following the argumentation of a stage-based approach,

organisational behaviour is best described by formal goals, procedures and administrative arrangements through which technology is controllable. Among others, stage-based approaches have received criticism for relying on rational economic interpretations of organisational processes, drawing upon universally applicable cause-effect relationships (cf. Fitzgerald 1996; Walsham 1993; Wastell 1996).

The technological and organisational imperatives fail to account for contradictions or diverse outcomes within studies and bodies of research (Robey et al. 1999). Rather than assuming universal valid claims, more researchers have argued to disavow attempts by the popular and academic cycle to explain technology *ex ante* (cf. Orlikowski et al. 1991a; Walsham 1993). Instead, it is proposed to follow a bottom-up approach to account for everyday experiences (Barley et al. 2001; Woolgar 2002).

Finally, Markus and Robey (1988) introduce the emergent perspective which assumes that the uses and consequences of IT emerge unpredictable from complex social interaction. With no dominant cause of change being accepted, the emergent perspective differs significantly from the former two approaches. Instead, an in-depth comprehension of the organisational processes and context is required to appreciate the implementation processes. Emergent perspectives generally apply a process approach to explain how sequences of events unfold over time (Markus et al. 1988; Van de Ven et al. 2005). Tracing changes over time, the process approach, in combination with an emergent perspective, allows to incorporate several different types of effects.

Following an emergent, processual approach, researchers have conducted a significant number of studies which have concentrated on a variety of aspects associated with the outcome of information systems, such as power, politics, control, or culture (cf. Bloomfield et al. 1992; Bloomfield et al. 1994; Coombs et al. 1992; Kling et al. 1984; Markus 1983; Wilson et al. 2000). Moreover, it is argued that rather than trying to explain technology *ex ante* or privileging the surrounding discourses, technology must be used to have an effect (Orlikowski et al. 2000). Distinguishing between espoused technology and technology-in-use emphasises that research should look at specific and embedded uses by particular people in particular times and places (ibid.). However, technology-in-use should not be understood as an invitation to neglect the IT artefact. Instead, there have been calls in the IS field to take a look behind terms such as IT artefacts or groupware (Markus 2005) and

explicitly theorize about "specific technologies with distinctive cultural and computational capabilities, existing in various social, historical, and institutional contexts, understood in particular ways, and used for certain activities" (Orlikowski et al. 2001b: 131).

From this discussion a picture of research emerges that requires expertise in studying both technological and organisational matters to simultaneously comprehend both (1) the role of human agents in institutional contexts, as well as (2) the enabling and constraining capabilities of technologies (Orlikowski et al. 2001a). Arguing against a technological or organisational imperative, this thesis takes an emergent, processual perspective which attempts to explain technology-in-use by focussing on human agents within their broader socio-organisational context. I intend to evoke a nuanced explanation of RTC which goes beyond the popular, technological deterministic claims in the media. I hope to do so through analysing the social practices which influence but at the same time are influenced by RTC. This theoretical perspective shall be introduced later on in more detail. Next, I will set out the research questions and objectives before concluding with a brief overview of the thesis.

1.2 Research objectives and research questions

In contrast to the business media and technology evangelists with their often overly optimistic forecasts and technological deterministic claims, this thesis aims at portraying a more nuanced evaluation of RTC. It aims at delivering an account of RTC use which does not regard technology as either an exogenous force or an almost infinitely malleable resource. Rather, it is my objective to offer an ontological explanation of RTC use; that is a conceptualisation of RTC which does not solely concentrate on the technology or the individual but explains how both factors are interrelated and the constitutive elements of social practices (the ontological understanding shall be explained later in more detail). The main objective of the research project is to develop a sophisticated understanding of how RTC affects the way people go about doing their work. The aim is therefore to give an empirically grounded explanation of RTC which focuses on (1) RTC as the premise for the opportunity to enact certain social practices, (2) implications of RTC on people's experience of the life world, and (3) the implications of the socio-organisational dimension on RTC use. The main research questions are therefore formulated as follows:

- **How might we understand the implications of RTC on people's work practices and forms of social interaction?**
    - How can RTC use be conceptualised?
    - How does RTC affect forms of organizing work in dispersed/ co-located organisational settings?

- **How can we understand the enabling and constraining implications of the socio-organisational dimension on RTC use?**
    - What role does management play in promoting innovative forms of RTC use?
    - What challenges do users encounter while embedding RTC in existing/ new social practices?

So far, no in-depth case studies on RTC use have been published and an empirically informed theoretical conceptualisation of RTC is missing. Attempting to better comprehend RTC, the thesis makes a theoretical and empirical contribution. First, practice theory is introduced to theoretically underpin the understanding of RTC in situ. In particularly, I develop a phenomenological understanding of the material artefact and integrate it in social practice theory to rehabilitate the status of things. Furthermore, the concept of awareness is discussed and embedded in practice theory. Second, so far, no in-depth case studies on RTC use have been published. Consequently, one of the contributions is to provide two case studies which offer rich empirical data on professionals' experience with RTC. Third, interweaving the theoretical and empirical work, I intend to advance the discussion on RTC. I shall theorize on how users experience RTC and embed it in forms of organizing work. Furthermore, I elaborate on how people's perception of each other altered and conclude with a discussion of social practices which either support or impede RTC use.

1.3 Structure of the thesis

In this chapter I introduced RTC technology, broadly circumscribed and justified my approach of studying ICT, and outlined the research questions and objectives of the project.

In chapter two, I shall revisit previous research on ICT. Since scarcely any empirical research on RTC has been published, I will review work on technological artefacts that show some similarities with RTC. In particular, I will concentrate on groupware

and instant messaging. As the previous discussion on RTC has shown, traditional software companies such as IBM or Microsoft are offering RTC products and either develop completely new solutions or revamp existing ones. Because of the history of many of these companies and their product portfolio, groupware features are part of their RTC solutions. In addition to the technological overlaps, a rich body of work with in-depth empirical accounts on groupware implementation and use has been published over the last two decades which provides an invaluable starting point for this discussion. Additionally, I shall draw upon work on instant messaging. With its chat functionalities and status information, IM shows many similarities with RTC and some of today's RTC applications like Lotus Sametime derived from simple IM applications.

In chapter three, I develop a practice theoretical perspective which is informed by Giddens' structuration theory but extends it by focusing on some theoretical areas in more detail. More specifically, I shall elaborate on aspects of power and knowledge which are central components of social practices. Additionally, the discussion delves into issues on awareness/co-presence and integrates a phenomenological perspective on the role of material artefacts into a practice theoretical understanding.

The research methodology and research design is presented and justified in chapter four. To do so, I clarify the ontological and epistemological position and justify the suitability of the selected research method. I shall then give detailed information on the selection process for the research sites, the field work, data collection and data analysis before closing the chapter with some reflections on the research endeavour.

In chapters five and six, the two case studies at local.ch and IBM are described at length. Each case study begins with a discussion of the broader socio-organisational context and the forms of organising work before giving a detailed account of how RTC was embedded in people's work practices.

Chapter seven draws on the earlier developed theoretical perspective and previous research on groupware and IM to make sense of the empirical data. More specifically, I shall first conceptualise how users experienced RTC and embedded the technology in their work practices. Afterwards, I discuss the implications of the socio-organisational context on RTC use and *vice versa*.

Finally, chapter eight summarizes the results of the theoretical discussion, the case studies and the analysis in a structured manner. I shall reflect upon the lessons learned from the two cases, discuss implications for future research on RTC and ICT in more general, and give some advices for practitioners intending to apply RTC.

Chapter 2

Literature review on groupware and Instant Messaging

Integrating synchronous and asynchronous information and communication channels in one application, RTC is neither clearly positioned in the discourse on asynchronous groupware applications nor Instant Messaging. In fact, using old technological frames for comprehending a new phenomenon, users, managers and researchers might fall short of appreciating the enabling and constraining capabilities of RTC. Nonetheless, theorizing about RTC can learn from and should take account of earlier findings from related research streams. Consequently, while earlier results need to be treated carefully, some significant similarities exist nevertheless and can inform the discussion on RTC.

This chapter starts with a brief overview of the discourse on groupware which started during the 1980s (Iacono et al. 2001). In the beginning, groupware was understood as a new kind of commercial software intending to facilitate collaboration among group members. During the 90s the discussion on groupware moved on and became embedded in the theorizing about flexible and virtual forms of organizing. Following the logic of the technological imperative, the business and academic cycles alike postulated the collaborative advantage which could be realized with groupware (ibid.).

However, like work in the broader area of IS implementation, researchers concerned with groupware have started to develop alternative approaches which reject a *logic of determinism* and have explained groupware implementation and use as emergent, processual phenomenon. In line with the positioning of this thesis, I refer to the body of in-depth case studies which provide a rich picture of the context specific organisational and social implications of groupware. I shall concentrate on a body of work that investigated the highly situated nature of using asynchronous groupware

applications, in particular Lotus Notes. [3] I will first describe groupware implementation as an emergent process in which users continuously enact forms of groupware use. I will then develop a selection of relevant themes in more detail by presenting detailed excerpts of previous case studies to illustrate the highly contextual nature of groupware use.

In the second part of the chapter, I shall review the literature on Instant Messaging. Instant Messaging is a relatively new communication technology, which has gained increasing popularity over the last couple of years in both the private and professional domain. To date, an emergent, processual perspective which, like parts of the groupware literature, takes account of the socio-organisational aspects is almost missing. However, due to the parallels between IM and RTC, literature on IM might nonetheless provide valuable insights on RTC use.

2.1 Introduction to Groupware/ CSCW

The two terms „computer-supported cooperative work“ (CSCW) and “groupware” became both popular during the 80s (Grudin 1991: 367). The former one was first used as a name for a series of conferences intended to examine the collaborative work of people supported by information and communication technology. CSCW is formed out of two disciplines, namely the engineering discipline, that tries to construct suitable systems, and a social science discipline, that attempts to understand the social basis of its constructions (Ackermann 2000). Informed by an appreciation for the limitations of technology dominated approaches to account for the flexible, nuanced, and contextualized characteristics of human action, CSCW researchers advocated drawing upon organisational as well as technological perspectives and giving particular consideration to the user perspective (cf. Clegg et al. 1994; McCarthy 1994). The focal point of this line of research has been to address and better understand what is referred to as the *social-technical gap*, i.e. the cleavage between social demands and the possible technical support (Ackermann 2000).

In the following, I will briefly recount Iacono and Kling’s (2001) historical description of the discourses surrounding groupware to illustrate that the arguments in the business and academic cycles resemble the technological deterministic

[3] I use the term groupware to refer to asynchronous applications (for example Lotus Notes) although the term is generally applied in a much broader sense and includes synchronous and asynchronous applications.

arguments which are frequently expressed in relation to RTC. Groupware was used as a product label for commercial software applications designed to support group work (Greif 1988). The increasing interest in groupware during the late 80s early 90s coincided with the disillusion about the absence of productivity gains (cf. Brynjolfsson 1993) from the individual use of computers and information systems at that time (Iacono et al. 2001). From counter-discourses, an understanding emerged that argued for groupware as an enabler of more collaborative work. Instead of conceiving work as a solitary endeavour, it was understood as a social process which should be facilitated by groupware use.

The introduction of groupware was accompanied in the popular literature by the promise that it would ultimately lead to increased organisational productivity (cf. Bullen et al. 1990). The use of positive connotations such as cooperation, coordination, and images of convivial workplace relationships (Kling 1991), indicated the hope that groupware would enable work to be organised in a more collaborative manner (**collaborative claim**) (cf. mentioned by Ciborra 1996b; Iacono et al. 2001; Karsten 1999a; Kelly 2004). To put it in a nutshell, the collaborative claim alleged that groupware allows, first, access to structured information, and, second, more efficient and democratic forms of collaboration by way of increasing communication within and across organisational groups (cf. Munkvold 1999; Sproull et al. 1991). The proclaimed outcomes, it was argued, are achieved as groupware-mediated interaction equalizes the social differences which are prevalent in face-to-face encounters. Furthermore, it was argued that with groupware people would be generally better informed, could extend their personal ties beyond their actual location, and could strengthen their informal and emotional connections with colleagues.

During the early 90s, the discussion on groupware merged with a surging scholarly interest in more socially rich conceptualisations, such as virtual teams (cf. Gibson et al. 2003; Lipnack et al. 1997; Townsend et al. 1998), virtual organisations (cf. DeSanctis et al. 1999; Kock 2000; Mowshowitz 1997) or social networks (cf. Monge et al. 2003). Proclaiming the "death of geographical distance", it was argued that new organisational forms would span across distance, time, cultures, departments, and organisations, thereby creating "anyone/anytime/anyplace" alternatives to the traditional same-time, same-place, functionally centered, in-house forms of

organisational experience (cf. O'Hara-Devereaux et al. 1994). Within this context, groupware was understood as enabler for distributed forms of organizing work as it supposedly facilitated communication and collaboration within and across organisational boundaries. Consequently, it was argued that groupware realized real-time or near-real time information sharing and the integration of distributed knowledge (Iacono et al. 2001). Taking the distributed organisation as the core metaphor, different streams of research developed which sighted new parameters as to understand and utilize the potentials of those novel forms of organising (Iacono et al. 2001). For example, on the team level organisational scientists showed an interest in "all star teams" (Goldman et al. 1995) as a means for improving performances. For the formation of such team, it was argued, companies could fall back on the whole pool of employees and staff the teams according to the needed expertise and people's capabilities rather than local availability (cf. DeSanctis et al. 1999; Konradt et al. 2002). Furthermore, discussions analysed issues such as leadership (Townsend et al. 1998; Tyran et al. 2003), trust (Javenpaa et al. 1998; Kanawattanachai et al. 2002), management and training (Hinds et al. 2000; Montoya-Weiss et al. 2001; Townsend et al. 1998), communication patterns (Carlson et al. 1999; Hinds et al. 1995; Maznevski et al. 2000), and patterns of collaboration (Bell et al. 2002).

However, empirical results of groupware-mediated (distributed) work show rather mixed findings which often did fall behind the overly optimistic expectations of the business and academic cycles. Karsten (1999a) reviewed 18 case studies discussing the implementation and use of Lotus Notes and found in six cases indications for tentative, exploratory use of Notes, in eight cases Notes was used to support explicitly defined organisational functions without prompting any major changes, and only in four cases could qualitative or quantitative changes in collaboration be observed. Karsten argues that because groupware is very modifiable and can be used in a variety of ways, the implications of the technology differ depending on the context of its use. To account for the situated use of groupware, Iacono and Kling (2001) pledge for more studies to actually investigate the *work practices* within distributed forms of collaboration.

To sum up, many of the arguments followed a technological imperative and often made universal claims as they tried to explain the outcome of groupware implementation *ex ante*. Interestingly, the story resembles the state of the current

discussion on RTC. To overcome the shortcomings of such blunt universal claims, Iacono and Kling propose to apply an emergent approach for studying groupware, which can account for the diverse and sometimes contradicting findings.

In the next section, I shall therefore present results of in-depth case studies on groupware use which mainly took an emergent, processual perspective to appreciate the situated use of groupware. I will first explicate the processual understanding of groupware implementation and use before focusing on some selected topics in more detail. By doing so, I hope to do both identify topics and show the suitability of such an approach for studying RTC use.

2.1.1 A processual understanding of groupware implementation and use

Research with a processual perspective frames groupware not as fixed-function or automating computing technology, rather the technology is described as 'radically tailorable tool' which allows end users to modify and alter applications to their particular needs (Malone et al. 1992). As such, groupware is understood as configurable and context specific general-purpose technology which is enacted by individual or collective, intended or unintended activities (cf. Bödker et al. 2004; Orlikowski et al. 2000). Users and specialists continuously re-invent the technology and, while doing so, explore new features and learn to exploit the potentials of groupware (Ciborra 1996a). The implementation process is open-ended; that is constant adaptations and innovations take place of both the technology and the respective work practices (cf. Malhotra et al. 2001; Ngwenyama 1998; Orlikowski 1996b).

Groupware technologies attempt to support communication, coordination, and collaboration through features such as information exchange, shared repositories, discussion forums, and messaging (cf. Orlikowski et al. 1997). However, as groupware itself gives no instructions on how to collaborate, users need to agree upon forms of working together and using the tool in a specific context (Bödker et al. 2004). With no workflow being inscribed, some argue that groupware is an especially fragile technology which directly competes with other already established substitute media, such as the telephone, e-mail, or fax (Ciborra et al. 1996). However, others argue that successful innovation with groupware is less jeopardized by substitute media, rather the applications should be conceived as supplementary and

implementation efforts should focus on the whole spectrum of media in a synergistic fashion (Kelly et al. 2001).

The implementation of groupware is best conceived as open-ended process with *intended* and *unintended* changes (cf. Orlikowski 2000). Intended changes can be subdivided into two categories, namely anticipated changes (planned changes ahead of time) or opportunity based changes (not planned ahead of time but purposefully and intentionally introduced during the implementation process) (Orlikowski et al. 1997). Both anticipated and opportunity-based changes result form deliberate actions.

Management plays a vital role in enacting planned and emergent changes. For example, Malhotra et al. (2001) describe the successful formation and work of an inter-organisational virtual team, responsible for the design of a new rocket engine at Boing-Rocketdyne. Team members had no prior working experience with each other and only met once for the kick-off meeting and later at the final technical review at the end of the project. Additionally, some of the team members had no prior working experience in designing rocket engines. Nevertheless, the project was regarded as a big success and exceeded the set objectives. The authors then described three management practices which they argued contributed to the positive outcome of the project. During the first phase, called strategy setting, managers of the involved companies engaged in a series of negotiations and discussions to identify potential contributions of each company and solutions for dealing with risks associated with such a cooperative venture. At the end of the first phase an umbrella agreement was signed which specified contractual obligations in different areas. The second phase aimed at selecting and developing technologies which addressed the needs of the team. Additionally, a coordination protocol, explicating practices of organising work in the virtual teams and forms of using collaborative technologies, was developed. With the coordination protocol the team made an explicit statement of how it intended to share information and collaborate. The agreed upon regulations diverged from traditional ways of doing work within the partner organisations and facilitated innovative practices of collaborating. More specifically, shifts occurred “from face-to-face discussions to complete reliance on technology for collaboration, from sharing information on a need-to-know basis to sharing information within everyone on the team all the times, from using personal collaboration tools (for example different e-mail applications across the companies) to using a single one” (Malhotra

et al. 2001: 237). As part of the final management practice, the team adjusted work processes to accommodate to the virtual teaming mode. However, although the team knew that alterations were required, restructuring should not affect basic creative needs of the team. Such requirements for creativity were 1) a shared understanding of the problem, possible solutions, analysis methods, and language, 2) frequent interaction with all team members, 3) rapidly creating and discarding information.

In contrast to intended changes, unintended or emergent changes "arise spontaneously from local innovation and (…) are not originally anticipated or intended" (Orlikowski et al. 1997: 13). Ciborra coins the term 'drifting' to describe small or significant changes from the originally planned, pre-defined and assigned objectives which surface while groupware is used *in situ* (Ciborra 1996a). "Drifting seems to lie outside the scope of control of the various actors; it consists of small and big surprises, discoveries and blockages, opportunistic turns and vicious cycles" (ibid.: 10). Drifting is attributable to "actors' "being-in-the-workflow" and the continuous stream of interventions, *bricolage* and improvisations that "colour" the entire system life cycle" (ibid.: 8-9). Diverging form pre-planned, formalized and rationalized change programs, concepts such as *bricolage* emphasise "informal, worldly, and everyday modes of operation and practice" (Ciborra 2004a: 20). Ciborra concludes that due to the openness of groupware 'what groupware is' or 'technology-in-use' is can only be ascertained *in situ* (ibid.). However, drifting occurs not only in the way groupware is being used in organisations, rather drifting is bi-directional as new work practices, organisational norms and policies are embedded in and developed based on the enabling and constraining conditions of the technology (cf. Malhotra et al. 2001; Ngwenyama 1998; Orlikowski 1996b). Hence, groupware applications and organisational processes mutually influence each other, creating the opportunity to produce new or re-produce existing practices.

Users may fail to appreciate the potential of the new system and apply the logic of previous systems to groupware applications (Ciborra 1996b). Communication about and training on groupware can help new users to appreciate the opportunities it offers (Orlikowski 1992). By doing so, the technological frames people have of preceding technology - i.e. mental models people hold about the world, their organisation, technology and which shape the way individuals approach the world - are modified in order to understand groupware (Orlikowski et al. 1994). Mediators play a

signification role in the implementation process as they facilitate ongoing and mutual adaptation between the technology and the organisational context (Bansler et al. 2004). They can act as boundary spanners by connecting users and IT people. However, mediators are not neutral facilitators rather they are actively involved in making sense of the technology. As such mediation does not always result in positive outcomes as mediators' conceptualisation of the technology can impede creative and efficient use.

The situated implementation of groupware is influenced by the broader organisational context, for instance the organisational culture or the company's strategic framework (Ciborra 1996b). The prevailing organisational culture it is argued plays a crucial part in explaining the success of groupware implementation. It is assumed that the organisational culture has to match with the underlying premises of groupware (cf. Failla 1996; Orlikowski 1992; Vandenbosch et al. 1997). For example, in her case study of Alpha Corporation, a consulting company, Orlikowski argues that it was partly due to Alpha's culture and work norms, that consultants rarely used groupware at all (Orlikowski 1992). Alpha had a relatively competitive culture and an 'up-or-out' career path with consultants vying with each other to get one of the few promotions offered each year. In an organisational culture of that kind, Orlikowski argued, values such as sharing or cooperating were underdeveloped and little incentives existed to do so. "The competitive individualism – which reinforces individual effort and ability, and does not support cooperation or sharing of expertise – is counter-cultural to the underlying premise of groupware technologies" (Orlikowski 1992: 367). Consequently, the author argued that it was not surprising that consultants made no use of groupware or it was rather used as an individual productivity tool. However, other accounts are questioning the assumption that directly links successful implementation with favourable cultural conditions within organisations. Karsten et al. (1995; 1998) describe in the case study of CCC, a computer consulting company, the introduction and use of groupware over a three year period. During that time CCC went through several upheavals which challenged the existing organisational culture. In particular, over the three year period several people took on the influential position of the managing director and left significant imprints on the organisational culture and work norms. However, despite the contrasting management styles, varying from democratic, decentralised management to hierarchical, formal management styles, Karsten shows that groupware was

adaptable to the different management approaches although the way people used the application changed significantly among the different managerial regimes.

2.1.2 Learning and knowing with groupware

After giving a brief overview of the processual perspective on groupware implementation, in the following I will concentrate in more detail on some selected topics, namely learning/knowing, relationships between subordinates and superordinates, and the materiality of groupware. I suggest that such topics are also relevant for and transferable to the study of RTC use. Knowledge is a fundamental component of every practice. As subjects perform the same social practice, they learn the practical knowledge upon which they draw to produce and reproduce routinised activities across time and space. Research concentrating on the implications of groupware on learning and knowing can therefore evoke an initial comprehension for the enactment of RTC-mediated collaborative practices.

Some authors argue that transparency of information would improve throughout organisations as work output and work processes were textualized and therefore accessible in the electronic network (cf. Ciborra et al. 1996). Consequently, the promise was that groupware would foster communication and knowledge sharing within organisations as all local units became an integrated part of the global network. It was argued, that the only pre-requisite for groupware to fulfil this role was that messages posted on the network needed to be detailed enough satisfy the needs of the global audience. Implicitly, such an understanding assumed that objective descriptions of experiences were possible and only depended on the length of the transcript.

Other authors disagree with the claim that any objective descriptions can be given by textualizing work which then results in higher transparency of information. Thompson et al. (2004) argue that representational endeavours (for example knowledge repositories or presentation slides) mostly prove to be irrelevant for a user's specific circumstances. Instead of representational forms of knowledge management, Thompson et al. suggest two more promising knowledge management initiatives, namely codified data in a more usable form (for example decision making tools, templates, technology-push reports) and knowledge management based on mutual communication and engagement among participants (for example mentor relationships, communities-of-practice). The latter two initiatives take account of the

importance of context in generating meaningful interaction among organisational workers. Informed by such an understanding, groupware should be viewed as "containing re-presentations of action and reflection, deeply involved in human processes of communication, and which cannot be divorced from their context" (Walsham 2005: 7).

The work of Walsham and his students can give in this context a theoretically sophisticated and empirically sustained conceptualisation which explains the way people produce and use information available on groupware systems for their daily work. I will therefore briefly present the theoretical foundation before turning towards the case studies. Walsham applies Polanyi's concepts of tacit knowing and sense reading/sense giving as a starting point for explicating the relationship between contextually embedded re-presentations of actions and groupware technology. Polanyi describes the relationship between tacit knowing and sense reading/sense giving as follows:

> "Both the way we endow our own utterances with meaning and our attribution of meaning to the utterances of others are acts of tacit knowing. They represent sense-giving and sense-reading within the structure of tacit knowing" (Polanyi 1969: 181).

Furthermore, Polanyi introduces the concept of tacit power as to explain how we experience our active engagement with the world. Tacit power is applied in processes of shaping experiences of the world and integrating the experiences in existing tacit knowledge.

Walsham (2001a; 2004; 2005) then applies Polanyi's concepts of sense reading/ sense making, and tacit knowledge to develop a four stages model of computer-mediated interaction. The first stage says that people while carrying out activities continuously reflect on their activities and absorb in a process of sense-reading sights, sounds, and events. Each individual's tacit power shapes their experiences and interpretations which are then incorporated in their tacit knowledge. Second, if a person A wishes to communicate some of his/her experiences – for example via voice, data, text, diagrams – sense giving efforts are required to create representations of the experiences (explicit knowledge). However, the meaning of the output for person A depends on and is rooted in his/her tacit knowledge. During the third stage, a recipient (person B) receives the explicit output of person A and applies sense-giving activities. Rather than being based on immediate experiences as

it was the case with person A, person B's sense-giving activities are thought-based and the meaning assigned to the explicit output is rooted in the tacit power of person B. The knowledge the recipient has of the sender will be taken into account and will influence the interpretation. During the last stage, person B will engage in action and reflection of his/her own, influenced by the change of tacit power brought about by the explicit representation of person A.

To give an empirically grounded illustration of the concept, I will draw upon the case study of Compound UK (for a detailed discussion see Hayes 2001; Hayes et al. 2000; Hayes et al. 2001) a multinational pharmaceutical company, which was primarily selling drugs to hospitals and general practices. As a response to the changes in the UK health care sector at that time, the selling division of Compound UK had gone through a serious restructuring program to reflect the recently introduced split between primary and specialist care. While the primary care sector covered general practices, the specialist care sector addressed the hospital market. In the latter, budget responsibility in hospitals was handed over to doctors making the sales situation for Compound UK more complex as, in addition to managers and accountants, a significant number of new actors (doctors) was now involved in the purchasing decisions. To address the new situation, the commercial function at Compound UK was reorganised into eight regions and was endowed with a significant amount of autonomy to cater for the needs of the local marketplaces. The commercial function consisted of a director, eight regional managers, 12 area managers, and around 150 sales representatives. In addition, in an attempt to improve knowledge sharing and collaboration across all functional and geographic boundaries, Lotus Notes was implemented. Besides the e-mail functionality, three databases were implemented to (1) support cooperative activities involved in strategic selling, (2) to provide different discussion platforms, and (3) to record customer details in a contact recording database.

Walsham (2004) applies the concept of sense-reading/ sense-giving to analyse the knowledge management system at Compound UK. More specifically, the contact recording database was intended for salespeople to record details of their visits to doctors, such as the date of the visit and the name of the person visited. In addition, less structured data, such as the broader context of the person visited and potential business prospects, were supposed to be stored in the strategic-selling database. By

doing so, management intended to centralize the knowledge of the sales force about the customer organisations. During their daily work, salespeople constantly engaged in sense-reading/sense-giving activities. While visiting the doctors in the hospitals, salespeople were acting and reflecting upon their encounters (sense-reading) and recorded their experiences after returning from their visits in the Notes databases (sense-giving). Other employees at Compound UK engaged in sense-giving activities when reading the records. To do so, readers brought to bear their knowledge of the creator of the information, the doctor and other knowledge that might be relevant to understand the representation; that is the meaning of the explicit knowledge was rooted within the reader's tacit knowledge. The reader would then draw upon the incorporated tacit knowledge for his/her future actions. Analysing the usefulness of entries within the database at Compound UK, Walsham concludes that strategic-selling records on primary care visits were regarded as less valuable compared to records on hospitals. The primary care sector was not very complex and the pharmaceutical products were fairly standardized. Salespeople found sense-giving efforts less helpful as they did not deepen their understanding of the field site. Contrastingly, strategic-selling sheets were viewed as more effective since they expanded people's contextual understanding. Walsham concludes that all electronic texts are deeply rooted in people's tacit knowing and are meaningless if cut off form the tacit knowledge. The discussion so far showed that the production and use of explicit knowledge is best understood as sense-giving/sense-reading exercises. The comprehension of (electronic) texts is always rooted in and can never be done without a person's tacit knowledge. Learning takes place if explicit knowledge is incorporated in and extends a person's tacit knowledge base.

Sense-reading/sense-giving is a philosophical conceptualisation of knowledge sharing and knowing which can help to understand learning processes with groupware. However, drawing upon the case study of Compound UK, Hayes and Walsham complement the above mentioned work by focusing on socio-political aspects which had implications on groupware use and learning. Hayes and Walsham (2001) analyse the reciprocal relationship between groupware and political/ normative aspects and the resulting implications on knowledge sharing. Focussing on the discussion platform at Compound UK, they found that national databases were 'captured' by career oriented sales representatives as they knew that the databases were monitored by senior management. National discussion databases therefore

became political platforms in which careerists were seeking attention from senior management. As a result, less career oriented sales reps saw no real benefit in participating in the discussions dominated by careerists and withdrew from the politicised national databases. Instead, non-careerist employees harnessed regional databases that were used by members of the local community to address work related local and regional issues. In those databases, sales representatives discussed how they approached sales situations and gave advice to less experienced members. Hayes and Walsham use the concept of safe and political enclaves to depict the function of regional and national databases within the organisational context. Safe enclaves enable people to express their own underlying views of activities and facilitate open discussions and reflections whereas political enclaves are used as a resource by political agents to foster their own agenda. The transparency brought about by Lotus Notes created a political enclave which provided both senior managers and ambitious representatives a platform for furthering their own agendas. By doing so, entries in the national databases mainly reinforced the existing legitimacy of senior management and the objectives of ambitious representatives. However, an unintended consequence was that representatives who did not indulge in self-promotion activities opted out of the political discussion databases as they saw no value in the recorded information. Rather, non-career oriented representatives preferred to discuss relevant issues in role and region specific databases, which were regarded as safe enclaves. The authors showed that safe enclaves not only encompassed groupware-mediated discussion platforms but also included face-to-face and telephone conversations. Some senior managers realized the limitations of political enclaves and functioned thereafter as facilitators developing safe enclaves and motivate reps to actively participate in those.

Hayes and Walsham then apply this socio-organisational perspective to explain the influences of the databases on learning. First, they argue that career reward structure, surveillance activities, and minimal use of national databases by non-ambitious employees cumulated in consensus of opinion regarding the objectives of management. Senior managers utilized the transparency of Notes to disseminate their political agenda throughout the organisation. Ambitious representatives utilized the transparency produced by the national databases for self-promotion. Non-careerist representatives saw groupware not as a political enclave to promote their personal agendas. Intensive use was noted if safe enclaves “did not mirror the career or

financial reward structure, or the surveillance or control activities of senior managers" (p.284). Hayes et al. conclude that access to communities does not end in the formation of a single homogenous community, rather access to different groups is more " likely to lead to the formation of different communities that reflect the overlapping motivations and normative assumptions of participants (p.285)" In addition, the transparency which was brought about by the databases increased the awareness of the heterogeneous practices across functional, spatial, and temporal boundaries to which employees responded in that they identified themselves with a community that best matched their interests.

2.1.3 Groupware use and social relationships

In this section, I will refer to a selection of case studies to discuss the implications of groupware-mediated interaction on social relationships with co-workers, subordinates, and superordinates. The discussion, which shall sensitize the analysis of RTC, illustrates the implications of groupware on collaborative forms of organising work. Among others, the increased transparency of work brought about by groupware can alter existing power relations as activities that were formerly part of the private sphere may become accessible in the public arena (cf. Ciborra et al. 1996; Orlikowski 1996a). The level of transparency affects relationships between subordinates-superordinates (cf. Barrett et al. 2004a; Ciborra et al. 1996; Orlikowski 1992; Orlikowski 1996a) and co-workers (cf. Hayes 2000). In the following, the implications of groupware on both kinds of relationships are examined in more detail.

Hierarchical relationships between subordinates and superordinates

Following Zuboff's concept of the information panopticon (Zuboff 1988), one group of studies argues that managers become more influential after the implementation of groupware. Previously, output or work processes were concealed and not exposed to direct surveillance by management. Groupware made work visible and thereby assessable across space and time. In Compound UK, for instance, organisational distance between managers and employees decreased, allowing superordinates to solidify their ability to manage from afar (Hayes et al. 2000). However, if subordinates distrust management, they might apply counter-strategies to reduce the transparency of their work. Ciborra and Patriotta (1996) describe the implementation of a groupware application at Unilever. All entries to the database were at first completely transparent, however, panic arose as employees realized that senior managers were using the tool and that entries could be seen at the highest level

within the organisation. Consequently, employees stopped using the groupware system for some months and only reluctantly resumed using it. A consequence of this episode was that from that time on people made sure that only grammatically correct information were entered into the database. Secondly, designers implemented two different levels of access, namely above- and below-the-line. Below-the-line information was only accessible to team members and represented the day-to-day work of the project team whereas above-the-line information was accessible to the management and gave an overview of the project. By doing so, employees were guaranteed secure zones where they could genuinely express their views.

While in Ciborra and Patriotta's case study, subordinates showed a level of scepticism and distrust for how management could use the databases, Orlikowski (1996a; 1996b) shows that the information provided a leverage for managers to protect their teams against wrong accusations and to justify their argument. In Zeta Corporation, a software company, specialists in the customer service department provided technical support for customers via the telephone. Often, providing technical support was a quite complex endeavour and required extensive research and interaction with other specialists or departments. After the implementation of Lotus Notes, Orlikowski found that managers changed their work practices as they utilized the newly available information on employees' workload and quality of work. However, managers did not use the transparency of work results to enforcing tighter control regimes; rather managers harnessed the newly available information to justify new job placements to accommodate to the increased workload. Interestingly, although evaluation criteria for specialists' performance were expanded and included specialists' entries within the database, specialists did not express strong concerns about surveillance issues. "High performers" were especially self-confident and argued that they would benefit form the transparency of their contributions. However, specialists were not naïve as to the newly gained visibility of their work and only entered professional representations in the database. Orlikowski concludes that it was partly attributable to the cooperative culture and the existing level of trust at Zeta that the way management made use of the information was acceptable to the employees.

The previous two case studies suggested that the transparency brought about by groupware enables management to either expand its control regimes or to protect its subordinates. In contrast to these accounts, Kelly (2004; 2005; 2001) gives an

illuminating example as to how the relationships between senior managers and subordinates changed in favour of the latter after the introduction of a groupware application. In Blue, a consulting company, both senior managers and subordinates welcomed the introduction of the groupware technology. At one office, senior management was very enthusiastic about the new system and embraced it wholeheartedly as they believed it would help them to keep track of all business activities. In general, management felt much better informed and in control of the consultants' activities. Surprisingly, consultants welcomed the system as enthusiastically as senior management but for different reasons. The consultants argued that the groupware system endowed them with more personal autonomy. Prior to their use of the system, senior managers would come to the consultants' offices and asked them for personal progress reports. In such face-to-face interactions consultants felt that senior managers 'pressed' information out of them that they were actually reluctant to disclose. With the implementation of the groupware system, electronic reporting was introduced which consultants experienced as a useful buffer between themselves and the senior management. Consultants had now more time to present their reports in a favourable light or could even withhold certain information and disclose them at a more favourable moment in time. Similarly, Orlikowski (1996b) shows how specialists at Zeta harnessed information from the database to protect themselves against wrong accusations from customers.

However, hierarchical relationships are not solely conflict laden rather attempts are made to overcome or mitigate mistrust and misunderstandings within and among communities, departments or professional groups. Kelly (2005) gives the example of a senior manager at Blue who tried to appeased existing fears among his subordinates regarding the visibility of their work by proclaiming collective responsibility for all entries in the database. Furthermore, he assured them that their work was of a high standard and that criticism was rather a reflection on his judgement than the individual concerned. The manager attempted to develop an atmosphere in which criticism was appreciated and interpreted as a source for learning.

Norms and procedures on how management and employees deal with visible information are important factors for the acceptance of groupware. Issues such as data security or personal liability need to be explicitly addressed and specified to

delineate acceptable conduct and re-assure users about the safety of their information (Kelly 2005; Orlikowski 1992). Unspecified expectations might bring about misrepresentations of entries and performances, distrust, and unsound perceptions of disloyalty (cf. Barrett et al. 2004a; Hayes 2001; Walsham 2001a; Walsham 2005).

Peer-to-peer relationships

As for hierarchical relationships, trust also significantly affects the quality of peer-to-peer relationships. In Blue, consultants were much less concerned to share information with peers if they knew that the information seeker was familiar with the contextual circumstances under which the activities were carried out and evaluated the information under that auspice (Kelly 2004; Kelly 2005). Moreover, consultants often favoured personal interaction over groupware-mediated information exchange as it first allowed them to expand their personal networks and second invoked with the information seeker a sense of obligation to grant a favour if it was required by the help-giver. Consequently, individuals not contributing to groupware databases should not be disparaged as uncooperative, rather their reluctance derived from qualitative changes in social relationships. Uncertainty about the interpretation of information and the missing obligation towards the information providers altered the incentives to impart information.

Other research found that existing problems among different functional areas within organisations further persisted or were even exacerbated after the implementation of groupware. In OptCo West, a high technology optronics company, groupware was applied for supporting collaboration between two functional communities (Hayes 2000). Hayes argues that business people on the one hand and engineers, estimators and operations planners on the other formed two groups with varying interpretations of how the system should be used. While engineers were expecting detailed and complete information of bidding orders in order to estimate the costs of the order, business people argued that such information could not be provided as the expectations of customers at an early stage of the bidding process were only tentative and subject to ongoing changes. Although the introduction of a groupware system forced business people to enter some information, it remained by and large rudimentary and was not sufficient given the tacit knowledge in which the information was embedded. Consequently, engineers used official meetings as a means to blame business people for not using the groupware system properly and, by doing so, tried to enforce their own understanding of how work should be done.

Engineers thus harnessed the information on the database and the work processes which were pre-described in the system to substantiate their own position.

Between professional groups, developing social bonds can be achieved through boundary spanners or mediators who sensitize different communities for the varying needs and assumptions (Hayes 2000). Rather than relying on groupware alone, mediators emphasised the importance of face-to-face meetings (Hayes 2001). By developing relationships among people with the same or other professional backgrounds, mediators tried to overcome politicising which negatively affected the use of groupware and collaboration in general (Hayes et al. 2001). Rather than solely relying on technology, a supplementary use of groupware was often preferred, especially to foster trust-based communication (cf. Barrett et al. 2004a; Walsham 2001b). The supplementary use might not just facilitate the development of deeper social bonds but also innovative forms of organizing (Kelly 2005). In Blue, managers capitalized on the social ties that developed through the use of groupware by organizing more regular social events which increased cooperation and strengthened relationships.

2.1.4 Materiality of groupware and its implication on social practices

Kelly (2005) follows Orlikowski and Iacono's (2001b) call not to take IT for granted but to carefully theorize about the situated use of IT artefacts with their specific cultural and computational capabilities. Drawing upon Wenger's concept of participation and reification (1998), Kelly analyses how groupware, as a particular materialized form of reification, enables "modes of reification and participation by mediating forms of social engagement and providing a means of reifying our experiences" (Kelly 2005: 498). Referring to his case study of Blue, Kelly concludes that social processes were not merely intensified or extended, but rather qualitatively altered. More specifically, after the implementation of the system, new forms of participation and reification emerged in one of the office at Blue, which brought about a better comprehension of the organisational processes and improved collaboration in more general. In contrast to Zuboff's (1988) concept of informating, Kelly argues that the consultants at Blue were already very knowledgeable about their work on both a tacit and discursive scale. Groupware did not informate the organisation. What the groupware application did was rather to change forms of knowing and engagement with the world. More direct, embodied personal

engagement in the work context with mainly oral discursive practices was supplemented with more detached, analytic, administrative modes of engagement.

Kelly proposes *digiscribing* to explicitly theorize the material forms of the produced reifications. Digiscribing refers to the process during which people "inscribe (reify) representations of or perspectives on (as opposed to objective depictions that render the world more transparent) their experiences and activities in a (persistent, easily reproducible, accessible, integrative) digital form" (Kelly 2005: 502). Kelly argues that digiscribing complements existing work on IS which has focused on the importance of social relations in the adoption of technology by "emphasizes the embodied nature of our engagement with the world and focuses on how this is shaped by the material features of technologies that mediate it, but not to the exclusion of the underlying social relations" (Kelly 2005: 502). Indeed, the concept of digiscribing emphasises the requirement to develop supportive social infrastructures to utilize novel modes of reification. Feelings of vulnerability, insecurity or difficulties to express one's opinions in writing were associated with the persistent, tangible, aggregated manner of the contributions in the database. As illustrated in Blue, rather than blaming a competitive, individualistic culture for the unsuccessful introduction of groupware, Kelly argues that enquiries might better concentrate on how groupware potentially disturbs underlying social protocols of help-giving and feelings of reciprocal obligations.

2.1.5 Reflections on the literature on groupware

From the review of the case studies on groupware, a picture of the highly situated nature of groupware use emerges. The implications groupware has in different organisational contexts might vary from having no real effect, to significantly altering the quality of organising work. By taking the contextual and processual dimensions into account, the case studies provide rich insights on the organisational factors and work practices which shape the enactment of groupware but which are at the same time shaped as they draw upon the new technology. The implementation process is open-ended with both intended and unintended changes. Furthermore, the findings illustrate the insufficiency of the universal statements made by the collaborative claim. Rather, the case studies show that a more nuanced perspective is needed. The perceived usefulness of textualized information which facilitated learning depended on people's (tacit) understanding of the context the information

referred to. Furthermore, to facilitate learning, textualized information needs to extend people's awareness and understanding of a subject matter. However, due to the transparency, textualized information is easily harnessed by people to promote their own political agendas. Not only is the usefulness of discussion databases hampered if they turn into political platforms. The transparency may also alter the quality of superordinate-subordinate and peer-to-peer relationships. The qualitative shifts vary from increasing personal autonomy, over new forms of management and collaboration, to stricter regimes of control and competition. Finally, discussions on the materiality of groupware illustrate that the material features of technology enable modes of reification and participation. However, it should be born in mind that modes of reification and participation can not be understood without the underlying social infrastructure.

2.2 Instant Messaging

Instant messaging (IM) has been around for almost two decades. While the technology was first embraced by university students (Goldsborough 2001), IM recently made inroads into professionals' communication infrastructure. Johansen's (1988) famous matrix categorizes groupware along a temporal and geographical dimension. While the latter one distinguishes between face-to-face or electronic meetings, the temporal dimension differentiates between groupware for synchronous or asynchronous collaboration. In contrast, IM is often interpreted as a hybrid between written and verbal communication (Hansen et al. 2002) allowing near-synchronous communication (Nardi et al. 2000). Despite the increasing importance of IM in the private and business sector, research on IM is scarce and is often concerned with the development of prototypes. In the following, I shall give an overview of the literature on IM. In particular, studies have investigated the functions IM can be used for. Moreover, a small number of studies analysed the distinct communicative practices which are enacted with IM.

2.2.1 Functions of IM use

To date, a major concern of research has been on the aptness of IM for different functional tasks, four of which are now singled out. Firstly, research found that IM is used for brief interactions such as asking simple question or requesting clarifications (cf. de Poot et al. 2005; Isaacs et al. 2002; Nardi et al. 2000; Quan-Haase et al. 2005). It is argued that by way of enabling more rapid exchanges than e-mail and without

the overhead of face-to-face conversations, IM is designated for fast and efficient communication. Secondly, IM is applied for scheduling meetings and coordinating work (cf. de Poot et al. 2005; Grinter et al. 2002; Handel et al. 2002; Isaacs et al. 2002; Ljungstrand et al. 2000; Nardi et al. 2000; Quan-Haase et al. 2005). IM messages relate to the coordination of participants' activities and work related discussions about administrative issues, personnel, computer trouble etc. Scheduling describes the organisation of social gatherings, events, and impromptu or formal face-to-face and telephone meetings. Often IM messages scheduling implied negotiating availability at very short notice. Thirdly, 'doing work' refers to a broad spectrum of more complex work activities and discussions (de Poot et al. 2005; Grinter et al. 2002; Handel et al. 2002; Hansen et al. 2002; Isaacs et al. 2002; Quan-Haase et al. 2005). People collaboratively carry out work and discuss it with IM to solve a problem. Furthermore, discussions are directly work related and further activities of the participants involved in the chat. Finally, it was reported that IM was used for socialising and staying in contact with friends (cf. Boase et al. 2006; de Poot et al. 2005; Isaacs et al. 2002; Ljungstrand et al. 2000). In private settings, IM becomes the fundamental tool for socialising and using IM is a prerequisite for students to participate in ongoing discussions and social event planning (Grinter et al. 2002). Teenagers even reported that they were annoyed by non-users as it complicated communication and the coordination of social gatherings. Non-users were described as invisible or missing-in-action (ibid.). In a corporate setting, some case studies mention that socialising with IM happens regularly and the tool is even used to build and strengthen social relationships (Pauleen et al. 2001). However, other studies emphasise work related activities and marginalize the role of IM (cf. Isaacs et al. 2002).

Nardi et al. (2000) coin the term 'media switching' for ways of managing conversational progress during interactions through changes of communication media. IM was often used for negotiating availability for conversations with other media. While Nardi et al. argue that media switching is initiated by users as to draw upon more appropriate media when discussions become too complex or lengthy, others suggest that media switching is not related to the inadequacy of IM. Rather, the phenomenon happened as users intentionally used IM only for particular tasks, such as initiating meetings (Isaacs et al. 2002). With a greater variety of ICT at people's disposal, media switching is expected to happen more frequently (Lee et al.

2007). Indeed, recent research on RTC applications which integrate chat and VoIP functionalities suggest that media switching can be found regularly as people start with IM chat and then switch to verbal communication (Hansen et al. 2002). Negotiating availability via text messages before initiating VoIP conversations becomes an institutionalized template which is even enacted in situations when people formally agreed upon the date and time of meetings and discussions (Joisten 2007). Thus, using IM was part of the communicative practices and a means to reduce inconvenient interruptions.

The status information of IM functions as a proxy for a person's accessibility by signalling statuses such as online, offline, away, or do not disturb. It is argued that the status information provides a social affordance that makes people aware of the opportunity to collaborate (Quan-Haase et al. 2005). Studies report that the status information brings about a feeling of connectedness even if users are not directly interacting with each other (Nardi et al. 2000). Simply checking the buddy list and knowing who is around was experienced as valuable in itself. However, status information was not interpreted as positive *per se*, rather its value depends on the specific context, especially the closeness of relationships and the interdependencies of tasks (Quan-Haase et al. 2005). If people share close working relationships, status information reveals as a by-product a sense of awareness of the colleagues. Strong social ties are therefore viewed as crucial for IM to bring about particular positive effects.

People often use two or more ICT applications, including IM, at the same time. For example, IM was used to send URLs while communicating verbally with the same person on the phone (Joisten 2007). In other cases IM was used to chat with one person while talking to someone else via the telephone (Cameron et al. 2005). Invisible whispering describes communicative practices during which people engaged during face-to-face or technology-mediated meetings in further conversations (Rennecker et al. 2006). Those additional conversations were intended to (1) improve the understanding of the currently ongoing meeting, (2) provide task support and input for the meeting, (3) provide social support, (4) influence the content and direction of the meeting, (5) participate in parallel meetings, or (6) manage extra-meeting activities. Engaging in unrelated activities was especially perceived as helpful, if it was clear that no active involvement in a meeting was

required (Watson-Manheim et al. 2007). However, being engaged in too many parallel interactions at the same time could result in a deterioration of concentration and quality of communication (Cameron et al. 2005).

With visible alerts of incoming instant messages and status information on people's reachability, IM attempts to decrease delays for initiators but at the same time it translates into potential interruptions for the recipient (Rennecker et al. 2005). It is argued that communication requests are often opportunistic and while the initiator may benefit from instantaneous feedback, the recipient can be engaged in other tasks (Nardi et al. 2000). Consequently, asymmetries in conversations arise if the time and topic are convenient and beneficial for the initiator while causing interruptions for recipients. Therefore, IM was perceived by some users as disruptive and detrimental to one's concentration while focusing on important tasks (Cameron et al. 2005). Users applied different strategies to deal with heightened accessibility, such as using two different computers (one for coding and the other for communications), letting IM run for 24 hours as to devalue the status information, or completely shutting down the application (Quan-Haase et al. 2005; Woerner et al. 2007). However, contrasting IM with telephone or face-to-face, IM was interpreted as a lightweight medium and as less disruptive (Nardi et al. 2000; Quan-Haase et al. 2005). Depending on the prevalent norms within a particular context, IM provided recipients with a greater control to time their responses. As messages were often left open on the screen, IM provided a persistent reminder people could refer to at a more appropriate time (Woerner et al. 2007). Again, depending on the organisational context, dealing with instant messages could be delayed without offending the sender. As the status information only functioned as a proxy for people's availability, denying one's accessibility was an acceptable option.

Relatively little has been written on the use of group chats. Handel and Herbsleb (2002) report that group chat is less intrusive than one-to-one chat. Being constantly on the screen or in the background and generally addressing a group of people, people feel less compelled to immediately look at new messages at inconvenient moments. The protocol of group chats allowed people to follow-up on earlier discussions and provided a transcript of the conversation which could be stored for later reference (Pauleen et al. 2001). Furthermore, Quan-Haase et al. (2005) argue that group chats may facilitate a sense of community among participants as

discussions bring about awareness for others' options, understandings, likes and dislikes.

2.2.2 Communicative practices with IM

Concentrating on the communicative practices enacted by IM, Voida et al. (2002) attempt to unveil the tensions and conflicts arising from the overlapping conventions of written and verbal communication. Contrasting general conventions of written and verbal communication, the authors identify eight dimensions along which the two can be differentiated.

General conventions of verbal communication	General conventions of written communication
No persistent record of communication	Persistent record of communication
Hesitations and thinking on the spot without being considered inarticulate	Crafted carefully and edited so as not to be perceived as inarticulate or illiterate
Synchronous	Asynchronous
Turn-taking by establishing "overt cohesive links within the text of the preceding speaker"	Turn-taking explicitly granted through exchange of communicative artefact
Syntax of sequentially adjoined clause chains	Syntax of hierarchical sentence structure
Requires continuous attention	Attended to as circumstances allow
Situational context through shared audio or shared space	No situational context unless explicitly communicated in text
Availability communicated primarily through body language; the power in initiating communication lies with the initiator	Availability is not an issue as communication is dealt with when opportune; the power in initiating communication lies with the receiver

Table 1: Comparision between the general conventions of verbal and written communication (Adopted from Voida et al. 2002)

Ambiguity arises since IM is interpreted as both synchronous and asynchronous. Voida et al. present five different kinds of tensions, namely (1) persistence and articulateness tensions, (2) synchronicity, (3) turn-taking and syntax tensions, (4) attention and context tensions, and (5) availability and context tensions. First, persistence tension refer to the fact that users did not worry about hesitations and did not edit their text as they would generally do with written text but they emphasised more the transient, informal and casual nature of IM communication. Attempts to repair flawed sentences were only made after they appeared on the screen. Second, due to its near-synchronous character and the asynchronous nature of written communication, users often engaged in multiple conversations and, partly because of it, missed comments in instant messages as they were too busy writing (in other

chats). Therefore, participants had to reiterate important issues and return the conversation to a particular point. Third, in contrast to written communication, IM does not rely on the exchange of a communicative artefact and tensions arose when participants contributed to discussions at the same time and thereby violated turn-taking conventions. Fourth, tensions existed as users had to decide on the appropriate level of attentiveness to incoming instant messages. People had to justify their inattentiveness and, as not to appear impolite, give contextual explanations for not responding. The appropriate level of attentiveness depended on the prevalent norms within the organisation. Finally, while in co-located settings body language is used to signal and negotiate availability, in written conversations the initiator has no such information and participants are required to manage their availability and to communicate the context regarding their availability.

Woerner et al. (2007) study a small geographically dispersed software team (IMSoft) which heavily relied on IM to coordinate its work. Similar to Voida et al., the study examines the existing tensions people experienced when using IM but in contrast to the previous study which discussed design implications for overcoming tensions, Woerner et al. elaborate on individual and organisational strategies for creating coherence. Lack of simultaneous feedback, disrupted turn adjacency, multi-tasking, and authority were identified as main challenges. A lack of simultaneous feedback refers to time lags until a response is given. Team members used to deal with this issue by sending brief greetings to establish contact and letting IM switched on all the time so that previous conversations remained on the screen and were used as points of referrals. However, within the software team, a lack of simultaneity of IM conversations was considered to be normal and team members tried to use this to their advantage. While eventual responses to instant messages were expected, people did not have to respond immediately. This gave team members more flexibility to control their communication and turn their attention to conversations when it was suitable for them. Disrupted turn adjacency occurred “when responses aren't received immediately after the message to which they refer, but are interrupted by messages on other topics or from other participants (caused by the system posting messages in the order in which they are received rather than as responses to particular questions) can lead to significant overlap between speakers, "dense and complex" exchanges, confusion and loss of coherence” (ibid., p.4). IMSoft members used both verbal and visual techniques to re-establish and maintain conversational coherence. Separate

windows were opened for each conversation, people made use of distinct colours for their written messages, and parentheses were applied to indicate off-turn interjections. As verbal techniques, developers used names of recipients in group chats to direct attention and separate ideas. In addition, partial sentences were sent as a signal that the writer was not finished yet. Furthermore, lexical repetition refers to the use of important keywords to emphasise continuity. Although multi-tasking affected both communication and work it was expected from IMSoft members to engage in several activities at the same time. On a day-to-day basis, time slots for programming and IM conversation took turns with the latter taking precedence over the former. To manage interruptions caused by IM, developers either went off-line or used two machines, one for programming and the second for communicating. Finally, Woerner et al. name power relations and authority as a further threat to conversational coherence. In particular, the communicative practices of subordinates and the boss differed at IMSoft. The boss felt justified in interrupting the developers and did it regularly, posing challenges to the developers' conversational coherence.

2.2.3 Reflection on previous research on Instant Messaging

Previous research on IM has been mainly concerned with the use of IM by university students (cf. Connell et al. 2001; Grinter et al. 2002; Li et al. 2005; Ljungstrand et al. 2000) or reported on the implementation and use of prototypes (cf. Handel et al. 2002; Hansen et al. 2002; Isaacs et al. 2002; Scupelli et al. 2005). Those studies were mainly focusing on the broad spectrum of functional tasks for which IM could be used. Rather than analysing the work practices in which the technology is embedded, most studies try to come up with general de-contextualized categories which circumscribe the functional areas of IM use. 'Asking quick questions' or 'socialising with IM' are supposed to be descriptions which objectify and ascribe functions to IM. The focus is therefore rather on the application and not on how the technology is embedded in work practices. Often, such studies also imply that IM possesses inherent properties. For example, it is argued that IM either prompts users to choose particular media for different types of communication (for example people switch from one media to another as their richness differs) or it is argued that technological properties determine social and communicative behaviours (for example the language and style of messages used in chats results from the characteristics of the tool). However, such studies fail to appreciate that one will find IM use in almost all spheres of social life if the scope of studies includes contexts of various walks of life.

Yet, such conceptualisations do not bring us closer to appreciate the meaning IM has for subjects in a particular situated context. What does it mean for people that IM enables them to socialize or ask quick questions? What has changed? How is the technology experienced? An approach that creates *objective* categories of functional areas does not bring us closer to shedding light on such questions. Instead, the discussion needs to originate from the human agents who draw upon and experience the technology *in situ*.

I argue that the discourse on IM could learn from earlier discussions on groupware technology. For example, understanding the IM implementation process as open-ended with constant adaptations and innovations shifts the focus towards the cultural and contextual dimensions which enable and constrain IM use. So far, both of these dimensions are rarely considered in research studies. Taking such an approach helps to account for the different functional tasks IM is used for and the partly contradicting findings for example in relation to media switching. Studies tried to reveal either inherent properties of IM (for example Nardi et al. (2000) argue that media switching occurred as IM was inappropriate for complex or lengthy discussions) or emphasised the role of rational users who choose a particular medium (Isaacs et al. (2002) argue that users intentionally use IM only for particular tasks such as initiating meetings). Instead, I suggest that the implications of IM can only be accounted for in relation to particular situated social practices. Consequently, more in-depth case studies are required as to explicate the situated use of IM and its embeddedness in people's work practices. To date, a few ethnographic studies (cf. Nardi et al. 2000) have investigated the situated use of IM but did so by asking individual informants about their job and their use of IM. The weakness of such an approach is that it separates the users from the nexus of social relationships with its distinct dynamics and work practices. In-depth case studies with an emergent, processual perspective have already provided rich insights of the organisational and social contexts and the embedded use of groupware. To date, empirically in-depth case studies which investigate the role of IM in different social and organisational settings are very scarce, Quan-Haase et al. (2005) and Woerner et al. (2007) being two exceptions. Furthermore, rather than studying IM use in isolation, research should take the whole communication portfolio into account (Cho et al. 2005; Lee et al. 2007).

2.3 Summary

In this chapter, I argued that a review of the literature on groupware and instant messaging can inform the discussion on technologies such as Skype and Sametime. The review of the groupware literature illustrated the highly situated nature of groupware use. The implementation process is open-ended and intended and unintended changes take place of both the technology and the respective work practices. Moreover, I elaborated on the implications of the organisational context on learning and knowledge management with groupware. The case studies showed that the perceived usefulness of textualized information depended on a person's (tacit) knowledge of the particular subject area, his/her political agenda, and the organisational context in general. Furthermore, case studies indicate that the stored information on groupware applications can alter the dynamics of social interaction among peers and between superordinates and subordinates. Such qualitative shifts can vary from increased personal autonomy to stricter regimes of control and competition. Finally, in-depth case studies provided a sophisticated way of theorising the materiality of groupware without falling into the division between subjectivism and objectivism. In particular, groupware became a part of the participation and reification duality and thus mediated new forms of social engagement. To sum up, by taking the social, organisational and processual dimensions into account, in-depth case studies developed rich and insightful pictures of the use of groupware.

While the scope of functionalities offered by instant messaging differs from RTC, the analysis of different functions and forms of usage as well as discussions on conventions of communicative practices provide a starting point for the analysis of RTC. Current research on IM proves to be theoretically underdeveloped, with social, organisational, and processual aspects being almost neglected. So far, research studies have focused on a broad spectrum of functional tasks for which IM could be used. Generally, de-contextualised categories – e.g. 'asking quick questions' or 'socialising with IM' – intend to objectify and ascribe functions to IM. Implicitly, such an understanding assumes that some inherent properties of IM suggest using the application only for specific tasks. Furthermore, relatively little has been written on other functionalities or characteristics of IM, such as status information, group chats, or potential disruptions caused by IM. The few research studies that address such issues reported varying stories about users' everyday experiences with IM. However, they overemphasise the interpretation of the user, regard IM as a pure object of

knowledge, and thereby fall into the subject-object dualism. Consequently, research has failed to provide a sophisticated theorisation of instant messaging. Similar to the work on groupware, a more mature understanding needs to originate from the human agents who relate to and experience the technology in their life world.

Methodologically, research on IM mainly analysed the implementation of prototypes or concentrated (in experimental settings) on the use of IM by university students. Although such work provided valuable insights and identified focal themes, the studies have a rather static appeal and fail to reveal how people make sense of and embed the technology in their work practices. Learning from the research on groupware, a productive approach would therefore be to conduct in-depth case studies on the use of RTC. More specifically, such case studies should account for the situated use of RTC, that is, they should reflect the processual and contextual dimension of RTC use.

Conceptually, theorising about how people relate to RTC poses specific requirements. RTC can not be conceptualised as an exogenous force which causes predictable outcomes on the individual, organisational, and social dimension. Neither should it be understood as a completely malleable instrument applied by rational agents who use it to satisfy varying organisational needs. Rather, following a bottom-up approach, research on RTC should account for the everyday experiences and practices of RTC use. That is, RTC use emerges over time from complex social interactions. Informed by such an understanding, RTC can not be understood *ex ante*. Instead, RTC can only be comprehended in a relational sense. Theorising about RTC has to conceptualise the way people relate to RTC as part of their work practices. In the following chapter, I intend to develop a theoretical lens which allows me to investigate the implications of RTC on people's work practices.

Chapter 3

Theory of social practice

In this chapter, I set out to present social practice theory as the conceptual lens that will inform the further investigations. Specifically, I advocate a practice theoretical understanding as presented by Reckwitz (cf. 2002b; 2003; 2005) which was first introduced by Kelly (2004) into the information systems discipline for analysing groupware innovation in a business consultancy. The theoretical backdrop of Reckwitz's interpretation of practice theory is mainly influenced by Giddens' structuration theory (Giddens 1976; Giddens 1979; Giddens 1984).

In the following, I intend to apply this conceptualisation and further develop it in relation to 1) co-presence and awareness and 2) materiality. Therefore, additional work is incorporated on subject matters less developed by Giddens. I first start by positioning practice theory in relation to other cultural theories and present its main features. The following two sections will then scrutinize and develop aspects in relation to knowledge and power. The review intends to recapitulate the discussion of both issues in the literature. Both concepts form fundamental structural elements of social practices which need to be considered in order to comprehend people's activities and engagement with others. The final two sections introduce literature which is concerned with awareness and materiality. From a practice theoretical perspective, both concepts have not been discussed intensively. The objective is therefore to recapitulate the existing literature and synthesise concepts where it is appropriate.

3.1 Overview of a theory of social practice

Reckwitz (2003) identifies three approaches in sociology which differ in relation to the positioning and understanding of the social. First, structure theoretical approaches, such as Marx's description of the lawful development of productivity and capital accumulation, see the social housed in structures overarching the subjects which are only perceptible from a sociological perspective. The second approach encompasses purpose oriented and norm oriented theories of social action. The former one, represented by the 'homo economicus', argues that the social is the

product of individuals' actions which, steered by self-interests, result in market mechanisms or patterns of resource allocation. The latter one, depicted by the metaphor of the 'homo sociologicus', understands the social to be 'situated' at the level of social rules which define appropriate or inappropriate behaviour. Normative social expectations and roles thus mitigate possible conflicts arising from disparate interests by establishing a consensus through rules of conduct. However, one major critique of purpose oriented and norm oriented theories is that they ignore the implicit, tacit and unconscious layers of knowledge, a point which is recognized by cultural theory. Cultural theories are concerned with "(…) explaining and understanding actions by reconstructing the symbolic structure of knowledge which enable and constrain the agents to interpret the world according to certain forms, and to behave in corresponding ways" (Reckwitz 2002b: 245-246)[4]. Four different variants of cultural theories can be distinguished, namely culturalist materialism (which locates the social in the mind), culturalist textualism (which position the social in an extra-subjective level of symbols, discourses, texts, etc.), culturalist intersubjectivism (which locates the social in interactions), and finally practice theory (which situates the locus of the social not in the mind, discourses, or interactions of subjects but in social practices) which will now be elaborated in more detail.

Following Reckwitz (2002b; 2003), practice theory has so far not produced a consistent theoretical framework but the diversity of available theoretical approaches offers a rich pool of ideas which have yet to be exhausted. Despite the lack of theoretical maturity, it is possible to mark off the boundaries of practice theory and distinguish it from other forms of cultural theory by discussing the materiality of practice theory, its implicit logic and the inherent conflict of routinisation vs. unpredictability.

Reckwitz (2003) argues that social/ cultural materiality is one fundamental aspect of practice theory. Practice is defined as a routinised "nexus of doing and saying" (Schatzki 2002) with a material existence which is found in the corporeal body and in artefacts. The body, which is neglected in intellectualized theories such as homo

[4] Symbolic structure stands for shared knowledge that allows and enables to assign socially shared meaning to the world. (Reckwitz 2002b: 246)

economicus, homo sociologicus, mentalism, textualism and intersubjectivism, finds recognition in practice theory.

> "A social practice is the product of training the body in a certain way: when we learn a practice, we learn to be bodies in a certain way (and this means more than to 'use our bodies'). A practice can be understood as the regular, skilful 'performance' of (human) bodies. This holds for modes of handling certain objects as well as for 'intellectual' activities such as talking, reading or writing" (Reckwitz 2002b: 251).

To perform a practice as a sequence of bodily movements, actors need to incorporate knowledge, know how and a practical understanding which should not be understood as explicit rules or forms of knowledge but rather as the corporeal mobilisation of knowledge without the need for explicating that knowledge. The performance of bodily practices is discernable to observers as skilful performance and as an example of a certain practice. Artefacts are the second material component of practices. Practices often do not only include subjects as their 'carrier' but also certain artefacts that are required to perform and reproduce a practice. The social of practice theory is not restricted to inter-subjective relations but the reproduction of the social practices also includes subject-object relations and "technologies of the self". This aspect of materiality will be dealt with at a later point in more detail.

The implicit logic of practices says that acting is neither reduced to pure intentionality of a subject complying with normative criteria nor the application of symbolic schemata but it is better understood as knowledge based practice (Reckwitz 2003). Special forms of practical knowledge (explicit and implicit) are expected and expressed by every practice or by different practice complexes. These forms of knowledge do not exist independent of a practice but are components of it. Subjects are 'carriers' of the knowledge of social practices. As subjects refer to the same practical knowledge inherent in a practice, the social in practice theory is the collective incorporatedness of practical knowledge which enables the repetition of routinised activities over time-space boundaries. Subjects are the carriers of multiple, loosely coupled practices. Giddens (1991) develops lifestyle as a concept that defines a "more or less integrated set of practices which an individual embraces, not only because such practices fulfil utilitarian needs, but because they give material form to a particular narrative of self-identity" (p.81). The routinised practices, which are incorporated for example into habits of dress, eating or favoured milieux for meeting

others, are open to change because of the mobile nature of a person's self-identity. The self-identity of people is reflexively organised. Reflexivity needs to be distinguished from reflection (Beck et al. 2004). While the latter is often used to refer to reflexive monitoring of actions (Giddens 1984), reflexivity describes the fact that "social practices are constantly examined and reformed in the light of incoming information about those very practices, thus constitutively altering their character" (Giddens 1990: 38). Giddens defines high modernity as a post-traditional order demanding human agents to reflexively organise their lives in relation to available social or psychological information (Giddens 1991). During the day-to-day activities, people have to answer several times "How shall I live?" and relate the answer to the temporal unfolding self-identity, for example how to behave, what to war and eat?

Finally, the strained relationship between routinization versus unpredictability shall be discussed (Reckwitz 2003). For social practices to be anchored in time, continuous repetition and reproduction is needed. A relative stability and understandability of the social is brought about by routinised actions enabled by implicit forms of knowledge. Incorporated practical knowledge tends to be used and applied time and again and brings about similar repetitive patterns of social practice. Yet, shifts do originate and to understand these changes the focus needs to be on ambiguity and misfit of practices in particular situations.

> "For practice theory, then, the 'breaking' and 'shifting' of structures must take place in everyday crises of routines, in constellations of interpretative interdeterminacy and of the inadequacy of knowledge with which the agent, carrying out a practice, is confronted in the face of a 'situation'" (Reckwitz 2002b: 255).

Such 'situations' of inadequacy come about due to the *contextuality* (each practice requires special forms of practical knowledge that match with the demands of the current situation; if the practical knowledge is not at hand or does not fit with the contextual demands, the practice needs to be modified) and *temporality* of practices (a practice as it is repeated over time harbours uncertainty about whether a further repetition will succeed and whether the practice should therefore be continued; meaning and knowledge of a practice potentially shifts as its context changes over time), the *loose complexes of practices* ('social fields' or 'ways of life' are clusters of practices which do not need to be characterized by homogeneity but are rather a conglomerate of practices with different demands on the practical knowledge) and

the structure of the *subject as a carrier of multiple, loosely coupled practices* (the heterogeneity of the multiple practices carried by a subject contains the potential of unpredictability; the need to manage different diverging practices and their routines is the cause for a persons 'individuality'). Different interpretations of practice theory tend to either emphasis the continuous/ stable character of practices or perceive them as variable and constantly changing. Reckwitz (2004) makes the point that arguing for either continuity or change is based on a theoretical misconception of practice theory. Practice theory argues against universalistic explanations and disapproves intellectual-rationalistic generalisations in favour of approaches that understand social practices within their very specific local-temporal context. To de-contextualize those empirically specific practices and generalize about either continuity or change as transcendental characteristics of practices is then to fall back into the intellectual-rationalistic tradition practice theory actually tried to overcome. Instead, rather than ascribing invariant characteristics to social practices, Reckwitz proposes to reconstitute the formation process of historically specific complexes of practices harbouring varying degrees of continuity or change. While in some practices tendencies of stability and routinization are dominant, other cultural codes of practices favour constant change and innovation.

The aspect of stability and routinization points towards the temporal dimension of social practices. Only a few researchers have chosen a temporal perspective to theorise the production and re-production of social practices. Drawing upon Giddens' distinction between durée of day-to-day experience, life span of the individual, and longue durée of institutions, Barrett and Scott (2004b) examine the emergence of electronic trading and the process of globalisation. They argue that the temporal perspective helped them to appreciate the interconnectivity of the individual level with the global and local logics associated with globalisation. Referring to Emirbayer and Mische (1998), Bourdeau and Robey (2005) as well as Cousins and Robey (2005) describe human agency as the capacity that is simultaneously oriented towards the past, the present, and the future. Conceptualising human agency with the three temporal elements allows them to analyse the degree to which people (1) are oriented to past practices and familiar routines, (2) project and imagine possibilities for reconfiguring patterns and actions, and (3) make practical and normative judgements in the present context of existing demands.

Finally, some researchers have explicitly concentrated on the temporal element of social practices (Hörning et al. 1997; Orlikowski et al. 2002). Orlikowski and Yates first distinguish between an objective and subjective understanding of time. The objective or linear notion of time is associated with a mechanical view of the world and emphasises on time commodification, work discipline, and machine time in industrial organisations. Time had always been linked with space in a pre-modern society, however, such an understanding of time qualitatively altered with the invention of the mechanical clock in the early 18th century. "The clock expressed an uniform dimension of 'empty' time, quantified in such a way as to permit the precise designation of 'zones' of the day (e.g., the 'working day')" (Giddens 1990: 17). Such a chronological understanding of time, which is particularly influential in western societies, is reflected in common metaphors (Lakoff et al. 1999). For example, time is often treated as a valuable resource which can be invested, won, or lost. Consequently, managers who understood time as a resource developed, even in the early beginning of industrialisation, efficient time management strategies in order to rationalise organisational processes or assess organisational success (Zuboff 1988). In contrast to the chronological understanding of time, the subjective, qualitative perspective on time focuses on potential opportunities and human activities (Orlikowski et al. 2002). However, Orlikowski and Yates argue, that focusing on the chronological or qualitative understanding of time misses to appreciate "how temporal structures emerge from and are embedded in the varied and ongoing social practices of people in different communities and historical periods, and at the same time how such temporal structures powerfully shape those practices in turn" (Orlikowski et al. 2002: 686). Temporal structures are therefore shaping people's actions but at the same time they are re-produced or altered by those very actions. Such a practice theoretical understanding of time recognises that time may appear to be objective (i.e. people treat it as objective as they reify or objectify temporal structures) or subjective (i.e. people produce or alter existing temporal structures). Rather than concentrating on accelerating or consolidating business processes, a practice theory with a temporal perspective focuses on variability and flexibility (Hörning et al. 1997). A lack of time should therefore be addressed by human agents who pro-actively coordinate and adjust various temporal practices. However, managing temporal practices is not an isolated task. Rather, the practice theoretical

perspective emphasises that the production and re-production of temporal practices is a social endeavour.

3.2 Towards learning and knowing in social practice

3.2.1 A cognitivistic understanding of knowledge

The Cartesian view on knowledge has strongly marked the understanding of knowledge in western cultures. It assumes that knowledge is held in the head of the individual, can be expressed in objective, codified and explicit ways, is transferable, manageable and represents a pre-given world (Cook et al. 1999; Lave 1993; Soerensen et al. 2002). Based on this understanding, the first wave of knowledge management advocated knowledge repositories, presentation slides or reports (Magnusson et al. 2000; Nonaka 1991; Nonaka 1994; Walsham 2001a). The approach has often been criticised for not appreciating the fact that explicit knowledge is deeply ingrained in tacit knowledge (Brown et al. 2001; Tsoukas 1996; Walsham 2001a). Although knowledge can be explicated in words or documents it can not be seen separately from the tacit knowledge it derives from (Brown et al. 2001).

3.2.2 Knowledge and knowing in social practices

Giddens argues that rules of social life are crucial components which are applied in the enactment/ reproduction of social practices (Giddens 1984). Rules have the form of typified schemes which do not and can not give detailed guidance for each encounter. Rather, they act as general methods and capabilities human agents draw upon in diverse situations and adjust them accordingly to influence the situational context. Giddens emphasises that most rules are not part of agents' discursive consciousness, i.e. agents are incapable of verbalising the motives of their actions. Rather, rules are part of the practical consciousness which means that agents know the conditions of their actions but can often not verbalise them. Hence, human agents count as knowledgeable depending on their discursive and practical consciousness of these rules, with an emphasis on the latter one. In general, agents are very knowledgeable about the situated context they live in but less so about larger institutions or *milieux* in which they are not directly involved. An agent is most knowledgeable about his own milieu but his knowledge declines the more the context of the milieu is left behind. Consequently, actors' knowledgeability is influenced by their spatial context but also their vertical position in society. Giddens

thus sketches people as reasonable and knowledgable agents with personal history and experiences (Tucker 1998). Mutual knowledge, incorporated in encounters, describes shared cultural stocks of knowledge agents draw upon for their actions (Tucker 1998).

A practice theoretical understanding of knowledge distinguishes between knowledge and knowing. Knowledge refers to things, elements, facts or dispositions (Orlikowski 2002) which are the residue of thinking/ knowing about a problem (McDermott 1999). Since knowledge and practice can not be separated from each other, one can not speak about universal knowledge but rather local knowledge which is always historically specific and refers to a particular practice (Hörning 2004; Reckwitz 2003). Knowledge is a tool of knowing that informs our understanding of the characteristics and limitations of individuals, groups, or objects (Cook et al. 1999). Knowing refers to action, doing, and practice and focuses on the socialisation of a person with other subjects, objects, or himself (Cook et al. 1999; Orlikowski 2002). Knowing has to be generated in recurrent actions and by doing so it creates the foundation for its future recreation. It is an ongoing social accomplishment, constituted and reconstituted in everyday practice marked by time, place, action and structure (Hörning 2004; Orlikowski 2002). Only through action and interaction can certain things be learned, as interaction opens a realm which would otherwise remain locked up (Cook et al. 1999). For example, we can only learn to ride a bicycle when we are actually sitting on the bike and trying to keep balanced as the forces you have to overcome to keep balanced only then come into existence. Orlikowski (2002) argues that tacit knowledge should be perceived as an element of knowing and that it is inseparable from action because it is constituted through such action. Only when they execute a practice do people draw upon their tacit knowledge which then becomes visible and can be observed.

Practice theory concludes that it is due to the *epistemic* and *ethical* entailments (Duguid 2005) of practice that knowledge is sometimes "sticky" (von Hippel 1994) or "leaky" (Liebeskind 1996). Epistemic entailment suggests that knowledge travels easier within/among communities which share the same practice. The gulf between people's tacit knowledge is smaller if they share collective practices due to shared sense-reading, sense-giving, thinking, and distributed understanding (Brown et al. 1998; McDermott 1999; Polanyi 1969). Hence, knowledge travels more easily

between organisations than within them if disciplinary groups form communities of practices (Wenger 1998) across organisational boundaries or if agents simply recognize each other's activities as 'knowledgeable' (Reckwitz 2002b). Managers, for example, share more similarities with counterparts of other companies than with workers of their company on the shop floor. Ethical entailment points to the fact that motivation and willingness are crucial variables in order to understand the extent of knowledge sharing and people's tendency to voluntarily constrain themselves. The point brings aspects of power and trust to the fore as people's unwillingness to share knowledge may result from suspicion about how the information will be used (Contu et al. 2003). To sum up, it is a misconception to suggest that knowledge is either sticky or leaky, rather knowledge is always sticky and leaky at the same time. Knowledge flows easily where practice is shared and where people are willing to share their knowledge but sticks where this is not the case (Brown et al. 2001).

In order to facilitate knowledge exchange, organisations should perceive themselves as a community-of-communities or network-of-communities (Brown 1998; Brown et al. 1991; Brown et al. 2001). Although the connections within networks-of-communities are less intense than those within communities, commonalities are shared across the boundaries of communities, thereby allowing knowledge to circulate. Appreciating an organisation as a network-of-communities acknowledges that work is often achieved in a non-canonical fashion by informal communities (Brown et al. 1991). While routinization of practices and a high level of homogeneity might result in ossified world views and resistance to innovative ideas, diverse practices in networks-of-communities function as a constant source to challenge traditional beliefs and ways of doing things (Brown et al. 1998). Organisations, consisting of multiple communities of practices, can use the myriad beliefs as an impetus for creativity and innovation if they succeed in tapping and utilising the diversity of existing practices within the network (Brown et al. 1991; Kellogg et al. 2003).

As was argued previously, a pre-requisite for successful and smooth knowledge sharing is the existence of common beliefs and shared practices. In contrast, discontinuities (Watson-Manheim et al. 2002), that is, gaps or lacks of coherence in the temporal, spatial or organisational dimension, could be an obstruction for knowledge exchange. However, organisational discontinuities, for example

collaboration across different communities, can be mitigated making way for continuity if one succeeds for example in clarifying mutual expectations across the different communities. Proactive engagement of knowledge brokers has proven to be positively related with overcoming existing discontinuities between organisations or communities. Mediating among communities, knowledge brokers can help to create a tacit understanding among communities (Walsham 2005) and increase awareness for other functional areas' working practices (Hayes 2000). In order to acquire legitimacy, they need to have a sufficient level of knowledgeability of the practices, working culture, and discourses of each group so as to become a trusted party and to phrase and frame the interest of one community in a way which is understood by other groups (Brown et al. 1998). Showing a high level of legitimacy then enables agents to facilitate transactions and learning by way of linking and combining practices. In addition, boundary objects function as ways of connecting different communities, as they belong to more than one practice and support several perspectives (Wenger 1998). Wenger mentions four characteristics of boundary objects. First, *modularity* describes the fact that each perspective can refer to some parts of the boundary objects. Second, the fact that all perspectives are reflected in one object is achieved by way of *abstracting*, that is deleting features that are specific to one community. Due to its versatile character, a boundary object can be *accommodated* in different practices. Finally, the standardisation of information contained in boundary objects enables their interpretation and use by different communities.

3.3 Power, control and surveillance

For Giddens power has a central position in social science although it is neglected in the work of most major social thinkers (Giddens 1979). If it is considered within the social sciences, two main perspectives of power are predominant in those discussions, namely an individualistic and collectivistic understanding. The former one treats power as the conduct of agents (transformative capacity) whereas the later one views power as a structural quality. Giddens' interpretation of the concept of power tries to overcome the aforementioned individualistic/collectivistic dualism, as he believes each of the two concepts to be insufficient in isolation, and argues that both concepts should be connected as features of the duality of structure (Cohen 1989). It seems therefore appropriate at this stage to introduce Giddens' concept of duality of structure. For Giddens, the concept of duality of structure:

> "(…) relates to the fundamentally recursive character of social life, and expresses the mutual dependence of structure and agency. By the duality of structure I mean that the structural properties of social systems are both the medium and the outcome of the practices that constitute those systems" (Giddens 1979: 69)

Transferring this understanding to the concept of power, structures of domination (the focus of those concentrating on structural qualities of power) are not simply imposed on individuals who are unable to resist, rather structures of domination are reproduced concurrently by knowledgeable agents, who could act otherwise, during the reproduction of social systems (Giddens 1984). On the other hand, individuals do not act in a 'free' present without restrictions, rather people's choices or even the option to consider certain choices are constrained and enabled by structures of domination. Power, as a transformative capacity of individuals or structural quality, depends upon the utilization of resources as the media "whereby transformative capacity is employed as power in the routine course of social interaction; but they [resources] are at the same time structural elements of social systems as systems, reconstituted through their utilisation in social interaction" (Giddens 1979: 92).

It is useful to distinguish between institutional analysis and strategic conduct as two different ways of approaching the study of system properties (cf. Giddens 1979; Giddens 1984). Strategic conduct means to bracket the institutional analysis in order to study actors' ways of drawing upon structural elements in their social interaction. Taking strategic conduct as a starting point, power can be understood as the mode in which people bring to bear facilities during the production of interaction in order to influence its course; this interpretation is in accordance with power as a sub-category of transformative capacity. Institutional analysis on the other hand brackets strategic conduct and views rules and resources as reproduced features of social systems. Looking at power from this angle, power concentrates on structural elements, namely authority and allocation, of social systems that are chronically reproduced. Nonetheless, each approach only temporarily suspends an interest in the aspects of the other one, for example strategic conduct temporarily suspends interest in the structural properties of systems (Cohen 1989).

Giddens perceives agency and power as closely connected concepts in structuration theory. Two forms of agency-oriented power can be differentiated (Cohen 1989). The first concept of power is very broad and is part of every instance of interaction.

It refers to agents' capability "to 'make a difference' to a pre-existing state of affairs or course of events" (Giddens 1984: 14). This can be done either by actively intervening in processes or passively through forbearances. If an individual loses the capability to 'make a difference', s/he ceases to be an agent. The second concept of agency-oriented power introduced by Giddens represents a sub-category of the first one. It interprets power in a relational sense which enables one to appreciate "the constitution of power in social systems in which practices and activities are related through their consequences" (Cohen 1989: 150). Power in this sense is used as a sub-category of transformative capacity, to refer to "the capability of actors to secure outcomes where the realisation of these outcomes depends upon the agency of others" (Giddens 1979: 93).

Giddens differentiates between two types of resources, namely allocative and authoritative resources, which are fundamental constituents in the structuration of systems as both sorts of resources supply agents with facilitating capabilities (Cohen 1989). Allocative resources refer to the dominion over material facilities (material features of the environment; means of material production/reproduction; produced goods) whereas authoritative resources address the dominion over human activities (organisation of social time space production/reproduction of the body; organisation of life-chances). The role of each of the two types of resources differs depending on the type of social system under consideration. Authoritative resources, for example, play a predominant role in administrative systems which rely on the coordination and control of activities across time and space. Having said that, it should not be implied that allocative resources are superfluous in administrative systems.

Resources in all social systems are asymmetrically distributed which causes varying degrees of political inequalities (Cohen 1989). Depending on the quantity, skills and effectiveness of the access to resources, actors or groups of actors take up positions of either superordinate or subordinate actors. At this point it is worth noting that the inequality of resources mentioned above can not be separated from procedural and normative inequalities of the structuration of systems. But no matter how dominant a superordinate agent, due to superior access to resources, or how inferior a subordinate might be, it is crucial to appreciate the existing complementarity between superordinate and subordinates. Superordinates are not capable of controlling subordinates' actions by the sheer employment of resources. Rather, as

superordinates rely on the compliance of subordinates in order to achieve a certain outcome, they always depend upon them which allows subordinates to retain some degree of autonomy and control over their doings which implies that power relations are always *two-way*. This leads us to the concept of a dialectic of control which says, that human beings are agents who can do otherwise and respond to forms of domination with counter-strategies (Giddens 1987). People always have the choice to act otherwise no matter how intense or broad the scope of control might be. Therefore, all forms of stable control, which Giddens coins types of rules, have their 'openings', which endow subordinates with the opportunity to influence activities appointed to them by superordinate agents. Giddens argues that the possibilities for subordinates to 'opt out' are even greater in social systems with extensive forms of administrative control as they depend to even bigger extents on the mobilization and compliance of subordinates (Giddens 1987).

'Administrative power' is defined as organisations[5]' capability to arrange and utilize authoritative resources (cf. Giddens 1987: 19). Although other sources of power exist (for example control of sanctions, ideology), administrative power is at the core of domination in social systems as it co-ordinates and regulates human activities in time and space through the manipulation of the settings in which they take place. Administrative power is therefore closely linked to the effectiveness of rules as superordinates who lack the facilities to coordinate activities across time-space can not enforce these rules (Cohen 1989). Surveillance, which means here the coding and storing of information, is closely bound to administrative power as it fosters control across time and space. But since coding of information is futile if the information is not applied to the direct supervision of human activities, administrative power is also dependent upon direct supervision as well.

Giddens identifies two different forms of praxis through which power is exercised, based on the contrasting theoretical positions of Max Weber and Michel Foucault (Cohen 1989). Following Foucault's argumentation, power is not centralized or owned by one person but institutionalized and employed through a net-like organisation. Giddens concludes from Foucault's argumentation that all social systems involve an 'institutional mediation of power' with domination being

[5] Giddens defines an organisation as a "collectivity in which knowledge about the conditions of system reproduction is reflexively used to influence , shape or modify that system reproduction" (Giddens 1987: 12).

"expressed in and through the institutions that represent the most deeply embedded continuities in social life" (Giddens 1987: 9). Analytically separated from this conception of power is a praxis marked by Weber's thinking. Weber talks about domination rather than power as he perceives the later one to be applicable to all personal qualities and circumstances, whereas the former narrows the focus down to the notion of whether commands will be followed. With this in mind, Giddens argues that in every system domination is expressed as modes of control with agents seeking to achieve and maintain the compliance of others. Rules as stable forms of control are marked by "stable relations of autonomy and dependence in social systems and are sustained by the routine practices that those in superordinate positions employ to influence the activities of the others" (Giddens 1987: 9). Thus, Giddens accepts the separation of both forms of praxis but his comment also signals that, in order to appreciate power in its entirely, both forms of praxis need thereafter to be interrelated (Cohen 1989).

Power is generated in 'power containers' – certain types of locales such as business firms, schools, universities - through the concentration of allocative and authoritative resources, with the later one primarily responsible for the level of concentration of the former one (Giddens 1987). Authoritative resources come into existence through four different kinds of sources, namely surveillance, administrative staff, sanctions and ideology. Surveillance deals with two sorts of phenomena which are only separated for analytical reasons and are closely linked in practice. The first sort refers to coded information, i.e. the collection and storage of information, about a person which are then employed "to administer the activities of individuals about whom it is gathered" (Giddens 1987: 14). The storage of information extends the opportunities for surveillance across time and space, a point which will be elaborated in more detail below. The second sort of surveillance deals with direct supervision of subordinates' activities by agents in superordinate positions. Direct supervision is inevitably restricted to locales, for example organisations, which enable the surveillance of agents' activities by their supervisors for large segments of their daily lives. As stated before, both sorts of surveillance are closely linked as the collection of information about social events or individuals may depend upon styles of direct supervision. The second source of authoritative resources is the existence of specialized administrative officials. Third, sanctions, enforced by instruments of threat, ensure that agents abide by legal rules developed by organisations. Lastly,

Giddens emphasises the role of beneficial conditions for the formation of ideology which stabilize systems as it is accepted by the members of dominant groups.

Surveillance and control

In this section I attempt to exemplify Giddens' understanding of surveillance and control, as I interweave some of the threads I developed earlier. In the following, control will refer to domination and describe forms of autonomy and dependence in social systems which are sustained by routinised practices of superordinates who attempt to influence others (Giddens 1987). Although all forms of rules depend upon the institutional mediation of power, the influence of superordinates can not be derived directly from the domination of the organisation. Rather, strategies of control need to be applied by superordinates to secure compliance from others. Here, the linkage between domination and procedural and normative elements becomes elucidated as agents not only must have access to resources but they must also know how to use them in particular circumstances (Cohen 1989).

Control differs in social systems depending on its scope and intensity (Giddens 1987). The scope of control refers to superordinates' ability to control large areas of their subordinates activities. While the scope of control can encompass large areas of subordinates' activities, it does not say anything about the means brought to bear in order to secure compliance. Intensity of control refers to sanctions superordinates employ to secure obedience. The role of information plays an important part for both scope and intensity of control, as it extends control which was formerly restricted to face-to-face interaction to the most intimate parts of social life. Having said this, however, Giddens emphasises that regardless of the scope and intensity of control, agents never lose their transformative capacity, as all forms of rules have their 'openings' which serve subordinates to influence the activities of those in higher echelons.

It was mentioned above that, among others, surveillance is one source of authoritative resource which describes two sorts of phenomena, namely administrative and supervisory surveillance (Cohen 1989). It can be argued that the application of stored information as part of administrative surveillance is one prerequisite of social systems that span time and space as the information refers to "spatio-temporal sequencing of systemic activities, the spatio-temporal movements of agents involved in these sequences, and the articulation of the outcomes of these

activities across time and space" (Cohen 1989: 166). The information can then be employed by superordinates to establish, regulate and alter organisations and to appoint settings where particular tasks are performed by designated agents at certain times and where all those activities are monitored so that more information is created and collected.

Giddens perceives disciplinary power, as developed by Foucault, as a sub-type of administrative power which derives from disciplinary procedures (regularized supervision), intended to enforce and maintain a particular behaviour (Giddens 1987). As supervision is a prerequisite of disciplinary power, it can be achieved and maintained either by administrative surveillance, for example personal records of life-histories, or by direct supervision. Giddens argues that an increase of disciplinary power can be noted in modern societies as larger areas of individuals' activities are exposed to this form of control; a development closely linked to the role of stored information in modern societies.

To understand the importance of stored information, its characteristics and the role it plays in social systems need to be elaborated (Giddens 1987). Stored information differs fundamentally from the spoken word in that texts as stored information can reach audiences far removed from its author. Therefore, information becomes separate from the immediate context of the author and the references to its natural context. Consequently, new referential possibilities are opened as text is conveyed across time and space and interpreted in ways initially not intended by the author. As stated above, stored information is not only a means for exercising administrative control as it represents a mnemonic device. Rather, storage of information is furthermore an effective means for standardizing and co-ordinating events. This can be achieved through lists or more complex descriptions of the particular events. As stored information has an enduring existence and becomes separated from its authors, it demands continuous interpretation. People who interpret information can determine 'what went on' in the past and, by doing so, control to a certain degree 'what should go on'.

Direct supervision in modern organisations describes people susceptible to direct surveillance by employers or management and which is enabled by the concentration of activities within bounded settings (Giddens 1987). Such locales offer a high level of presence-availability, i.e. the ability of people to come together (Giddens 1984).

Managers can then determine the expected behaviour of their subordinates in situations of co-presence and monitor the degree to which other agents comply to the prescribed conduct (Cohen 1989). Face-to-face encounters enable subordinates and power-holders to establish bonds of trust which reduces the need for negotiation and monitoring on a day-to-day basis. However, a prerequisite for the direct supervision in modern organisations is that disciplinary power is built around timetables which are used to order the sequencing of settings within physically restricted locales (Giddens 1987).

Supervision in modern organisations demands direct observation of subordinates' activities or ready access to relevant information (Giddens 1987). However, it is important to note that modern organisations such as schools or companies are characterised by the fact that, first, people spend only a part of their day in these institutions and, second, that the disciplinary power does not permeate all activities. The later point refers to the regionalisation of locales with zones of time and space which help to cultivate 'front' and 'back' regions; both concepts carry a spatial notion. Giddens argues that the spatial regionalisation in 'front' and 'back' regions does not necessarily overlap with 'enclosure' and 'disclosure' (Giddens 1984). But if 'back' regions and enclosure do coincide, these regions enable agents to attain forms of autonomy not permitted in frontal contexts as sanctions are there imposed upon actors to comply with the norms. "The forms of enclosure and disclosure which allow agents to deviate from, or flout, those norms are important features of the dialectic of control in situation involving surveillance" (Giddens 1984: 127). At this point it should be obvious that modern organisations are marked by an extension of the degree of disclosure as the collection and storage of information makes activity patterns visible.

3.4 Ontologies of Presence and Awareness

In day-to-day life which is mainly dominated by face-to-face situations, concepts of presence and awareness are generally taken for granted and are therefore seldom discussed. However, ICT is one factor among others which enabled the radical transformation globalisation brought about (Beck 1997; Giddens 2003). Consequently, interaction nowadays involves more and more communication among dispersed parties. The question if and how computer-mediated forms of interaction permit some intimacies of presence similar to co-located settings is therefore one of

increasing interest. Researchers have been particularly interested in the role of technology for facilitating presence and awareness in dispersed settings. It is often argued that while staying aware of others' activities in collocated environments comes almost naturally, it is much harder to maintain awareness in dispersed groupware supported environments (cf. Gutwin et al. 1996a; Gutwin et al. 2002).

In fact, the concepts of presence and awareness have been extensively discussed within the CHI and CSCW communities, however, even within the two single lines of research, definitions of both concepts are far from being unanimous (cf. Gross et al. 2005). In the following, three ontologies are presented upon which varying definitions of presence and awareness draw. Rather than introducing novel definitions of presence and awareness, this section attempts to reveal the underlying traditions behind current definitions. By doing so, networks of meaning of presence and awareness are developed for the Cartesian worldview, phenomenology and practice theory. While the Cartesian worldview is influential for the design and development of technologies, it falls short of explaining how presence and awareness are socially produced and reproduced over time. In order to overcome this shortcoming, I select and elaborate the phenomenological and practice theoretical approaches, with the latter building upon and extending the former one.

3.4.1 The Cartesian Worldview

The Cartesian worldview is the predominant research strand within both Computer-Human Interaction (CHI) and Computer-Supported Cooperative Work (CSCW). The fundamental assumption of this approach is the distinction between the subjective/mental and objective/physical, with reality being defined as a set of objects located outside of the mind (Mantovani et al. 1999; Zahorik et al. 1998). Within CHI, the concept of presence first described individuals' perception of Virtual Reality - i.e. technological devices intended to simulate the 'real world' – but was later extended to include interpersonal computer-mediated communication (cf. Ijsselstein et al. 2003; Riva 1999). While the Cartesian view perceives 'real' presence as an individual's experience in the physical world, 'virtual' reality is defined as presence in an environment mediated by information and communication technology (Steuer 1992). Information richness theory (Daft et al. 1984; Daft et al. 1986) is one representative of this rationalistic tradition. Based on the *conduit* metaphor, the theory assumes that ideas (objects) can be put into words and sent via

a conduit to the hearer who takes the meaning out of the words (Lakoff et al. 1980). Information richness theory distinguishes between real and virtual presence insofar as it is argued that real presence, i.e. face-to-face meetings, shows the greatest capacity for transferring rich information whereas technologically mediated information is always less rich. In addition, rather than perceiving different ICT channels as complementary, information richness theory defines the richness of each channel in isolation and, by doing so, fails to appreciate people's experience of the ICT landscape as a whole and consequently the importance of ancillary technologies (Kelly 2005).

Within the Cartesian tradition it is assumed that people cannot become aware of something without deliberately paying attention to it; consequently relevant aspects need to be made explicit (Leinonen et al. 2005). The quality of virtual collaboration is affected by the fidelity with which ICT recreates the objective/ physical world and makes relevant aspects explicit as to facilitate collaboration (Flach et al. 1998; Leinonen et al. 2005; Lombard et al. 1997). Leinonen et al. (2005), for example, argue that awareness of collaboration can be enhanced solely by making the different project phases of virtual collaboration transparent. Technology was perceived as a means to promote virtual forms of collaboration by way of making activities of dispersed team members visible. The technological solutions with awareness information span from video systems (cf. Borning et al. 1991), groupware systems (Boyer et al. 1998; Greenberg 1996; Gutwin et al. 1996b), collaborative authoring systems (Dourish et al. 1992), devices that are aware of their own and other devices' location (Dix et al. 2000; Hess et al. 2005) to instant messaging systems (Herbsleb et al. 2002; Nardi et al. 2000; Scupelli et al. 2005). However, rational approaches have been criticised for lifting theories which have been develop to explain specific phenomena out of established fields (for example theories of cognitive psychology which are developed under laboratory conditions to explain particular cognitive processes) and falsely using them for seemingly related problems (for example human computer interaction in the real world) (Rogers 2004). Furthermore, the Cartesian view was disapproved for its dualism between the real, physical world and the subjective, mental one (cf. Mantovani et al. 1999; Zahorik et al. 1998).

3.4.2 A Phenomenological Understanding

Disavowing the dualism between the objective and the subjective world, phenomenology as a fundamental ontology argues that 'being-in-the-world' is the primary mode of existence (cf. Heidegger 1927). Distinguishing between the subject and the object means that one has already stepped back from the pre-reflective form of experience and understanding (Winograd et al. 1987). It is assumed that people, while being immersed in their everyday activities, first, do not hold stable mental representations of the objects of their environment, second, beliefs and assumptions cannot all be made completely explicit, third, a practical understanding is more fundamental than a detached theoretical understanding, and fourth, that meaning is fundamentally social and can not be reduced to individual subjects (cf. Mantovani et al. 1999; Robertson 2002; Winograd et al. 1987). 'Being' and 'action' are understood as two sides of the same coin, since 'being' is defined as action within a worldly context. Following this line of reasoning, it is argued, technology should facilitate purposeful action (Zahorik et al. 1998). More than depending on the richness and fidelity of images, the sensation of presence is affected by the interaction /interactivity enabled by virtual and real environments.

Awareness is understood as an active embodied process that is generative of meaning and which is experienced by people as they immerse themselves in their lived world (Robertson 2002). It is argued that awareness is a learned, embodied, skilful action which is why awareness can never be a property of any technology (ibid.). Awareness can only be achieved by the skilful activities of participants in a shared space who draw upon publicly available resources which function as sources for awareness. For instance, representations of coffee cups are used by some designers as publicly available awareness resources which signal that a person is having a break. However, it is important to recognize that the meaning of those icons is not pre-given rather people learn and negotiate the meaning over time.

The main shift which takes place in phenomenology is away from the subject/ object distinction of the Cartesian view towards appreciating being-in-the-world as the fundamental state of human beings. Such a re-conceptualisation has fundamental implications for the two concepts presence and awareness. Computer-mediated presence is not any longer understood as something which has to resemble the physical/ real presence. Nor is it suggested that awareness simply results from

increasing the visibility of objects or activities. Instead, phenomenology emphasises the thrownness of being-in-the-world. The sensation of presence therefore results from a subject's purposeful engagement with the world. Furthermore, phenomenology emphasises that awareness is an embodied process and subjects become aware of something as part of learned, embodied, skilful actions.

3.4.3 A Practice Theoretical Understanding

In contrast to phenomenology, practice theory explicitly elaborates on the duality between agents and structure (Giddens 1984). By doing so, the practice theoretical understanding appreciates the ambiguity of everyday situations and the role cultural frameworks hold in managing the complexity of everyday life. People's perception of presence - both within a natural or computer generated environment - is a product of situated communities with their very own interpretive schemes, norms, knowledge and artefacts.

The application of a practice theoretical approach for studying how presence is produced and reproduced over time has been neglected until recently, Panteli (2004) being one of the few exceptions. Using a discourse analysis for examining organisational practices, Panteli (2004) shows how presence in virtual teams needs to be negotiated and renegotiated. However, her conceptualisation of presence is wanting for some other reasons. Based on a definition of presence as a "state of being there", the three discursive ways of articulating presence, namely present availability, absent unavailability and silenced availability, rather address the necessity of human agents to constantly and explicitly articulate their involvement or engagement in the shared computer-mediated environment. While this is in itself a valid point to make, Panteli understands presence too broadly which is why it remains under-conceptualised.

Distinguishing between presence, co-presence and presence availability, Giddens (1984) provides a more sophisticated conceptualisation for this discussion. Explicitly referring to phenomenology, the term presence denotes a 'being there' (*Dasein*); that is the situation of the active body oriented towards its tasks. Consequently, presence emphasises people's embodied personal engagement which is always bound towards a particular local (work) context. Presence availability describes "means whereby actors are able to 'come together'" (Giddens 1984: 123). While in traditional societies, means of transportation posed constraints on people's availability, ICT and

its separation of time and space radically changed the nature of presence availability as people can communicate without being physically present. Referring to Goffman, Giddens defines co-presence as a sensation agents have whenever "they are close enough to be perceived in whatever they are doing, including their experiencing of others, and close enough to be perceived in this sensing of being perceived" (Giddens 1984: 67-8). The notion of 'being close' is not limited to physical proximity, rather Giddens argues that computer-mediated communication also permits some of the intimacies existing in unmediated contact between those who are physically present. Co-presence is a fundamental prerequisite for social interaction and therefore for the production and re-production of social practices.

From a practice theoretical perspective, awareness is not a simple 'state of mind' or a 'cognitive ability' (Heath et al. 2002). Analysing awareness cannot be separated from human action but should rather be interpreted as an integral aspect of practice, with 'being aware of something' as one aspect of these practices (Schmidt 2002). To know what a person is aware of can only be answered with reference to certain practices. Roth et al. (2006) showed for dispersed settings and Heath et al. (1992; 2002) for co-located settings how the practical accomplishment of awareness is embedded in practices on which people rely for producing and coordinating their activities. Before elaborating on awareness as one aspect of practices, I briefly introduce an excerpt by Heath et al. to illustrate the theoretical argumentation.

Heath and his colleagues (cf. Heath et al. 1992; Heath et al. 2002) analysed in different workplaces how co-located colleagues established awareness through work practices. In the Line Control Rooms on London Underground, one control room is responsible for a particular line. Besides the signalman, the control room is staffed with the Line Controller (coordinates the running of the railway) and the Divisional Information Assistant (DIA) (provides information to passengers and communicates with the station managers) who sit next to each other. Although the jobs of the Controller and DIA differ significantly from each other, they both rely for various tasks on extremely close collaboration. A complex body of practices has been developed for monitoring each other's conduct and coordinating activities. Because of the time pressure when dealing with urgent incidents, the Controller and DIA do not tell each other what they are doing. Instead, the DIA overhears the Controller's conversations with the drivers and thereby deduces the consequences for the

timetables. He then informs the passengers about potential delays or changes to the service. Often, certain words uttered by the Controller (for example 'takes a couple of minutes') are enough for the DIA to infer what the Controller is concerned about and to assess the implications for his own conduct. The DIA is not only overhearing the activities of the Controller but also peripherally monitors the activities of the Controller to grasp what he might be looking at on the computer screens. Additionally, the Controller and DIA apply practices to render aspects of their working environment visible for each other. The Controller for example talks out loud information which is not directly addressed to other people in the control room. Without explicitly addressing a person, the Controller displays private information without directly engaging the DIA and disturbing his accomplishments. By doing so, not only does the Controller display information but also renders the course of reasoning for making particular changes visible. This selective form of displaying does not place anybody under obligation to respond but gives them the opportunity to either to align the conduct accordingly or to attain more information if required. The rendering visible of information also shows that the Controller was sensitive to practices and processes of the DIA. Furthermore, despite their distinct obligations and skills, the Controller and DIA monitor the local working environment and alert each other about events and actions that might have passed unnoticed. In one case, the DIA used bodily gestures to direct the attention of the Controller, who was interrupted by a couple of telephone calls, to an urgent matter.

This excerpt shows that practices through which awareness is established are always cooperative in character in that they intend to align people's interdependent activities (Roth et al. 2006; Schmidt 2002). Cooperative practices interpret *displaying* and *monitoring* not as mutually exclusive aspects of practices on which people draw for the production of awareness, rather both are defined as complementary. Displaying and monitoring are interrelated concepts and rely on each other, as monitoring aspects of activities that are relevant for one person requires that those aspects are intentionally or unintentionally displayed by other actors. Consequently, awareness means, on the one hand, that a person is aware of those activities of others that are meaningful to him/her. On the other hand, the very same person engages in displaying activities s/he reckons are meaningful for others. The practical accomplishment of awareness as part of practices also has a 'lightness of being' insofar as people are sensitive to the obligations of others and alert them but also

consider the level of obtrusiveness as not to disrupt the activities in which a colleague may be engaged (Heath et al. 2002). Often, computer screens, diagrams, or lines of text become momentary centres of coordination as people draw upon them to either display/monitor activities or to direct people's orientation towards them.

Especially in dispersed settings where bodily gestures or observations are not feasible does the accomplishment of awareness depend upon constant communication. Roth et al. (2006) discuss how different strategies of awareness creation were used to organise work across dispersed teams of roadway workers, train crews and railroad dispatchers. Besides formal communication, people in dispersed settings applied proactive (informal) communication strategies to render relevant information visible. Informal communication practices are referred to as courtesies as they are not formally required but they play an important role for coordinating activities in dispersed settings. Additionally, in dispersed settings people actively 'listened in' on conversations, for example radio communication, although it did not directly relate to their work. By so doing, they maintained awareness of activities and events in their environment and could adjust their conduct accordingly. Thus, like in co-located settings, people in dispersed settings accomplish awareness through displaying and monitoring activities. However, observations of bodily gestures are not feasible which is why people mainly rely on various communication strategies.

Awareness is a precarious and volatile state, whose accomplishment requires constant production and reproduction as part of social practices (Roth et al. 2006). Individuals as competent agents who are able to align activities because they know the setting, understand the processes, know how they are interrelated, and anticipate what might happen next (Schmidt 2002). Because of shared stocks of knowledge and a contextual understanding of their surrounding, individuals' observations take on an almost effortless appearance. That is to say, while agents are involved in activities, they observe at the same time aspects which are only peripherally relevant to their ongoing activities.

To sum up, the practice theoretical approach suggests that co-presence describes people's sensation of closeness, i.e. the perception that their activities and their sensing of being perceived is perceived by others, which depends on creating a social context that facilitates communication, collaboration and the development of a sense

of community. The question of co-presence is closely related to a person's presence, that is the embodied engagement with the world, and presence-availability which refers to the ability to come together. In addition, awareness is understood as an integral aspect of social practices, with human agents skilfully displaying and monitoring their activities. To know what a person is aware of can only be answered with reference to the practices s/he is engaged in.

In this section, I introduced three ontologies which inform research on presence and awareness. Although the Cartesian worldview makes a valuable contribution to the development and design of new technologies, it was criticised for its over simplistic understanding of ICT, for the dualism between the objective and subjective, and finally for drawing upon research methods unsuited to the studies of individuals and groups interacting with ICT. While the phenomenological approach overcomes the aforementioned problems, its concentration on 'subjective acts as interpretations of agents' (Reckwitz 2002b) fails to explain how individuals' activities are informed by social structures and how social structures are produced and reproduced over time. A practice theoretical approach emphasises the importance of institutionalized practices for the production and reproduction of awareness and the perception of presence.

3.5 Materiality

Recently, researchers remarked that artefacts are marginalized, unspecified and under-theorized in the IS and organisational science discipline (cf. Bakke et al. 2006; Orlikowski 2006; Orlikowski et al. 2001b). However, for a long time, scholars have shown interest in the role of technology or materiality and ways of conceptualising its relation to and implications on human existence in various disciplines such as philosophy, anthropology or sociology. While introducing some of the concepts can do no justice to the breadth and richness of the discourse on materiality, I will nonetheless outline a selection of concepts by some of the most prominent authors. By doing so, it is intended to trace and bring to the fore the main arguments as to sensitize and prepare the practice theoretical discussion on materiality.

3.5.1 Heidegger's later work: Ge-stell

The work of Heidegger, which has already been applied in the IS discipline by various authors (cf. Ciborra 2002; Ciborra 2004b; Winograd et al. 1987), addresses technology both on a broader level in relation to its role in modern society and in a more basic sense concerning the application of equipment by human beings. First,

Heidegger's (1954) later work in which he develops the term *Ge-stell*[6] (enframing) is introduced to describe man's existence in modern society permeated by technology, or to put it in another way, the relationship of technology with human existence (Ihde 1979). As part of the discourse on practice theory, we will return at a later point to Heidegger's earlier thoughts as developed in *Being and Time* where he explicitly analyses 'the worldhood of the world' and man's existence within it.

The structure of the world already appears to man in its significance which is accessible to him in the form of a revealing-concealing ratio, that is the ratio of gathered presence to what is not revealed (Ihde 1979). In its ontological sense, technology is more than a collection of things and activities, rather it should be understood as a field within which things and activities may appear as they do (Ihde 1979). Consequently, technology is a mode of revealing, that is a variant upon the revealing-concealing ratio. Heidegger uses the term *Ge-stell* to describe the essence of this technological truth as a ratio of revealing and concealing which comes only into presence with technology and could not be accomplished by man alone. In the following, one needs to ask what the term 'revealing' actually means in relation to technology. Heidegger argues that revealing rules throughout modern technology which has the character of a challenging-forth. That is, energy which is concealed in nature is unlocked, transformed, stored, distributed and switched about by modern technology with unlocking, transforming etc. describing forms of revealing. Being challenged in such a way by technology, the world reveals itself not in its natural form but "the earth now reveals itself as a coal mining district, the soil as a mineral deposit" (p. 14). Everything which is challenged by technology becomes a standing-reserve, which connotes more than a mere stock rather it designates the mode of presence of everything addressed by challenging revealing.

Man's role is then to accomplish the challenging setting-upon which is revealed as standing-reserve. This ordered revealing can only happen as man is already challenged to do so. Heidegger then asked whether man, if ordered to do so, is not himself a standing-reserve as some discussions about human resources or supply of patients for hospitals might indicate. However, he answers this question by saying

[6] Ciborra (2002; 1998) was the first to use *Ge-stell* in the IS discipline. However, he misconceives *Ge-stell* to be a self-feeding perpetuating process with man being one part of the standing-reserve. By doing so, he can not fully appreciate human agents as being free to act otherwise and the ambiguity of technology as it is implied by the concept.

that man should not be understood as mere standing-reserve. “Yet precisely because man is challenged more originally than are the energies of nature, i.e., into the process of ordering, he never is transformed into mere standing-reserve. Since man drives technology forward, he takes part in ordering as a way of revealing” (Heidegger 1954: 18). As technology is driven by man, he takes part in the ordering as a form of revealing. Thus, if the world is perceived as a standing-reserve, the human response to such a world is the ordering, that is unlocking, transforming, storing, distributing, and switching about (Ihde 1979).

Having clarified the notation of standing-reserve and man’s role within the process of ordering, the meaning of the previously introduced term *Ge-stell* should be clearer by now. *Ge-stell* is then used to describe “that challenging claim which gathers man thither to order the self-revealing as standing-reserve” (Heidegger 1954: 23). By *Ge-stell*, Heidegger means nothing technological, rather it designates the mode of revealing which rules as part of the essence of modern technology. Heidegger argues that *Ge-stell*, the dominant mode of revealing in the modern world, sends man on the way of revealing, a sending which he calls *destining* (Geschick). Destining does not carry a deterministic connotation, rather the *Ge-stell* points out a direction or provides a set of conditions (Ihde 1979). “But that destining is never a fate that compels. For man comes truly free only insofar as he belongs to the realm of destining and so becomes one who listens and hears, and not one who is simply constrained to obey” (Heidegger 1954: 25). Destining therefore constitutes the non-neutral, ambiguous character of technology. The *Ge-stell* as a destining of revealing sends man upon its way and, under way, man has the choice to either blindly obey or rebel against technology or enter into a free relationship with the essence of technology. However, faced with these choices, danger arises if man believes that Ge-stell reveals the totality rather than only a revealing-concealing ratio. In such a situation, man comes dangerously close to a point where he will be taken as a standing-reserve although he might believe to be in total control of his destiny as main creator of his environment.

Heidegger (2004) himself however believes that a free relationship with technology is possible and promotes *releasement towards things* and *openness to the mystery* as two ways of dealing with technology. Heidegger suggests releasement to indicate that technology should not be regarded as indispensable. People should be able to say

"yes" and "no" at the same time that is people should use technology but deny it the right to dominate, wrap, or confuse them. That implies, while using technology, Heidegger argues, one should always be able to let go. Doing so, Heidegger argues, evokes a way of thinking which is not purely calculative. We realize that technology is changing forms of engaging with the world although the quality of change is initially concealed. Releasement towards things also sensitises people for the underlying and often hidden meaning in technology, a comportment which Heidegger coins *openness to the mystery*. Both releasement towards things and openness to the mystery belong together as they are two dispositions of a way of thinking which opens the opportunity for a free relationship with technology.

Nonetheless, the essence of technology remains ambiguous. On the one hand, the *Ge-stell* challenges forth a particular ordering which limits alternative ways of revealing. On the other hand, the *Ge-stell* always implies a form of granting as it sends man upon his way. Heidegger concludes that in order to avoid blind obedience, one should always be aware of the danger which lies within the *Ge-stell*.

In Heidegger's work a practice theoretical account of the human-machine relation is completely missing and no explanation is given for the direct engagement of man with machines. Nonetheless, Heidegger's work is revealing for different reasons, as his concepts of *Ge-stell* addresses man's existence in a technologically saturated society. While it was argued that technology provides a set of conditions and thereby directs human actions along a trajectory, the non-neutral and ambiguous characteristic of technology does not determine people's activities. Instead, human agents have the chance to act otherwise, which requires a reflective dealing (i.e. releasement and openness) with technology.

3.5.2 Social Shaping of Technology

Research conducted under the label 'Social Shaping of Technology' (SST) encompasses a wide range of perspectives and concepts, attempting to elucidate the role between technology and society (Howcroft et al. 2004). While the overall research agenda of SST shows a coherent stream of research topics, the approaches of doing research differ significantly, partly due to varying national academic traditions. The pre-dominant schools of SST are social construction of technology (SCOT), actor-network theory (ANT), and groups which subscribe to meta-theories, such as Marxism and feminism, so as to provide rather general and universal

explanations. The common denominator of all schools of SST is the disapproval of any form of technological determinism in favour of a stronger consideration of the construction of technology during research, development and innovation phases. Rather than understanding technology as a 'black box', it is argued that the socially shaped characteristics of technology which reflect both the structural and political circumstances of its development need to be appreciated in more detail.

Social Construction of Technology (SCOT) represents a strand of research which describes the developmental process of technological artefacts as an alternation of variation and selection (Bijker et al. 1987). While traditional technology studies depict linear processes of technological development, it is argued that those interpretations are only possible with hindsight by imposing a retrospective distortion. Generally, technology is flexible in the way it is interpreted and designed. However, interpretive flexibility is silenced at later stages where the debate on the design of the artefact is closed or the artefact itself is stabilized.

SCOT has been criticized for the fact that although its main interest is in understanding the development of technology, the artefact itself is repressed in most accounts. Technology becomes mainly an arena in which political or economic issues are played out (Howcroft et al. 2004). Furthermore, early work on SST took a great interest in the accomplishments of technology developers and technology design in general but by doing so marginalized all activities during the processes of adoption and use. Orlikowski and Robey (1991b), for example, argue that engineers and software developers embed structures in technology during the development phase which later on influences the users' actions. The influence users have on changing embedded structure is limited to the arena of active participation in design processes.

Actor-network theory (ANT) is the second influential research stream of SST which was pioneered by Callon (cf. Callon 1986; Callon 1991; Callon et al. 1982) and Latour (cf. Latour 1987). While it is difficult to recount the body of work on ANT in a consistent way as the authors have revised some of the concepts over time, Walsham (2001b) entwines its major ideas which offer a good starting point for an informed discussion. ANT is interested in the formation of heterogeneous networks aligned by shared interests. In this regard, ANT attempts to trace and fathom the processes resulting in the formation of relatively stable networks and their

maintenance. Network formation requires successfully attracting and enrolling a sufficient number of allies by way of translating their interests so that they overlap with the network objectives. However, the most radical step taken by ANT is to overcome the dualism between objectivism and subjectivism. Rather than being clearly demarcated, socio-technical boundaries are fluid and disputed (cf. Bloomfield et al. 1994). In ANT, social networks not only consist of human beings and their relationships, rather non-human 'actants' are perceived as equal components within these networks (Reckwitz 2002a). The interwovenness of human and non-human actants in networks appreciates artefacts or things as irreplaceable components of social practices. Artefacts are not only being interpreted but also handled in a certain way.

ANT has been criticised for its symmetrical relation between human and non-human agents, especially for using the language of intentionality for both groups (Schatzki 2002). Intentional agency is ascribed to a wider variety of nonhuman agencies, for example scallops (Callon 1986), as a way to overcome the subject/object distinction. However, while this approach is understandable on linguistic grounds in order to develop an unbiased vocabulary[7], certain distinctions between human and non-human entities should be respected (Schatzki 2002). The status of artefacts and human agents can not be completely equal, as the former are only effective in practices insofar as they are handled by human agents and when they are sites of materialized understanding (Reckwitz 2002a). Furthermore, ANT has been criticised for concealing the perspective from which the symmetrical relationship is drawn (Ihde 2002) and addressing local and contingent effects on the expenses of marginalizing broader social structures that influences the local (Walsham 2001b).

Social Shaping of Technology tries to open the 'black box' of technology by strengthening the social agenda for studying technology. SCOT, the first branch of SST, entangles the social and political processes involved in technology development but unfortunately at the expense of theorizing the material artefact. Deriving from this tradition, ANT sets out to overcome the subject-object dualism by conceptualizing human and non-humans as symmetrical actants in social networks.

[7] However, Schatzki (Schatzki 2002) remarks that such a vocabulary already exists with the 'language of doing' which is applicable without prejudices to human and non-human.

Although ANT should be hailed for discussing the socio-technical boundary, I argued before that ascribing intentionality to non-humans is rather problematic.

3.5.3 Anti-essentialism

Finally, the discussion turns to the work by Grint and Woolgar (1997) and their critique of essentialism. Grint and Woolgar start by critiquing earlier theories on technology. Although they acknowledge the SCOT literature's attempts to open the black box of technology, they criticise it for the assumption that once issues with the artefact are resolved interpretive flexibility makes way for a closure and stabilization of the technology. Such an interpretation of technology underestimates the significance of actors' interpretation and use of the technology. Similarly, by presenting technological artefacts as 'actants' within networks, ANT is criticised for relying on definite accounts of non-human actants and their properties in the actor network. SCOT and ANT are therefore rejected for committing in one way or another to forms of *essentialism*; that is for accepting that objective technical attributes derived from the internal characteristics of the technology. For Grint and Woolgar, the challenge is to find ways of keeping the sceptical question raised by SCOT alive without ascribing objective criteria to technology at any stage. Having said so, technology should not be eradicated from the discussions to avoid substituting a social for a technological determinism. Consequently, Grint and Woolgar's objective is "to find a way of 'taking the technology seriously' without having to depend upon uninterrogated notions of technical capacity, and to account for the intermingling of technical and social without merely nurturing the view that these are essentially independent variables conjoint through 'interaction'"(Grint et al. 1997: 25).

Taking an anti-essentialistic approach, Grint and Woolgar suggest the 'technology as text' metaphor. Rather than ascribing any objective characteristics to technology, artefacts are understood "as texts that are embedded in, and at the same time constitute, their interpretative contexts" (Grint et al. 1997: 32). The capabilities of technology are never obviously transparent nor do they lend themselves to pre-defined interpretations. Rather, technology is interpretatively flexible and the focus is on the processes of construction (writing) and use (reading) of the technology. Technology is then perceived as the intermediate between the readers and their writers with their corresponding interpretations of the technology. Describing the

process of PC development, Grint and Woolgar argue that different interpretations of the intended user of the PC were reflected in the design of the computer. For the reader (user), the text of the machine was restricted to its outward appearance, that is, the case of the computer whereas for the developers within the organisations the 'real' machine was inside the case. While users received detailed instructions on accessing and connecting the machine in a prescribed fashion, the user was prohibited from accessing the interior of the machine under penalty of voiding the warranty. Inside the case, modular components such as the disk drive bore similar warning posts, remarking that the warranty would be void if the component was opened. By doing so, the producers attempted to delimit and define the relationship of the text for a putative reader. In this respect, the boundaries of the machine overlapped with the boundaries of the company and the PC's case symbolized the user's relationship with the company. Consequently, although some users resisted the proposed reading of the machine, users had a configured relationship to the machine.

The work of Grint and Woolgar is part of the broad and diverse stream of cultural theories, more specifically in this case textualism, which originated in the 1960s from the work of Wittgenstein's language-game theory, phenomenology, structuralism, poststructuralism etc. (Reckwitz 2002a). Despite their diversity, all types of cultural theories share a common denominator in the way they interpret material entities. Within this line of theory, the material world exists only insofar as it becomes an object of interpretation (Orlikowski et al. 1994, for example introduce the term 'technological frames' to describe the interpretive schemes (assumptions, expectations, knowledge) used to understand technology in organisations). More specifically, material objects exist only as 'objects of knowledge' or 'carriers of meaning' rather than as independent material entities and no independent explanatory force exudes from material entities. While the contribution of cultural theories is beyond any doubt as they demonstrate that material entities derive their meaning from certain interpretive schemes, those insights come at the costs of marginalising material entities by treating them as pure 'objects of knowledge'. Due to this conceptualisation of material entities, Reckwitz identifies three major shortcomings of cultural theories: first, a reduction of human action to 'intersubjective' interaction by neglecting human and non-human interaction; second, interpreting social orderliness in terms of discourses, languages, etc.; third, social change is tantamount to changes of cultural code. For Reckwitz, the challenge lies in

developing an alternative account which retains the insights of cultural theories but appreciates materiality in a more sophisticated way. Such theories should be able to account for human activities with things, relate social stability to the consistency of artefacts and appreciate the invention or modification of artefacts as one potential impetus among others of social change.

3.5.4 A practice theoretical understanding of materiality

In the following I try to develop an account which describes the ambiguity and non-neutrality of technology in praxis. The materiality of technology enables and constrains activities of human agents who reflectively learn to grasp its potentials. While technology is to a certain degree interpretive flexible, the materiality and its specific characteristics are also a pre-requisite for practices to be enacted.

I first present the work of Reckwitz (2002a) who suggests to interpret the material 'artefact' as an integral components of practices. Informed by a view which embeds materiality in practices I set out to develop in more detail the engagement of subjects with artefacts. In particular, I am taking Reckwitz's advice to interpret Heidegger's *Sein und Zeit* (1927) "(…) as an early attempt to formulate a practice theory which rehabilitates the status of 'things' within these practices" (Reckwitz 2002a: 215). I conclude with the work of Ihde (1979), who, drawing upon Heidegger, presents three different types of human-machine relations and their effects on how people experience the world.

Introduction into a practice theoretical understanding of materiality

Reckwitz (2002a) criticises cultural theories for their attempts to purify and separate culture from nature and to degrade the material to pure 'objects of knowledge'. By trying to de-materialize the social by way of marginalising artefacts or treating them as technical means (Reckwitz 2003), cultural theories fail to explain for the multitude of hybrids which form an indispensable component of social practices, for example non-human creatures such as the ozone hole or computers.

Reckwitz proposes to combine a practice theoretical understanding of the Wittgensteinian tradition with the recognition artefacts experience in actor-network theory (a similar suggestion is made by Rose et al. 2005a; Rose et al. 2005b). Latour's concept of social networks provides an attempt to treat both human and non-human creatures as actants in networks. Translated into a praxiological thinking,

Reckwitz maintains that using Latour's understanding rehabilitates objects as indispensable components of many practices since carrying out these practices requires not only the interpretation but also the knowledgeable handling of artefacts (Reckwitz 2002a; Reckwitz 2002b). Not only does it become impossible for social practices to be reproduced if the knowledgeable human agent disappears, likewise, the reproduction or the sheer existence of social practices would be unthinkable if things with a certain materialized understanding (for example communication media) were to disappear (Reckwitz 2002a). Hence, the reproduction of social practices is not restricted to the stable relationships between human agents but also includes routine relationships between human agents and objects (Reckwitz 2002b). Reckwitz remarks, however, that while recognizing artefacts as influential components in social practices, there are good reasons not to follow Latour the whole way and equate humans and artefacts but instead to retain an 'asymmetric' relationship between the two (Reckwitz 2002a). The distinction should not be blurred as artefacts are only influential in practices if they are handled by human agents with their embodied understanding and become the sites of materialized understanding.

Praxiologically, it follows that human actors are carriers of social practices. In contrast to the physical connotation of the term 'body', 'embodiment' describes the fact that humans' conceptualisation of the 'self' or 'society' derives from and is crucially shaped by their bodies *and* brains, especially including the sensorimotor system and emotions (cf. Crossley 1995; Lakoff et al. 1999; Williams et al. 1998). However, at the same time, the body is always already engaged in and mediated by historically and geographically contingent practices and on a daily basis falls below the threshold of perception (Crossley 2007).

Social practices are not only materialized as they are embodied 'in the flesh', rather the materialisation of practices is also reflected in artefacts (Reckwitz 2004). Grounded on this understanding it is argued that both the problem of social order and the concept of agency are materialized and the relative continuity of form is based on the materiality of both the body and the artefacts. Consequently, social order and reproduction can only be appreciated by recognizing their materialization in both human bodies and artefacts (Reckwitz 2002a).

Although they have a physical presence, in order to be effective artefacts need to be integrated in social practices (Giddens et al. 1998; Reckwitz 2002a). Artefacts

provide resources which enable and constrain ways of doing and saying. As shown by research on communication technology (cf. Ngwenyama 1998), technical materiality enables new ways of communicative practices which not only transmit messages across further distances but even more importantly transform people's perceptions and communicative practices. Social change is therefore not only cultural change but can also be triggered through modifications of the material texture. However, this is not to say that technology determines certain activities. Rather, the linkage between human agents and artefacts as components of a routinised nexus of doing and saying is a relationship of practical understanding which implicitly excludes an arbitrary use and understanding of artefacts. The application and use of technology is more than a choice among a close set of pre-defined alternatives, rather it is a situated and recursive process of constitution during which people draw upon technology in both intended but also improvisational and innovative ways (Orlikowski 2000). To put it in another way, while the knowledgeable handling of artefacts is not determined by the technology, its materiality delimits arbitrary use (Orlikowski 2000; Reckwitz 2003). In the following, referring to phenomenology and the work of Heidegger and Ihde, I will try to grasp the relationship between technology and its use in more detail.

Heidegger and the 'the worldhood of the world'

Heidegger's analysis of human's dealing with things, that is the distinction between ready-to-hand and present-at-hand, was established in the IS field by Winograd and Flores (1987). However, other concepts of Heidegger's discussion of the 'worldhood of the world' remain neglected and underdeveloped in the IS discipline. In the following, the concepts of ready-to-hand and present-at-hand are reiterated before the discussion is extended by elaborating on the spatiality of the ready-to-hand. Additionally, 'references and signs' are introduced as a further concept of Heidegger's analysis of worldhood. Following Reckwitz's (Reckwitz 2002a) suggestion, the succeeding phenomenological exposition is interpreted as an early practice theoretical attempt to rehabilitate the 'status' of things within these practices as people's orientation towards them is analysed.

In *Sein und Zeit*, Heidegger (1927) interestingly first discusses people's orientation towards things before turning in a later chapter towards 'being' as a form of 'being with others'. Heidegger sets out to develop a fundamental ontology in which all

existential concepts are grounded in the state of *Dasein* called *Being-in-the-world.* Being-in-the-world represents a unitary phenomenon which cannot be broken up into different pieces and can only be understood as a whole as the terms constitute each other. Dasein is always thrown in the world, that is it finds itself always dispersed in specific forms of Being-in which Heidegger terms *Besorgen* (concern), such as "having to do with something, producing something, attending to something and looking after it, making use of something, giving something up and letting it go, undertaking, accomplishing, evincing, interrogating, considering, discussing, determining…" (1927: 56-7). What Heidegger expresses is that people are always involved in certain forms of doing and saying. The two existential characteristics of this kind of Dasein are *Befindlichkeit* (states of mind) and *Verstehen* (understanding). Dasein, as it is thrown in the world, always has a mood by way of which it sees and understands possibilities, that is as a projecting disclosure of such possibilities it has always a mood. Understanding discloses the world from the whole state of Being-in-the-world so that things are discovered in a context and against a background as for example serviceability, usability or detrimentability.

In *Sein und Zeit,* a practical engagement with entities is given existential primacy over theoretical contemplations about things. Consequently, Heidegger first explicates how Dasein encounters and orients itself towards entities in the environment before showing how a theoretical, contemplative understanding derives from practical engagements with objects. Methodologically, Heidegger proposes analysing entities within their average everydayness as such a study of everyday Being-in-the-world would bring a phenomenological understanding of the world into view. Rather than delving into theoretical reflections, *Besorgen* (concern) needs to be fathomed in regard to its own kind of knowledge by way of which things are put into use and manipulated.

Entities which are encountered by the concerning Dasein are called *Zeug* (equipment); as concerning Dasein we encounter equipment for writing, talking, or transportation. Strictly speaking, talking about equipment is a misconstruction as it could imply an isolated object existing on its own. Instead, equipment always belongs to a totality of equipment in which a specific equipment shows its essential characteristics, that is 'something in-order-to…'. In this context, equipment always refers to other equipment through which it is what it is.

The appropriate way of dealing with equipment is not discursively or theoretically grasped, rather the true comprehension of equipment is shown in the way it is put to use. "(…) the less we just stare at the hammer-Thing, and the more we seize hold of it and use it, the more primordial does our relationship to it become, and the more unveiledly is it encountered as that which it is – as equipment" (Heidegger 1927: 69). 'Readiness-to-hand' then refers to this kind of unreflective unveiling through which equipment manifests its distinctive characteristics by way of being used productively. Peculiarly, what is ready-to-hand becomes transparent as the main concern is directed onto the work and not the tools which are used in a process to accomplish the work.

An understanding of things as purely there, i.e. 'presence-at-hand', is found upon the concept of 'ready-to-hand'. The transparency which characterises 'readiness-to-hand' is broken and equipment becomes conspicuous in moments where it fails to function. The equipment presents itself as 'present-at-hand' although the equipment has not yet degenerated to a pure thing. Rather the present-at-hand is revealed in the context of unreadiness-to-hand when our routinely and concernful dealing with those entities breaks down. The modes which bring the characteristics of present-at-hand to the fore are *conspicuousness* (tools which turn out to be damaged or unsuitable for a practice), *obtrusiveness* (equipment which is needed for carrying out a practice but is missing) and *obstinacy* (things which deter the concerned dealing and by doing so make the focus of work even more visible). In its unreadiness-to-hand, equipment does not appear as a single thing, rather through its uselessness the tool's references to the equipmental context are distorted, making the references and the whole background of the practice with its relations explicit.

In the previous discussion, issues of reference were already dealt with implicitly. Heidegger uses for example 'signs', i.e. a particular form of equipment, to grasp the phenomenon of references more clearly. We will trace Heidegger's argumentation on signs and references by drawing upon his example of cars and indicators. Controlled by a driver, indicators signal for instance at an intersection the direction a vehicle will take. However, the indicator is not only ready-to-hand for the driver who uses it, rather other road users, that is pedestrians or drivers, make use of it as they stop or give way to the car. The indicator as a sign is "ready-to-hand within-the-world in the whole equipment-context of vehicles and traffic regulations" (Heidegger 1927: 78).

Stopping and giving way when encountering the sign, other road users display appropriate forms of directional/ spatial behaviour. To understand the sign does not mean to stare at the indicator or to look in the signalled direction. Rather, by bringing particular aspects to the fore and making them explicit, the sign gives orientation to practices. As a person's engagement with the world wins orientation through such signs, they let some context become accessible and can encounter what is ready-to-hand. Due to the transparency which the readiness-to-hand of certain forms of equipment implies, other ready-to-hand equipment (signs) is needed in an easily accessible manner so as to bring the first ones to the fore.

The closeness of things which are ready-to-hand or the references of signs already implicitly assumed an underlying concept of spatiality. What is ready-to-hand has the characteristic of 'closeness' which should not be confused with measured distance in a three-dimensional space. The spatiality of equipment does not mean that it has a random spatial position. Rather, closeness is part of the circumspective and concernful dealing in practices through which the encountered equipment is comprehended against a background of existing equipment. Hence, as indispensable components of practices, artefacts are always meaningful within a context and acquire the characteristics of closeness for the knowledgeable human actants. Being encountered in practice, equipment always has its place in those very practices. Like equipment, being ready-to-hand on a day-to-day basis, places are characterized by the modus of transparency and only become conspicuous in the moments one fails to find something in its place.

De-severing and *directionality* are the two characteristics of people's experience of spatiality. De-severing is the existential modus of making farness vanish as closeness towards something is brought about. For the most part, de-severing can therefore be understood as an existential characteristic of being-in-the-world to bring something close as to have it ready-to-hand.

> *In Dasein there lies an essential tendency towards closeness*. All the ways in which we speed things up, as we are more or less compelled to do today, push us on towards the conquest of remoteness. With the 'radio', for example, Dasein has so expanded its everyday environment that it has accomplished as de-severance of the 'world' – a de-severance which, in its meaning for Dasein, cannot yet be visualized (Heidegger 1927: 105).

Bringing something close implies that de-severing is already directed towards the respective region out of which something is brought close. Practices therefore have the characteristic of directed forms of de-severance. In this regard, signs are the equipment that takes over the role to explicitly open directions for practical engagements.

As mentioned before, equipment does not exist on its own but belongs to an equipmental context through which it is what it is. Heidegger then argues that other people are always sent along with equipment. A boat at the pier, for instance, refers to a friend or a book is bought by someone or is a present from someone. Equipment is therefore encountered in a world in which it is not only ready-to-hand for myself but for others as well. Consequently, equipment which is ready-to-hand lets us encounter others. Heidegger then argues that it is part of the structure of the worldhood of the world that others do not initially exist as free floating subjects next to other equipment. Rather others exist in their concernful being-in-the-world with equipment.

However, it is important to emphasise at this point that closeness of things which are ready-to-hand differs fundamentally from discerning closeness towards people. Rather than being ready-to-hand, others are themselves Da-sein and therefore encountered in different modes of *care* reaching from indifference to concern. Indifference in relation to human actors refers to a mode of transparency when people for instance pass each other on the street without taking any notice of each other. On the other hand, Heidegger argues that even providing food or clothes that is the encounter of equipment, thereby is a mode of concernful care as it refers to others.

To sum up, Heidegger's analysis of the 'worldhood of the world' was introduced as a concept to explain the encounter equipment and other people in practice. The concept draws upon an implicit understanding of spatiality which is existential part of being-in-the-world. Concernful practices are always already directed towards something in a process of bringing it close for being ready-to-hand. Grounded in this phenomenological understanding, I will try to grasp more clearly the fundamental characteristics of human-machine relations in day-to-day practices.

Human-machine relations

In his inquiry into human-machine relations, Ihde (1979) distinguishes three different forms of relations, namely embodiment, hermeneutic and background relations. *Embodiment relations* describe a type of human-machine relations specifying events where the world is experienced through a machine. Phenomenologically, something other than the machine being used is experienced while the very machine mediates the person's experience. The machine functions as a 'means' of experiencing the world as the self is extended through that machine. Consequently, it is argued that depending on its quality a machine may acquire varying levels of transparency as it mediates the relation of the subject to the experienced world. Nonetheless, a machine's transparency always remains incomplete, that is one can talk of semi-transparency, as people remain generally vaguely aware of the fact that their experience is mediated by a tool. Using the example of a piece of chalk and a blackboard, Ihde argues that the blackboard is experienced through the chalk, more specifically, that one can actually feel the smoothness or roughness of the board at the end of the chalk. Curiously, primary experience is not given to the chalk which takes on a rather transparent existence and becomes an extension of the self. Rather, what are experienced are particular characteristics of the blackboard's materiality. However, while the medium becomes embodied, as it is not objectified but transparent, it shapes people's orientation to and experience of the word. Ihde's argumentation is in line with Merleau-Ponty's (1962) example of a blind man's stick which ceased to be an object and is no longer perceived for itself.

> "(…) its point has become an area of sensitivity extending the scope and active radius of touch, and providing a parallel to sight. In the exploration of things, the length of the stick does not enter expressly as a middle term: the blind man is rather aware of it through the position of objects than of the position of objects through it. The position of things is immediately given through the extent of the reach which carries him to it, which comprises besides the arm's own reach the stick's range of action. (Merleau-Ponty 1962: 165-6)

Going back to Ihde's example of the blackboard, using your fingers, chalk, or a dentist's probe allows a person to experience different characteristics of the blackboard. A person using a probe notes every imperfection of the surface in an amplified way; even perhaps in ways not experienced before. Ihde terms the transformation of mediated experiences *sensory-extension-reduction* relations. A medium such as a probe might amplify the way people experience and interpret the

blackboard, but a touch with the fingers would reveal other experiences, such as warmth or coolness of the board, which might be reduced or forgotten altogether. As new perspectives become available, people's excitement leads them to misinterpret novel features to be 'more real' by forgetting the extension-reduction relation. In this sense, technology is not neutral as it amplifies but at the same time reduces people's experiences.

Hermeneutic relations do not refer to experiencing the life world through machines but to experiences of machines, that is the machines become thematised. Rather than directly experiencing something, in hermeneutic relations a person is only aware that something happens elsewhere as he engages with the machine which becomes "his primary experiential terminus"(p. 12). The machine becomes like a text in which the author (world) is only indirectly present. In hermeneutic relations, as people engage with machines those machines become focal 'others' which sometimes results in ascribing human traits to machines. For instance, today's science relies more and more on instruments which become the pre-requisite for gaining the knowledge scientists are seeking and therefore turn into a central object of concern as scientists explicitly relate to them. It should be noted that the *extension-reduction relation* as explicated for embodiment relations holds true for hermeneutic relations as well.

Finally, *background relations* are unlike embodiment or hermeneutic relations in that they are not explicit and direct, rather they describe in a society penetrated by human-machine relations atmospheric background conditions. Nowadays, people constantly live amid of machines often even without noticing their presence. Rather than being in its natural state, the daily environment in the modern world is controlled by machines, which regulate the temperature or expand the boundaries of the working day through the presence of artificial light. However, such machines often function unnoticed while affording the texture of people's non-technical experience.

Ihde summarizes the implications the three types of relations have by offering the following statements. First, the use of technology is non-neutral as it transforms experiences. Technology mediated experience differs from and transforms unmediated experience as the technology not only extends the reach of the body but also enables certain actions. Second, three different types of experience with technology can be distinguished which describe humans relation with machine,

namely embodiment, hermeneutic, and background relations. Third, the structures of transformation, that is the specific shapes of non-neutrality are the *extension-reduction transformation* - describing the amplification of some possibilities while at the same time reducing others -, and *selectivity* – inclination of technology which favour certain rather other directions of its use. Finally, the term 'world reflexivity' refers to humans' tendency to form an image of the world according to dominant experiences and to reflect this image back into one's own self-interpretation. Ihde argues that in a world saturated with technology, implying transformation of experiences of the world along the extension-reduction relation, the concept of world reflexivity highlights the need to carefully investigate self-interpretations which are based on transformed experiences. In particularly, it should be born in mind that although amplifications do always stand out and are more obvious, transformations also imply reduction of experiences which are too easily forgotten.

To sum up, I proposed to re-emphasise the role of things in practices. Not only is it impossible to reproduce practices without the knowledgeable agents but also if the things required for the enactment of the practices were to disappear. Consequently, the relationship between human agents and objects is as important as intersubjective interactions. However, the asymmetric relationship between human agents and things remains, as artefacts are only influential if they are handled by people in social practices.

Furthermore, I suggested integrating Heidegger's conceptualisation of worldhood with social practice theory to explicate the status of things in practices. People encounter equipment as they engage in particular practices at particular times and locations. It is part of the concernful dealing with the world – i.e. engaging in social practices - that people draw upon equipment. The equipment always refers to a totality of other equipment which is also applied in the enactment of particular social practices. Consequently, equipment shows its characteristics within situated practices which imply a totality of other equipment. The example with the car showed that not only the driver uses the indicator when he competently drives the car. Rather, indicators are a locus of materialized understanding for the other road users as well. Functioning as a sign, the indicator reveals particular aspects of the environment which thereby acquire the characteristics of closeness for human agents. That is, engaging in practices implies that such practices are always directed and thereby

bring some things close. Signs are equipment that gets the attention of human agents and thereby explicitly opens directions for practical engagement. As people encounter equipment through directed social practices they also come across other people who also engage with the equipment in different ways. To conclude this section, the discussion of signs and things in more general explicated the enabling and constraining characteristics of material artefacts and their implications on the enactment of social practices.

3.6 Summary

In this chapter, I attempted to develop a practice theoretical understanding which shall function for the two case studies as a 'sensitising device' (Walsham 1993) for the analysis of RTC use. A practice was defined as a 'routinised nexus of doing and saying' which has a material existence in the human body and in artefacts. Not only are artefacts and bodies required to perform a certain practice. Additionally, knowledge needs to be mobilised in order to perform a practice. Actors who are the carriers of shared practice incorporate the same knowledge which makes actions and utterances collectively comprehensible. Rather than being inherent properties of practices, stability brought about by routinised actions and changes occur in situations of misfit.

Knowledge and power are two fundamental concepts which are regarded as crucial in order to complement a practice theoretical perspective. Although knowledge and power are not explicitly discussed during the analysis of the two case studies, they nonetheless distinctively shaped my outlook on and interpretation of the activities in the field. More specifically, in the discussion on knowledge I argue that knowledgeability depends on the discursive and practical knowledge of rules which guide but not direct human agents. The term knowledge refers to things, elements or facts but is nevertheless historically specific and linked to particular practices. Contrastingly, knowing is associated with action or doing and has to be produced and reproduced in every day practices. Furthermore, the discussion of knowledge and human agents as carriers of shared practices reasons why groups or individuals collaborate successfully. Knowledge travels easier when people share the same practices and are willing to collaborate.

The theoretical perspective also deals with issues of power and control in order to explain social dynamics, the relationships among subordinates and superordinates,

and forms of coordinating and controlling activities across time and space. The concept of power refers to the allocative and authoritative resources people and organisations draw upon in order to secure certain outcomes. The asymmetric distribution of resources brings about subordinates and superordinates. Conceptualising the potential of superordinates to coordinate activities in organisations, administrative power refers to the utilisation of authoritative resources to regulate human activities in time and space. Disciplinary power, a sub-type of administrative power, derives from disciplinary procedures which intend to enforce and maintain a particular behaviour. To secure the compliance of others, superordinates need to apply strategies of control and surveillance. However, the discussion also showed that superordinates can not dominate by the sheer deployment of resources. Rather, the dialectic of control indicates that all forms of control have their openings.

Additionally, this theoretical perspective is supplemented by work on awareness, presence, presence availability, and co-presence. The discussion on presence explicitly addresses how people engage with and relate to each other and thereby establish and reproduce social practices. The term presence is influenced by phenomenology and describes the situation of the active body oriented towards its tasks. Presence availability denotes means whereby actors are able to come together. Finally, co-presence is a fundamental prerequisite for social interaction and describes the sensation of closeness and of being perceived. Awareness on the other hand focuses on how people gain an understanding of their counterpart's activities and make their own activities transparent to their colleagues. Awareness is understood as an integral aspect of social practices with being aware of something as one part of these practices. Practices of awareness production are always cooperative since displaying and monitoring activities are always recursively related. The discussion also showed that the condition of awareness is always precarious and volatile. Thus, constant production and reproduction of social practices is required to sustain a high level of awareness.

Finally, the section on materiality first gives a selective overview of theories which deal with materiality in different ways. The discussion intends to prepare the ground for a practice theoretical perspective on materiality which synthesises arguments from Reckwitz and Heidegger. More specifically, practice theory interprets artefacts

as enabling and constraining but does not explicate in more detail the implications of materiality on people's work practices. Therefore, the discussion of Heidegger attempts to rehabilitate the status of things in social practices. *Dasein* describes what it means to be thrown in the world and to be dispersed in specific forms of being (concern). The entities which are encountered by the concerning *Dasein* are called equipment. Equipment always belongs to and refers to a totality of equipment, called equipment context. Signs, a specific form of equipment, give orientation to practices and thereby let some context become accessible. They de-sever and thereby make farness vanish. Consequently, practices have a directed form of de-severance. However, equipment not only directs social practices but it also refers to others who use the particular equipment during their day-to-day activities. Consequently, practices are always directed and thereby bring things and people close.

To sum up, while the three concepts presence, awareness, and materiality provide fresh insights into the use of RTC, knowledge and power form the backdrop which affects and fundamentally shapes the understanding of the two case studies and the resulting analysis.

Chapter 4

Research methodology and research design

In the literature review, I argued that research has to take account of the social, organisational and processual dimensions in order to appreciate the implications of information and communication technologies. Thereafter, I developed social practice theory as a conceptual lens for conducting the empirical investigations. Both the literature review and theory share a processual understanding of organisations (Markus et al. 1988; Van de Ven et al. 2005) that is sensitive to context, time, change, continuity, beliefs, desires, and power (Tsoukas 2005). In the following, I shall argue for and justify the aptness of an interpretivist research perspective to accommodate the theoretical approach. Furthermore, I found that an interpretivist approach is well suited to analyse in a processual and contextual manner how people make sense of RTC technology. In a confessional manner (van Maanen 1988), I shall then delineate the choice of the research sites before turning towards issues of data collection and analysis. Finally, I shall make an effort to critically reflect upon the overall research endeavour.

4.1 Interpretive field studies

All research must have a theory of reality and an understanding of how reality can be depicted through knowledge-seeking efforts (Zuboff 1988). While such research philosophies are open to debate, they are never subject to ultimate proof (ibid.). Orikowski and Baroudi (1991a) identify and discuss three main research traditions in the IS discipline, namely positivism, interpretivism, and critical research. In their analysis of journal publications, Orlikowski and Baroudi identified positivism as by far the predominant research stream in IS, however, more recent investigations suggest that interpretivism is constantly gaining acceptance (Walsham 1995a). I shall only concentrate on interpretivism and refrain from discussing positivism and critical research as both approaches are not central to my endeavour and are elsewhere documented at length (cf. Bryman et al. 2003; Orlikowski et al. 1991a).

Interpretivism starts from the *ontological* position that reality and knowledge thereof - such as language, consciousness, meanings, documents, tools, or artefacts - are

social products by human agents, (Klein et al. 1999; Walsham 2006; Williams 2000). The social world is not regarded as objectively given, rather it is produced and reproduced through interactions between human agents. Hence, multiple realities exist – for example the reality of the researcher and those being investigated – and interpretive research tries to report of these realities with their intersubjective meanings, socio-political and symbolic actions (Creswell 1998; Orlikowski et al. 1991a). The intention of interpretivism is therefore to fathom the enactment of particular realities by human agents through their participation in social processes and to show how social actions are constituted through those very realities. Interpretivism regards people as knowledgeable agents whose context-dependent actions it intends to understand from their point of view (Flyvbjerg 2001; van Mannen 1979). Following this line of argumentation, interpretive research aims at appreciating technology in organisations by "producing an understanding of the *context* of the information system, and the *process* whereby the information system influences and is influenced by its context" (Walsham 1993: 4-5).

The *epistemological* foundation of interpretivism, that is the question of what is regarded as acceptable knowledge (Bryman et al. 2003), does not rest as in positivism on the belief in capturing universal laws through hypothetical deductions by researchers who are detached from the research process. Rather, meaning is produced and re-produced as part of social practices and researchers aim at understanding phenomena through assessing the meaning that human agents assign to them (Orlikowski et al. 1991a). Within this process, researchers can never assume a value-neutral stance rather they are directly engaged with those they are studying (Creswell 1998). The prior beliefs, assumptions, values, and interests a researcher holds are always going to affect the investigations (Orlikowski et al. 1991a) and researchers should admit their historical and intellectual basis and openly report their biases (Klein et al. 1999).

Lakoff and Johnston (1999) rightly make the point that one of the oldest philosophical questions is the problem of what is real and how we can know it. The Cartesian philosophy introduced the dualism between the mind and the world. In this tradition, the mind was separated from the body and the world and could not be directly in touch with the world. Once the distinction was made and the mind was

taken to be disembodied, the gap between mind and world posted a constant problem for philosophy and science.

The prominent role of materiality in the theoretical chapter, on the one hand, and the emphasis on interpretivism on the other almost provoke questions and ask for clarification concerning the existence of material objects. That is, do objects exist in an external world independent of human agents or are they objects of knowledge whose meaning is socially negotiated? Arguing for the former, realism – the prevalent ontology in the natural science - suggests that reality is given independent of the observer (Zelic et al. 2005). Realism argues that there is an external reality to which scientists direct their attention (Bryman et al. 2003). That is, reality exists separately from our descriptions of it but can be understood through the use of appropriate methods (ibid.). Such knowledge of the external world is supposed to be stable and the concepts and forms of reason are characterised by the external world in itself (Lakoff et al. 1999). The scientific discourse reinforces such an understanding as it reiterates that scientific methods and results are objective but thereby confuse the ambiguous words 'object', 'objective' and 'objectivity' (von Glasersfeld 2001). 'Object' generally describes an item isolated as part of someone's experience, e.g. the chair you sit on. The latter two terms are intended to imply direct knowledge of things as they are *in-themselves*. Objectivity therefore assumes that observations could be made without an observer.

Appreciating the paramount importance of the human body and artefacts in social practice theory, I therefore advocate 'embodied realism' (Lakoff et al. 1999) as an alternative to realism. Basically, embodied realism argues that we are coupled to the world through our embodied interactions. Lakoff and Johnson argue that an embodied realism is grounded in people's capacity to function successfully in the physical world. "It gives up on being able to know things-in-themselves, but, through embodiment, explains how we can have knowledge that, although it is not absolute, is nonetheless sufficient to allow us to function and flourish" (ibid.1999: 95). Following an embodied realism, a person's understanding of the world is determined by a variety of factors, such as the sensory organs, the ability to move and manipulate objects, the structure of the brain, the culture, and the interaction with the environment. Consequently, what is taken to be true depends on the embodied understanding of the situation. Thus, embodiment keeps truth from being purely

subjective or relative as people's bodies and their engagement with the world is basically the same. Consequently, while embodied realism acknowledges the relative nature of knowledge and culture, it is not an extreme form of relativism in that embodied concepts enable us to function successfully in the world and form our basic understanding of it. Such an understanding is therefore in line with the previously outlined position on interpretivism but restates and clarifies the way people relate with the world.

The research method for interpretive investigations is often the in-depth case study, where the researcher conducts fieldwork over a reasonably long period of time so as to directly observe how events unfold (Walsham 1995b). Meanwhile, in-depth interpretive field studies are generally accepted in IS research (cf. Boland et al. 1989; Karsten 1999b; Karsten et al. 1998; Schultze 2000; Schultze et al. 2000; Walsham 1993) and other disciplines such as organisational studies (cf. Barley et al. 2004; Kunda 2006; Pettigrew 1987; Pettigrew 1990).

In contrast to positivism with its nomothetic research devoted to discovering universal law-like relationships, idiographic research is concerned with the concrete reality of specific incidences (cf. Tsoukas 1989; Williams 2000). The potential contribution of in-depth case studies has been disputed quite extensively in the scientific community. While some researchers justified their approach by embedding case studies within the positivist discourse (cf. Eisenhardt 1989), others regard case studies as complementary or even better suited for certain research issues (Walsham 1995a).

No matter which justification is chosen, the objective of interpretative research is to come up with analytical generalisations, that is to generalise from empirical to theoretical statements (Lee et al. 2003; Yin 2003). Although authors frame and position their contributions for a certain audience, there is no guarantee for the success of such strategies nor is it controllable that the contributions are taken up by the intended readers (Barrett et al. 2004c). Building upon the discussion of analytical generalisation, Walsham (1995b) distinguishes among four different types of generalisations that derive from case study research, namely concepts, theory, specific implications, and rich insights. For example, Heidegger's concept of 'presence-at-hand' which was introduced earlier can be understood as an attempt to relate particular, contextual everyday phenomena to abstract categories that apply to

multiple situations. Generalisations may result in theory if an integrated cluster of concepts or propositions emerges (for example Heidegger's understanding of world-hood). Specific implications, the third type of generalisations, are drawn from particular domains of action but may provide insights for related work in different organisational contexts. Finally, rich insights refer to generalisations which can not be categorised under the previous three types. These four types of generalisations emphasise according to Walsham the fact that the validity of conclusions does not correlate with statistical generalisability but rather with the plausibility and cogency of the logical reasoning.

Primarily, the thesis will focus on conceptualising as it develops selected aspects of the empirical findings. However, my optimistic hopes are that the cases may provide rich insights that go beyond the explicated results.

4.2 Selection of research settings

In a process that lasted from August 2005 until May 2007 I studied the use of Skype and Sametime 7.5 at two companies, namely local.ch and IBM. Through my field work, which became a source of excitement and learning but also frustration and exhaustion, I gained insights into the innovative but also conservative application of such tools.

Having used Skype myself in a private and professional setting, I was eager to study the implications of these new applications within the business context[8]. The technology therefore guided the selection of the research sites which would allow me to study people's situated use of the technology. The advantage of this strategy is that the novelty of the tools and people's unfamiliarity with them brings about a heightened sensibility as people consciously engage in making sense of the application (Zuboff 1988). On the other hand, letting the technology guide the case selection entails additional risks resulting from high implementation failure rates (Schultze 2000). As it turned out, both aspects proved to hold true in the two cases.

After a year of reading and sketching out tentative research propositions, I approached the university representative of IBM Ireland and talked with him about

[8] Prior to the two case studies on which the thesis is based, a Delphi study (Frößler et al. Forthcoming; Klein et al. 2006) was conducted to learn about experts' interpretation of the technology. Furthermore, a pilot study on the use of Skype (Frößler 2006a; Frößler 2006b) helped to clarify the focus of the case studies and to sharpen theorizing about RTC.

my project. At that time, I was particular interested in IBM's Workplace Collaboration Services (WCS), a software programme that bundled Lotus Notes with real-time communication features. He put me in contact with Brian O'Donovan, at that time chief of the Dublin Software Lab (DSL) and Centre of Advanced Studies (CAS) which aimed at facilitating knowledge exchange between IBM and university partners. The DSL was involved in developing WCS and, at our first meeting in August 2005, Brian welcomed my suggestion to study the social and political implications of WCS so as to better appreciate its implications. While I proposed studying and contrasting the use of WCS within the business and software development context, no detailed discussion took place during the first meeting regarding the potential research setting. However, I left the IBM campus in the north of Dublin happy as I had finally access to a promising research site. I was registered as a CAS researcher which gave me the permission to conduct research within IBM. Additionally, Maria Hyland, a manager at the DSL, was appointed as my mentor at IBM.

Over the next couple of months I immersed myself in the activities at the DSL and attended several workshops and presentations. I was glad to realize that WCS was high on people's agendas and presentations dealt with the introduction of the application within the user community. Furthermore, I met Maria on several occasions to discuss the research project with her in more detail. We agreed to concentrate on the software development and business community at IBM Dublin and Maria gave me the contact details for some of the team leaders at the DSL. Subsequently, I met three managers in November 2005 and talked with them about their experiences with WCS. As it turned out during those discussions, the early pilot version of WCS was regarded as unreliable for their day to day work and was therefore not used; though all three were convinced that WCS was the application of the future as soon as it would be more stable. Interestingly, during the interviews it surfaced that all of the managers heavily relied upon Sametime and one of them – Donna Maloney – gave a vivid account of her work practices with Sametime.

I mentioned the results of my discussions with the managers to Maria during one of our meetings in November 2005. She explained that WCS was currently lagging behind the expected level of user acceptance, mainly because e-mail and Sametime were not yet integrated. As the integration of Sametime was expected to happen in

March 2006, I decided to delay my project until then and hoped for a positive change in user acceptance. My optimism was partly justified since the implementation of WCS became one of the DSL's strategic objectives in 2006. However, the initial deadline for the integration in March was first postponed until the end of April and then indefinitely. Consequently, in April 2006, despite being in contact with IBM for over 9 months, I found myself in the situation of not having a concrete case. Indeed, my strategic intention of following the technology proved to be affected by implementation failure and frustration loomed as I saw my dissertation under threat.

In May 2006, my supervisor put me in contact with David Steiner, one of his former PhD students, who was then the CEO at local.ch, an internet start-up which was founded only ten months earlier. David signalled an interest in my research project and mentioned that they were using Skype and Wiki at local.ch. During subsequent phone calls and e-mail interactions, David expressed an interest in collaborating so as to hear from an outsider about the strengths and weaknesses of local.ch. Although he was convinced that their current achievement was a big success, David maintained that he wanted to understand why it worked so well in the end. He was very conscious about the importance of the socio-organisational factors for the success of the project. Thus, my suggestion to include the organisational and social dimension in the analysis of Skype found David's consent. After my research proposal was reviewed and approved by all employees at local.ch, access was granted. In particularly, we agreed that I could interview all employees at local.ch. Since employees from external partner organisations had to be paid by local.ch on an hourly basis, access was only granted under the restriction that they agreed not to bill for the interview time. Additionally, local.ch would not cover any additional costs (for example flights from Dublin to Zurich, accommodation in Zurich), however, my research centre funded the project. I was therefore quite independent in terms of obligations towards local.ch but willingly agreed to present my findings at the end of the project. Finally, I embarked on my first field trip to local.ch in August 2006.

At the same time, I maintained my contacts with Maria at IBM who reported about a new version of Sametime which showed strong resemblance to the features offered by Skype. I knew from my previous discussions with the team managers at IBM, that Sametime was broadly accepted and heavily used within the DSL. Additionally, my first visits to local.ch had made me aware of the striking organisational and cultural

differences between local.ch and IBM. I saw the opportunity for a multiple-case study with polar cases (Eisenhardt 1989; Pettigrew 1990) that would improve my theorizing about the usage of Skype and Sametime (Bryman et al. 2003). Both settings were concerned with software development and used comparable applications, however, the organisational and social contexts differed significantly. I therefore turned down my plan to study WCS and decided to concentrate on Sametime instead. At the end of November 2006, I got in contact with Donna Maloney, the team manager who talked so enthusiastically about Sametime when I interviewed her in November 2005. After presenting my research project to her, she agreed to support me and granted access to study the application of Sametime within her software development team. I started with my fieldwork at IBM in March 2007, briefly after bringing my work at local.ch to a close. After the completion of the fieldwork I found that the two settings were not only marked by differences of the organisational and social context. Rather the case studies were examples for innovative and conservative use of RTC. For several reasons, this reconfirmed my decision to pursue a multiple-case study approach with polar cases. First, so far, no in-depth case studies on the use of RTC have been published. Presenting two polar case studies with diverse outcomes makes a valuable empirical contribution as it re-emphasises that the implications of RTC are context-specific and depend upon its use by particular people at particular times and places. Thus, the two contrasting cases expand our understanding of RTC use and show that the outcome of RTC is far from being predictable. Second, choosing a multiple case study approach had some analytic benefits. The two case studies allowed me to compare and reflect upon the circumstances in which concepts will or will not hold (Bryman et al. 2003; Yin 2003). Interestingly, I found that some interpretations of RTC could be found in both settings. Such empirical findings gave strong evidences for the enabling and constraining role of RTC. Nonetheless, the two cases told the story of innovative and conservative practices of RTC use. Having two polar cases helped me to analyse the circumstances that contributed to the diverse outcomes, despite the fact that the initial interpretation and perception of the technology was the same.

Besides having a clear understanding of the particular genre of information and communication technology I aimed to investigate, the overall process of selecting the research sites proved to entail elements of serendipity and chance. But my

persistence also helped to capitalize on my relationship with IBM and to finally come up with the multiple-case study design.

4.3 Fieldwork and data collection

Fieldwork at local.ch

When I started my fieldwork with local.ch in August 2006, the objective was not to solely concentrate on the application of Skype but to understand it as part of the interplay between the outer- and inner-context and the process of organising work (Pettigrew 1987; Pettigrew 1990). Such an endeavour is associated with particular demands regarding the positioning of the researcher and data collection.

The aim of my first 2 day trip to Zurich was to position and present myself as a neutral participating observer who does not have a stake in the project or takes side with the management (Bryman et al. 2003; Walsham 2006). Having gained access to the company via David, I was particularly conscious of the latter aspect. I was also introduced to the rest of the team and some of the external contractors. The latter was particularly important, as three externals from two different organisations agreed to be interviewed free of charge. All in all, I have legitimate reason to believe that my presence was accepted and regarded as unproblematic since interviewees openly expressed during the following months their views and in some cases shared personal and sensitive information.

Besides socializing with the team members, I also spend during my first visit three hours at some point with David, during which he presented his understanding and vision of local.ch. He sketched out the envisioned organisational structure and spoke eloquently about the means for facilitating and realising it. While David functioned during the first visit as the key informant (Bryman et al. 2003), I had to caution myself time and again not to rely to heavily on his accounts. Consequently, I planed to give voice to alternative representations which were not in line with David's official definition (Knights 1995).

I returned to Dublin from my initial trip with permission to access the Wiki of local.ch which functioned as the main knowledge database. Over the next month (Sept. 2006) I reviewed documents, strategic business plans, and entries on the Wiki which gave me a better understanding of how events unfolded chronologically, how the project was structured, and, even more importantly, introduced myself to the

project-specific terminology. Furthermore, I was invited to group chat discussions on Skype (see chapter 5 for a detailed account of the group chats at local.ch) which I constantly monitored over the next couple of months so as to appreciate what people were working on or talking about. All these digital traces (Barley et al. 2001) gave me invaluable information on how work was actually conducted at local.ch and prepared me for my forthcoming field trips. More specifically, interviewees were only practically conscious of some aspects of their behaviour (Giddens 1984) and digital traces provided invaluable cues I used to illustrate my arguments during the interviews and to probe further into these issues. As part of this work, I analysed the group chats in more detail to identify communicative practices people enacted within these chats (cf. Im et al. 2005; Yates et al. 1992; Yates et al. 2002; Yates et al. 1999).

The information from Wiki and Skype therefore helped me to refine my interview questions and to adapt my language to the prevailing jargon when I returned to the site. At the end of September and November 2006 and the beginning of February 2007, I spent a week in Zurich. During that time, I conducted fifteen semi-structured interviews (see Table 2) which lasted between 47 minutes to three hours (*mean:* 78 minutes; *median:* 68). The interviews were conducted in German and the author translated the excerpts which are used in the case study from German to English.

Section	***Manager***	***Software developer***	***Business***	***Partner organisation***	***Total***
No.	3	6	3	3	15

Table 2: Number of interviews grouped by job roles

Generally, interviews took place in a separate meeting room at the local.ch headquarters, however, I had to revert twice to the smoking area and two interviews were conducted at the Namics office in St. Gallen. I prepared a list of questions beforehand which loosely guided the interviews but left enough space to improvise and trace interesting themes as they emerged during the discussions (Myers et al. 2007). At the beginning of each interview I asked for permission to record the conversation (all interviews expect one were tape-recorded with an unobtrusive digital dictating machine). I started each interview with a brief overview of the research project and rationalized my interest in the social and organisational aspects of people's working environment. I explicitly mentioned that the confidentiality

would be protected and all interviews were to be anonymised[9]. The introduction took up to four minutes; however, I found that investing the time was worthwhile as it took the formality out of the interview setting.

During my stays at the local.ch headquarters I was able to observe how people worked closely together. In particular, I was able to study those visible cues that were lacking in the off-site Skype conversations. I also got a feel for the atmosphere and dynamics in the open plan office. Additionally, one developer allowed me to shadow his work for half a day which gave me further information on what was actually happening on the computer screen, which programs he was using, how he was combining them, and how he was interacting with co-located and dispersed colleagues.

My daily presence enabled me to socialise and develop social bonds with the people at local.ch. Informal interactions took not only place in the office, but at several other occasions, such as lunch breaks and social events after work. Those opportunities gave me further insights into people's doings and sayings and the intensity with which the local.ch reality formed a part of people's life.

To sum up, different data sources - namely semi-structured interviews, observation, document analysis, shadowing, genre analysis – were applied which allowed me to address and investigate the phenomena from different angles as to confirm, question, and reflect upon my emerging interpretation of the case (Glaser et al. 1967). After concluding the field work, I returned to Zurich for a final visit in April 2007 to present my preliminary findings to an audience of local.ch employees and external contractors. The presentation was received positively and provoked further discussions which strengthened my confidence in the findings.

Fieldwork at IBM

In the beginning of March 2007, I started my fieldwork at IBM. Having just recently finished the project with local.ch, I intended to approach the site in a similar fashion. The objective for the first month was to start with the document analysis, monitor people's interactions, and attend the team meetings. Interviews would be conducted in the following months.

[9] The names of all interviewees in both case studies have been made anonymous.

Donna introduced me to the team during a team meeting in March and I took advantage of the situation to briefly explain the objectives of my project to the team members. As concerns were publicly raised during the meeting that the project could be intended to measure the team or individual performances, Donna and I assured everybody that this was not the case and that I would join the team for the next months as a neutral observer.

Over the next two and a half months, I spent every week three to four days at the Dublin Software Lab (DSL). The lab was a large open-plan office with desks for over two-hundred developers. Though no desks were available in close proximity to my team, I was able to secure one of the few separated offices - two of which were particularly dedicated to external researchers. Having my own office proved beneficial for the interviews as private space was rare at the DSL. However, sitting at the desk in the office throughout the day left me cut of from the activities in the DSL and more importantly impeded developing social ties with the team members. Opportunities for socialising and monitoring were therefore scarce and mostly limited to conversations after team meetings, at the water cooler, or on the corridor. Additionally, rather than taking lunch breaks together as a team, people spent their breaks in small groups to which I was generally not invited.

The document analysis was significantly hampered by a malfunctioning Lotus Notes account which could not be fixed over the whole duration of the project. I was therefore left with no access to the knowledge database (Lotus Teamroom) and did not receive group e-mails that were disseminated within the team. Furthermore, I was not able to use Sametime without the missing Lotus Notes account. It was only at the end of my work that I could use someone's computer for one hour to access the teamroom. During the first three weeks, my work was therefore limited to searching the internet and intranet and attending the weekly team meetings. The latter provided information on the current activities in the team which helped to get an initial understanding of people's job roles, responsibilities, and the overall team structure.

Since no progress was made in relation to the Lotus Notes account, I decided after three weeks that in order to extend my understanding of the case, I needed to alter the initial strategy and start the interviews before completing the document analysis. Over the next six weeks, I conducted fifteen semi-structured interviews (see Table 3) which lasted from 33 minutes to one and a half hours (*mean:* 60 minutes; *median:* 60

minutes). In particularly, rather than artificially extending interviews, I decided in two cases to cut them short after 33 and 42 minutes as interviewees proved reluctant to talk about their work.

Section	***Manager***	***Technical lead***	***Developers and Testers***	***Total***
No.	2	5	8	15

Table 3: Number of interviews grouped by job roles

All interviews, they took place in my office at the DSL, were tape-recorded. The atmosphere in my small office was strikingly different from the rest of the open-plan office which became even more obvious when the door was shut and the buzz coming from the open-plan office ceased. Again, at the beginning of each interview I asked for the permission to record the conversation, gave a brief overview of the project, rationalized my interest in social and organisational aspects of their working environment, and guaranteed the protection of the confidentiality. I regarded the latter to be of particular importance as I remembered the concern raised during the first team meeting. I therefore emphasised time and again my role as a neutral observer within the team. Nonetheless, interviewees seemed to be tense at the beginning and it took more time and effort to ease the tension. In particular, the personal anecdotes I slipped into the conversations were effective to break the ice maybe because they vividly demonstrated my interest and concern for the issue. A list of questions was prepared for the interviews. While some questions aimed at testing and extending observations and findings from the local.ch case, I was conscious of providing space for topics to emerge.

To sum up, the data collection was much more dependent on interviews as the chief source. Clearly, this had implications on the questions asked during the interviews. Not being able to monitor ongoing Sametime discussions hampered attempts to identify communicative practices and to address these within the interviews. Without such targeted probing, interviewees seemed to struggle to express their actions. Though I continued to enquire in detail into the communicative practices enacted with Sametime, my questions reverted back to the general perception of the technology as interviewees felt more comfortable to addressing those questions.

4.4 Data analysis

Data collection and analysis formed an iterative process in both case studies (cf. Glaser et al. 1967; Walsham 1995b), however, the approaches differed due to the varying time frames. At local.ch I had two months in between each field trip which were used to transcribe interviews verbatim. I then read and coded the transcriptions with atlas.ti to get a better understanding of the case and looked for interesting themes. During the next visit to Zurich, I then felt more comfortable as my interpretation of the case had matured and the questions became more focused. It was then after returning from my last visit from Zurich to Dublin that I systematically re-examined the data and analysed them in more detail. The timeframe in the IBM case required a different approach. After each interview I made notes to identify interesting themes and issues that had emerged during the discussion. I followed up on these themes during the subsequent interviews. It was then only after I concluded my fieldwork with IBM that interviews were transcribed verbatim and coded.

I had familiarized myself with the qualitative data analysis tool atlas.ti during workshops and previous projects and this was used for coding. To learn from the data, my analysis was loosely informed by grounded theory (Glaser et al. 1967). I generated and organised themes in categories and as I read and re-read the transcripts those categories were further refined through the development of properties. For, example, the empirical data of both case studies indicated that status information and blinking chat windows formed two important themes. Subsequently, the two themes became categories which were further refined through the development of properties. However, as Walsham (2006) already suggested, I openly admit that coding remained a subjective process of thinking and reflecting about what happened in the field.

As prominent themes emerged, I turned towards the literature on practice theory to find explanations for the observed phenomena. More specifically, social practice theory provided the guidance for the general direction of my enquiry. However, at this stage I immersed myself in further theoretical strands which promised rich and convincing explanations for the empirical phenomena. In particular, further influences came from work that was rooted or could be incorporated in social practice theory; for example various work on knowledge/learning (cf. Chaiklin et al. 1996; Contu et al. 2003; Duguid 2005; Lave et al. 1991; Tsoukas 1996), awareness/

co-presence (cf. Giddens 1984; Roth et al. 2006; Schmidt 2002), or materiality (cf. Heidegger 1927; Ihde 1979). As my theoretical understanding evolved, I returned to the empirical data, re-read the transcripts, and refined the previously developed categories and properties. For example, combining practice theory and Heidegger's understanding of equipment provided a theoretical concept which gave a plausible explanation for the importance of status information and blinking chat windows.

The three elements theoretical perspective (for example structuration theory), the research method (interpretive case study), and approach for data analysis (elements of grounded theory), formed as part of the overall research design closely linked components which informed each other (Tan et al. 2007). That is, social practice theory does offer limited guidance regarding the conduct of the research and may benefit greatly from the in-depth case study approach. On the other hand, structuration theory may help to strengthen the findings of in-depth case studies. Grounded theory facilitates learning from the data and avoids getting overwhelmed by the sheer amount of unrelated data.

4.5 Reflection on the research projects

Striking differences between the two research projects existed which required different strategies for approaching the field and positioning myself as a researcher. Local.ch was a one year old, dynamic company when I started my research there. It was therefore easy to trace the chronological process up to the presence. Crucial events or decisive organisational decisions had not yet sedimented into people's subconsciousness; rather everybody was very reflective and outspoken regarding their behaviour. Additionally, the local.ch case provided rich insights into how people creatively utilized Skype and enacted innovative forms of organising and communicating. The triangulation of various data sources was therefore needed to comprehend the rich setting. Moreover, because of both people's self-image and the young age of the company, work practices were not deeply institutionalized but open to change. Having two months in between each field trip extended the overall duration of the case study and enabled me to follow up on the emergent changes.

In contrast, the DSL at IBM has existed for over two decades which was manifested in the mature organisational culture and institutionalized work practices. Some of the members of the team had started their jobs recently, while others were at IBM for more than a decade. Most of the members in the team however had never worked for

another employer. The broader organisational context was regarded as a given and only minor changes occurred on the team level, such as the appointment of a new team manager. Moreover, when I joined the team it was at an advanced stage in the project cycle. Tasks were clearly defined and alterations to the work processes were not to be expected. Sametime had been used in software development for over six years, but because of institutional regulations and people's traditional technological frames (Orlikowski et al. 1994), the tool was conservatively regarded as an Instant Messaging application.

Although a review of Sametime conversations would have been beneficial for my overall understanding, group chats were not common in the team and analysing one-to-one chats would have raised serious privacy concerns. However, I found that a dearth of multiple data sources did not affect my competency to report on the IBM case. Interviews, the chief data source, gave a good description of this mature setting with its deeply institutionalized work practices. Consequently, I feel that the duration of the case studies and the chosen data sources in both cases correspond with the richness and characteristics of each case.

In the two settings, I found myself - more or less consciously - playing different roles. This was not solely an intended decision by me but a reaction towards the acceptance of social research within the organisation. More specifically, my role varied between the one of a *participant-as-observer* and an *observer-as-participant* (Gold 1958). At local.ch, David played an active part in promoting the research internally and enrolling employees in the project. Furthermore, my work was regarded as a learning opportunity for the team and team members quite willingly engaged with me and invited me to join them on lunch breaks and other social events. My engagement in the project met the criteria of a participant-as-observer (ibid.: 220). Contrastingly, at IBM no gatekeeper was directly involved in the project. The sensitivity for the project and its priority within the project team I studied was less pronounced and my role was confined to the one of an observer-as-participant (ibid.: 221). I felt less integrated into ongoing activities and I found that team members regarded me more as an external researcher who was allowed to do 'his work'.

Chapter 5

Skype usage at local.ch

The chapter offers a detailed description of the application of Skype at local.ch. I embark on this endeavour by first drawing attention to the social and organisational context at local.ch. More specifically, I shall sketch out the 'outer context' (Pettigrew 1987) of local.ch, that is the broader socio-economic setting which influenced the formation and structure of local.ch. I shall then describe the organisational culture ('inner context') at local.ch. In particular, I will sketch out both the managerial ideology and the norms and interpretive schemes as experienced, maintained, and displayed by employees. Section 3 aims to extend the discussion on the organisational culture, as a more detailed account is given of organisational communities and their enactment of various social practices. The different practices of structuring and organizing software development at local.ch are represented in section 4. Finally, I shall depict in detail how developers embedded Skype within their work practices.

5.1 Local.ch – Formation of a network organisation

5.1.1 The broader social and economical context of local.ch

Local.ch, a Swiss-based internet start-up, develops and runs a local internet portal for the Swiss market. Founded in 2005, local.ch is owned by a joint venture of the two listed companies Swisscom and PubliGroupe. With over 16,000 full-time employees in 2006 and revenues of CHF 4.8 billion for the first half of the year, the Swisscom Group is Switzerland's leading telecom company, delivering services and products for both mobile and fixed IP-based voice and data communication. PubliGroupe is a marketing and sales organisation dedicated to selling advertising spaces for the press, directories and the internet in Switzerland and other countries.

In 1999, the two companies brought the two subsidiaries Swisscom Directories and PubliDirect into a joint venture called P & S. Market liberalisation and technological innovations, it was argued, had significantly changed the market for directories, with electronic directories, new content, forms of financing, and international competition

playing an ever more important role. By bundling resources, the joint venture attempted to strengthen the position of the two companies and to prepare them for new challenges and the perceived fierce (international) competition. Swisscom Directories had 230 employees and showed itself responsible for data management and data processing of all directories and for publishing electronic and national directories. PubliDirect with its 350 employees took on the acquisition of advertisement for all product lines and functioned as publisher for local and business directories.

P & S started with élan in 1999, however, from 2002 onward the joint venture lost its drive and the relationship between Swisscom Directories and PubliDirect cooled off. Swisscom Directories and PubliDirect disagreed on the strategic organisation of the joint venture and the required steps in order to achieve and secure economic growth. Swisscom Directories made the strategic decision to solely concentrate on national and electronic directories and to strengthen its involvement in this area. Partly due to the close linkages with PubliGroupe, PubliDirect's positioning was different and the company did not limit its product portfolio to directories, rather their market experience opened its perspective to additional segments such as classifieds or guides.

In 2004, the economic situation in Switzerland was interpreted as difficult and the management did not expect a quick recovery. In this context, the management found that the market of print classifieds was consolidating or even declining, consumer behaviour and media use had altered significantly, legal changes took place in the publishing market, and new (international) competitors such as Google, eBay, Ricardo, or MSN had entered the search and classifieds market in Switzerland. PubliDirect was particularly suffering and found itself under pressure as revenues per customer stagnated in the classifieds market. However, PubliDirect's strategic options were constrained as it found itself caught up in a conflict of interest between Swisscom with its national and electronic directories and PubliGroupe.

In January 2005, the management of PubliGroupe decided to launch a project group called 'Columbus' to identify and define future growth areas for PubliDirect in the domain 'local search and find'. Robert Schmidli, the CEO of PubliDirect, asked David Steiner, who was at that time a partner at Namics Consultancy to lead the project group. In his function as a member of the board at Namics, Robert knew David very well. Originally, Columbus consisted of 11 participants from

PubliGroupe, until in May 2005 two members from Swisscom Directories joined the project. In the final business plan, all the members of the project group concluded that in order to secure the economical success of PubliGroupe, in a situation with stagnating markets, activities in the local search and content aggregation market in Switzerland needed to be strengthened and new revenue sources needed to be generated. Especially in the print domain, revenues per customer were decreasing, partly due to the surging use of the internet and the consequent migration of advertisements to the online market. Thus, the internet posed a threat to PubliDirect's established business model. Swisscom was already hosting two national electronic directories, namely "white pages" and "golden pages", however, the Columbus group concluded that both portals were inappropriate for addressing the specific requirements of the local advertisement market. The Columbus project was therefore intended to supplement the two existing national search engines with a third local search and find portal. Concentrating solely on the local market, the proposal provided PubliDirect with a way out of the existing strategic gridlock with Swisscom Directories.

Grouped around a geographical mapping solution, the local portal would concentrate on four segments: directories, guide, classifieds and web communities. The value proposition of the platform was to offer consumers the best search and find platform which provides high quality information under an established brand name to guarantee familiarity and trustworthiness. For advertisers, the platform would offer high frequency, different pricing models and a regional field sales force. The business plan was finally presented to the management at PubliDirect and Swisscom Directories which both agreed to go ahead with the project in August 2005.

Management was motivated to reduce the time to market as much as possible since (potential) competitors were at the same time developing and extending promising rival products. Hence, the schedule was very ambitious and the first beta version was to be shipped in mid 2006, with the project supposed to break even in 2008. To succeed with this 'mission impossible' and to ship on time, the business plan stated that attracting and hiring highly qualified, passionate people should be given high priority.

5.1.2 Forming a network of partner organisations

In August 2005 the project finally kicked off and a separate legal entity (local.ch AG) was founded which was completely owned by PubliDirect. David was appointed as the new manager for local.ch and found himself in a situation where he had no team and less than a year left until the beta version was scheduled to go live. As it was already stated in the business plan, David said that in order to keep to the ambitious deadline, recruiting highly talented and professional people would be crucial for the project's success. Additionally, rather than developing the whole platform internally, David decided on an alternative strategy. Instead, he chose to outsource parts of the software development to contractors, in order to immediately acquire the (temporarily) needed resources and skills. Having worked for several years as an IT consultant for Namics, David was well connected in the Swiss IT industry and mobilized his network to identify appropriate candidates. Rather than relying upon the company's reputation, a prerequisite for becoming a contractor was that David could single-handedly identify and select people who would work on the project. For instance, Eurospider, a provider of information retrieval software, was asked to present its product. Although local.ch decided not to use Eurospider's product but to develop an open-source system instead, local.ch was convinced of the people's know-how at Eurospider and offered them the opportunity to develop the new open source solution.

Company	Description	Project members
Bitflux	Solutions for web sites and content management	2
Eurospider	Information retrieval software	3
Namics	Consultancy for IT and web services	6
Consultas	Maintenance, development, and upgrade of information and advertising management systems	2
Zeix	User centered development and user research to align web offerings with user requirements	2

Table 4: Overview of the partner organisations

By the end of 2005, David succeeded in forming a network consisting of local.ch and five partner organisations (see Table 4). Usually, fifteen external contractors worked on the project, however, during peak times this number could rise to up to 24 members. Local.ch had nine employees in the beginning, with four of them working on business and strategy matters and five on the software development. However, in a move to insource some activities the number increased to 12 in total towards the end of my research in February 2007.

Company	Functional role	Names
Local.ch	Manager Technical lead Slot leader Slot leader Developer Developer Developer/ IT support Business partners contact person Sales force contact person Team assistant	David Steiner Conrad Huber Kevin Hosbach Pascal Niederberger Clement Huus Samuel Chabot Tim Birrer Celine Kobler Mélissa Schmidt Resli Obermayr
Namics	Manager (from Nov. 2006) Manager (until Nov. 2006)	Benjamin Lehmann Alexander Frei
Eurospider	Developer/ project manager	Fabio Hofer

Table 5: Names and job roles of the interviewed team members

5.1.3 Organisational setting

At the time of its foundation, local.ch was a special project to work on for both developers and partner organisations for several reasons. Firstly, the Swiss IT market is relatively small and not many opportunities arise to work on a start-up project of comparable scale. Developers in particular were excited at having the opportunity to work in an environment without being constrained by any pre-existing hierarchical or traditional structures, thereby having the opportunity to shape the project and to take on responsibility at an early stage. Secondly, since the end of the dotcom boom in 2000, projects with a comparable budget had not existed in Switzerland. Furthermore, the budget for each partner organisation was not fixed; they were rather paid for the time and resources allocated to the project. This brought about an atmosphere where contractors were more willing to engage actively on both a professional and social level.

Local.ch represented an organisational network consisting of six dispersed organisations; all of them were located in a radius of 100km around Zurich. Local.ch's headquarters were in Zurich, as were four of the contractors. Only Namics worked from St. Gallen which can be reached by train from Zurich in one hour. David remarked that it was deliberately decided to select partners in close proximity as he regarded it to be important to be able to contact and meet people if required. Additionally, outsourcing software development to other countries was not an option, David argued, because foreign developers would lack the required contextual understanding of the Swiss market for directories and classified ads.

At the start of the project, David and Alexander - the project leader for Namics - both paid particular attention to creating opportunities for people to meet each other

personally. As Alexander saw it, creating a positive and productive working environment requires spaces where people can socialize and by doing so get an appreciation of others' roles and responsibilities:

> Well, with a group of twenty people I need to know who is doing what. Everybody actually needs to know what the others are doing; at least having a rough picture of it. (Alexander Frei)

Alexander argued that having a rough understanding of people's responsibilities and knowing whom they can ask was a prerequisite if they are supposed to work in a self-responsible manner. Consequently, Alexander not only tried to facilitate collaboration among developers at Namics, it was his objective to bring participants from all organisations together.

5.2 Organisational culture

5.2.1 Selecting the right people

As it was already mentioned in the project plan, selecting the right people was considered to be a decisive success factor for the whole project. David was mainly responsible for identifying and selecting qualified candidates. For him, it was not the organisation or a person's affiliation to an organisation which served as selection criteria. Rather, David aimed at selecting highly qualified people and summarized his strategy candidly "Get the right people on the bus, get the wrong people off the bus and then make the decisions". He maintained that it is the right staffing which makes a team tick or not and what he was looking for were passionate people who should be able to add something useful to the project. Reflecting upon the quality of the current team members, David argued:

> … the true differentiator between us and them [referring to a different company] … is *passion*. (David Steiner)

> But to be honest, the whole thing works because there are excellent people who do not need any guidance. They know for themselves what they need to do. (David Steiner)

Selecting the right people proved to be influential for the overall atmosphere within the project. Developers mentioned that they felt fortunate to work with such knowledgeable and determined colleagues and they appreciated David's efforts to select people based on qualifications and not affiliations or other political constraints. This left people with the impression that those who were working on the project

really deserved to be a part of it because of their qualifications. In addition, working constantly with highly qualified people affected the dynamic of collaboration. Over time developers gained confidence and started to trust each other's capabilities.

Furthermore, knowing about the competencies of the team members allowed management and technical leads to grant developers a high degree of autonomy. This practice was reconfirmed over time as developers regularly over-achieved on the expected results, thus confirming that the trust in them was well placed.

The high quality of the selected team members became visible in situations of break down. While no fluctuation took place in the local.ch core team, some of the partner organisations assigned new people to smaller parts of the project for a limited period of time. It happened that the temporal developers did not deliver to the expectations and norms of the core group:

> And the whole culture goes in a direction that you are used to work with good people. And from my perspective you realize it when mediocre people help out or those who are not ambitious. (Kevin Hosbach)

The working atmosphere in the developer community was strongly driven by a performance oriented working culture, internal commitment, and intrinsic satisfaction. Rather than being influenced by hierarchical structures, it was very much the developers' self-understanding and their attempts to be accepted and to appear as competent and full members of the developer community that shaped the disciplined working culture at local.ch. Conrad - the technical lead of the project - was an outstanding example of that culture. Conrad was acknowledged for his technical and business expertise and was strongly influenced by the open-source movement. His fascination for projects like Mozilla derived from the way they were organised as cooperations of loosely grouped people and he had always planned to incorporate some of the ideas in the local.ch project:

> I actually want … through competition, that everybody is achieving his best performance and is challenging one another. So, if anybody has a better idea in that case it means: GO! (Conrad Huber)

Within this environment developers were expected to be fully committed to the project, to work and organise tasks in a self-responsible manner, and to proactively engage with others. Attaining and sustaining respect from colleagues demanded

developers to be fully committed to the project and to develop creative and high class solutions under intense time pressure. The peer pressure and high standards, which were embodied in the frequently mentioned concept of 'best effort approach', disciplined developers' conduct:

> … meritocracy which is rather about getting good people over here, who then try to attain a certain level of respect through delivering good work or high-quality in a short period of time. (Kevin Hosbach)

The appreciation for achieving something special and working with an exclusive group of highly talented people created a strong sense of identity within the group. However, the sense of identity was not restricted to work related aspects; rather it encompassed people's general *worldview* (Weltanschauung). Asked about the culture within the local.ch project, Alexander responded:

> Hm. Digital Avantgarde. (…) Because of the people it was a great project to work on. It is difficult to tell, you simply need good people to work with. I believe the people who work on this project are all living in the same context, on a professional level at least. Internet, IT and so on. *And that is a way of li*fe, I believe, which is required so that you can implement such new forms of working. *The people have to want the new.* (Alexander Frei)

Thus, a rather homogenous culture emerged in the developer community in which people shared the same *worldview*. The members of the community took pride in being perceived as highly competent and knowledgeable. To attain and maintain this level of respect required a person to fully commit to the project.

5.2.2 Team rules and norms

In the early stages of the project, David developed team rules and norms, firstly, to reify values which he perceived to be of utmost importance and, secondly, to lay down criteria that one could cite if a dispute arose (see Table 6). Having such rules in place functioned as a yardstick people could and should consult to in order to settle controversies. However, David was also well aware of the rather symbolic meaning of the ground rules:

> Nobody knows them, which is not important, but we behave accordingly, that is important. (David Steiner)

Rule 1 - Customer First
In case we have to judge commercial interest against user interests we will always decide in favor of the user interest.
Reason: If we get it right for the user, the user will honor the platform and in turn the advertiser will come to us to find the user (i.e. spends ad ch-francs)

Rule 2 - The solution is the team
Nobody knows it alone.
With thorough discussion we are able to get the best solution filtered out.

Rule 3 - Long Term over Shortterminism
In case we have to judge long term interests against short term interests we will always decide in favor of the long term interests.
Reason: We are here for the long term, so let's behave that way.
And anyway in case we opt for a quick fix against better judgment or possibility the boomerang will hit back sooner rather than later.

Rule 4 - We're optimistic
The road is steep, yet we will make it!
And we suppose that the opposite is doing the right thing.

Rule 5 - Errors are ok, if...
We build something huge from scratch. So errors will inevitably happen. Nobody will be brought to justice for an error.
However, under two conditions only: One first tried to do the best and we may have a thorough review of what happened.
That is to say: No error twice.

Rule 6 - Don't be evil
We assume that the other parties to the project are well intentioned
In case not, back to Rule 2

Table 6: Six ground rules at local.ch which are documented on the Wiki database at local.ch

Some of the ground rules represented personal attitudes and values David intended to promote over time. 'The solution is the team', 'we're optimistic', 'errors are ok, if…', or 'don't be evil' were clearly aiming at cultivating a learning organisation, a culture of open exchange, and respect for each other. Those rules were uncritical and appreciated by the whole team.

In contrast to the four abovementioned rules, 'customer first' and 'long term over short-terminism' represented normative management decisions. The two rules illustrated an open and constant conflict between the business[10] and the developer community within local.ch. While the business side advocated that attentiveness should be given to commercial interests, the ground rules favoured the developers and their attempts to concentrate mainly on developing a user friendly platform. The favouritism shown towards the developers' interests not only concerned the design of

[10] In the following, the term 'business community' denotes the non-technical staff at local.ch and 'developer community' to refer to the software developers within the local.ch project.

the platform, rather the business community found itself in a situation where their requirements were not met with the needed resources. The developer community on the other hand welcomed the ground rules as strategic decisions and interpreted the rules as a conscious managerial decision to back and to support the creative work in the developer community:

> And they [ground rules] are there to back us up. (…) If a decision needs to be made either for users or business, then we decide in favour of the users. (…) Or if business wants an ugly, huge logo across the whole platform and you can't see the platform any longer. I don't want that. There won't be a discussion because it is written in the ground rules. (Kevin Hosbach)

Consequently, the ground rules not only favoured the developer community, but also illustrated that David took side with the developers.

5.2.3 Developing a learning organisation

David argued that local.ch is not working in an established industry with reliable business models. Instead, local.ch aimed at creating something completely new and an organisational culture was therefore needed which facilitated learning and discussions. Two main concepts symbolized the attempts to bring about a learning organisation, namely 'tolerance for errors' and 'seeing the team as the solution'.

First, as it was stated in the ground rules, errors were accepted as long as they did not happen twice. To learn from previous failures, reviews were carried out in order to detect what went wrong. Errors should not be punished, rather they should be perceived as learning opportunity and as a normal occurrence during the long and complex process of system development. Consequently, people should not lose their motivation when errors occur but should keep their spirit and passion to reach the best solution.

Second, it was intended to foster a culture of open exchange and appreciation for multiple opinions. Rather than simply implementing decisions that were proposed by technical leads, suggestions were intensely discussed among the developers:

> We got very good people from Namics, who pro-actively come and say: "Hey, I don't like that concept". With Thomas I can discuss for hours. Well, sometimes it is getting even a bit cumbersome if he approaches me and questions everything. But the ideas are good and the discussions are good. And that's what I like. It challenges you. It brings me out of my shell und I say to myself "Oh, right". Or you come up with a better solution in the end which would never occur to you on your own. (Conrad Huber)

> Among the developers, we often have quite rough discussions but in the end it generally leads to good results. (Pascal Niederberger)

> … not “I know” but “We know”. (David Steiner)

By stimulating creative discussions among the developers, the struggles were accepted as part of the development process and as a way to come up with innovative results. In addition, regardless of position or affiliation, every developer was able to contribute to discussions which generated a strong feeling of inclusion among the team members and strengthened their motivation:

> But it was, well, we could contribute many of our own ideas to the project. And I think that motivated the people very much. (Alexander Frei)

Cultivating an atmosphere of open exchange required the right people to engage proactively with each other and think independently. However, even more importantly, tolerance for criticism was a prerequisite and so was the aptitude to work with others despite fundamental disagreement about some issues. David regarded it as being part of his job to create and cultivate among the team members an appreciation for diversity and a belief that the team is the locus for generating ideas. David constantly exemplified his attitude on a daily basis by including the local.ch core team in making strategic decisions, informing them about management decisions, or discussing marketing strategies.

5.2.4 Trust, support and autonomy

At local.ch people regularly mentioned it to be a positive surprise that they were getting along so well with one another on both a personal and professional level. Developers had quickly gained confidence in each other’s capabilities. Trust and confidence in the work of one’s colleagues was reconfirmed over time as the outcome usually exceeded the initial expectations:

> ...well, definitely it needs to work on a personal level, but if you are developing functional blocks with other people or you are taking over functional blocks, you definitely need a high level of technical trust. So that you can say, okay, I will concentrate on this area and I let the others work on other parts. And I can trust them that it will function in the way it was specified before. (Clement Huus)

Besides trusting each other on a professional level, the atmosphere was marked by mutual support and help-giving. Team members knew that they could contact one

another and they regularly made use of this option when difficulties surfaced. Again, affiliation did not matter and externals felt free to ask but were regularly contacted as well:

> I think everybody asks unscrupulous [laughs]. (Fabio Hofer)

On a day-to-day basis people worked proactively and organised their tasks in a self-responsible and independent manner. Developers felt that they earned the autonomy bestowed on them by David through their constant and good performances:

> I think it has something to do with meritocracy that we are all respected for the role we are carrying out. And one gives us a free hand. It does not happen that David comes and says "You do it this way because I say so". That does not happen. (Kevin Hosbach)

Furthermore, the developers believed that David was very aware of his own strengths and weaknesses and, they argued, he had selected them in order to supplement his own capabilities. Selecting talented developers, it was suggested, gave David the opportunity to leave the development of the platform to people like Conrad and to concentrate himself more on business related aspects. The developers very much appreciated the trust David invested in them but they felt that autonomy came with high expectations and accountability for the outcome:

> …he [David] trusts the people a lot; his own people but also other participants. And that is definitely motivating when I know that someone trusts you without constantly checking on you. There are certain expectations but I can organize my work independently. (Benjamin Lehmann)

5.3 Organisational context

Management and team members alike attempted to address the complexity of the organisational setting by creating an atmosphere of mutual acceptance regardless of affiliation or profession. In general, the strong sense of identification with the product and the organisation was testimony to the successful cultivation of the culture. However, subtle differences or conflict zones existed nonetheless within the local.ch network. Those fractures run along the organisational boundaries and even more prominently along the professional groups within local.ch. In the following, it is attempted to trace the different communities and the conflict zones so as to depict a more nuanced picture of the organisational context at local.ch.

5.3.1 Local.ch core team

The developers and business people formed two distinct communities in the local.ch core team, marked by technological savvy, work practices, and interpretive schemes. Although both groups tried to find a common understanding, the different interests and activities clearly separated them from each other. The separation was also visible during mundane events, such as lunch or coffee breaks. While developers generally had lunch together, business people never joined in nor did it happen the other way around. Kevin and Resli succinctly summarized the fracture among the two groups as follows:

> So, for myself I make this distinction: The business part and the technical part are for me two things. (Kevin Hosbach)

> We were divided into two groups; one part addresses the business related issues and the other is the technical part. Although we are in the same office we were separated. (Resli Obermyr)

The development community at local.ch represented a fairly homogeneous group. All developers shared the same professional background and most of them had long work experiences in the software industry. Furthermore, new hires were recruited based on internal recommendations and so many developers had worked together on previous projects or even had close personal relationships. This history of close professional and personal relationships definitely contributed to and strengthened the sense of identity within the developer community.

Additionally, developers worked within a clearly defined and closely knit group. The homogeneous context facilitated the formation of group-specific work practices which were then produced and re-produced over time. These practices - and their innovative use of technology - exemplified for many developers the essence of what local.ch stood for.[11]

Contrastingly, the business community was significantly smaller with only three members and David – a convinced technophile – who functioned as their manager. Each of the three members worked on different tasks namely, team assistant (Resli), business partners contact person (Celine), and sales force contact person (Mélissa). With Mélissa working two days per week from Lausanne and Resli not speaking English or French, Celine often filled in for the other two. Consequently, the

[11] For a detailed discussion of the work practices within the developer community, see chapter 5.5

competencies within the business community were partly overlapping. Moreover, frequent communication beyond the local.ch network with regularly changing contacts meant that, in contrast to the developer community, developing distinctive work practices was more difficult in the business community.

The differences between the two communities were evident in the way they dealt with technology. The developers constantly tried to be innovative and experiment with the latest ICT. Referring to the application of Wiki at local.ch, Kevin illustrates the cultural difference between the two groups as follows:

> We want to be innovative, Wiki is innovative, we like to use it and instantly see the advantage. Whereas the business is more like: "Well, it's another system than Word". …Maybe they don't see the gain. That's why it is more difficult for them to establish it. With us, it's more "Hurray, finally a new system which does not have some problems Word is having. (Kevin Hosbach)

The rather sceptical stance in the business community towards novel technology was confirmed by Celine who found it cumbersome in the beginning to use Wiki as the main knowledge database:

> Yes, in the beginning I thought "It's the pits". It was so corrosive to use the Wiki. Because if you do something new you don't know where something is and who organises it. Some people started with it in November and when you join them later, you first need to find your way around. (Celine Kobler)

The distinct work practices of the two communities were also reflected in the organisational structure and control regimes. While the business community was more hierarchically organised, the developers enjoyed relative autonomy and organised their work independently. Developers maintained that the existing structure suited their need to develop innovative solutions whereas creativity was not demanded to the same extent in the business community:

> …there are differences on an organisational level …; we just have to deliver lots of innovation … and therefore we are structured very flexibly and very independently. (Kevin Hosbach)

Compared with the developers, the business community was clearly structured and David was actively involved in making decisions and giving instructions:

> For us freedom, well, he [David] interferes a lot in our issues. (Celine Kobler)

The different professional backgrounds and work practices impeded the knowledge exchange and collaboration between the communities. Developers complained about the lack of understanding between the two communities and collaboration was perceived as even more cumbersome than with the externals. The developers understood that the gaps were partly caused by the fact that shortly after the requirement analysis in the beginning of the project the two communities had started to work in isolation from each other and the information flows between the two communities had drained as a consequence.

Spanning the boundaries between the business and the development community remained problematic. The conflicting interpretive schemes became evident when close collaboration was required. As a response to customer feedback the business side regularly approached the developers with new conceptual ideas for features. While the developers were used to collaborating, brainstorming and challenging each other's ideas, they criticized the business side for not following their example and for proposing concepts that were much too general:

> ...I would be glad if they were much more concrete with their ideas. (Conrad Huber)

Therefore, rather than discussing mature concepts, developers had to engage with the business people from scratch in an attempt, firstly, to translate ideas into their own language and, secondly, to develop the concept jointly with the business people.

The confidence and the paramount position of the developers within the project owed much to the legitimacy which management bestowed upon them. David was convinced that the project was all about technology. Not only was his position made explicit in the ground rules, but it became evident on a daily basis as he favoured the developers' perspective over the business side and defended the space he had granted to the developers:

> You know, the core of local is technology. Local is a technological story (Technologiegeschichte). (David Steiner)

Having said this, he argued that people have to understand the core of the business so as to be competent and fully accepted team members. With this remark David referred to Mélissa and Celine who both were knowledgeable in the business realm aspects but lacked an in-depth understanding of the technical area:

> Cultural difference is the description of the phenomenon. (David Steiner)

Being aware of David's preferences, the business people lamented about their lack of influence in the project. Celine expressed her feelings metaphorically:

> You have potatoes and you have meat. The meat is somehow something you like. The potatoes come with the meat but they are also important for your meal. But the meat does taste better. And that's how it is here. (Celine Kobler)

However, by and large, their attempts remained futile as David strongly believed in giving technical issues priority over business aspects. Thus, IT related aspects clearly dominated the daily discussions and the organisational culture in more general at local.ch.

5.3.2 The Developers

Although team members came from six different organisations, differences among the developers were less evident. In general, developers shared a common set of values and technical expertise because they felt like they were part of the 'digital avant-garde'. Again, the primacy of technical over business aspects was of paramount importance for the self-understanding of the team and to be respected required for management to have fundamental knowledge of the technical metier:

> I think that business people need to be so far into it to be able to think about concepts on their own, even if they are not completely technically matured. … And if you can do it, everything is alright. If you can't do it – just sales at the front or just blah-blah without understanding anything – that does not go down very well. (Alexander Frei)

Within the network of tightly linked organisations, a sense of unity and closeness among the participants emerged. Organisational boundaries blurred as informal structures were substituted for traditional customer-supplier relationships:

> What definitely holds true is that the form of collaboration we are cultivating brings about an extreme feeling of togetherness. The organisational boundaries become almost fluid; you are working very much for the common cause and not so much in traditional customer-supplier relationships. (Benjamin Lehmann)

> We definitely try as part of the organisational culture to integrate the externals. You can tell it from the extreme responsibility the external developers are having. (Pascal Niederberger)

> Yes, I think it is very open. Yes, the boundaries are fluid which I find quite exciting. It is almost not important at all who is working for which company. It is much more about who is doing what task. (Fabio Hofer)

Being treated on an equal basis, the externals were left with the impression that their suggestions were taken seriously which positively affected their motivation:

> …we could contribute many of our own ideas. And I think that is what motivated the people a lot. (Alexander Frei)

However, working more closely together with local.ch also posed new challenges for the contractors. Whereas in traditional projects, developers at Namics could refer to pre-defined tasks, they now had to take on more responsibilities, think independently and act proactively. It cost Alexander some effort to cultivate the required understanding among the developers at Namics:

> It was difficult for the people to take on so much responsibility. …some of them had to get used to the situation that they had to arrange some tasks, to organize themselves and maybe even approach people at local to ask them "How should we go on from here?". (Alexander Frei)

Shifting the organisational culture towards a more cooperative form of collaboration proved to be difficult. While the relationship between local.ch and Namics was generally considered to be very good, the different, historically conditioned routines and working styles between the organisations caused confusion and disruption every now and then:

> ...I don't really know how much they are talking with each other at Namics. Sometimes I have the feeling they speak relatively little with each other [laughs]. Because I am sometimes surprised when people say: "Yeah, well, this and that, I don't have a clue". I say then: "Your colleague next to you … is exactly doing this. You just need to ask him". (Conrad Huber)

> They have the feeling that they have a project leader. That is the traditional project system, they have a project leader and the project leader gives them work and asks them everyday how things are. That's the way they work, how they have worked before or how they work on their own projects. And with us, there is no project leader or maybe just indirectly. (Conrad Huber)

However, the differences between the local.ch core team and the external partner organisations were generally rather subtle. While the local.ch core team took pride in their proactive and efficient communicative practices, those forms of communication were not established to the same extent throughout the whole network. In addition,

David's democratic management style attempted to include people and endow them with the right to have a say in important matters. Pascal succinctly described his daily experience with the externals as follows:

> Definitely, we consider us as the core team but that does not mean a lot in practice. Having said so, there are a few exceptions. Concretely, within the core team David gave us the power of veto which you can not extend to the externals. (Pascal Niederberger)

While shared communicative practices, legal rights and daily contacts created a sense of identify among the local.ch core team, discontinuities between the various organisations were marginal. Rather than resulting from organisational factors, disagreements or a lack of cohesion within or between organisations resulted from personal affection or dislike.

5.3.3 David's role within local.ch

By being involved in the Columbus group and functioning as the manager for local.ch from the very beginning, David was one of the key persons in setting up the organisational structure and influencing the social practices. In the following, I shall explicate David's interpretation of the local.ch project and his role as a manager. Thus, discussing parts of David's interpretive schemes at this point shall help to, first, shed some light on and rationalize his positioning and decisions and, second, comprehend the consequences of his decisions on the overall project. More specifically, his attitude and decisions laid down the foundation on which the organisational process of software development was based.

Referring to 'Golden Pages' and the publishing business in general, David argued that such businesses had existed for thirty years or more and all crucial parameters were well-known. Within such mature industries, David suggests, optimisation and standardisation of existing business models becomes a viable and decisive strategy:

> It is even of utmost importance that not everybody can act like *'jekami' – jeder kann mitmachen* [everybody can take part] with large group discussions on how an advert should be posted. Rather you need operationally structured things … with high efficiency. (David Steiner)

In contrast, David maintained that the current project showed no resemblance to traditional business models in the publishing industry and therefore demanded a different management style and organisational structure:

> What we are doing is different. We are building something from scratch. (David Steiner)

While some domestic and global companies with similar approaches functioned as reference points on *what* could be done they did not give any guidance on *how* it could be achieved. Informed by this argumentation, David believed it to be necessary for the team to create an environment which facilitated the open discussion of ideas. Implicitly, a specific management style was demanded within such a situation:

> …where we intensively grapple with the knowledge that we don't know it. And it is my deepest conviction that does not work with someone standing in the front and saying: "I know" but it is only possible if we try things together… (David Steiner)

Therefore, rather than giving strict instructions and defining organisational regulations, David interpreted his positioning within the network to be the one of a moderator or discussant.

> The whole thing is organized like an elitist club. It is an elitist club and in my function I am club secretary. (David Steiner)

> Yes, my role within the organisation is the one of a coach. Primarily, I am responsible that all open issues point in the same direction. But I am not responsible that the issues are tied together. (David Steiner)

Again, rather than enacting an authoritarian management style, David respected the knowledgeability and expertise of all team members. He understood that it was impossible for him to have an overview of all aspects of the project, especially in the technical realm. Relying on highly talented people whom he could trust and bestowing them with the needed level of autonomy allowed David to hand over some of his responsibilities to Conrad who was unofficially responsible for the technical part. From this perspective, the managerial style at local.ch was democratic and in line with its achievement-oriented culture.

However, although David entrusted developers with important tasks and did not intervene in their work, he defined and reinforced normative standards. Not only did he define the 'ground rules' to reify normative guidelines but he also interfered in 1) strategic decisions with long term implications, and 2) behaviour that runs counter to the agreed upon norms.

> There I did interfere and I will interfere in the future in decisions that are influential on the future. That is my job but I keep out of the rest. (David Steiner)

On another occasion, he referred to an argument between the business and developer community that broke out during a team meeting but was subsequently resolved:

> If they had not done it yesterday, I would have said to all involved parties "And I wish that it happens until next week". 'To wish' might be the wrong word. I can express is more directly "I order that you will do it until next week". That is … the role of a benevolent dictator, isn't it? (David Steiner)

David's effort and involvement in the project can therefore be understood as an attempt to create a scaffold that enabled certain forms of social engagement for which he had lain down clear expectations about proper conduct.

5.4 Organising work at local.ch

After giving a description of the main elements of the organisational culture, I shall picture in this section how the software development process at local.ch was structured and organised. By doing so, I intend to illustrate both the institutional scaffold and the daily working environment which shaped people's routinised ways of organizing, collaborating, and communicating.

5.4.1 Structuring the software development process

During the early phase of the project from August 2005 until the day in April 2006 when the search engine went finally live, work had been organised in four distinct iterations. During the first two months (August-September 2005), a small team was concerned with conceptual developments. In the following two months (October-November 2005), a workable prototype was launched. Furthermore, key functional components (slots) of the system were identified and developers started with the initial coding. The third iteration dealt with resource planning for the project and encompassed a detailed specification of the system. Starting in Jan. 2006, the fourth iteration aimed at implementing the specifications. The system went finally live 18th April 2006, only ten months after PubliGroup and Swisscom Direct had agreed to the project.

Afterwards, local.ch changed its organisational process. Rather than working with iterations, from May 2006 onwards releases were used as the main organising instrument. With the key slots being clearly defined and the beta version of the

system being in place, the releases were intended to add new functional components to the existing system. Therefore, together with the slot leaders, project management set out to develop a roadmap for the summer of 2006 which specified the most important functional components that were to be added to the system. Although the roadmap was constantly updated over time, it served as guidance to specify the main tasks which had to be implemented over the next couple of months. In addition, with the main tasks being made explicit, the roadmap facilitated resource planning among the partner organisations.

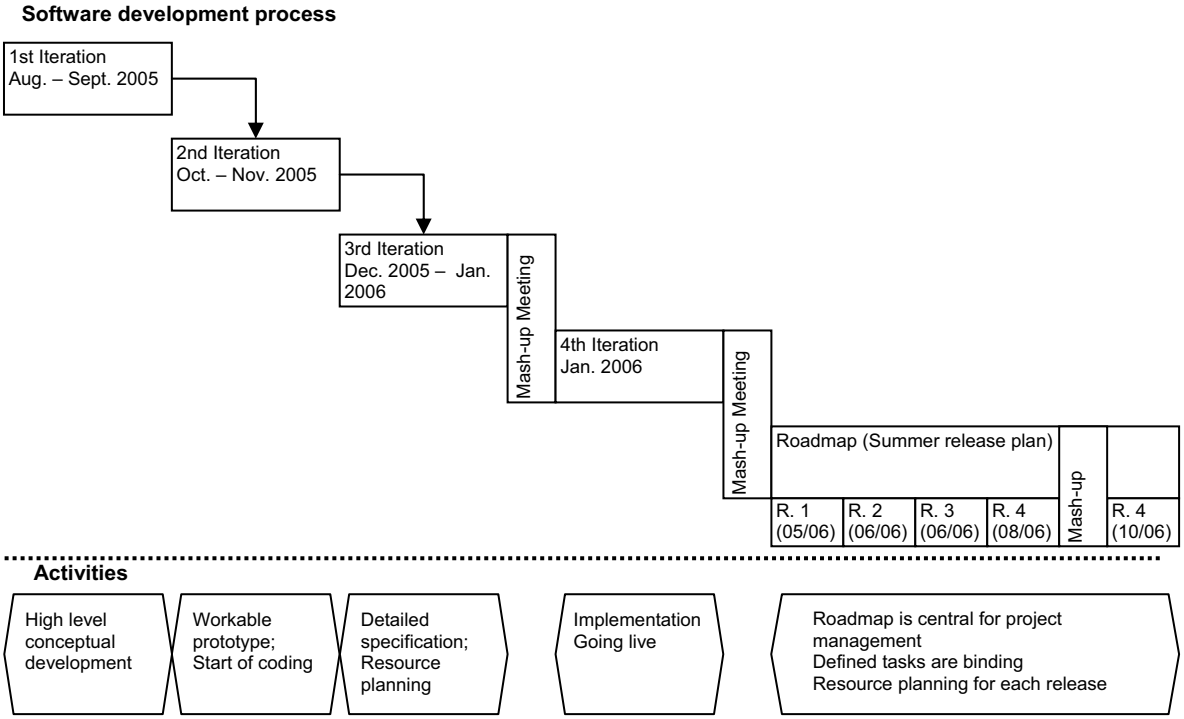

Figure 1: Software development process at local.ch

Besides the roadmap, mash-up meetings functioned as an important steering instrument for structuring the software development process. Mash-up meetings were two day intensive workshops after iterations or releases for which project members always retreated to hotels outside of Zurich. During the first day of the workshop, potential shortcomings of the previous iteration/ release were discussed and team members updated each other on the current status of the different slots. The mash-up meetings were welcomed as an opportunity to stop and reflect upon what had been done and how it had been accomplished. As the project grew over time and became more complex, the meetings were also valuable for gaining awareness of the

activities and sensitising people about problems in other technical areas. In a second step, smaller, subject specific groups were formed to discuss and plan the tasks for the upcoming release. As a final step, the whole team assembled again to introduce and discuss the ideas and the outcomes of the subject groups and tried to agree (sometimes in fierce discussions) upon a list of components for the next release. Conrad described the process quite metaphorically:

> We have a huge list of things we would like to do. And you need to prioritize. I like to compare it with a glass in which you throw big stones; you want to do those and you need to be clear about them. And the freedom is the sand in-between which you can fill in later and everybody can decide a little bit what he wants to do. But with the rocks, we all need to be in the same boat. (Conrad Huber)

Consequently, mash-up meetings were intended to identify and select the main components for the upcoming releases. However, rather than defining a stringent plan, releases offered developers enough leeway to pursue their own ideas, structure and organise their work independently, and integrate smaller features which were not discussed during the mash-up meeting. Additionally, the mash-up meetings were appreciated by all team members as opportunities for socializing. The events helped to strengthen the ties among the team members and facilitated the exchange of informal information.

After the mash-up meetings, specifications were further refined and documented in the wiki system – the shared database at local.ch. Additionally, Jira - an issue tracking tool – was used for documenting the list of tasks for each release. Single tasks were then assigned to specific developers which represented the 'must' features – called 'fixed for' – the respective developer had to implement. By doing so, responsibilities for features were clearly defined and developers used Jira to document implementation specific details. However, some slot leaders used another strategy and assigning tasks was one of their responsibilities. Being responsible for the front end, Pascal had estimated together with his developers the time needed to complete each task. However, rather than assigning the tasks to developers at the beginning of the release cycle, they remained with Pascal who allocated them as the project went on according to the developers' work load.

Sub-teams which spanned across the organisational boundaries were formed in order to do the work within the technical slots. Interestingly, although team members were

affiliated to different companies a stronger sense of identity and belongingness emerged which was sometimes even more distinct than within intra-organisational teams:

> But I believe … that sub-teams within the team have stronger bonds – I mean sub-teams crossing organisational boundaries – as intra-organisational teams which are working on the local.ch project … (Fabio Hofer)

Depending on the specifications of the releases, the requirements and composition of sub-teams changed. Some developers proactively attempted to influence the tasks they were appointed to. Not being limited by organisational boundaries, their choices depended on preferences concerning the subject area or the people on the sub-teams:

> Yes, that's irritating. If someone from another company approaches you and asks "Hey, try that I can work for you. I don't want to do the other stuff for that person". Yes, that's a bit irritating. Something like "Yes, I would like continue working on that team no matter that I am affiliated with another company". And that is still quite special. (Fabio Hofer)

5.4.2 The bazaar as a role model for organizing software development

While release specifications prioritized some features over others, on a day-to-day basis developers experienced sufficient autonomy to organise their tasks autonomously. Referring to Raymond (2002), David argued that the philosophy behind their software development strategy was to implement the *Bazaar* instead of the *Cathedral* approach. He maintained that the cathedral approach results in projects that generally run over budget and over time. Instead, David described eloquently their philosophy of software development as follows:

> Cairo, do you know the bazaars? What is happening there? On the first glance it is a complete mess, complete chaos. But still, if you stop for a moment and look thoroughly you will see that it is perfectly organised; otherwise it would not be possible to bring tons of spices into and out of a central square. It's perfectly organised. For us it might be chaotic but for the people there it's perfectly organized. And what is specifically organized? It's the square where the bazaar takes place. And the people at the bazaar, the spice traders, they organise themselves to bring the stuff in and out of the bazaar. (David Steiner)

David argued that for organizing such a construct, a few ground rules need to be defined and adhered to, such as he tried to do in the local.ch setting. However, once the rules are set no intervention should take place from outside – for example senior management – rather the people at the bazaar should organise themselves within the

outlined framework. Instead of defining tasks and features and then completing them independently, in practice, the bazaar approach meant close collaboration and constant communication between the participants.

The development of the internet platform was sub-divided into slots. For each slot, a sub-team was formed whose developers could come from different organisational backgrounds. Although the sub-teams were not structured hierarchically, slot leaders had technical responsibility for parts of the project and informally took on the role of managing the developers within the sub-teams. Slot leaders described their role as 'jugglers' who 'try to keep the balls in the air'. Rather than being heavily immersed in coding, the slot leaders were more responsible for bringing the different parts together and making sure that the features of the slot fitted with the rest of the system.

Slot leaders needed to retain an overview of who is doing what and to allocate work depending on available resources. Keeping an overview and maintaining awareness happened almost naturally when slot leaders worked closely with developers on the same tasks. However, developers often got tasks which kept them busy for three days or more without requiring any interaction whatsoever. During that time slot leaders did not know whether developers had encountered any problems or were still on track. Generally, two different practices were enacted to deal with the level of uncertainty and ambiguity. First, slot leaders relied upon established working relationships with the developers and a common understanding of 'how things are done'. They felt that developers would proactively contact them if they faced any problems. Contrastingly, developers who had only recently joined the project were not immersed in the proactive communication style to the same extent. Slot leaders could therefore not be sure that everything was going as planned when they did not hear anything from the developers. Hence, the second practice required a stronger investment in order to establish awareness and even more importantly shared norms:

> When new people join the project, I generally ask pro-actively and tell them:" Guys, please let me know where you are". (Conrad Huber)

Within this virtual setting, people depended on information and communication technology for their daily communication. However, team meetings functioned as another crucial instrument for coordination and structuring communication. Once a week - either Thursday or Friday - the partner organisations were obliged to come

and work at the local.ch office in Zurich. Supplementing daily communication via e-mail, telephone, or Skype, those days provided opportunities for developers to 'synchronize' or 'update' each other. During those days, the open-plan office, in which on a normal day around ten people were working, became a beehive and you could hear the buzz all the time. On a typical day, four of the external developers would be gathered around a small table, working away at their notebooks. Others managed to get hold of one of the unused desktop computers in the office. The first hour was generally used for catching up and socializing. People walked around and stopped at others' desks to exchange courtesies or information about what happened during the previous week and what needs to be achieved next. David was shaking hands with almost everyone of the externals and had a chat with them. The constant movement and restlessness created a significant level of noise. After people had settled in, the atmosphere in the room cooled off as people started working on their machines. However, a certain level of unrest remained as people walked out of the office to take coffee breaks, had chats at the crowded tables, moved around to talk with each other, or told jokes that often got the attention of a larger audience for a brief moment. Moreover, small groups of developers disappeared every now and then and went to one of the two adjacent meeting rooms. While some meetings were scheduled others might be more ad hoc gatherings:

> The groups got used to work together. Most of the people here are working on the project from the beginning and consequently it is clear which person from which partner organisation will be in our office on what day. And the meetings are generally scheduled ad-hoc in that the responsible person for a slot gets hold of the people and says "We still have this open issue". (Clement Huus)

Management was well aware of and admitted the social and emotional dimensions that the weekly meetings had:

> Well, let's put it this way, it is definitely important to maintain the team spirit or the solidarity. When you really work together, it's different compared to hearing someone on the phone or communicating per e-mail or text message. (Benjamin Lehmann)

Management tried to complement virtual communication with face-to-face exposure to break the ice among the developers from the different organisations.

Clearly, such an understanding of software development had strong implications for the positioning of the manager within the project and David was well aware of them:

> But that's okay, you know. That's bazaar. If you say bazaar approach, you have to live the bazaar approach. You have to live with the fact that even as the responsible person you don't know everything which is happening at the bazaar. You have to want it. And I know that it is for many hard to imagine. In a hierarchic organisational culture you have the expectation that the boss – he knows it. But here, we don't do it this way. (David Steiner)

Thus, management needed to accept that it was not involved in all the decision making processes and that people worked independently without explicitly asking for permission. One pre-requisite was therefore that management trusted their employees. As mentioned before, elements of meritocracy and the best effort approach were fostered by the organisational culture. The performance and outcome driven culture at local.ch created the required environment for the implementation of the bazaar approach. Trust in the qualification and knowledgeability of the developers enabled managers to grant them the required degrees of autonomy.

Rather than simply withdrawing from decision-making, management needed to redefine its management style. Benjamin mentioned that both the contact to local.ch as the customer but also the management of team members posed different challenges compared to previous projects:

> The last project I managed was very big and we simply had three hundred requirement specifications on the table and as a service provider we were responsible to meet those requirements… it was a very distanced relationship and we worked a lot with instructions [from the customer]. We had to fulfil something and I briefed the developers on what needed to be done. (Benjamin Lehmann)

The distanced customer relationship demanded a more hierarchical management style as Benjamin functioned as the main contact between the customer on the one side and the developers on the other. Contrastingly, the bazaar approach at local.ch emphasised a self-organizing working style among developers irrespective of any organisational boundaries. In addition, management only needed to intervene if more serious problems occurred:

> Here it's done differently. In general, we define together what needs to be done next and the team is then more or less organizing itself; everybody knows what he needs to do. And the people are exchanging themselves as to reach the goal. That means my role as a project leader is suddenly different. … the fundamental difference to other projects is that I just need to dispose of problems but I do not disseminate and control work because it works somehow on its own. And I needed to get accustomed to it. (Benjamin Lehmann)

As Benjamin joined the project after it had been under way for over a year, getting accustomed to the working style and finding his position within the project was difficult. However, in the end Benjamin started to appreciate the advantages of the approach which enabled him to direct his attention from simply monitoring work towards strategic decision making:

> *Interviewer:* Had the people already had this working style when you joined the project? *Interviewee:* Yes, exactly! And I had the temptation to intervene somewhere but everything worked. Well, it was as if you are not needed [laughs]. (Benjamin Lehmann)

> To put it differently, I have now as a project leader much more time for other stuff, for strategic issues, for innovation instead of chasing people and looking what they are doing because now they are simply organizing themselves. (Benjamin Lehmann)

5.5 The use of Skype at local.ch

In the developer community, Skype was regarded unanimously as crucial for the project, in that it enabled people to successfully work within the existing organisational setting. In the beginning of the project, David and other project members deliberately made the decision to choose Skype or a similar application as the main ICT for the project. David suggested that they aimed to replicate the Bazaar approach in a virtual setting by using tools like Skype.

> … we make sure that we find the digital equivalent of a Bazaar environment. It is simply … we can't all sit in the same office, that is the chit-chat where someone stands up and shouts in the room "hey, I shut down the server, does anybody have anything against it?" that doesn't work with us. And Skype is for us, more precisely, SkypeChat is for us exactly that. (David Steiner)

As mentioned before, daily, ongoing communication was regarded as crucial and Skype enabled this pro active communication within a virtual setting. David described the role Skype took up in the project as the "glue that keeps everything together". Interestingly, although the VoIP functionality was frequently used, instead it was rather the different forms of SkypeChat that developers appreciated the most. Skype established a sense of closeness among the team members regardless of their actual location:

> Well, you get kind of the feeling, aha, the person is there. (Conrad Huber)

> It is definitely that with Skype you feel closer. For example, it does not matter if I am doing home office or if I am here [local headquarters]. Because I can communicate in a *normal* way with Skype. (Kevin Hosbach)

Consequently, Skype-mediated communicative practices were associated with some tasks irrespective of whether people's counterparts were sitting in the same room or were geographically dispersed.

In the following, I intend to describe the different forms of using Skype at local.ch. More specifically, by concentrating on the developer community I shall elaborate on the different practices of using SkypeChat. I shall then refer to forms of media switching and aspects of accessability, delays, and interruptions before discussing the implications Skype had on the customer-supplier relationship and the partner organisations in more general. I shall conclude the section with a brief description of the application of Skype in the business community.

5.5.1 The use of SkypeChat in the developer community

The chat functionality was described by many developers as the 'killer application'. It allowed developers to instantaneously initiate one-to-one or group chats, assign topics to chats, and bookmark chats. Once a chat was bookmarked by a user it could be easily re-opened with all its proceeding discussions and would additionally pop-up every time a new message was posted in the chat. In the following, the discussion differentiates among three distinct forms of using SkypeChat, namely institutionalized chats, group chats, and one-to-one chats. While the categorization remained stable throughout the fieldwork, the quality of the chats constantly altered as team members adjusted them to the changing requirements. The description can therefore be nothing more than a snapshot in time.

Institutionalized chats

Institutionalized chats were permanent chats dedicated to a particular topic and generally of interest to a broader audience. In early 2006 the "Developer Broadcast Channel" was the first institutionalized chat that got initiated. Initially, the channel was intended to disseminate project relevant information throughout the developer community. Developers posted messages when the server needed to be shut down or the mail server was temporarily not available. Over time the channel enjoyed increasing popularity which resulted in a surging number of participants. Even team members who were not directly involved in writing code (for example people from the business community) joined the chat in order to be peripherally informed on activities within the developer community. The objective of the channel became

more and more to disseminate news throughout the local.ch network. This transformation was not without consequences. In fact, the number of posted messages increased significantly over time and so did the number of non-work related messages. Users experienced the surging communication volume as becoming an increasing burden which negatively affected the usefulness of the channel. The tipping point was reached at the day the new MacBooks were shipped. Apple fans among the developers feverishly discussed the features of the MacBook via the "Developer Broadcast Channel". These lively discussions disturbed other subscribers and prompted them to leave the chat.[12] Responding to people leaving the chat, Pascal initiated a new channel called "Trash and Talk" and sent an invitation email for the chat to all team members at local.ch. The objective of the "Trash and Talk" channel was to address non-work related communication such as jokes or links to articles and it quickly equalled the "Broadcast channel" in popularity.

After the initiation of the new channel, further changes emerged as both channels developed distinct communicative styles. Messages within the "Trash and Talk" channel were colloquial and informal whereas the communication norms for the "Developer Broadcast" channel were more formal. In addition, in October 2006 the 'New stuff' channel was found in an attempt to further reduce the communication volume on the 'Developer Broadcast' channel and to increase the visibility of new feature releases. In the following, I shall explicate the role of the three institutionalized chats within the developer community.

Having learnt from their previous mistakes, developers argued that in order to reduce interruptions messages in the 'Developer Broadcast' channel should always be work related and short. Rather than having long discussions on this channel, the messages took on the character of brief announcement which aimed at notifying the audience about ongoing or forthcoming activities. Keeping the messages and consequently interruptions to a minimum was for a chat with such a large audience considered to be crucial.

> [06/09/2006 12:41:33] Tim Brunner says: Please note that I will now start the upgrade of the wiki and jira services.
> [06/09/2006 12:41:43] Tim Brunner says: there will be a series of short downtimes.
> [06/09/2006 12:41:59] Tim Brunner says: shouldnt take to long.
> [06/09/2006 12:42:22] Tim Brunner says: I'll announce the individual downtimes here in this channel.

[12] A message saying that a person left the chat makes the activity visible to the rest of the participants

[06/09/2006 12:44:46] Tim Brunner says: okay, the first one happen now... should only take a second or two.. ;0(
[06/09/2006 12:44:52] Tim Brunner says: ;)
[06/09/2006 12:46:51] Tim Brunner says: ...and back online!
[06/09/2006 13:21:17] Tim Brunner says: okay, i will now take the jira offline, to prevent data issues during the move. I hove to finish everything within 5-10 minutes.
[06/09/2006 13:22:55] Tim Brunner says: restarting wiki now...

The messages were directly relevant for ongoing work processes and intended to keep recipients, from whom no direct input might be expected, informed on the status of ongoing work. Relevant subjects were for example the status of servers or the implementation of new releases.

Occasionally, announcements received emotional responses from colleagues who paid respect to and celebrate special (team) achievements, such as a new feature releases.

[13/09/2006 09:00:25] quorgxtn says: We are now ready to release Beach - for a last check, please go to http://www.trunk.local.ch and scream, if you find any killer
[13/09/2006 09:39:28] quorgxtn says: This is your last chance - switching the next few seconds ;)
[13/09/2006 09:43:55] quorgxtn says: RELEASED!!!!!
[13/09/2006 09:44:05] quorgxtn says: hoooorraayyyyy!

[13/09/2006 09:44:43] Christian Stocker says: (dance)

[13/09/2006 09:45:36] Fabio Hofer says: (d)

[13/09/2006 09:46:34] Cédric Hüsler says: (sun)

[13/09/2006 09:46:48] Alexander Frei says: hopp (flag:ch)

Interestingly, the Broadcast channel became the only means of notifying both co-located and dispersed developers:

> We did some changes [at the mail server] and it potentially affects everybody which is why we wrote in Skype that we are shutting down the server … And generally it is just done like this, that means there is nobody who additionally writes an e-mail or stands up and shouts it in the room. He just writes it [in Skype] and if you read it you know it if not you are unlucky. (Kevin Hosbach)

Thus, notifying developers via the Broadcast channel became the only established and accepted communicative practice for both co-located and dispersed colleagues. The use of the 'Developer Broadcast' channel substituted earlier forms of notification, such as e-mails or verbal reminders. In this regard, communication differences between co-located and dispersed team members shrank to a certain extent as both groups started to rely on the same information.

Eliciting feedback or input from the developers was a second practice associated with the “Developer Broadcast” channel. By posting messages in the channel, people aimed at bringing issues to the attention of a large audience, eliciting feedback, and identifying suitable contacts.

> [01/09/2006 12:40:50] Pascal Niederberger says: We have a problem with our paginating on Internet Explorer. Currently we could never reproduce it. Could you please open the page http://tel.local.ch/q/?what=H%C3%B6rger%C3%A4te,%20H%C3%B6rberatung and check if the paginating works? If it doesn't work, please get in contact with me. All of the affected browsers so far seem to have been IE6, Win XP.
>
> [01/09/2006 12:43:47] Kevin Hosbach says: works on my ie
>
> [01/09/2006 12:44:03] Ditscheid Pierre-Jean says: Works also for me on ie6 / Win XP
>
> [01/09/2006 12:44:05] Vuattoux Jean-Luc says: me too
>
> [01/09/2006 12:47:45] Tim Brunner says: work for me to
> [01/09/2006 12:47:47] Tim Brunner says: too
> [01/09/2006 12:48:05] Tim Brunner says: is suspect it's related to some adware that those useers have installed
> [01/09/2006 12:48:21] Pascal Niederberger says: The useragent strings don't show anything special unfortunately.
>
> [01/09/2006 12:48:22] Tobias Ebnöther says: Does work on wine too
>
> [01/09/2006 12:48:28] David Steiner says: works for me. however, the pois on th map do not follow. that is on page 2ff on the map the a flag is still on the old spot
>
> [01/09/2006 12:48:40] Tim Brunner says: maybe we should create a vmware image where we install all sorts of toolbar, etc.
>
> [01/09/2006 12:48:56] Pascal Niederberger says: Actually the URL that I posted seems to indicate that the user had a JS error on the previous page as well. Because the URL wasn't converted to a "readable one"

Although the ‘Developer Broadcast’ channel was an efficient way for generating feedback and the excerpt given above is testimony to it, social protocols restrained developers from doing so frequently. Using the broadcast channel to elicit feedback was regarded as ‘the last instance’ as it generated additional interruptions for an audience to whose majority the issue was not of any interest.

> And the broadcast is the clumsiest means; well it is the last instance if no other [option] exists. You disseminate the message to everyone. And rarely is information relevant for all. (Kevin Hosbach)

Since the broadcast channel was regarded as clumsy, in that information was disseminated to the whole team without differentiating people’s interests, developers increasingly tried to enact clear rules on when the channel was supposed to be used and attempted to refine these rules over time:

> Yeah, do some hygiene; not that someone is doing his funny jokes in the developer-chat … (Tim Brunner)

> I would say, it is subliminal education, in that you automatically rap someone's knuckles and say "No, not in the Broadcast channel. You must discuss it directly". (Kevin Hosbach)

Initiating further institutionalized channels was another strategy developers referred to when issues consistently re-emerged on a channel and no alternative outlet existed. The institutionalized channels were not considered to be static but people referred to their existence as an evolutionary process which had to be constantly adapted to the currently existing requirements.

> And at any time we will initiate a new channel if people are complaining … It might happen that someone says "Hey, this is a developer channel. We don't want that here". We will then simply change it. There will simply be an „Infrastructure channel" with people who are interested in it. (Tim Brunner)

Consequently, further institutionalized channels emerged over time in the developer community. After being initiated during the 'MacBook incidence', the "Trash and Talk" channel mainly aimed at referencing interesting or funny articles and websites. This was generally done through posting the respective hyperlink accompanied by some additional remarks.

> [04/10/2006 13:36:44] Philipp Lüchinger says: web 2.0 validator ;)
> [04/10/2006 13:36:45] Philipp Lüchinger says: http://web2.0validator.com/
> [04/10/2006 13:36:53] Philipp Lüchinger says: local.ch at least 6 out of 52 points
>
> [04/10/2006 13:37:19] Pascal Niederberger says: Varies each day as the rules come out of del.icio.us and can be created by different people.
>
> [04/10/2006 13:38:45] Tobias Ebnöther says: Uses the "blink" tag?
>
> [04/10/2006 13:39:05] Clement Huus says: Uses Google Maps API?
> [04/10/2006 13:39:09] Clement Huus says: come on...
>
> [04/10/2006 13:39:36] Philipp Lüchinger says: well, it's still beta....
>
> [04/10/2006 13:39:37] Kevin Hosbach says: I like: Appears to be web 3.0 ? Yes!
>
> [04/10/2006 13:41:40] Pascal Niederberger says: The web 3.0 rule is actually really funny ;) appears to be web 3.0 : /a/

Occasionally, funny discussions or remarks in the channel sparked ideas for developing new system features.

> [20/09/2006 14:22:04] Christian Stocker says: search.ch now with opening hours :) http://about.search.ch/archives/2006/09/20/offnungszeiten-der-postschalter-auf-telsearchch/
> [20/09/2006 14:22:11] Christian Stocker says: s/l/ö/

[20/09/2006 14:35:29] Kevin Hosbach says: Hmmmm... makes lots of sense – I almost break away if we can not deliver it very soon for the post and other counters (bank, administration) very soon :(

If the ideas were approved and regarded to be of interest, developers picked up some ideas of the discussion and documented them on a Wiki page which was dedicated to evaluating potential ideas for future features.

Finally, the "New stuff" channel was initiated in October 2006, firstly, to further reduce the communication volume of the Developer Broadcast channel and, secondly, to heighten business people's awareness of the new feature releases.

[16/10/2006 13:39:56] Christian Stocker says: If you have plazes, and want to see my first "real" firefox extension in action, install http://trash.chregu.tv/gps.xpi Then restart firefox, open the Extension window again, then the preferences of the "gps" extension, type in your plazes username and password And then open www.trunk.local.ch :)
[16/10/2006 13:40:17] Christian Stocker says: (doesn't seem to be compatible with greasemonky...)
[16/10/2006 13:41:27] Christian Stocker says: I also have a mode in the works, which directly asks a GPS device via gpsbabel. basically works (with a Garmin USB device :))
[16/10/2006 13:50:53] Christian Stocker says: together with a routeplaner, we could do cool stuff this way :) No need for tomtom anymore .)
[16/10/2006 13:52:33] David Steiner says: cool, now we know finally what to use the map on the first page for!! Congrats!

Before the initiation of the 'New stuff' channel, announcements of feature releases were still part of the developer broadcast channel. Due to the diversity of the discussions, information on new features got often lost in between the mainly technical discussions on the channel. Conrad argued that initiating the "New stuff" channel was aimed at clearly delineating the technical discussions from news about the system. By doing so, it was also intended to address and mitigate the communication breakdown between the business and developer communities. In addition to the weekly meetings, messages posted on the "New stuff" channel aimed at packaging and highlighting information for the business community:

> They [Mélissa and Celine] were not in the [same] context. Now, we have initiated the [New stuff] chat, which does not contain any technical details but is all about new features, new indexes so that they catch and know what's going on. (Conrad Huber)

Although the initiation of the "New stuff" channel was well-intentioned, the acceptance of the channel within the business community fell short of the initial expectations. The reason the business people too a rather sceptical stance towards the channel was not because it was considered to be useless. In fact, Celine suggested

that since developers invested more time in surfing the internet they discovered topics and information which proved to be relevant for her own work. However, while they occasionally checked the chat for interesting discussions Celine and Mélissa generally restrained from taking on a more active part in the "New stuff" channel. Their interpretation of the situation was owed to the existing communication norms within the chats which - enforced by the developers - scared them finally away:

> And first it was said "The girls, they don't use it [SkypeChat], we need to include them in the channels. That's all very well, but somehow when somebody asks a question and you respond to it and you ask someone else, suddenly the master of the channel Tim says "That does not belong in here, it belongs to another channel". Excuse me. … Well I thought to myself "Please, come on, allowing me when I shall write something and when not. I find that very stupid" (Celine Kobler)

> And one IT person said: „That is not the channel were such things are discussed. This one is just for new stuff". And that doesn't create a good atmosphere. Very bad. It does not matter if some lines derive from the pure new stuff. (Mélissa Schmidt)

Consequently, rather than integrating Mélissa and Celine in ongoing activities, developers impeded a more active involvement of the business side through the enforcement of strict communicative norms.

Besides the large institutionalized channels ("Developer Broadcast", "Trash and Talk", and "New stuff"), the majority of team members had subscribed to them, smaller and more subject oriented channels emerged as well. While these chats were also permanent, the subjects were rather specific and addressed a significantly smaller audience. Some of them were only peripherally work related (for example a channel for all Macintosh users was initiated) while others were associated with coordinating work within sub-teams (for example Front-end channel). At Namics, for example, a channel was initiated, exclusively for those people at Namics who worked on the local.ch project. Within the channel, local.ch specific topics were discussed or people simply arranged to meet for lunch.

Team members over time became more competent and accustomed to the institutionalized channels. Indeed, people started to use the channels more and more proactively, to initiate new ones, and to adjust and select the channels for their communication accordingly. Consequently, rather than using Skype only for one-to-

one communication, developers drew upon institutionalized chats to establish innovative forms of one-to-many communication. Channels like 'Developer Broadcast' or 'New Stuff' made sure that interesting news and information got disseminated throughout the team. Consequently, the notification in combination with proactive communicative practices brought about a transparency of work statuses and awareness for these specific fields. Especially for team members from the partner organisations, the channels provided a constant update on activities within the local.ch context. While in co-located settings, awareness is partly established through eaves-dropping on others' conversations, such opportunities did not exist in general. External developers could read the channels to keep up with the activities within the project although they were constantly involved in the project or worked apart from the core team for most of the week.

Furthermore, in his role as a team leader, Alexander especially argued that the institutionalized channels functioned for him as a means not only to monitor the work progress but to be sensitized to the team atmosphere:

> ... especially the channels and the techi-channels, they were for me [a means] to have an eye if anything is happening – maybe the *Befindlichkeit* is not that good. For me it is something which I use to grasp the mood of the people because I can see what is going on and happening. (Alexander Frei)

Monitoring the chat channels gave Alexander a feel for the developers' mood and the atmosphere in the team in general. While the understanding could then be used by Alexander to talk to developers and address potential issues, from the developers' perspective it was never mentioned that this level of monitoring by management was a problem or posed a threat to them.

Group chats as expert groups

Group chats represented the second category of Skype use. In general, group chats were instantaneously called together and aimed at addressing a specific issue. While people subscribed to institutionalized chats to be peripherally informed on ongoing activities, only those to whom issues were of direct relevance joined group chats. Depending on its purpose, the lifetime of these chats could vary from some hours to several weeks:

> There are all the time channels which run for a while and then are pulped. … For the last release we had a channel to discuss all issues that were required for building the release. (Clement Huus)

> … you have a concrete problem, you have three, four people where you know that these people are working on the issue or that they know something about it. You then have the option to open a chat, ask a question, wait for a response and close the chat. The life time is then very short. Or you open such a channel which survives one or two weeks and you know that you will mention the topic over the next few weeks and the same people are working on it. (Kevin Hosbach)

The formation of group chats was very dynamic and the number of participants could grow over time as further expertise was required to tackle a problem:

> You can more or less start with a one-to-one chat and then "hey, one moment, we need Kevin for that. And then you add him to it … I assume that most groups emerge like this. (Tim Brunner)

Developers argued that the advantage of expert groups was that, in contrast to conference calls which required exclusive attention, group chats allowed developers to post questions and wait until someone replied. Developers argued that because chats gave people the opportunity to decide when to react to requests they were more able to incorporate group chat within their daily work without causing big interruptions. That is, although expert groups created a pool of expertise one could obtain information from, the interruptions accompanying this practice were regarded as minor. Besides asking single questions, discussions within expert groups were lively and dynamic as people collaborated in real-time in order to fix a problem.

Awareness of others' activities was created when people were working closely together on a task and were constantly sending chat-messages back and forth:

> Before our first live deadline we had a relatively long night session and although I was sitting at home on my bed, at the desk or on the coach, no matter where, we could work very closely together. We all had the same objective: We need to be online by then! ... If really everybody has the same objective you have more or less the situation as though everybody is in the same room. Not completely. When you realize it is getting difficult to discuss something, you can call: What's up? You can escalate very quickly. (Conrad Huber)

Within this clearly defined work setting awareness of each other's activities was produced and re-produced through the constant exchange of messages. The following

excerpt from the query application expert group shows how work was actually accomplished within the group chats.

> [27/11/2006 13:52:57] Clement Huus says: at the moment something is blocking in the classified query app on local_application_nightly
>
> [27/11/2006 13:53:12] Roger Wegmann says: okay
> [27/11/2006 13:53:17] Roger Wegmann says: I reboot the console
> [27/11/2006 13:53:29] Roger Wegmann says: found one bug
> [27/11/2006 13:53:36] Roger Wegmann says: I will have a look if there are more
> [27/11/2006 13:55:02] Roger Wegmann says: it is again at start stop
> [27/11/2006 13:56:11] Roger Wegmann says: i am for rebooting
>
> [27/11/2006 13:56:37] Clement Huus says: strange – this time all threads are WAITING and none BLOCK
> [27/11/2006 13:56:44] Clement Huus says: re-start again
>
> [27/11/2006 13:56:57] Roger Wegmann says: okay
>
> [27/11/2006 13:56:58] Clement Huus says: Kevin says stop ;)
>
> [27/11/2006 13:57:03] Roger Wegmann says: aaah okay
> [27/11/2006 13:57:44] Roger Wegmann says: what happened?
>
> [27/11/2006 13:59:03] Kevin Hosbach says: Nothing yet – we are looking into it
> [27/11/2006 13:59:11] Kevin Hosbach says: Or do you definitely know what's wrong?
> [27/11/2006 13:59:22] Kevin Hosbach says: (is it what you mentioned above as "fixed"?)
>
> [27/11/2006 13:59:30] Roger Wegmann says: no that would be in transfer
>
> [27/11/2006 13:59:42] Kevin Hosbach says: Then let's take a look at the cause…
>
> [27/11/2006 13:59:44] Roger Wegmann says: but I will search, if I have similar bugs here
> [27/11/2006 13:59:46] Roger Wegmann says: okay
> [27/11/2006 13:59:47] Roger Wegmann says: go for it
>
> [27/11/2006 14:01:34] Clement Huus says: in the meantime I will reboot

In the group chat involving Clement, Roger, and Kevin, Clement first starts the discussion by identifying the problem. Roger then takes on the initiative, states the actions he is taking to resolve the problem and reports the results. Clement gives supplemental information, based on the established understanding of the problem situation, and proposes further efforts that Roger should undertake. However, Kevin who monitored the ongoing activities intervenes. Roger is surprised and asks Kevin for the reason to call a halt to the planned action. Kevin reminds him that they first need to find the cause of the bug before they can make the steps proposed by Roger. The three reach an agreement and realign their actions accordingly.

Furthermore, using the chat functionality rather than VoIP brought about a positive side effect, in that discussions were documented and developers could go back to conversations and check what they had agreed upon. As the above stated excerpt shows, chats created reifications of work processes developers could refer to and follow if similar issues did arise at a later point in time.

Fast interaction with one-to-one chats

Besides institutionalized and group chats, people frequently made use of one-to-one chats. Generally, developers were aware who was working on which tasks or was knowledgeable with regard to a particular issue. Using one-to-one chats, the developers argued, was the most practical way of contacting someone and attaining the needed information. In particularly, one-to-one chats allowed conversations to be stretched across the whole day as people could decide to direct their attention to them when it was most appropriate for them. Consequently, it was reported that discussions were often asynchronous with ten or fifteen minutes' delay in between each response.

While one-to-one chats were frequently applied for asking questions, others used chat messages occasionally even within the same room to get someone else's attention:

> When Conrad and I are too lazy to stand up and Conrad is behind his screen where you can't see him and I call for him and he doesn't respond I know that he has his headphones on again. And then I Skype him and he comes up behind his screen. (Celine Kobler)

Although it was clearly preferred only to include the minimum set of required people in chats – and one-to-one chats were in this regard the smallest unit – developers mentioned that such a strategy also brought with it one downside effect. Limiting participants within chats impeded the information from spreading throughout the team and towards those to whom it would be of equal importance. Consequently, a trade-off existed between either including a small number of people in chats to avoid interruptions or mentioning it to a broader audience. A person's inclination, liking, and routines decided in the end which strategy was applied.

5.5.2 Forms of media switching with RTC

The convergence of instant messaging and VoIP provides Skype users not only with a chat client for one-to-one and group chat but it also enables voice communication and conference calls. VoIP was regularly used within the developer community, often in combination with group chats, to discuss complex issues in more detail. Conrad illustrates one typical example of how the combination of chat and VoIP enabled the escalation of communication:

> That is exactly escalation. That means two of us are discussing something, for example in a chat. … And I realize that there are some bigger inconsistencies. We then start to talk to each other on the phone and we add Kevin or Fabio or Boris to the discussion who had done something on that issue. In the end there are five of us in the conference call and we thrash it out. (Conrad Huber)

Rather than being pre-planned, these discussions emerged and escalated spontaneously. It was exactly the fast and instantaneous way of initiating conf calls that was experienced as beneficial for speeding up problem solving processes. Comparing the current approach with previous companies he had worked for, Conrad elaborates:

> In other companies you would have said: "We need to have a meeting for that. When will we have the meeting". And then a discussion would have started about when to have the meeting and three days later the actual meeting would take place … And that becomes completely unnecessary. (Conrad Huber)

However, chats were clearly the preferred medium and developers only changed to VoIP communication if discussions got too complex. The tipping point for switching varied significantly and depended on the person, his perception of the complexity of the subject matter, the mutual understanding with the communication partner, and communicative norms in more general. Complexity was associated with, firstly, with the process of reifying or digiscribing (Kelly 2005) and, secondly, the topic itself. In relation to the first point, people pursued different strategies to decide when it was appropriate to switch to VoIP. Alexander, the team manager at Namics, preferred to switch to VoIP rather early, while others mentioned that established communicative practices refrained them from switching to different media:

> Yes, as soon as I need to write more than ten words, I would prefer to make a call … (Alexander Frei)

> … sometimes it would even make sense if you did not discuss it in a chat but rather call someone directly. But how often do people actually do it? (Kevin Hosbach)

Referring to the second aspect, people felt tempted to switch to VoIP communication as synchronous communication – especially turn taking during conversations - was considered to be faster in order to thrash out complex issues:

> If several discussions go back and forth, I get the feeling that Skype or instant messaging is in general not that efficient. (Benjamin Lehmann)

However, it was the established mutual understanding among the communication partners that influenced the threshold of when the process of reification got too complex or asynchronous chats too slow:

> With some people it works relatively well with chat because they can clearly put it [the facts] in words. And with others, I am not sure which context the person is coming from and I am not sure if I can just post the missing facts. And when I know that the person does not know it [the context], I then prefer to make a call. (Conrad Huber)

Additionally, developers not only used chat and VoIP in succession rather they frequently combined the two when they were working closely together. Kevin told that three or four of them were sometimes working together at night while each of them was at home. Skype allowed them to escalate conversations, to switch to conference calls, to send attachments (for example screenshots), or to impart complicated links which would be difficult to disseminate otherwise. Alexander adds:

> It is a combination of talking and writing at the same time. Giving someone an URL via the telephone is stupid. … For many things you need to write and talk at the same time. Then it is getting really interesting. (Alexander Frei)

In fact, handing over URLs to direct others to parts of the code or features was an important part of their work which was even better and faster accomplished with Skype than without.

5.5.3 Accessibility/ Interruptions/ Delays

Managing accessibility and interruptions were two closely related topics which developers took seriously. Especially at the end of a release cycle interactions got very dynamic as problems needed to be fixed in short time spans. In general the chat functionality was preferred over verbal conversations (i.e. telephone or even VoIP).

Verbal communication, it was argued, forced developers to react, that is the recipient accepted the call or waited until the initiator gave up. No matter which strategy one referred to, a phone call represented a substantial interruption of people's work:

> And Skype is very handy because it is less intrusive; you don't call someone and get him out of something just to ask him a quick question. And Skype is very good at that because you can ping someone and … you generally see if he is active at his desk … and if yes then you can ask him something… (Tim Brunner)

It was the element of intruding somebody's current context which was regarded as less intrusive with Skype than with the telephone. Additionally, in some situations chats were even preferred over face-to-face interaction. Conrad for example remarked that although face-to-face communication was more efficient as soon as one is starting to talk with each other, the initiation of conversations itself was less intrusive with chats:

> Every day I have a certain amount of credit points with him [Pascal], and I know that I can walk over to him four times. That is just a social [thing]; I don't want to disturb him because he needs to do his work and I am doing mine. And with chat the hurdle, that is the credits you loose when contacting someone, is much smaller. … You can send a message and he does not need to respond. (Conrad Huber)

The ability of instantaneously accessing someone but without appearing to be overly intrusive constituted Skype to be the preferred choice for initiating conversations.

Thus, having the ability to swiftly initiate short conversations endowed developers with a feeling of security. That is while developers did not generally know *per se* what their counterparts were working on in detail, Skype enabled them to ask questions at the time it was required:

> I think the others don't know *per se* what I am doing but they can ask me. And that's the difference. No matter where they are they can ask me: "Where are you at the moment? This and that is important. Can you take care of it?" (Kevin Hosbach)

Having this fall back option endowed developers with a feeling of secure attachment (Holmes 2001), that is they were assured that peers were always in reach if additional information was required:

> I know that I can all the time ask this person or that one. I get cracking and if I encounter a problem, I still can ask someone. (Alexander Frei)

However, it were not only the developers themselves who appreciated the element of instantaneous accessibility, rather the technical leads drew upon it as part of their managerial activities. Awareness of subordinates' activities deteriorated over time when no information exchange took place. As developers did not proactively communicate every step of their work, technical leads needed to check every now and then the work progress. Fabio described the use of Skype for his management activities as follows:

> It is not that everybody says "I do this or that". And in my case it is more that I say what needs to be done. … And I assume that the people are doing it. And it is really more that I can ask "Did you think of that?" or "Did you do this?" (Fabio Hofer)

The status information supported the instantaneous initiation of conversations. Status information was welcomed as a means to directly initiate synchronous communication without having to result to asynchronous communication for negotiating availability. Glancing at the status information became a regular habit people almost automatically enacted and some even felt that there was no way of getting round it. After starting the computer, looking at the buddy list, Benjamin argued, was one of his very first activities as to get a feel for who was online and who was not:

> It actually starts with the fact that … when you start the machine you see who is online and who is not available. Even if I don't want to contact someone with Skype but want to write him an e-mail or call him instead, I do still very quickly get a feeling for whether he is available. (Benjamin Lehmann)

Depending on people's status information, communicative practices were adjusted accordingly.

> And if I see that he is available I write him [a chat message] and then it's okay. And if I see that he is not available I might write him an e-mail instead. (Alexander Frei)

When status information signalled 'available' it gave orientation to people's practices who then routinely enacted appropriate forms of contacting one another. The interchange of status information and interaction, developers argued, speeded up communication exchanges:

> You see that he is there - I pose a question - problem solved - next problem. (Kevin Hosbach)

However, the status information was only a proxy and retained an element of ambiguity concerning a person's real activities at the very moment in time. For example, developers could leave their desk and were suddenly unavailable although they were in collaboration with others only some minutes before and the status information still showed them to be available. It became a routine with some developers to give additional information on their whereabouts with the mood messages. Hence, mood messages made what a person was currently doing and why s/he might not be responding visible for everybody. In particular, managing the

transition process from working closely together with someone towards being unavailable was regarded as delicate by some of the developers. The mood messages gave additional contextual information which allowed people to drop out of conversations without appearing to be rude.

Initiators welcomed the opportunity Skype provided to easily access co-workers. The assessment of Skype from a recipient's perspective was rather more ambiguous. While some developers took a favourable view of Skype in regards to managing interruptions others complained about the level of intrusion. No matter to which camp a developer belonged, developers drew upon a variety of strategies to manage interruptions. Generally, recipients tried to respond to communication requests within the first few minutes:

> …it is an interesting question how we are team-working. It works very good … that people join ad-hoc and … don't say "No, I don't have time". … It definitely has something to do with the culture. We did it like that from the beginning and it is normal for the people. (Conrad Huber)

> ...if I skype someone, he makes an effort to find a solution for the issue. (Pascal Niederberger)

However, the instantaneous support developers tried to offer on request prompted some of them to complain about the level of interruption and the usefulness of Skype in more general. After joining the project at a later stage, Benjamin subscribed to the different Skype channels. However, he subsequently experienced that the frequent message exchanges negatively affected his work:

> But where I joined the group discussions, I got the feel that it is 'too much'. I can't work anymore. Particularly, when a group dynamic develops and unnecessary traffic, which does not interest the others, goes back and forth. Or someone makes a joke and another person responds and that goes over ten times back and forth. And every time a window pops up. (Benjamin Lehmann)

Although as a project manager he understood that to get interrupted was part of his job, Benjamin maintained that the amount of messages distracted him and others from doing 'real' work. He argued that time intervals without disturbances were needed to deliver input. Technologies such as Skype were just a further source of interruptions that reduces the duration of these periods. Partly, Skype and similar technologies, Benjamin suggested, could be used to exchange information all day long without doing 'real' work. Consequently, Benjamin struggled to balance the

amount of needed interaction and the periods of uninterrupted time:

> And I deliberately disengage, switch off Skype and take more the train to turn the whole instant messaging stuff away from me and to work concentrated on conceptual things. (Benjamin Lehmann)

Disturbances were in particular related to the fact that incoming messages either popped up on the screen or became visible as a flashing window. Developers felt that those two indicators were almost impossible to ignore. For it could potentially be of importance, people were prompted to direct their attention to the incoming message.

> And Skype is obtrusive; when Skype is switched on I get quite often interrupted because a window blinks and something important might be in it. (Kevin Hosbach)

> What I could not do is to work on a machine and at the same time windows are popping up. (Fabio Hofer)

Four different strategies emerged over time in order to deal with interruptions. First, Skype allowed developers to manage their status information. Blocking incoming information and suppressing blinking windows, the 'do-no-disturb' status was used by developers to protect themselves. Especially, when traffic on the different channels was high or developers needed to work without interruptions, they set their status on 'do not disturb'. However, rather than enabling developers to specify and select the channels which should be excluded, the disadvantage of this strategy was that it categorically blocked all incoming messages. Therefore, people were, first, not accessible if they were really needed and, second, important messages remained unnoticed.

> ...it may happen that when somebody wrote in the broadcast channel "I shut down the network" and I am doing something very important for which the network is needed, I then don't realize it. (Kevin Hosbach)

The second and more extreme strategy was to leave chat channels altogether. Being annoyed by the frequent interruptions and partly unnecessary information, people like Benjamin decided to leave some of the channels. Again, the disadvantage of this strategy was that once a person had left, s/he was excluded from ongoing discussions and would miss out on crucial information. This was no option for developers anyway, as they were working closely together with Skype and some notifications were exclusively made with the channels.

Third, additional hardware and software was applied in an attempt to bring disruptions under control. For example, developers used two screens or even two machines with one mainly used for coding and the other for communication purposes. For example, Fabio switched back and forth between a notebook (for communication) and a desktop (for coding) to avoid chat windows from popping up while working on code. In contrast, Conrad deliberately traded his Windows computer for a Mac as the latter one offered a broader variety of additional applications for managing and filtering communication flows.

Finally, communication norms emerged which shaped both the way people managed their own accessibility and their expectations of others' accessible. First, communication preferences and dislikes of certain forms of interaction were made explicit:

> I try to inform the people how I prefer it. And if someone is calling me, it should be urgent because then I am interrupted and can't work. (Kevin Hosbach)

> And you can't avoid that the window blinks all the time. And that is why remarks are made quite quickly „Wrong channel. Go somewhere else to thrash it out". (Kevin Hosbach)

Such remarks clearly reminded developers and raised awareness for the appropriate conduct in the chat channels but also for communication in more general. While the communication norms were never reified nor even broadly discussed among the whole team, developers referred to them during their everyday interaction. It was the daily interaction through which people learned how to use Skype within the team. Being asked about the kind of norms that were created as to deal with interruptions, Alexander said:

> The solution is first of all self-discipline from the people, because it affects everybody. Everybody gets interrupted which is why everybody has the same problem and … before making a shout to the rest he thinks for a moment "Does it really interest everybody?" (Alexander Frei)

Consequently, developers were sensitized to the problem and were anxiously adhering to the norms as they found themselves in the same situation.

5.5.4 Implications for the organisational network

People both in the local.ch core team and the external contractors successfully embedded Skype in their work practices. Developers were enthusiastic about the

application and unanimously believed Skype to be one of the main enablers for the existing organisational structure. More specifically, developers argued that Skype enabled efficient collaboration within the cross-organisational sub-teams:

> … I believe that the collaboration with the partner organisations as we have it today would not be possible without such a tool [Skype]. The information flow would otherwise be less fast and rich. (Clement Huus)

However, substantial additional effort – especially in the form of regular face-to-face conversations – was required to establish Skype as the main instrument for both co-located but more important virtual communication. In this context, the weekly meetings proved to be crucial in order to supplement and buttress the daily communication via Skype:

> I believe the quality of communication would deteriorate if we did not see each other regularly and did only chat with each other via Skype. (Fabio Hofer)

Consequently, having closely established ties among the team members was regarded to be a prerequisite in order to bring about effective, Skype-enabled forms of organizing:

> I don't believe that Skype has an integrating effect but it can help if the team is closely knit together, knows what it needs to do and if the background information are already there, so that the geographical distance doesn't matter … you can compensate a lot with Skype. (Kevin Hosbach)

Close working relationships, background information, and regular face-to-face meetings brought about the atmosphere within the developer community which facilitated and further fostered the daily, Skype-enabled collaboration in both dispersed and co-located settings.

Especially the contractors who were working at the same time on additional projects recognized significant differences. More specifically, instantaneous communication and accessibility set the work at local.ch apart from other projects. E-mail communication, which was still prevalent in other projects, was almost regarded as cumbersome and slow.

In addition, the customer-supplier relationship at local.ch differed qualitatively from other projects as the parties collaborated more closely and frequently across the

organisational boundaries. In Benjamin's experience 'customer face time', that is the time spend together with the customer, positively affected the customer relationship. It was not just face to face conversations but also communication via Skype which counted as customer face time. Consequently, Benjamin argued that the frequent discussions with Skype helped to strengthen the customer-supplier relationship and by doing so to advance the project.

Forms of organizing work at local.ch spread throughout the network and Namics in particular changed their approach of organizing work. Because of the decentralized organisational structure of the project, Benjamin told, it became easier at Namics to adopt forms of dispersed collaboration. After moving to a different city, Benjamin only came to the Namics headquarters in St. Gallen two or three time per week and worked the rest of the time at home. Although regular physical meetings were crucial, he suggested that work within the project but also with his subordinates at Namics went equally well.

5.5.5 The business community and its usage of Skype

In general, the developer community wholeheartedly embraced Skype, embedded it in their work practices and by doing so brought about innovative and productive forms of organizing and communicating. Contrastingly, the business community doubted the value of Skype in regards to their work. The enactment within the business group could be classified as what Orlikowski (2000) called *inertia*, that is retaining established work practices in the face of a novel technology. Skype was considered as complementary to existing technologies, especially the telephone, without substantially altering or extending the technical conditions.

Celine and Mélissa were constantly communicating with people outside of the local.ch project. While the developer community constituted a closely knit group, the contacts of the business people were rather diverse and came from different professional and organisational backgrounds. Therefore, embedding Skype within their work practices proved to be a much more difficult endeavour for Mélissa and Celine, as contacts did either not use Skype or were not allowed to do so. In some cases, the telephone was literally the only available choice to contact external business partners.

Some conservative forms of Skype usage arose nonetheless both within the business community itself and with external partners. For example, Celine who was coordinating projects with external partners told that she personally disliked calling people she did not know very well. In her case most of the persons she dealt with were in a high position and sometimes even CEOs. She assumed that they were under intense pressure and felt uncomfortable to disturb them. Previously, she had used e-mails for negotiating appointments. However, in some cases Celine got the Skype ID from her business partners and preferred Skype to write a short chat message in order to negotiate availability. Doing so, she argued, was less intrusive and giving responses required less effort.

Furthermore, Celine used Skype to instantaneously ask questions. While being in the field, Celine was occasionally confronted with technical questions that exceeded her expertise. In such situations, she looked at the status information to see who is accessible and then instantaneously contacted this developer to get the needed information.

Within the business community itself, the status information gave Mélissa, Celine, and Resli helpful information on each others accessibility. Skype usage was mainly restricted to either outeraction (Nardi et al. 2000) or asking quick questions.

5.6 Summary of the local.ch case

This chapter gave a detailed account of the local.ch case by describing the formation of the local.ch network, the organisational culture, the organisational context, forms of organising software development, and finally the use of Skype. The organisational context at local.ch was very dynamic with work practices constantly changing in the light of incoming information. Such an organisational setting had strong implications on how people went about doing their work. In fact, considering the use of Skype at local.ch on its own might leave the reader questioning the importance and innovativeness of working with the application. Rather, the implications of Skype use can only be appreciated by taking the organisational context, the culture, and the concepts used for organising work into account. Consequently, the sections of the chapter should be understood as elements of an ensemble which all affected in different ways and to different degrees the work practices at local.ch. In the following, I recapitulate the main arguments of the sections, link them explicitly with

earlier theoretical developments of chapter three, and thereby try to reveal their implications on forms of organising work.

In an attempt to reduce the time to market, the schedule for the launch of the search engine was very ambitious and the first beta version ought to be shipped eight month after the project had been kicked-off. To fulfil such challenging targets, attracting and hiring passionate people was considered to be of paramount importance. Therefore, David single-handedly identified and selected both the internal team members and those from the external partner organisations. All of the selected partner organisations were located in a radius of 100km around Zurich to facilitate socialising and regular team meetings. In his position as CEO, David exercised administrative power to design the organisational setting and coordinate the activities of team members in time and space.

Different practices influenced the overall organisational culture at local.ch. First, due to the right staffing, team members were highly qualified and passionate which proved to be influential for the overall atmosphere within the project. Intrinsic satisfaction, internal commitment, and a performance oriented working culture meant that developers worked independently, pro-actively, and in a self-responsible manner. Consequently, rather than feeling controlled by their managers, team members attempts to establish and retain the acceptance of their peers. The constant control of the quality of their work by their peers brought about an element of disciplinary power. Second, ground rules explicated values which reflected the priorities in the organisational network and captured the attitudes of the developers. Third, as local.ch intended to create something completely new, learning from failures and constant discussions were regarded to be crucial elements in order to come up with innovative results. A prerequisite for creating such an atmosphere was to have the right people who engage proactively with each other and think independently. Finally, work at local.ch was facilitated and characterised by a high level of professional and personal trust, mutual support/ help-giving, and autonomous work. Consequently, the overall atmosphere at local.ch was characterised by highly passionate and inquisitive people who worked closely and pro-actively together to develop innovative solutions.

Although a strong sense of identification with the product and the organisation prevailed throughout local.ch conflict zones existed nonetheless. The fractures run

along the organisational boundaries but even more prominently along the professional groups. Within the local.ch core team, the developers and business people formed two distinct communities marked by technological savvy and varying work practices. The developers formed a homogeneous group which shared the same professional background and had strongly established relationships. As the developers worked closely together without any interference from outside of the group, distinct work practices emerged and stabilised over time thereby allowing knowledge to circulate easily. Contrastingly, work practices in the business community were less distinct since frequent communication beyond the local.ch network was required. The contrasting (ICT mediated) work practices and backgrounds of the developers and business people therefore hampered the knowledge exchange between the two communities. That is, the concepts of epistemic entailment (Duguid 2005) suggests that knowledge did not travel easily between the organisational communities since they did not share collective practices and therefore struggled to engage in the same forms of sense-reading, sense-giving, and thinking. Despite the different organisational backgrounds, the developers at local.ch formed a group which was marked by a shared set of values and interests. The epistemic entailment was a main reason for the fact that organisational boundaries blurred and a feeling of togetherness evolved among the developers. Nonetheless, working closely together with local.ch challenged established work practices of some partner organisations as their team members had to take on more responsibility, think independently, and work without a direct project leader. Within this context, David saw his role as a coach or a club secretary of an elitist club who set and monitored ground rules, took care that everybody was pursuing the same objectives, but otherwise respected the knowledgeability and autonomy of the developers.

Furthermore, I elaborate on the institutional scaffold and the daily work practices which shaped the ways of organising, collaborating and communicating. Initially work was organised in iterations, however, from May 2006 releases were used to add further components to the local.ch search engine. Mash-up meetings were used to reflect about the previous releases and to specify the components that were to be added to the system. Such features were then further refined in the Wiki and Jira database. The bazaar approach was selected as the guiding metaphor for developing software at local.ch. While shared values and priorities gave the project its overall

direction, developers were responsible for cultivating practices for coordinating and collaborating. In particular, sub-teams were formed which addressed specific technical areas of the platform, e.g. front-end or back-end. In such sub-teams, developers worked independently across the organisational boundaries. Consequently, the overall project management was less involved and essential for coordinating work on the team level. Rather, slot leaders kept an overview of the progress within the sub-teams and established awareness of the work status either through constant interaction or weekly team meetings.

Local.ch tried to replicate the bazaar approach in a virtual setting by using Skype which was regarded as 'the glue that keeps everything together'. In particular, the chat functionality – institutionalised, group, and one-to-one chats – was crucial in order to develop software in a collaborative manner across organisational boundaries. More specifically, institutionalised chats addressed specific topics and were of interest to a broader audience. Rather than eaves-dropping on conversations in co-located settings, people used institutionalised chats to monitor and display (Schmidt 2002) ongoing activities in their work context. Often, such chats became the only means of notifying both co-located and dispersed developers. Consequently, awareness of specific areas was produced and re-produced as people constantly displayed activities and monitored conversations and remarks of their counterparts. Group chats were instantaneously called together to address specific issues. The lifetime could vary from some hours to several weeks. Group chats often started as discussions between two developers and more participants joined in as further expertise was required. As developers worked closely together on issues and constantly exchanged messages with short feedback loops, group chats were influential in establishing awareness and the sensation of closeness (Giddens 1984) among team members. Finally, one-to-one chats, which could stretch over the whole day, were the most practical way of contacting colleagues in order to attain the needed information.

At local.ch, Skype was perceived as an efficient means for accessing team members and managing interruptions. In particular, Skype was considered to be less intrusive than verbal conversations. Furthermore, while people did not know per se what others were working on, Skype gave them a sensation of security as they could contact others as soon as problems arose. In particular, status information supported

the instantaneous initiation of conversations and team members argued that looking at the status information became a regular habit. The communicative practices were often adjusted according to the displayed signal, e.g. people used Skype when a person was available but reverted to e-mails when the status information signalled 'unavailable'. Consequently, similar to the indicators of a car (Heidegger 1927), status information functioned as signs (i.e. a particular form of equipment) which directed people's communicative practices. Simultaneously, the status information affected the mode of care as team members took the activities and engagement of their colleagues into account before initiating conversations. On the other hand, recipients regarded the level of interruption caused by Skype more ambiguous and cultivated different strategies to deal with them. In general, developers and team managers alike perceived the blinking chat windows as the main source of interruption which could not be ignored. Again, the blinking chat windows can be interpreted as signs which brought not only particular ICT artefacts to the fore but also represented references to colleagues, ongoing projects and other activities.

To sum up, several aspects have to be considered simultaneously to appreciate the importance of Skype at local.ch. While aspects of power and knowledge feature more prominently in the first three sections, co-presence/awareness and materiality are crucial for the interpretation and understanding of the last two sections. Developers worked in a dispersed organisational setting and relied on ICT for most of the week. Furthermore, passionate and inquisitive people who worked pro-actively and autonomously on the project characterised the atmosphere at local.ch. That is, people organised their work in sub-teams in a self-responsible manner and established context specific work practices. For developing software in a collaborative manner, developers relied in such a setting on Skype. The three kinds of chats enabled developers to update the whole team on ongoing activities, collaborate in a group with short feedback loops, or exchange information in one-to-one chats. Skype was therefore for developers the premise to pro-actively engage with each other, to learn, and to establish awareness in a collaborative manner.

Chapter 6

Sametime usage at IBM

In this case study, I describe the application of Sametime within a software development team at IBM. In the style of the local.ch case, I shall first sketch out in section one the physical setting, the organisational culture and the atmosphere within the team. In section two, I shall then give a brief overview of the history of the team before dealing with its practices for organizing software development. Finally, section three aims at depicting how Sametime was embedded in the work practices. More specifically, I shall differentiate three contextual settings in which forms of Sametime use were enacted. These settings shall then form the backdrop for further elaborations on the functionalities of Sametime and its socio-organisational implications.

6.1 Socio-organisational setting at IBM

IBM is one of the largest IT companies in the world with revenues of $91.1 billion and more than 329,000 employees in over 160 countries. With its first subsidiary in Ireland found in 1956 and a workforce of currently over 3200 employees, IBM is one of the largest technology companies in the country. The IBM software group is one among several functional areas of IBM in Ireland. The group consists of the Dublin Software Lab (DSL), the Lotus support centre, and industry models & assets. In the following, I shall concentrate my investigations on one team within the DSL. More specifically, the case study describes the work of the PAF team which developed and tested a novel feature for the latest Lotus Notes release.

The DSL was originally found by the Lotus Development Corporation in 1987 but with the acquisition of Lotus by IBM in 1995, Lotus Software became an integral part of the IBM Software Group and the DSL was since then run by IBM. The DSL is specialized in developing components for Lotus Workplace and advanced linguistic tools. The lab consists of three functional divisions, namely collaborative learning development, software tools & technologies development, and Lotus engineering & test.

The software tools group was established in 2003 and consisted of approximately 60 engineers. The group was responsible for developing tools for the development and deployment of collaborative applications. Currently, the PAF team of the group was involved in the development of 'paramount application'[13], a central feature for the new Lotus Notes release. Paramount application enabled clients to integrate Notes components with components developed on other platforms.

All in all, fourteen different teams were part of the paramount application group. While twelve of the teams were located in the USA, the remaining two, namely PAF and FAB, were situated in the DSL. Additionally, the project management of the overall paramount application group had recently been moved from the US to Dublin. The PAF team on which the study will concentrate showed itself responsible for developing the front-end of the feature. In the following, I shall briefly describe the physical setting of the DSL and the IBM Dublin campus. I shall then portray the structure of the PAF team in more detail as I shall turn towards the main players and their positioning within the team. Finally, the main elements of the organisational culture at IBM shall be brought to light before elaborating on the team culture.

6.1.1 Physical setting

The DSL itself was a large open-plan office which offered space for around 200 people. A glass façade lit up a small part of the room on one side while the rest was illuminated with neon light. Within the lab eight rows of desks were lined up from one end of the lab to the other, each with two people sitting opposite each other. Although small partitions separated office space, people could easily lean over them and talk to each other. Several meeting rooms were located at two sides of the open-plan office and people used them for meetings and (conference) calls. Managers had their desks together with developers out on the floor; however two more senior managers had secured themselves two of the smaller meeting rooms and turned them into their offices. The atmosphere within the lab was regarded as positive. It was argued that working together in an open-plan office made people more approachable.

6.1.2 The PAF team structure

Donna, a trained software developer, was the project and personnel manager of the PAF team for most of the project. However, at the end of 2006, a decision was taken to appoint Caroline Wilson as the project manager of the PAF team, thus allowing

[13] The names of technological products, applications, and teams have been made anonomous

Donna to solely concentrate on personnel management. Donna argued that her new role was to define the scope of the project, hand it over to Caroline, and only step in if things went wrong. However, separating the project and personnel positions from each other proved to be difficult and after the change of job roles developers were initially undecided whether to approach Donna or Caroline.

Caroline, the new project manager, joined the PAF team in December 2006. Previously, she had worked for the IBM engineering department for eight years, a part of this time as a project manager. Without any expertise in software development, Caroline was appointed the project manager for both the PAF team and the overall paramount application project. The role of the paramount application manager had previously been filled out by a person in the US and it was regarded as a boost for the importance of the DSL that the responsibility was devolved upon Caroline.

Paul, the software architect of the PAF team, had 25 years of experience in the IT industry and had already been working with Lotus since the beginning of the 90s. His main responsibility was the design of the paramount application tool for which he stood in close exchange with teams in the US. Although at the beginning of the project he had been deeply involved in the activities of the team, Paul was momentarily engaged in the strategic planning for the upcoming releases. However, he regularly updated the PAF team on decisions reached by the senior architects for the forthcoming releases.

The technical lead of the project was Martin McGlue. He joined IBM in 1997 after graduating from college but since had worked for three years in-between for other IT companies before rejoining IBM. Assigning work to the developers, dealing with questions from developers, and functioning as the main contact point for external questions were his main responsibilities. Theresa and John were the two senior developers on the team. Theresa started as a junior developer with IBM after graduating from university in 2002. John had worked as a developer for over ten years but only joined IBM in the beginning of 2006. Both of them functioned as intermediates between Martin and the junior developers. All five of the junior developers – Edward, James, Paul, Colin, and Brian – had come to IBM straight after graduating from university/college and had not been with IBM for more than one and a half years.

The test team was led by Michael Thompson, who had joined the Lotus group in 1996 straight out of college. In addition to the PAF team, Michael also led the paramount application focus group for testing which required him to coordinate testing among the various test teams and to ensure that they had the required information for doing their testing. Recently, Michael had moved to Cork which is around 260 km away from Dublin. For most of the time, he was therefore working remotely from the IBM office in Cork and only came to Dublin three to four times per month. The three testers of the team – Doris, Brendan, and Kevin - had different working experiences. Doris had been with IBM for over 9 years but had only recently joined the project. Brendan had more than five years of experience in the IT industry but only worked with IBM since November 2006. Kevin was still a graduate student from university who was on a one year placement.

Functional Area	Job role	Names
Management Team	Project/personnel manager Project manager	Donna Maloney Caroline Wilson
Systems Architect	Software architect	Paul Ellis
Developer Team	Technical lead Senior software engineer Senior software engineer Software engineer Software engineer Software engineer Software engineer Software engineer	Martin McGlue Theresa Lynch John Flynn Edward Cash James Hughes Paul Kerrigan Colin O'Connor Brian Murdoch
Test Team	Test lead Test Test Test	Michael Thompson Doris Robinson Brendan Walsh Kevin Harding

Table 7: Project team structure

6.1.3 Organisational culture

The origin of the DSL goes back to 1987 when it was founded as a part of the Lotus group. Interestingly, although the lab belonged to IBM for more than twelve years, the early history of the DSL was still very much alive. The more senior people in the DSL who had worked in the lab before its acquisition by IBM in 1995 still cherished the values of the early days. Two of the obvious remainder from the Lotus era were a more casual dress code than was common at IBM and an informal working atmosphere. Managers at the DSL differentiated themselves from the business culture at IBM and promoted a more relaxed culture within the lab:

> But, one thing to remember is that all of DSL here … or at least all the people that have been around long enough came from Lotus which had a kind of a more relaxed and family culture.

> And I think … most of the managers here and the architects would have been come from Lotus …. . So, I think there is a certain culture in DSL … a large family to a certain extent. (Martin McGlue 6:93)

The remains of the Lotus culture were noticeable on a day to day basis in that the informal and relaxed atmosphere facilitated interaction among people within the lab. In addition, the fact that developers at the DSL had no direct customer contact further contributed to the emergence of the informal culture. The junior developers in the PAF team in particular felt to their relief that the atmosphere in the lab diverged from the IBM culture with its formal corporate structure and manifold rules. More specifically, developers felt that it was always possible for them to contact others irrespective of the team a person worked for or the hierarchical position:

> There aren't really any offices. So the managers are all out on the floor as well. If you have a problem, and you could find out who the person to ask is (laughing) then like you can either Sametime, e-mail or just call over and say "Hi, have you got a minute"? (Theresa Lynch)

In fact, mutual support and help-giving was reported to be all-pervasive within the DSL.

A well balanced and moderate work load helped to bring about a context in which people generally gave each other time. Junior developers in particularly maintained that they experienced little pressure over the duration of the project as the objectives for the long-term deadlines did not stress them and were regarded to be achievable. However, developers suggested that they never regarded their work to be undemanding, rather opportunities for learning constantly emerged with management assigning them new tasks:

> I'd say it is extremely well relaxed. It's very relaxed, and but it's nice it's not relaxed that nobody works; people have time for other people in the lab. (Paul Kerrigan)

Interestingly, although everybody was aware that IBM applied a promotion system which compared developers' performance against each other, direct competition among the developers for new job positions or financial rewards was regarded to be marginal:

> I never noticed any competition between teams or even between developers despite the fact that we are all looking for the same recognitions and pay rewards. (Paul Kerrigan)

Therefore, apart from the IBM promotion system which valued individual performance, the Lotus era with its norms, that is balanced work load, informality, and help-giving, was still very much experienced in the DSL on a daily basis. However, those values were recently challenged as the lab experienced unprecedented growth with the number of developers skyrocketing. Consequently, the sheer size of the lab resulted in deteriorating communication and awareness of the work of other teams. Despite or because of the constant grouping and re-grouping of teams in the lab, developers did not socialize regularly with each other but stayed with colleagues they had worked with on previous projects:

> … people kind of keep to themselves otherwise. You know there's a lot of history of where teams were born … And even though people are moving into different teams, maybe because there's so much movement, the teams may not be forming very strong teams - formed for people to work together, but they're not - they may not necessarily be jelling otherwise, because everybody else is keeping their … other pals. (Caroline Wilson)

Thus, social networks within the lab did not have to overlap with the teams people were working with. Creating a distinct feeling of togetherness in a team was therefore less common in the DSL.

6.1.4 Team culture

The PAF team reflected many of the norms and characteristics of the culture within the DSL but it also showed some distinct features. In general, developers held that the good atmosphere within the team helped people to closely collaborate, share information and support each other:

> And, most people in the team get on very well with each other. And … it has to affect work as well, because you find that when you're friendly with someone, you find it much easier just to go over and hassle them for five minutes to ask them a question about. (Martin McGlue)

Striking the right balance of hard effort on the one hand and informality/ socializing on the other were important for bringing about the supportive working environment within the team. Additionally, in contrast to other groups in the lab, many of the PAF team members were all in their mid twenties and had only recently started working with IBM. Many of the team members shared the same interests and social events such as team nights were welcomed opportunities for socialising and generally attended by the PAF team in high numbers. The strong cohesion in the team kept the fluctuation low and open positions in the group were very much sought-after.

Developers in the PAF team were neither outspoken nor extroverted; they rather lived up to the image of a calm, introverted techie. Team meetings, for example, were always very quiet. Although Caroline had introduced a 'round the table' question session, giving everybody the chance to talk about what they were doing and to report difficulties, it rarely happened that someone took the opportunity to talk about his/her work:

> I'm not quite sure whether people … would put up their hand and go "I have a problem". And other people might want to do that more on a one to one basis, just don't want people to know that they might be having a problem and might think they have a silly question. They don't want to be seen as not knowing something. (Michael Thompson)

However, the quietness during the team meetings did not mean that developers were not confident in their capabilities or had problems working together. Rather they looked for different outlets to discuss issues. In general, developers favoured face-to-face conversations. This meant that they were often not sitting at their desks but rather preferred to wander through the lab and sit at someone else's desk to thrash out potential problems.

6.2 Organisational structure and processes

In this section, I shall first present a historical account of the PAF team from its foundation in 2005 until the end of my research in May 2007. Based on the description I will focus on the period of my investigations (March – May 2007) and relate about the practices of organising software development within the team.

6.2.1 Organisational structure of the PAF team from a historical perspective

The PAF team was found in 2005 and initially started off developing prototypes for the paramount application editor. At the beginning the team consisted of Donna, Martin, Michael, Theresa, and Paul. In December 2005 the prototype was eventually chosen to become a feature of the next Lotus Notes release. Over the next couple of months, the team went through five milestones which overlapped with the project plan of the Lotus Notes release.

Milestone one roughly specified on a conceptual level the functionalities of the prototype. Paul at this stage was mainly responsible for specifying the requirements of the paramount application editor feature and building a high level design.

Subsequently, the concepts went through a review process with different managers and architects from the Lotus Notes project.

For milestone two, the core architecture of the feature was tentatively sketched out. In order to do so, different parts and their functionalities were investigated in more detail. While Paul was solely responsible for the design during milestone one, at this stage, the senior team members became more involved and were asked to research and to prototype the previously specified concepts:

> Yes, initially Paul would define like the high level design for the project. So, what the different kind of the main functionality, the different areas and then I would kind of drill down into that and provide more detailed information on how we did it. (Martin McGlue)

During this phase, senior developers regularly met to discuss the specification documents and prototypes. Thus the design of the feature was by and large completed before the implementation commenced.

Milestone three - a private beta - was presented to a selected number of customers in June 2005 so as to generate early customer feedback. In the preparation for this milestone, the team actually started writing code. New members joined the PAF team at that stage to write the code. Tasks were broken down in separate sections and assigned to developers corresponding to their expertise:

Scheduled for November 2006, milestone four was an open beta version which, despite some remaining problems, included the paramount application editor feature and all its functionalities. Again, a specific section of the feature was assigned to each developer. In parallel to writing code, the testers on the PAF team had to keep up with the newly added functionalities by writing test cases for each of them. If a bug was found, the developers created an SPR (software problem report) which was documented in a Notes database. In general, the emphasis within the team at that time shifted from specifying concepts and implementing them to actually stabilizing the feature. The SPRs became more important in that they functioned as an indicator for the feature's stability.

After milestone four no further functionalities were added to the feature and the period until milestone five was intended to stabilize the system; that is refining existing functionalities and ironing out any problems and usability issues. The

developers were mainly concerned with closing SPRs, that is, bug fixing. It was during this phase that I joined the project.

6.2.2 Organizing work within the PAF team

After giving a historical overview, I shall now describe in more detail how work was organised within the PAF team during the period of my investigation. Martin, the technical lead of the PAF team, was the main contact point for questions from within and outside of the team. In this role, Martin frequently attended meetings and communicated with people from other teams. Within the PAF team, assigning SPRs to the developers was one of his responsibilities. All incoming SPRs, that is, SPRs either detected by the test team or external teams, first went in Martin's queue. He then checked each SPR and if it was related to the work of the team he reassigned it depending on the priority, the required expertise, and people's work load. In general, SPRs were assigned to the developer who initially wrote the code for the functionality the SPR referred to.

Theresa was one of the two senior developers on the team. Over the duration of the project she took on more responsibilities, one of which was to deliver code to the US where it was integrated in the Lotus Notes source code. Before the code could actually be delivered it had to be reviewed by one of the senior developers and most of the junior developers preferred to entrust Theresa with this task. John was the second senior developer on the team in contrast to Theresa he had less team responsibilities. Additional, he found that his current work was rather separate and not linked with other functionalities or external components. Consequently, he did not interact very much with the rest of the team, James being the only exception.

As mentioned before, specific functionalities of the feature were assigned to junior developers whose areas of responsibility were therefore clearly defined. However, problems did arise and functionalities overlapped making coordination among developers necessary:

> Yes, well we have to, because while it's split up into different sections, a lot of the sections have to talk to each other. … if you change something, you have to talk to the other person it affects and so it would definitely be collaboration in that aspect. (Theresa Lynch)

Due to his expertise and established network within the DSL, Martin would be the first person the junior developers consulted if problems emerged that went beyond their own expertise:

> But and you go to him anyway. And, if he didn't know, then he - he has such a wide network or people he knows. And he knows people's skill sets, so he can direct you to someone who might be outside the team. And so that's generally how you'd get - get information. (Colin O'Connor)

The level of interchange required from a developer strongly correlated with the corresponding functionality. Paul, for example, was working on a functionality which tied into code from a team in the US. He therefore needed to work with them to ensure the compatibility of the code fragments. Brian was mainly responsible for the back-end of the feature and was in contact with everybody whose components accessed the server of the paramount application editor. However, other developers rarely or never talked with people outside of the team:

> Yes, checking with externals is less regularly. Yes and most of the interaction is within the team. (James Hughes)

> And, I've worked with one of the other team members a bit, because she's doing the back end for it. But mostly it has been up to me. (Colin O'Connor)

While Martin assigned tasks and SPRs to junior developers, the latter enjoyed large degrees of autonomy to organise their daily work. This was especially true of those developers whose work received little interferences from external parties.

The work in the test team was organised around a reporting database that tracked whether functionalities had failed or passed the tests. During their weekly team meetings the test team discussed problems, the number of tests they had run, and the objectives for the upcoming week. As the team leader of the test team, Michael would create an execution report for each phase of the project which gave detailed information on the test cases for the next two or three weeks. He then assigned the test cases to the testers. As testers specialized on certain areas of the feature, they were generally well aware of any changes on the code or new functionalities and directly contacted the respective developer to get detailed information in order to write and specify the test cases.

As the test lead of the team, Michael regarded information sharing within the team as one of his main responsibilities. First, he coordinated the work with the other test teams involved in paramount applications. He therefore communicated regularly with teams in the US and fed information back to the overall manager for Lotus Notes. However, most of his interaction took place within the PAF team. For example, in the weekly team meetings, Michael presented the statistics of the test cases, areas were the test team was blocked, and reported on the overall progress to the PAF team.

In contrast to Michael's role, the work of the testers was rather clearly defined and detached:

> Most of the time you're working on your own or you're working away on something … (Doris Robinson)

The developers and testers formed sub-teams within the PAF team. Traditionally, broth groups were split, not necessarily in terms of team cohesion, but with regards to forms of organising their work:

> … on a work level, they're two independent teams. But then, there is cases like whereas people in the QE [test] team, they're friendly with the development team and they would have lunch together and things like that. And, I suppose they are kind different groups. But then, there's mixings between the groups. (Martin McGlue)

However, connections existed between the two groups as each tester had an area to look after which related to a particular section a developer was working on. For example, John was working with Paul, Colin with Brendan and Edward with Kevin. Although these pairs teamed up for the duration of the project, the dynamics and requirements of the bond changed over time. Before the feature freeze, the testers would have asked developers more questions as they tried to apprehend the features:

> Yeah, yeah there should have been a specification, describing the new feature, but it wasn't always the case. So you'd probably have to ask the developer to show you and explain to you how it worked, and what it should do, what it shouldn't do. How can you test that it's doing what it should be doing … (Paul Kerrigan)

Whereas from milestone four onwards, developers reached out to the testers to comprehend what caused an SPR and how it could be reproduced. Each time a developer fixed a bug, the SPR would be marked as fixed in the database. The testers

would then turn towards the fixed bugs to verify that the issue was corrected properly. Often, the given specifications in the SPR database were not detailed enough for the testers to understand what had been done and how it could be tested. Regular interaction among developers and testers was therefore part of their work.

6.3 Using Sametime within the PAF team

In the previous sections, I elaborated on the PAF team structure, the historical perspective and forms of organizing work in the PAF team and its sub-teams. In particular, I delineated the working relationships within the PAF team and across its boundaries. Based on these descriptions, I will focus in this section on different forms of Sametime usage and its socio-organisational implications. The PAF team mainly used Sametime to ask for advice, specific data, or updates, to schedule meetings or lunch breaks, to socialize, or to forward files, code snippets and hyperlinks:

> I would use Sametime generally if it's a short, quick question I need an answer to. Or basically, yes, if it's a short question like you know 'Where is this file'? 'Do you know why that isn't working'? 'Does this build work'? (Brian Murdoch)

> For Sametime within the team, it would be like asking the quick question of someone. 'How are you getting on with this task'? or 'Have you anything ready to send off today'? (Martin McGlue)

Interestingly, the stories of the usefulness of Sametime varied significantly among the developers. While some argued that Sametime had no implications on their work at all, others regarded it as a convenient substitute, a tool that helps to execute work, speeds up things, simplifies communication, supports dispersed work, and changes work routines in a subtle manner. In order to understand the different forms of how people made sense of the technology it is necessary to scrutinize the work practices of the developers and managers in the PAF team. As discussed before, the PAF team consisted of different sub-teams (for example the test and development team) and contained several hierarchical levels (for example management, technical lead, senior developers, junior developers), each of them associated with varying task characteristics and requirements. In the following, I shall describe three work settings in the PAF team in which distinct forms of Sametime usage emerged, namely work in the DSL, collaboration in the test team, and partnering with people in the USA.

The three settings will then form the background for contemplations on the aspects status information, accessibility/ interruption, and relationship building.

6.3.1 Three different work settings of Sametime usage

In this section, I shall relate the use of Sametime to three different work settings, namely co-located work in the DSL, collaboration within the test team, and partnering with people in the USA. Distinguishing among the three settings is only done for analytical reasons and staff continuously had to juggle between the three settings. However, such an approach is considered appropriate for clarifying the sense making processes and giving a coherent account.

Co-located work with Sametime at the DSL

For most of the developers and testers, especially junior ones, work was clearly defined and conversations were mostly confined to the DSL. For instance, in contrast to Martin, developers like Darren or Edward did not need to talk to people in the USA. Partnering with people beyond the team boundaries, in particular the USA, was generally the responsibility of senior team members and in only a few exceptional cases did task characteristics require junior developers to do so. Consequently, the latter were either working separately on their own tasks or they communicated with people within the PAF team:

> You know like Martin would probably be talking to more senior people in the States and Paul certainly would be, probably on a daily basis or as good as. Whereas … I would generally just be talking to people in the team here. (Edward Cash)

With communication being limited to the PAF team, those developers found that Sametime was not an integral part of their everyday work:

> …most of the days, generally, I get maybe two messages a day in Sametime. Sometimes it can be more but in general there can be no messages at all for the whole day. (John Flynn)

> Yes, I haven't really needed it that much. … I haven't been working closely with some that isn't a few steps away from me. So, I haven't - wouldn't use it that much now for collaboration. (Colin O'Connor)

Instead of using Sametime within the team, developers preferred to walk to someone's desk to ask questions and discuss problems. Asked about the dynamics in the team, Donna responds:

> It's there [pointing to the open plan office]. It's just out. You know half the time if you walk out into the team you won't find a time when everybody is sitting at their desk working away. There will always be one person talking with somebody else… (Donna Maloney)

In general, developers preferred face-to-face discussions over Sametime conversations. In particular, they argued that in face-to-face situations imparting information or discussing issues was quicker and easier. Developers found that it took longer to get a certain message across and to express some facts in written rather than spoken words:

> I'm not very good at putting stuff into words so that's probably better, just go walking right over. (Kevin Harding)

> Walking over to someone's desk. If they are close enough I just ask them face-to-face. I find you can kind of exchange the information a lot quicker plus you hold their focus. (Paul Kerrigan)

When collaborating with the junior developers, the more senior people in the team enacted similar communicative practices. Martin preferred to just walk over to the developers, discuss an issue for five minutes and then close it instead of engaging in prolonged conversations on Sametime. He found it easier and quicker to just lean over the partitions of the cubicles or wander to someone's desk. Theresa also favoured face-to-face discussions to manage her relations with the junior developers.

Despite the preferences for face-to-face encounters, Sametime was used in the PAF team nonetheless. First, some developers were rather undecided whether to use Sametime or to talk to people personally. Instead of having a clearly defined appreciation on when to use Sametime, James maintained that the decision for or against Sametime depended on his mood at a particular point in time:

> It depends on the mood you're in on a particular day really. Sometimes, I think it would be easier just to go over to someone's desk and actually talk to them face to face but if it's something very quick like, you know, I mean, it's probably not worth the hassle of actually going over and talking to someone. (James Hughes)

It was then especially for very short interactions that developers drew upon Sametime to avoid the hassle of getting up and walking over to someone's desk. In this regard, Sametime was a convenient substitute for face-to-face interaction.

A second reason for using Sametime was the fact that team members regularly worked from home. In such situations, Sametime became essential as e-mail was generally regarded as too slow for accomplishing the work. However, developers' skepticism concerning Sametime and their preferences for face-to-face discussions were reinforced in these situations since they often struggled to thrash out complex problems:

> I do find out that if I work from home that I just seem to be spending half the day on Sametime (laughing). Because then for people who just normally walk up to me at my desk - and it will be over in a minute or two - we have a Sametime conversation that might go on like for ten or fifteen minutes, just because it's slower getting the information across … (Martin McGlue)

> …if you have this really complex problem and you know someone can help you and they're at home. And it's hard to get across exactly what's going on for you at Sametime or e-mail. Like Sametime can be a little confusing, I find, because some people like you know they chat like a text and half sentences or bits of words in there you just don't know what they're trying to say. (Brian Murdoch)

In particularly, people found that it took them longer and it was more difficult to express intricate issues in writing. Furthermore, the informal writing style applied on Sametime made it difficult to comprehend and follow people's thoughts and explanations.

Third, due to their high work load, senior team members like Donna carefully managed their involvement in ongoing activities. Sametime allowed Donna to pose a question and be assured of getting a response. Calling someone, Donna argued, increased the probability that the respective person would bring up other topics while Sametime allowed to only specifically address the relevant issue. Additionally, Sametime brought about efficiency gains because one could have several conversations simultaneously:

> …because you can have five, six, seven different windows open at the same time and talking to different people. Whereas if you walk over to them, then you can only talk to that person and it kind of means that if anybody else is looking for you, they can't find you. (Theresa Lynch)

Staying at her desk and using Sametime for coordinating activities did not only increase the number of people Theresa could talk to but also guaranteed that she remained available for her team members. Even during meetings Theresa continued to be accessible and could communicate if her involvement was needed.

Fourth, as Caroline expressed, some of her contacts 'where not there to chat'. Nonetheless, socializing with Sametime was an important aspect of the work life of Caroline and the other team members. Caroline had kept the people from her previous projects in her buddy list when joining the PAF team:

> I always keep my lists of all of my oldest teams, (…) if you have a down minute, you can ping somebody from an old team and check in with them. You know and have - and have a little bit of a joke. (Caroline Wilson)

Chatting with friends cheered her up and helped her to stay in contact with friends and colleagues.

However, all in all, the usage of Sametime in the DSL was rather conservative and e-mails were the preferred means to make group announcements, such as server updates:

> I think for information that I need to pass out to the team I would generally use e-mails instead of Sametime. (Martin McGlue)

Additionally, group chats were rarely used to thrash out issues and work together in parallel on a task. People argued that because they were sitting in close proximity, group chats were not needed within the PAF team. Martin, John and James recounted only one incident where all three of them actually had to use group chat because John was working from home. At that occasion, they were working on a critical bug that overlapped different areas:

> So I just basically set up a three way chat so I could get an update from John. So John knew what James was doing. And James knew what John was doing. And I knew what both of them were doing. And we knew what problems were outstanding and we need to tune in our ideas for what we can do for this. (Martin McGlue)

The constant discussion on Sametime substituted their usual face-to-face conversations, created a shared understanding about what each of them was doing and what further steps had to be taken. However, John remarked that not more than two percent of the chats were used that way.

Collaboration in the test team

The test team which was lead by Michael Thompson, consisted of three testers, namely Doris, Brendan and Kevin. Furthermore, Paul had been part of the test team but left it early in 2007 to join the developer group in the PAF team. Recently,

Michael had moved to Cork which is around 260 km away from Dublin. Since then he spent approximately one day per week in the DSL. The rest of the time, he was working from the IBM office in Cork. Consequently, the situation in the test team was quite specific with testers relying on ICT to communicate with Michael in Cork.

For Michael, working in Cork proved to be more productive as he felt he was more in control of his time. In the DSL, he always found himself involved and dragged into meetings and face-to-face conversations. However, Michael maintained that in order for such a distanced form of managing to work efficiently, building personal relationships was of paramount importance:

> Like you have to have a relationship particularly in a lead role, that they can come to you with their issues and they know that they can come to you rather than trying to solve it themselves and spending three or four days trying to solve an issue. (Michael Thompson)

According to Michael, building up a rapport was crucial so that team members did not hesitate to contact him. In combination with the weekly test team meetings in Dublin, Sametime and telephone created an atmosphere which Michael regarded as 'almost like being [t]here'. While testers approached him and asked for advice, Michael also checked on them or requested input.

> It's a mixture of both, and particularly my team that would let me know "By the way this is happening" or "I have a question" so it's a two way thing. If they have questions, they ping me. (Michael Thompson)

> It's just that I always know he's there for me if I need any questions. And he always knows I'm here for him as well… It's probably - it is easier face to face. But when he's away it's almost the same. I can talk to him about anything. Like it's I don't feel that much different. (Brendan Walsh)

As the test lead, Michael had to share information with the test team, such as information on decisions, events, or test statistics that could affect their work. The weekly meetings of the test team were the main occasion for information sharing and this was not unproblematic. Doris, who had recently joined the team, mentioned that when Michael was working in Cork, he usually talked only to one of the testers. Doris therefore remarked that information was sometimes only accidentally relayed back and she generally had to wait until the team meeting to get the full picture:

> But Michael does seem to have a lot more overall information, and sometimes he doesn't pass it directly. This would be on a day to day basis, but at the weekly meeting you get it. He says what's going on anyway. (Doris Robinson)

> And sometimes he'd say it to Brendan, and I'd just here it back from Brendan or whatever. So it might be better if he sent an email or something. (Doris Robinson)

Thus, Doris would have preferred to be directly updated on important information and not to have to rely on other testers to impart information.

The team preferred to experiment with Sametime and members drew upon group chat to coordinate work in the team, in particular when Michael was in Cork. As the test team was rather small, with only five (and later four) members, testers did not hesitate to start group discussions with Sametime:

> And I suppose it was easier because it's a small team just four or five people. So it's easy to ping four or five people and get everyone talking, instead of with the development team out of 9-10 people … some people won't care. (Paul Kerrigan)

Group chats were initiated by Michael or other team members to generate feedback on activities, and to clarify the status of various pieces of work:

> [You] might ping someone and say "Did someone install today's build? Does it work?" And you have people say "No", "No", "Yes, I did it". And that would be it. (Paul Kerrigan)

Group chats were applied in an impromptu and unplanned manner for status discussions, reports on server status, or other day-to-day tasks. However, the usefulness of group chats was disputed and a few testers sometimes regarded them as disturbance or a waste of time:

> They [group chats] could be helpful or incredibility annoying … because we kind of moved away from something that is relevant to you, and you are not interested, but you don't want to leave it either. You constantly get the window popping up and it got very annoying to the point that you would consider signing-out of the meeting. (Paul Kerrigan)

The discussions on the group chats were rather emergent and unfocused with people taking the chance to ask questions so that conversations drifted over time to unrelated topics. As the group chats meandered to different topics, some testers found them rather annoying and time consuming. However, leaving the chats altogether was not

an alternative for them as the discussion could switch back to the initial topic at any point.

Partnering with the peers in the USA

Management, senior developers and, to a lesser extent, junior developers interacted for different reasons with colleagues in the US. Caroline, for example, was not only the project manager for the PAF team but she also coordinated the overall paramount application project. Michael, in addition to his work as the technical lead, was also spearheading a focus group of the test teams working on paramount applications. Consequently, both of them regularly interacted with co-workers in the US.

Collaboration with the larger IBM community differed considerably from everyday interaction in the lab. Caroline found that not being able to meet people she was working with face-to-face had an impact on how influential she could be in her role as a project manager for paramount application. As the majority of the teams were in the US, they regularly forgot about the two teams in Dublin and discussed issues informally because their time-space paths coincided:

> You want to be part of a team. And you are part of a team. However, specifically for the people who are meeting in the rich communication environment, they could easily forget you. … And in the case of this organisation, there's probably only one or two people who are remembering that we exist and remembering to make the communication and remembering to invite us. So, we are finding that we're falling off. We're - we're being left out to a certain extent. However, when you're being left out, you do not know to what extent we're being left out of things. (Caroline Wilson)

Only when the US teams encountered problems which they could not resolve on their own, Caroline argued, did they consult the project management or team members in Dublin. Conversations were usually short and problem directed without any exchange of pleasantries:

> … it is very problem directed. There's - there's no informal communication at all then as a result. And it's - you know any relationship is built as much on the informal communication path as on the formal. (Caroline Wilson)

Strong relationships or feelings of cohesion did not develop with the co-workers in the US. Concurring with Caroline's account, Michael maintained that people in the US would contact him if they faced a problem but he would otherwise not hear from them for a couple of weeks. In general, Michael suggested that the teams he was

dealing with in the US were all located in the same building and people solved issues during meetings or when bumping into each other in the corridors. Like Caroline, Michael constantly felt out of the loop as information on decisions was not passed on to him and up-dates were not reported in documents.

> You're involved but you're not physically involved. (Michael Thompson)

Due to a lack of physical presence, missing out on informal conversations and having no other means of attaining the input left Michael frequently feeling excluded. According to Michael, his work with the US and the test team made a good distinction of how dispersed collaboration can work if it is done with a good rapport and sporadic face-to-face meetings. The mixture of accessing people instantly, knowing what is going on, and not working remotely all the time enabled fluid collaboration in an almost dispersed setting, but this was exactly what was missing in the larger IBM community. Michael did not feel as comfortable 'pinging' and interrupting co-workers in the US with Sametime because the relationships were not yet strongly established. Instead, he waited for the weekly meetings to get a full up-date but, by so doing, was left out of the loop for the rest of the week. Caroline was, for the same reasons, reluctant to use Sametime. Group chats were regarded by her as a particular waste of people's time as (conference) calls could generally settle issues in half the time than group chats or one-to-one chats.

In this section, I illustrated three work settings and different forms of Sametime usage. The descriptions represent the backdrop for the following discussions and references are made to the work settings when appropriate. More specifically, I shall talk in more detail about the interpretation of the status information, the implications on accessibility/ interruptions and relationship building.

6.3.2 Status information

Status information on Sametime was a proxy for a person's availability. All members of the PAF team reported that they regularly made use of the feature. In particular, status information was regarded as useful in order to ask quick questions. After consulting the status information, people decided if and how to contact someone:

> I wouldn't be asking questions if the person is away or I'll ask them to ping me back when they're back, but that's only with people I know. (John Flynn)

> … definitely [useful] to know whether or not they're online. Because for most people, if they're not online, it means they're not at their desk or not in. So you know whether or not to send an e-mail. (Theresa Lynch)

> It's mainly I think often handy just to you know when you can contact them or like if you see the little green light come. You know they're there. And - - they might be able to give an answer quickly. (Martin McGlue)

Thus, people oriented their communication according to the status information. John, for example, would generally use Sametime but if the status information signalled that a person was not available he wrote an e-mail. It was then only if he knew a person well that he would write an instant message and waited for the person to come back to him. Rather than writing e-mails, others preferred to delay their requests and waited for the respective person to come online again:

> Generally, what I do is I give it a few minutes. Like if he's idle, I'd wait generally and get him on Sametime if possible. (Brian Murdoch)

Only if the person was idle for more than ten minutes or even longer would Brian actually consider writing an e-mail.

Status information was associated with the time it would take to get a response, in that recipients who were online were expected to respond almost immediately. However, people were aware that the status information was not always accurate either due to technical problems or because some people purposefully put their status information on 'not available'. Paul reported on a misjudgement he made about a colleague in the US resulting from the ambiguity of status information:

> Like last night I sametimed someone and he didn't respond I think [for] an hour and a half. And I thought oh maybe it's another ignorant person. So I closed Sametime and I went home, I came in this morning and found an email apologizing and saying that he was away from his computer. Whereas Sametime was saying that he was at his computer. (Paul Kerrigan)

Paul had not been in contact with his colleague in the US before but assumed, based on previous negative experience with people in the US and expectations about proper behaviour, that the person was intentionally not responding. Donna on the other hand maintained that she frequently ignored the status information. The managers she was dealing with regularly put the status information on 'not available' although they were at their desks:

> I might check it [status information] but I probably would still ignore it, and go he says he's away but I bet if I ring him he is actually there. And nine time out of ten they are. (Donna Maloney)

Therefore, it strongly depended on the person she was dealing with whether she actually respected the status information or not. That is, Donna would not disturb a person who usually didn't use the 'not available' status but failed to take the status information into consideration if a person constantly signalled unavailability.

Status information was interpreted in connection with the organisational context. More specifically, the status icon and the meaning associated with it resulted from the knowledge about the respective person and his/her working environment, routines, and job role. For example, within the PAF team and the DSL in more general, people had different lunchtimes. Martin checked the status information during lunchtime to see whether people were at their desk. If the status information signalled 'not available', he associated it with the person still having lunch. Similarly, James pointed out that additional contextual information was taken into account when interpreting the status information:

> I just saw a person going for a smoking break …, so I'll see he will come back in about ten minutes and he'll be able to respond to my message. (James Hughes)

When collaborating with the US, the knowledge about the broader social and organisational contexts was lacking, leaving the status information ambiguous:

> I know certain people are here say from nine to five. So if they're idle, I'd wait. Like but then if I don't know the person and I see them idle, then I have no idea if they're idle, because they're not in work… . So I'll … probably go to e-mail in that sense. (Brian Murdoch)

While people saw each other in the DSL and knew more about each other's routines and working conditions, status information was a good indicator for directing one's communication and interaction. However, the status information of people in the US could not be related with the broader context of the person and therefore remained ambiguous.

6.3.3 Accessability and interruptions

Sametime influenced forms of accessing both co-located and dispersed colleagues. Simultaneously, the tool was a new source of interruptions that people had to deal

with. In this section, I will delineate new forms of accessing co-workers with Sametime and ways of coping with (undesired) interruptions at the workplace.

In fact, accessing others with Sametime was widely regarded as the most important function of the application:

> I would say the most important would be the accessibility, like the fact that everyone is just on the other side of a chat window, it's kind of handy. (Brian Murdoch)

First, using Sametime within the DSL for contacting peers was a matter of convenience as pinging someone saved oneself from walking over to the person's desk. It was therefore a preferred way of immediately getting feedback on requests. However, in comparison with face-to-face interactions, Sametime was also associated with shortcomings not only because it impeded more nuanced discussions but also because it did not ensure that one would get a co-worker's full attention:

> And like face to face interruptions would take priority over Sametime because of the fact that somebody is there at your desk. You can't kind of turn, unless there's something very urgent you're working on. (Martin McGlue)

The preference for face-to-face discussions in the lab guaranteed having a person's undivided attention but also caused significant interruptions on the other hand. In the excerpt given above, Martin argued that the physical presence of a person demanded his full concentration and only when he was deeply immersed in a task did he request delaying the discussion. Sametime was instead regarded as less intrusive because it gave people the opportunity to respond at more suitable moments.

In contrast to the co-located setting, Sametime was favoured in the dispersed working environment over other communication technologies, such as e-mail. Developers drew in particularly upon Sametime to ask quick questions and appreciated the intrusive character of the application:

> …you can also force people as well. … like when you Sametime it is intrusive it can pop up in their face. You know; when you email them it has many mistakes. It might be tomorrow morning that I get my reply, but with Sametime I can almost put pressure on them to respond to me instantly,… (Paul Kerrigan)

Sametime speeded up the communication process. Rather than taking hours or even days to get a response to an e-mail, people found that they generally got replies on Sametime messages within minutes:

> Sametime can solve a problem in a couple of minutes where an email could have taken hours. (Paul Kerrigan)

Indeed, the fact that Sametime messages popped up on the screen directed people's attention to the messages and almost forced them to engage with its content. In contrast, e-mails gave people more time to respond as they were neither compelled nor expected to check their inbox constantly:

> And people aren't constantly looking at their email. I mean especially for an engineer, you don't have time to look at email all the time… (Doris Cunninham)

Thus, while contacting others with Sametime was purely a matter of convenience in co-located settings, it was fundamental in dispersed settings and changed the dynamics of interaction, as people were prompted to attend to messages popping up on their screens.

However, it was exactly the intrusive character of Sametime which discouraged some members form using the tool. In particular, some colleagues in the USA had explicitly forbidden being contacted by Sametime. Caroline mentioned that in her role as the global project manager of paramount applications, she tried not to use Sametime. Her scepticism originated from an incident with colleagues in the US who explicitly asked not to be contacted with Sametime as they found the technology to be too intrusive. Being sensitized for the intrusive, push-character of the application, Caroline avoided using Sametime and only pinged team members (for example Michael) whom she clearly knew had a favourable perspective on the technology. In general, however, she was cautious of interrupting others:

> …there would be … certain team members that I would ping, but for any of the development team or the technical team, I tend to not to communicate with them through Sametime. Because they're … doing work, so they don't need to have something pop up or distract them at the bottom of their screen. (Caroline Wilson)

> …it's this engagement of people's time. And … I feel that I have to be very conscious of not wasting people's time. (Caroline Wilson)

Caroline therefore preferred e-mail over Sametime for approaching people in the US.

The ambiguity of the technology, that is causing interruptions but improving accessibility, was well appreciated and people dealt with it in different ways. Martin reasoned that 'what goes around comes around' with which he referred to the element of mutual helping-giving cultivated in the lab and the fact that in the long run interruptions between two parties would level out:

> But in both cases by interrupting him I might have saved myself half an hour, an hour, and taken three or four minutes of his time. So, I think there's a net of twenty-five minutes saved. And then tomorrow he'll do the same. He'll interrupt me for three or four minutes. (Martin McGlue)

However, when Martin joined IBM he had never worked with an Instant Messaging application before and Sametime initially required him to adapt his work practices:

> Yes. Initially [it] used to kind of frustrate me a bit that there were the interruptions. But, I think over time, you develop - you develop a kind of a - maybe a process for dealing with them … (Martin McGlue)

Getting used to Sametime required Martin to develop competencies in gauging the importance and urgency of messages. The feature of Sametime that prompted recipients to give attention to the application was the blinking chat windows that popped up on the screen.

> It's the fact that it kind of it pops up and it's there and it's flashing [laughing] You're kind of obliged. (Martin McGlue)

> With Sametime if you're on it, it's all up in your face. (Donna Maloney)

Instant messages 'popped up' and 'started flashing' and, by doing so, caught people's attention. Because of this feature, Sametime instantaneously grasped people's attention; it was almost 'annoying' in the way it demanded attentiveness.

Nonetheless, in contrast to the telephone or face-to-face conversations, Sametime left space for people to negotiate the appropriate time for interaction. Members of the PAF team maintained that while Sametime was definitely interrupting their work and affected their concentration, it did so less than telephone or face-to-face conversations which gave no option whatsoever to time the response. Sametime was regarded as a mid-way between e-mails which put little pressure on the recipient and

spoken conversations. While developers generally tried to instantly reply to messages, it was common to delay responses for a couple of minutes or to send a message asking the initiator to wait for a moment:

> You know but there are times like when again, if I do get a Sametime and I am busy … I just kind of write a quick note saying actually can you give me ten minutes. (Martin McGlue)

> Like if I'm in the middle of something and I get a window popping up I can ignore it for you know a moment and finish what I'm doing. And then attend to it. (Edward Cash)

When it was clear that a question would lead to an extended conversation, senior developers and management found it more appropriate to set up a meeting.

Job roles and work load were two further factors influencing ways of dealing with interruptions. Donna, for example, reported that disturbances frequently prevented her from concentrating on important work:

> Yesterday, I decided to work at home for the day, because I want to do a review on a lot of documentation material on paramount applications and I haven't gotten around to doing it and every time I tried doing it in the office I kept getting disturbed, getting called to a meeting, somebody dropping by my desk. At the same time … somebody sends you an email with important written on it or high important or urgent … And then what they do is they Sametime you to see did you receive my urgent mail. (Donna Maloney)

Donna therefore worked at home and switched off Sametime because simply putting the status information on 'not available' would not deter most people from contacting her. Donna maintained that making the decision not to be available was important to actually get work done and clear the backlog.

6.3.4 Forms of establishing relationships

Sametime was interpreted as a fast, informal technology that replicated verbal and unstructured conversations. E-mail on the other hand had a more formal appearance which was regarded as more suitable for some tasks. The fact that e-mails were recorded and could be stored added to their formal appearance and made people wary of using e-mail in an ill-considered manner. For instance, people were more conscious about writing emails in proper English. Furthermore, the formality of e-mail was welcomed to clearly structure complex problems or large pieces of information, define expectations and present possible solutions.

Contacting colleagues in the USA was widely perceived as difficult in the PAF team. The relationships were not firmly established and stories about the problems with getting help from staff in the US were passed around in the team. John for example reported that:

> Talking to the US is generally very complicated because - in my experience and I hear some opinions from other team members - talking to certain people is just a pain because they come across as very arrogant and very "You're stupid". (John Flynn)

When John joined IBM, he needed to get information from a colleague in the USA. However, John found it difficult to engage the person in a discussion and to receive the required information. He was self-reflectively aware that being a novice in the company and the subject area impeded his ability to present himself as knowledgeable and to formulate informed questions. However, he nonetheless argued that his counterpart's unwillingness to engage with him hampered attempts of developing a shared understanding. It took a significant amount of time and effort until the repulsive tone in the conversation receded and a friendlier atmosphere emerged.

Because of the loose relationships with the colleagues in the US, PAF team members preferred not to introduce themselves with Sametime but to use e-mails instead. With Sametime, it was argued, one would infiltrate into a person's private sphere without any advanced warning:

> …maybe it's [e-mail] a better way of introducing myself to these people instead of kind of *appearing* on their desktop and asking for help. (Paul Kerrigan)

Initiating contacts with e-mail gave the recipient the chance to deal with a request in their own time which was why it was regarded as less intrusive. While it was suitable to contact colleagues with Sametime after close working relationships had been established, doing so from the outset did not comply with the social protocol:

> …it's in relation to how well you know the person. If I got a name to contact somebody, I would always go for email first. I would never Sametime somebody I didn't know. (Michael Thompson)

> I would send an email first to build up a relationship rather than just an initial Sametime… Sametime has to be an evolved relationship to get to that level where you can ping someone at anytime... (Michael Thompson)

Furthermore, feeling uncomfortable sending out unstructured, unclear or incorrect messages to co-workers they did not know well, PAF team members preferred e-mail to present their cases properly. In particularly, starting off conversations with e-mail enabled people to provide clearly structured information which would not be applicable to the informal style of Sametime:

> …email is a lot kind of easier because you can kind of say okay, well, I don't want to kind of go back to them and mislead information or I don't want to kind of like lead them around the loop or whatever when I don't have all my facts straight. … Email gives you a lot more time to think out what you are going to say. (James Hughes)

Consequently, e-mail offered a defense as one was not rushed into giving false information but gave time to gather one's thoughts.

6.4 Summary of the IBM case study

In the following, I shall summarise and emphasise the main arguments of the IBM case study. In order to provide a stronger conceptual analysis, I intend to link the main points with the theoretical concepts of chapter three. By so doing, I hope to prepare the ground for the following discussion of the results.

I started the description by giving a detailed account of the socio-organisational setting at IBM. In comparison with the local.ch case, the situation at IBM was in several respects less dynamic. The DSL was found in 1987 by Lotus Notes and became an integral part of IBM in 1995. It consisted of over 200 developers with 60 of them working with the software tools group. Over all these years, an organisational culture emerged and matured in the DSL which shaped the way people organised their work and socialised with each other. For instance, the informal working atmosphere with its casual dress code was a remnant of the Lotus Notes era. Generally, developers mutually supported each other and a balanced work load guaranteed that both developers and managers had time to help out and answer questions. The atmosphere was reflected in the PAF team where team members were in the same age group and got along with each other well. However, in contrast to the local.ch case, developers were not outspoken and avoided open discussions. They lived up the image of the calm introverted techie, a fact which was reflected in their preference for one-to-one and personal conversations rather than public disputes. Furthermore, as developers worked less closely together, they did not challenge each other by commenting on the output of their work, thereby reducing the role of

disciplinary power which is brought about through the close collaboration with colleagues.

In the second section of the chapter, I sketched out the organisational structure and processes of the PAF team. In particular, I attempted to give an historical account of how the organisational structure evolved over time as the team went through several project phases. The PAF team was found in Dec. 2005 in order to develop a prototype for the paramount application. Gradually, the project went through five milestones ranging from specifying the functionalities on a conceptual level, delineating the core architecture and functionalities, presentation of a private beta version, development of an open beta version, to finally testing and stabilising the feature with all its functionalities. Requirements and deadlines of the overall paramount application project strongly affected the work of the PAF team. For example, throughout the different project phases with their milestones, the management in the PAF team was not in the position to utilize administrative power and influence the structure of the organisational setting. Rather, management had to adhere to the requirements of the overall project and could only make minor adjustments in relation to aspects which only affected the PAF team.

The case study then concentrates on the final stage in which the system was tested and stabilised. The work of the developers in the PAF team was organised by Martin who assigned SPRs to the rest of the team. The level of interaction which was required from each developer strongly correlated with the corresponding functionalities he or she was working on. For example, while some developers needed to collaborate with colleagues in the US or in the DSL, others were concentrating on isolated functionalities and were therefore not affected by any external party. In the test team, the work was organised around a reporting database which tracked the status of the single functionalities. Once a week, the test team discussed problems, the number of tests they had run, and objectives for the upcoming week. Michael assigned test cases to the testers who were all specialised on certain functionalities. The work of the testers was rather clearly defined and detached, that is they worked most of the time on their own. However, overlaps between the work of testers and developers did exist, as testers tried to apprehend the features or developers attempted to reproduce the SPRs. In contrast to local.ch, the PAF team and IBM in general applied a top-down approach of organising software

development. The deliverables or tasks of the developers and testers were clearly defined. Consequently, due to the redefined architecture and the clearly defined work packages, less collaboration and constant interaction was required for the production of the feature.

In the PAF team, Sametime was mainly used to ask for advice, specific data, and updates, to schedule meetings or lunch breaks. However, the perceived usefulness of Sametime varied significantly among the developers and testers. Generally, whether or not developers regarded Sametime to be beneficial for their work depended upon their work context. Three different work settings were identified, namely co-located work in the DSL, collaborating in the test team, and partnering with peers in the USA. Most of the developers had to collaborate to different degrees with co-located colleagues and their work was therefore confined to the DSL. Sametime was not an integral part of their everyday work. Developers rather preferred to walk around and ask questions in a face-to-face situation. Personal conversations were regarded as faster than discussions with Sametime, basically because people were prompted to direct their full attention to the person who was physically present. Sametime was mainly used when people were working at home, however, such experiences often reconfirmed their sceptical assessment of Sametime. In particular, people argued that it took them longer to do the same amount of work in a virtual setting as Sametime forced them to express issues in writing. Nonetheless, some managers reported efficiency gains since Sametime allowed them to have several conversations in parallel and to manage their involvement in conversations.

With Michael working from Cork for most of the week, the test team relied on the use of Sametime and ICT in general. However, building personal relationships was regarded to be crucial for people to work efficiently and effectively in such an organisational setting. Team members in the test team needed to know that they could approach one another and Michael in particular as not to waste hours trying to solve problems on their own. The combination of physical presence during the weekly team meetings as well as Sametime and telephone conversations created a sensation of co-presence which was sustained in the co-located and the dispersed setting. For example, testers argued that work in the dispersed setting was ‘almost like being there’. Group chats were used more regularly to elicit feedback or to clarify the status of work. Through the constant exchange of messages with short

feedback lops, testers succeeded in creating awareness in relation to specific aspects of their work. However, some regarded them as a waste of time since conversations often meandered to different topics but nonetheless obliged everybody to actively monitor the conversation as it might return to the actual topic.

Finally, collaborating with the colleagues in the US differed fundamentally from the work in the DSL. The lack of physical presence meant that people felt left out and less influential than they wanted to be. Conversations were rather problem directed and the missing sensation of co-presence hampered attempts to establish shared social practices. As no personal relationships had been established, people in the DSL felt uncomfortable to use Sametime and just ping their counterparts in the US. Furthermore, peers in the USA even resisted attempts by colleagues in the DSL to be approached with Sametime.

Based on the different work settings, I discussed three aspects of Sametime use in more detail, namely the role of status information, implications of Sametime on accessibility and interruptions, and forms of establishing relationships. Status information was interpreted as a proxy for people's availability and people oriented their communication according to signal of others. Like in the local.ch case, status information functioned like a sign in Heidegger's sense, which directed people's communicative practices and engagement with others. However, the interpretation of status information was not a singular, isolated task rather the signal was understood in connection with the organisational context, the knowledge about the respective person and hi/her working environment.

The most important function of Sametime was to access both co-located and dispersed colleagues instantly. People had a sensation of closeness and argued that everybody was just on the other side of the window. However, in co-located settings people still preferred face-to-face interaction since a person's physical presence guaranteed the full and undivided attention of others whereas Sametime messages were less intrusive and could be delayed. Contrastingly, people preferred Sametime over other applications in dispersed settings as chats popped up in people's face. Because of this intrusive characteristic of Sametime people argued that others felt prompted to respond quicker thereby speeding up conversations. On the other hand, the application was associated with a constant level of interruptions when Sametime messages popped-up on people's computer screen. Again, the blinking chat windows

functioned like a sign which referred to other people, projects, tasks and equipment. Developers had to learn to live and deal with such interruptions.

Finally, Sametime was interpreted as mid-way between e-mail and telephone face-to-face conversations. E-mails were considered to be more formal allowing the sender to carefully formulate and structure their argument. This aspect was particular influential when contacting colleagues in the USA. Without and pre-established relationships with their counterparts in the US, team members preferred e-mail over Sametime to establish first contacts or to carefully structure their arguments and requests.

To sum up, while the discussion of the organisational culture, organisational structure and processes was mainly influenced by aspects of power and knowledge, the elaboration on Sametime use within the PAF team drew upon concepts such as co-presence, awareness, and materiality.

Chapter 7

Thinking about Skype and Sametime

In the previous two chapters, I described the application of Skype and Sametime within local.ch and IBM respectively. Now, my objective is to systematize in a theoretical fashion the analysis of the case studies. In particular, I relate the findings to previously introduced theoretical concepts (see chapter 3) and develop them further. More specifically, the analysis explicitly draws upon and elaborates on the three concepts presence, awareness and materiality. While issues of knowledge and power are not explicitly addressed and further developed, they profoundly shaped the interpretation of the two case studies and consequently my way of thinking about RTC use. Furthermore, the main emphasis will be on the local.ch case which I shall compare with the IBM case to specify under which conditions certain concepts do or do not hold and to appreciate the influence of the organisational context on RTC use.

As the two case studies showed, the technology is embedded in a complex nexus of doing and saying which not only refers to the level of human agency but also to the institutional structures. The argument I am making is that the materiality of RTC has implications on social practices and that management and other affected parties need to cultivate its use. The way of thinking I propose here is threefold and will hopefully lead to a better comprehension of RTC.

First, I aim to conceptualize how users experience RTC and embed it in forms of organising work. I argue that in order to apprehend the dynamics introduced by technology into interaction processes, the analysis needs to originate from the artefact. The artefact is the locus of materialized understanding which enables and constrains the existence of social practices, or to put it differently, artefacts are the premise for the opportunity to produce and re-produce certain social practices. More specifically, grounded on Heidegger's concept of worldhood, I promote an understanding that specifically conceptualises the dynamic element introduced by RTC into work practices. In particular, I argue that the implications of RTC need to be understood within the whole equipmental context and in relation to a person's existence with others. I show that the pointing-at/ pointing-out characteristic of RTC

directs social practices as a person's engagement with the world wins orientation and things or people become accessible.

Second, drawing upon concepts of presence, presence availability, co-presence, and awareness, I demonstrate that the enabling and constraining capabilities of RTC provide the potential to enact innovative social practices. People at both local.ch and IBM pointed out that their experience of each other significantly altered due to the application of RTC. A sense of closeness and instantaneous accessibility are only two aspects regularly mentioned in discussions. I argue that RTC-mediated practices can not only improve awareness within teams but can, in dispersed settings, even strengthen feelings of co-presence and inclusion. Indeed, I suggest that both awareness and co-presence are recursively related

However, accomplishing innovative forms of RTC use depends on supporting practices within the socio-organisational context. In the final step, I therefore refer to Heidegger's concept of Ge-stell and describe practices that either facilitated an open and experimental engagement with the technology or resulted in rather conservative modes of RTC use. More specifically, I show that management practices play an influential role in promoting RTC use. However, management needs to be cautious so as not to neglect others who are affected by the managerial instructions. Users especially need to be willing to openly engage and experiment with the Ge-stell.

7.1 The directedness of social practices

The question that guides the argument in this section is the following: Why is it that people throughout both settings maintained that RTC enables fast forms of social interaction? The question leads us to investigate the *invariants* within both case studies to understand the qualitative shift in social interactions. The argument is then extended by considering the invariants *in situ*, that is the embeddedness of the technology in the socio-organisational context. Table 8 gives an overview of the main concepts and arguments of this section.

The local.ch and IBM case both point towards the implications RTC has on altering the dynamics of social interaction. In general, interaction with RTC was regarded as faster and resonated with users desire to ask impromptu questions. On the other hand, RTC prompted recipients to render attention to the application each time messages appeared on the screen. I introduced Heidegger's concept of signs before and now

argue that it offers a sophisticated explanation of how people experience each other and RTC within social practices. Specifically, I suggest that the **pointing-at/ pointing-out** characteristic of RTC significantly influences the dynamics of interactions. The pointing-at/pointing-out characteristic refers to people's experiencing of particular signs in social practices which are introduced by RTC in the working environment.

Concepts	Description
Pointing-at/pointing-out	Refers to people's experiencing of particular signs in social practices
Status information	Status information functioned as a sign people encountered during the course of their working day. Status information **pointed-at**, directed communicative practices, and had implications on the mode of care in which people encountered each other. Monitoring status information was not a singular task rather it referred to others who also used the sign in their life world. Furthermore, the interpretation of status information de-severed and brought to the fore the appropriate ICT and thereby directed the communicative practices. Directedness and modes of care were constitutive elements and came into presence as part of social practices.
Blinking chat windows	Blinking chat windows were easily accessible signs which brought not only further parts of the equipmental context to the fore but also altered modes of care towards others. Messages popped up, flashed and thereby **pointed-out** projects, activities, colleagues and other equipment. They symbolized references to ongoing projects and activities and simultaneously referred to others who were engaged in the same activities.
Dynamics of interaction	The pointing-at/pointing-out characteristic of RTC enabled and constrained the enactment of diverse practices. The communication flow was considered to be faster since status information revealed a person's availability and allowed others to direct their communication practices. On the other hand, blinking chat windows resulted in interruptions as colleagues with their associated projects or activities were pointed-out.

Table 8: Directedness of social practices through the pointing-at/pointing-out characteristic of RTC

So far, status information was interpreted in the literature as a proxy for a personas accessibility which might bring about a sensation of connectedness (Nardi et al. 2000; Quan-Haase et al. 2005). However, previous accounts have often a rather functionalistic tone as they fail to integrate the empirical findings in an ontological understanding of the user who experiences status information in his life world. The analysis of the local.ch and IBM case underlines the importance of **status information** for collaborating in co-located and dispersed settings. More specifically, status information functions as a sign people encounter and consult during the course of their working day. In this role, status information points-at and, by doing so,

directs communicative practices and therefore has implications on the modes of care in which people encounter each other.

In the analysis of the local.ch case, I illustrated that people regularly referred to status information to check if someone was active. As Benjamin remarked, glancing at the status information became a routine when starting the computer. Even if no direct contact was to be initiated with Skype, status information mediated an understanding of who was around and who could potentially be contacted. Consequently, following Heidegger's interpretation of equipment and its references to other human beings, it can be argued that status information is not encountered in isolation but others are always sent along with it. Monitoring status information is not a singular task rather such routinised observations refer to others who also use the signs in their life world. That is, status information is not only ready-to-hand for the particular person who looks at it, but the subject also knows that it refers to and is ready-to-hand for the whole network of colleagues who set their individual status. Status information thereby affects the mode of care in which people encounter each other. First, status information showed who was online at local.ch and could therefore be approached to accomplish certain tasks. By referring to status information, people got a feeling for who was available and estimated how long it might take to get a response. Second, status information gave developers a sense of security as it signalled a potential to contact colleagues if instantaneous information was required. For managers, status information provided the opportunity to approach developers and get an up-date on the work statuses. Thus, due to the referencing of status information to others it functioned as a means for pointing-at and thereby encountering colleagues which affected the mode of care in which they were discerned.

Moreover, status information directed people's communicative practices. At local.ch people often consulted status information and brought their communicative practices in line with the given sign. The interpretation of status information de-severed or brought to the fore the appropriate ICT and thereby directed the communicative practices accordingly. That is, while a person's availability prompted Skype-mediated interaction, unavailability resulted in the readjustment of communicative practices, and people for example reverted back to e-mail. Similarly, people at IBM decided after consulting the status information if and how to contact someone. Some

people only asked questions with Sametime or sent emails when they saw that the respective person was online. Others such as John used Sametime if a person was online but composed e-mails if the status information signalled that a person was not available. Consequently, as part of the concernful dealing in practices status information referred to, and was interpreted against the whole equipmental context. The 'availability' or 'unavailability' status referred to appropriate forms of contacting others. By doing so, status information gave direction to those very practices as it pointed-at the existing ICT landscape and the tools people could use for such means. The referencing of status information took on the form of de-severing ICT through directing communicative practices.

Both directedness of communicative practices and the implications on modes of care are only separated for analytical reasons. Neither aspect exists before or without the other. Rather both aspects are equiprimordial that is they come into being together as part of social practices. Established social practices which included knowledge about a person's extended context, that is "all that has happened before or after, retrospectively and prospectively, and all that might have happened instead" (Scheff 1990), informed the implications of status information on modes of care and directedness of communicative practices. The influence of the extended context can be illustrated by the PAF team at IBM where people had different lunch times. Being unavailable on Sametime between 12pm - 2pm, it was associated with the person having lunch. Consequently, knowledge of an extended context with the associated social practices affected the interpretation of the status information and, by doing so, resulted in an adjustment of the communicative practices. In contrast, no established social practices existed with colleagues in the US nor did people share knowledge about the broader social and organisational context at the different locations. Beyond the pure signalling of availability, status information was less effective in directing communicative practices and it did not significantly affect modes of care as most activities of colleagues in the US remained opaque.

Previous studies argued that IM translates into potential interruptions for the recipient of such messages who can be engaged in other tasks (Nardi et al. 2000; Rennecker et al. 2005). Users might therefore perceive IM as disruptive or even detrimental to one's concentration and might apply different strategies to deal with heightened accessibility (Cameron et al. 2005; Woerner et al. 2007). The two case

studies reconfirm these findings and I try to give them further meaning as I integrate the empirical findings in a phenomenological understanding. RTC not only introduces signs for initiators (status information) but also recipients which direct interaction and help to speed up communication processes. **Blinking chat windows** are the second form of signs which catch a person's attention and direct communicative practices accordingly. In both case studies, developers and managers alike unanimously reported about the obtrusive character of RTC. While RTC generally remained in a transparent mode and formed a part of the background relations, blinking chat windows represented easily accessible signs which brought not only further parts of the equipmental context to the fore but also altered the modes of care towards others. The blinking chat windows brought the chats to the fore and made them accessible to a person. They symbolized references to ongoing projects and activities. Simultaneously, the windows referred to and brought the others who were engaged in the same activities closer. Kevin at local.ch remarked for instance that the continuously blinking chat windows on the desktop grasped his attention and curiosity because something important regarding ongoing work might be in it. Martin at the PAF team also reported that the flashing chat windows almost obliged him to direct his attention to incoming messages and alter his mode of care towards the people the message referred to.

Messages popped up, flashed, and were perceived as 'all up in your face', that is they directed people's activities by pointing-out projects, activities, colleagues, and other equipment. However, social practices affected ways of dealing with the pointing-out characteristic of the blinking chat windows. At local.ch, fostered by a culture of mutual support and help-giving, people made an effort to respond almost immediately to chat messages. However, different degrees and forms of disengaging from RTC interaction were socially accepted. Benjamin, the Namics project manager, left most of the institutionalized chats as he found that the price he had to pay for the interruptions was too high and the topics were generally not relevant for his managerial work. Benjamin was not directly involved in work of the developers and regarded the windows which popped up as disturbances. In contrast, developers depended on institutionalized chats for most of their interaction throughout the week and for their work in more generally. They therefore reverted to other practices for managing interruptions, such as promoting communicative norms within the chats or filtering communication flows by technical means. Similarly, at the PAF team, in an

organisational/ team culture that cultivated support and help-giving, responding instantly to messages was the norm. However, delays were accepted depending on the current work load and a person's job role(s). The results support earlier findings, which implied that users had to decide on their own level of attentiveness and justify inattentiveness (Voida et al. 2002). While responses were expected eventually, people did not have to reply immediately, which gave them more leeway to control their communication (Woerner et al. 2007). Thus, the pointing-out characteristic of blinking chat windows seemed to be an invariant factor which was confirmed in both cases. However, users developed different strategies and practices as to dealing with the obtrusive character.

Status information and blinking chat windows directed social practices and the mode of care in which people encountered each other. I also showed that the pointing-at/pointing-out characteristic seemed to be an invariant factor of RTC. However, I argued that it can not be understood on its own as it only provides requirements for practices by presenting resources which enable and constrain ways of doing and saying. Furthermore, I illustrated that the pointing-at/ pointing-out characteristic had implications for people's perception of the dynamics of social interaction. The communication flow was considered to be faster since status information revealed a person's availability and allowed others to direct their communicative practices accordingly. On the other hand, blinking chat windows resulted in interruptions as colleagues with their associated projects or activities were pointed-out. These two characteristics then enabled and constrained the enactment of diverse practices. However, the discussion also showed that the implications of RTC use *in situ* varied significantly depending on the social practices in which they were embedded.

Competence in dealing with RTC and social relationships within teams appeared to influence the effectiveness of embedding RTC in communicative practices. Writing RTC-messages implied effort not only associated with the process of composing the message but also in relation to expressing thoughts skilfully in writing. Kelly (2005) argues that the process of digiscribing poses limits to the extent to which experiences and activities can be reified in a digital form. Additionally, the findings indicate that people had to learn particular skills which were required for digiscribing. Some of the PAF team members at IBM felt that they did not possess the skills to express themselves competently with short RTC messages. Therefore, while RTC was used

in some social settings (for example test team) face-to-face interaction was generally preferred in the DSL and e-mail communication with co-workers in the US. Restricting the use of RTC in such a way not only limited the development and enactment of a broader variety of RTC-mediated communicative practices but, by doing so, impeded opportunities to widen the knowledge needed for competently enacting such practices. In contrast, at local.ch RTC was deeply embedded in established social practices. Rather than diverting to other forms of social interaction, people engaged in RTC use regardless of whether they were communicating with dispersed or co-located colleagues. RTC-mediated interaction formed normatively sanctioned and for certain activities predominant modes of engagement. Over time, team members at local.ch acquired the knowledge to competently enact RTC-mediated communicative practices in situations which were regarded as unsuitable for RTC use at IBM.

Rapport and closely knit groups were favourable conditions to establish practices of RTC-mediated interaction. The developer community in the local.ch case and to a lesser extent the test group in the PAF team provided the required atmosphere to foster innovative modes of interaction. At local.ch for instance, tasks within the developer community were closely enmeshed, demanding intense and constant communication and coordination among the team members. Broadly accepted social practise transported shared norms about appropriate forms of interaction. A sophisticated set of norms existed concerning the appropriateness of using institutionalized chats in particular situations, forms and timing of responding to messages, or practices of media switching. The coherent practices within the homogeneous developer community clarified expectations and enabled and constrained RTC mediated interaction. In the PAF test team, good rapport was crucial to establish norms of mutual exchange and help-giving. Such norms also specified the context in which RTC was more or less socially accepted. Being themselves confronted with the intrusive character of blinking chat windows, initiators of conversations understood the disturbances they caused and took this into account when contacting others. As no established relationships existed with co-workers in the US, collaborating with RTC was regarded as problematic and considerable effort had to be invested in relationship building before people started using RTC. This suggests that in closely knit groups, with team members frequently collaborating with each other, shared practices of RTC use are more likely to emerge.

7.2 Implications of RTC on awareness and co-presence

Previously, I attempted to explain the invariant characteristics associated with RTC. In both case studies, the pointing-at/ pointing-out characteristic in the form of status information and blinking chat windows had implications on the directedness of communicative practices and the modes of care in which people encountered each other. Given the diverse outcomes of RTC use in the two case studies, I furthermore argued that the pointing-at/ pointing-out characteristic of RTC does not determine human conduct. Rather, it is the enabling and constraining capability of RTC which is enacted in practices of communication, managing interruptions, and collaborating in more general.

In the following, I investigate innovative work practices whose production and reproduction would not be possible to the same extent without RTC. More specifically, elaborating on the implications of RTC on modes of care, I shall draw upon the concepts of presence, co-presence, presence availability, and practices of awareness production to analyse innovative forms of RTC use. The discussion starts out with the local.ch case (see Table 9) before it briefly returns to the IBM case.

Concepts	Description
Presence	Physical presence provided presence availability for planned or spontaneous interaction. Within a physical setting, people developed confidence in the capabilities and an understanding for the different roles and responsibilities of their colleagues. Physical presence thereby helped to establish a sensation of co-presence.
Presence availability	Skype provided new means of coming together within the dispersed setting
Awareness	Chats were used at local.ch to produce and re-produce awareness. Communication in chats implied a dualistic relationship between monitoring and displaying. Participants needed to be competent carriers of communicative practices to make sense of the messages within the chats. By way of displaying, monitoring, and rationalising, people aligned their activities as they established a shared understanding in a collaborative fashion.
Co-presence	Status information referred to a network of colleagues and showed who could be approached. Furthermore, developers knew about their own visibility and managed their status information accordingly.
The recursive relationship between co-presence and awareness	Extensive exchange of awareness information resulted in a sensation of co-presence if a person believed that others knew what he was doing. The displaying of activities and the feedback messages induced a sensation of co-presence. On the other hand, qualitative variations in the sensation of co-presence had implications on the style of communicative practices.

Volatility of awareness	Awareness was closely linked to communicative practices and degenerated when the practices were not regularly enacted.
Volatility of co-presence	The sensation of co-presence was also affected when practices of awareness production were not enacted. However, together with status information, institutionalised work practices at local.ch meant that colleagues became predictable in their actions and a sensation of co-presence remained. Co-presence was a sensation which existed in co-located and dispersed settings.
Temporality of practices	Three modes of temporal experience existed at local.ch which affected the production and re-production of awareness. People referred to *loss of time* to depict the overhead caused by outer-action and the delays of practices of awareness production. *Normal time* was associated with the whole nexus of doing and saying which represented the consultative, participatory style of software development. Skype enabled impromptu discussions which short feedback loops which almost resembled f-2-f situations. *Flexible time* refers to discussions in chats which could stretch over several hours or even days. Participants managed their engagement or disengagement in accordance with available time slots.

Table 9: The perception of co-presence and the production of awareness at local.ch

In the local.ch case, I pointed to the importance of the head office for operational procedures. In the core team, the physical presence of team members within the open plan office provided presence availability for planned or spontaneous interaction throughout the day. Regular daily contact, shared lunch breaks, and continuous interaction created a sense of team spirit and solidarity among the team members. Through regular face-to-face encounters, confidence in each other's capabilities was attained. The need for control was reduced at the same time as knowledge and predictability of how others will act was established. Consequently, team members worked self-responsibly on their tasks. Furthermore, the time-space paths with the other project partners coincided at least once a week which concentrated the activities of the project in a bounded setting and allowed direct supervision. The presence availability of all team members provided an opportunity for socialising, catching-up, and spontaneous or planned break-out meetings. Consequently, against the backdrop of a supportive and cordial organisational culture, an appreciation for each other's role and responsibilities in the project emerged in that everybody became aware of the work of others. This appears to emphasise the importance of embodied presence in order to evoke a sensation of closeness towards others. Not only is such a sensation of co-presence crucial to establish solidarity and trust but it is equally important for the formation of social practices through which people learn about other's current activities and extended context. Therefore, the routinised

exchange of news and information during informal conversations or formal meetings brought about awareness for activities within the project.

However, regular physical presence was not an option in the broader local.ch network, where dispersed team members relied on ICT most of the week to conduct their work across the organisational boundaries. In addition to the weekly meetings in the head office, Skype provided team members with a new kind of presence availability. One of the key instruments highlighted in the local.ch case were the institutionalized chats and the group chats as expert groups. In the "Developer Broadcast", "Trash & Talk", or "New Stuff" channels, team members proactively displayed work related or informal information. In the "Developer Broadcast" channel, for instance, the server downtime or new releases were announced. Just as in the case presented by Roth et al. (2006), members of the dispersed network organisation relied on proactive RTC-mediated communication to produce and re-produce awareness. Communication in chats, a joint action of continuous engagement in speaking and listening (Suchman 2007), implies a dualistic relationship between monitoring and displaying. Two kinds of monitoring could be distinguished. First, active monitoring of chats as people worked closely together on tasks. For example, in the group chat conversation involving Clement, Conrad, and Kevin, the developers constantly monitored incoming messages and responded almost instantly. Second, monitoring existed as a form of listening in on discussions in institutionalized chats. Monitoring institutionalized chats implied that news and information were openly displayed. Displaying required team members to estimate the relevance of the news for the readers of the chat and to invest effort in posting a message.

Subscribers to the respective channels proactively monitored and interpreted the posted information based on their contextual understanding of the subject matter. However, a shared, common understanding of the subject matter was crucial in order to make sense of the brief and highly contextualized messages. While developers at local.ch were knowledgeable about technical topics, business people lacked this knowledge as they were not actively involved in such matters on a daily basis. Celine for instance remarked that the "New stuff" channel did not give her an overview of what developers were doing and which problems they were facing. RTC-messages were often too context-specific and embedded in the tacit knowledge of the

developer community. This clearly indicates that for awareness to be produced as part of communicative practices, people had to be competent carriers of the practices to engage in sense-reading and sense-giving (Walsham 2004).

Moreover, not only did the proactive posting of messages render events and activities visible, but it also revealed people's reasoning. In group chats which functioned as expert groups, people not only displayed their undertaken or planned activities but they also rationalized their actions. The displaying, monitoring, and rationalizing of activities helped team members to align their activities as they developed an understanding for the setting, the processes and the interdependencies among tasks. For example, in a group chat between Clement, Roger, and Kevin, the participants developed, through constantly displaying and monitoring facts and activities, a shared understanding of the problem situation. As they went along, they constantly realigned their activities and rationalized them if required. This indicates that the mutual intelligibility which the participants attained was a collaborative achievement. Meaning was socially negotiated through the constant exchange of messages in chats. What this suggests then is that learning, knowing, and awareness are integral and closely related aspects of (RTC-mediated) social practices. Through displaying, monitoring, and rationalizing activities, developers learned about the project, its processes and problems and, by doing so, broadened their knowledge of the associated practices. Learning took place as an integral aspect of action and interaction in RTC-mediated chats. These chats opened up opportunities for collaboration in the dispersed organisation, which might not otherwise have existed.

The discussion illustrates that institutionalized and expert group chats established awareness on different levels of granularity. Similar to research on displaying and monitoring in co-located settings (Heath et al. 1992; Heath et al. 2002) work related and topic specific group chats or one-to-one chats produced a fine grained level awareness of work settings, processes and interdependencies among tasks. As argued before, such chats had strong collaborative elements and participants engaged in joined sense-making as they worked simultaneously on tasks. Interestingly, institutionalized chats or group chats also created awareness on a more coarse-grained level which is comparable to forms of listening in on radio conversations by railroad operation workers (Roth et al. 2006). Designated chat channels displayed information on issues such as server updates or new features and notified team

members on activities which were potentially relevant for their work. Furthermore, institutionalized chats were used as a means of proactively imparting interesting news which was only peripherally related to work. However, these informal discussions could trigger creative ideas and the cordial and humorous tone of these discussions reflected and affected the *Befindlichkeit* within the team.

Three factors, namely commitment, scope of people in chats, and communicative norms, were influential in initiating and sustaining practices of awareness production. **Commitment** to exclusively use RTC and not to revert to other means was one factor that differentiated local.ch from the PAF team. At local.ch co-located developers restrained themselves from prioritising face-to-face discussions and resorted to discussions in Skype instead. Therefore, RTC-mediated chats represented the main communicative practices through which project-wide awareness was established. Team members clearly committed to using group chats as the main communication channel and did not circumvent them so as not to exclude dispersed team members nor did they regard Skype as purely supplementary (Kelly et al. 2001). In contrast, no commitment existed in the PAF team to use group chat. While the test team sporadically drew upon chats for group discussion, emails and face-to-face conversations were prevalent, which excluded parts of the team from what was happening on a daily basis.

Group chats allowed an adjustment of the **scope** of the audience being included in or excluded from such chats. In the PAF team, proactive communication existed on a one-to-one basis but was missing in relation to chats that would have facilitated the dissemination of news. People regularly remarked that they felt excluded or did not know what was going on in the team. The local.ch team felt committed to using group chats, despite the interruptions they caused and the additional effort involved in composing such messages. However, they also adjusted the audience of people who were included in chats in accordance to the relevance of the topics. As people were sensitized towards the interruptions caused by RTC messages but also knew about the importance of keeping each other informed, they had to make decisions in relation to including vs. excluding others and opting-in vs. opting-out of discussions.

One interesting finding is that defining, establishing, and enforcing **communicative norms** facilitated the process of institutionalizing chat discussions. At local.ch, the implementation of chat channels was an ongoing process which resembled the open-

ended implementation of groupware with its unintended and intended changes (Orlikowski 2000). Team members struggled to adapt chats to the existing organisational context and work requirements. Depending on the number of participants, topics were clearly defined and communicative norms set expectations concerning the communication style. Doing so brought about a conversational coherence (Woerner et al. 2007) which reduced the level of unwanted interruptions. Some participants took the lead and enforced the prevailing norms more or less explicitly. Indeed, the test team at IBM did not invest in establishing norms for group chats. In this case, group chats were consequently regarded as 'a waste of time' as discussions frequently shifted to other unrelated topics.

So far, the discussion has mainly been concerned with the implications of RTC on awareness within teams. In the following, I shall elaborate on the sensation of co-presence and the recursive relationship between awareness and co-presence. Through continuous interaction within chats awareness of activities was produced and re-produced throughout the week. As a consequence of such interactions and forms of rendering activities visible, people had a sensation of co-presence even when they were not physically present. As Kevin remarked, Skype did not substitute physical presence but alleviated the effects of geographical distance within the organisational network. This would suggest that with Skype, team members were able to compensate for a lack of physical presence and retained a feeling of co-presence based on already closely established relationships. Such a sensation of co-presence is a prerequisite for social interaction in both co-located and dispersed settings. Two means can be differentiated whereby Skype use affected the sensation of co-presence.

As argued before, status information and chats altered the modes of care in which people encountered each other. First, status information referred to the network of colleagues, it showed who could be approached and gave a sense of security in that others could immediately be contacted. Furthermore, developers knew that their own status information was ready-to-hand for their colleagues as well, who drew upon it to contact them. Knowing about their own visibility, developers managed their status information according to their current work load and preferences. Developers knew of the importance status information had for initiating social interaction. This might suggest that status information can evoke a sensation of co-presence in that people believe that others use it to observe their accessibility.

Second, a sensation of co-presence might quite likely result from the extensive exchange of awareness information if a person senses closeness towards others in that he believes that others perceive what he is doing. I argued that developers constantly displayed and monitored activities in institutional chats, one-to-one, and group chats. In the latter, for example, people worked simultaneously on tasks. It can be argued, that the displaying of activities and the immediate feedback messages generated as people objected or accepted proposed activities and ideas, induced a sensation of co-presence. Developers knew that participants in the chat were observing their messages. Consequently, the feeling of co-presence was sustained in the local.ch context due to the ongoing displaying and monitoring in a broad spectrum of chat conversations.

While the previous point suggests that practices of awareness production affect co-presence the reverse holds true as well. Qualitative variations in the sensation of co-presence also had implications on the quality of communicative practices. The sender of RTC messages at local.ch assumed that recipients are knowledgeable about his extended work context or even the detailed tasks he was dealing with. Even messages that were posted to seeming singular tasks, for example Tim upgrading the Wiki and Jira services, assumed that others listened to the discussions and knew about what he was doing. Although he did not receive any feedback on the messages, the sensation of co-presence prompted Tim to write messages on server-updates in a personal style and even to include emotional remarks. The existing sensation of co-presence in the team therefore affected the style of practices of awareness production. The discussion suggests that co-presence, a prerequisite for social interaction, and practices of awareness creation are recursively related. While co-presence enables and shapes RTC-mediated communicative practices it is at the same time influenced by those very practices. However, the local.ch case also highlights the importance of physical presence in order to develop an initial sensation of co-presence and to establish social practices among trusted parties. It was against the backdrop of an established sense of closeness that RTC-mediated practices had the stated effects in the dispersed organisations.

The discussion so far showed that awareness needs to be produced and reproduced. Furthermore, I argued that co-presence is affected by such communicative practices. The argument implies that not only is awareness a precarious and volatile state (Roth

et al. 2006) but co-presence as well. In contrast to co-located settings, the quality of co-presence in dispersed settings degenerates if it is not constantly produced and re-produced. In the following, I intend to elaborate on the fragile state of both co-presence and awareness. In one case, Conrad was working at night with other team members on a release which was due the next day. Despite the fact that everybody was working at home, the frequent exchange of messages established a shared sense of the problem situation. People focused their concentration on the group chat and the related activities of software development as they displayed and monitored activities. To gain awareness on such a fine level of granularity, short intervals between messages were decisive. The mutual intelligibility of the subject matter was then a collaborative achievement. To illustrate the volatile state of awareness, Conrad mentioned that developers were often working on bugs for three days. During these time spans, no messages were exchanged among developers and slot leaders. Consequently, team leads did not know what the developers were doing and the awareness among the participants broke down. This might suggest that awareness is closely linked to communicative practices and degenerates if the practices are not enacted on a regular basis.

The volatility of the sensation of co-presence is much more difficult to reveal. In the first case, when several developers are working on one task, the sensation of co-presence was profound. Kevin mentioned that he felt much closer with Skype. Developers know in such situations that others are monitoring the activities they are displaying in the chats. The sensation of being observed is reconfirmed as they receive cues from their messages provided by the listeners. But how is the sensation of co-presence affected when no interaction takes place for a considerable amount of time? Does it break down under such circumstance like awareness does? Clearly, the sensation of co-presence altered when the displaying and monitoring ceased. However, the institutionalized work practices at local.ch meant that colleagues became predictable in their actions (Karsten 2003). Relationships among team members were strongly developed and slot leads knew that developers would proactively contact them if they faced any problems. In this context, Skype and the status information in particular reassured slot leads and developers and reminded them of opportunities to approach each other instantly. Kevin for instance mentioned that others did not know per se what he was working on (awareness on a fine-grained level did not exist) but no matter where they were they could ask him. Thus, based

on the history of previous interactions, a sensation of co-presence remained because status information referred to the network of colleagues and established routinised practices. This emphasises that co-presence is more than a context which refers to people who are physically in the same location. Rather, the analysis underlines the fact that co-presence is a sensation or *Befindlichkeit* which derives in co-located and dispersed settings. Such a sensation does not instantly break down when people become physically separated. Rather, established social practices together with the perception of signals guarantee that a degree of co-presence can be sustained. The high level of social integration in the local.ch team was therefore decisive for the interpretation of status information which became obvious in moments of breakdown. Conrad for example mentioned that new team members were less familiar with the proactive communication style at local.ch. Conrad therefore did not know about how others would act and needed to control those team members more actively. The status information alone was not sufficient to sustain a feeling of closeness among the parties. The discussion illustrates the fragile character of awareness and co-presence. Awareness on a fine grained level is produced and re-produced through displaying and monitoring. However, it is vulnerable and might easily break down if no interaction takes place. Co-presence is directly affected by practices of awareness production. However, simple signs such as status information may be sufficient to sustain a sensation of co-presence if they are embedded in routinised social practices which are established through a shared history of social interaction.

Before, I argued that a recursive relationship exists between awareness and co-presence. I also remarked that both concepts are precarious and have volatile states. Co-presence and awareness degenerate to different degrees if they are not constantly re-produced or stimulated by the respective practices. Thus, there is a temporal dimension to the recursive relationship between awareness and co-presence as both need to be produced and reproduced at certain times to be sustained. Temporality can not be added later to the relationship. Rather, the temporal dimension is a constitutive element of every social practice. Discussing temporality helps to appreciate the aptness of particular practices for maintaining awareness and a sensation of co-presence. The question therefore arises, is there any appropriate rhythm for synchronizing in order to maintain awareness and co-presence in dispersed settings?

Temporality does not refer in this context to an objective, chronological understanding of time. Instead, against the background of the whole nexus of doing and saying the temporal experience of subjects derives from the enactment of particular social practices. In local.ch, three modes of temporal experience can be worked out and delineated according to their conceptualisation of time. The first mode of temporal experience can be called 'loss of time'. The mode did not factually exist or was at least not reported on a regular basis. However, people referred to stories of 'loss of time' in a negative way to depict the overhead in the form of outer-action which was required for coordinating activities in dispersed settings. For example, Conrad remarked that in other companies, people who encountered a problem had to plan a meeting. Such a process could take up to three days until the actual meeting would take place and the issue could finally be resolved. The temporal experience people associated with 'loss of time' was that of hesitation, in that actually urgent issues were not swiftly addressed. The necessity to engage with each other in dialogs, to learn about the issue and to jointly make sense of it was well recognized. However, in these circumstances people felt that direct engagement was halted as introductory practices of outeraction had to be performed first. People regarded these intervals as too slow or even as a loss of time. The stories expressed disapproval for situations in which colleagues had to delay their interaction and consequently awareness of the problem situation could not be established.

The second mode of temporal experience can be coined 'normal time'. Using the term normal directly provokes the question: Normal in relation to what? As Kevin remarked, at local.ch it did not matter if he was working at the headquarters or was doing home office because in both settings he said that he could communicate in a *normal* way with Skype. Normal refers here to the whole nexus of doing and saying which represented the consultative, participatory style of software development at local.ch. In particular, local.ch had the expectation to develop innovative solutions for its customers. Constant engagement and collaboration was regarded as crucial in order to come up with creative solutions. Such work was done in sub-teams which spanned across time and space. The tasks in such teams were closely linked and often required constant and time critical interaction. As discussed before, many RTC-mediated communicative practices were enacted no matter whether colleagues were dispersed or in the same room. Skype enabled impromptu discussions with a low overhead, almost resembling the dynamics of face-to-face situations. As Conrad

mentioned, when people were working at the same task and regularly exchanging information, collaborating with Skype was almost like being in the same room. Furthermore, developers relied on each other to engage in dialogic processes. It was due to the short feedback loops between chat messages and intense interaction that developers brought about mutual intelligibility in relation to a problem situation or shared areas of responsibility. Thus, these communicative practices enabled in both dispersed and co-located settings shared sense making with short feedback loops. Time was less obtrusive as people could collaborate productively no matter whether they were in the same location or geographically dispersed. However, as argued before, awareness on a fine grained level of analysis is susceptible to breakdowns. Consequently, collaborative effort was a prerequisite for the existence of the unobtrusiveness of time in the dispersed setting.

The last mode of temporal experience can be described as ‘flexible time’. Depending on the urgency of the issue, discussions in group chats or institutionalized chats could stretch over several hours or even days. Instead of being closely linked, the interdependencies among tasks were less distinct. Messages in institutionalized chats for instance displayed news from the broader organisational context rather than direct work related information. Consequently, participants could drop out of conversations without missing out on important messages or interrupting the flow of ongoing discussions. Rather than being drawn into a conversation, dialogs in such communicative practices enabled participants to consciously organise their engagement or disengagement. The pronounced temporal experience in such practices implied a consensus to coordinate and organise activities flexibly in accordance with available time slots rather than to purely react with a short-term perspective on incoming messages. Instead of focusing on ‘presence’ and ‘being pressed for time’, subjects reflectively considered past events and planned with foresight their engagement in dialogs. In addition to the intensive interactions in group chats, institutionalized chats in particular provided further impetus for collaborative exchanges in the dispersed work setting. Consequently, sustaining a level of awareness did not depend simply on short feedback loops as in the previous case. Communicative practices with a flexible temporal understanding emphasised the spontaneous use of time over an extended period to produce and reproduce awareness. Together, practices with a normal and flexible experience of time formed

a nexus which generated a high level of transparency and intelligibility at local.ch in various realms.

Finally, some brief remarks shall be made in relation to the IBM case. In contrast to the local.ch team, the PAF team did not establish similar communicative practices of awareness production. Tasks were rather clearly defined and allocated to designated developers. Consequently, coordinating interdependent activities and collaboratively creating innovative solutions played a less prominent role in the IBM case. The requirement for communicative practices which establish awareness of ongoing activities was therefore less distinct. Furthermore, apart from some exceptions, team members were all physically present in the lab. Although Sametime introduced a new form of presence availability, face-to-face discussions were the preferred form of contacting each other. The situation was slightly different in the test team as Michael worked most of the time in Cork and the time-space paths of team members coincided only once a week. Nonetheless, the test team was partly successful in establishing the recursive cycle of co-presence and practices of awareness creation. Based on trust and co-presence during physical encounters, a strong feeling of co-presence remained throughout the week in the test team as members saw the opportunity to instantaneously contact each other with Sametime and ask for help. Finally, no physical presence existed with colleagues in the US. Communication was rather problem directed and people even avoided using Sametime for contacting others. They did not know on what others were working nor did people had the feeling that others monitored or were interested in their work. Consequently, no shared practices of displaying and monitoring were established. Indeed, reflecting upon the differences between the test team and collaboration with the US, Michael suggested that the test team shows that dispersed work can function with good rapport and sporadic face-to-face discussions. This might suggest that physical presence and the related sensation of co-presence facilitate the initiation of social practices. However, once such practices are institutionalized, they are produced and re-produced even in dispersed settings and thereby help to sustain a feeling of co-presence. Such a feeling in return stabilizes the re-production of social practices.

7.3 Practices of engaging with the Ge-stell

So far, the local.ch and IBM case provided insights on the materiality of RTC and its implications on presence and awareness. As the analysis showed, the enactment of

RTC was embedded in diverse practices, resulting in innovative but also conservative modes of RTC use. Here, I reflect upon the socio-organisational practices in order to explain the contradicting empirical results. More specifically, I apply Heidegger's concept of Ge-stell which describes nothing technological but designates the mode of revealing which is evident through modern technology. The Ge-stell sends men towards a direction as it provides a set of conditions. In the first section of this chapter, I argued that status information and blinking chat windows direct communicative practices and affect the modes of care in which people encounter each other. I coined the term pointing-at/pointing-out for these invariant characteristics of RTC. However, pointing-at/pointing-out describes nothing technological. Rather, from the user perspective, I portrayed the implications on social practices and the experience of the life world. In the following, I suggest to interpret the pointing-at/pointing-out characteristic as the Ge-stell of RTC that is a mode of engaging with the life world which is enabled and constrained by RTC. Contrasting the local.ch and IBM case, I present social practices through which people enter into a free relationship with the Ge-stell, which Heidegger called 'releasement towards technology' and 'openness to the mystery of technology'. Furthermore, instead of entering into a free relationship, people only drew conservatively upon RTC. That is, I describe social practices where people either choose to blindly obey or rebel against the *Ge-stell*. The discussion presents the analysis of the two cases in turn before finishing with some general statements.

Local.ch

The innovative RTC use at local.ch resulted from the way team members and management engaged with Skype. They continuously experimented with the Ge-stell and tried to come up with innovative forms of utilizing Skype. The modes of saying and doing that signify such a free relationship are concerned with managerial and organisational thinking, but they also indicate broader social practices which constitute a person's lifestyles. Nonetheless, conservative forms of dealing with RTC existed in the local.ch context and they are briefly mentioned as well. Table 10 summarizes practices which describe people's relationship with the Ge-stell and aims to guide the reader through the analysis.

Practices	Description
Free relationship	
Organisational designing as management practices	Management envisioned an organisational design which included the Ge-stell as a central component. Organisational designing laid down purpose, principles, people, concepts, and the role of technology but left team members space to create structures and practices that matched their needs. Management also continuously reflected and redesigned the organisational structure to adjust it to the organisational context and the requirements of those who are affected.
Openness to innovate practices	Developers displayed an openness to innovate and adapt existing work practices. Releasement towards technology helped people to reflect upon their engagement with the Ge-stell and to adjust their practices accordingly. Developers showed openness to learn about the Ge-stell and its enabling and constraining capabilities. Such an understanding helped to capitalize on the technology to address issues in the work setting.
Lifestyle which is open towards technology	Lifestyles affected people's openness towards technology. Accepting technology was integrated into and reconfirmed the lifestyle of the developers.
Conservative engagement	
Lifestyle which is sceptical about technology	Technology was not a central part of people's lifestyle in the business community and posed a threat to established practices and even to some extent the feeling of ontological security.
Resentment to alter established practices	Conservative, complementary use of RTC without adjusting or innovating work practices was prevalent in the business community. No attitude of releasement or openness towards the Ge-stell was displayed.

Table 10: Practices of relating to the Ge-stell at local.ch

Organisational designing as management practice[14]. Management plays a vital role in enacting planned and emergent changes of groupware (Malhotra et al. 2001). Similarly, in the local.ch case, management was consciously reflecting upon the role of RTC within the organisational network. Not being forced to take any pre-existing organisational structures into account, management could start local.ch with a blank sheet. Although his managerial style was more democratic than authoritarian, David generated consensus and then enforced rules of how to work within the organisational network. In particular, due to his prominent position within the project, David could exercise the administrative power and utilize authoritative resources to organise activities across time and space. Management was therefore able to design together with some of the senior developers the organisational structure from scratch by formulating regulations and defining norms. It started with the assumption that the local.ch project was trying to accomplish something completely new and therefore

[14] The term 'managing as designing' originated from a conference which tried to analyse decision making and leadership by drawing upon examples in architecture, art, and design (Boland et al. 2004). 'Organisational designing' was coined in a subsequent journal paper which drew upon the ideas of the early conference (Yoo et al. 2006).

called for a special organisational design. In the envisioned organisational design, Skype was seen as a central component of the broader socio-organisational arrangement. More specifically, management was not particularly interested in regulating what team members did in detail, rather the organisational design sketched out by management roughly explicated how things should be done. In particular, David promoted the metaphor of the bazaar which embodied notions of flexibility, improvisation, learning, and collaboration. Developers had the opportunity to bring about an inspiring working atmosphere within the framework outlined by management. In this context, David saw himself as a coach or moderator who framed the way team members engaged with each other. Developing and communicating norms and interpretive schemes were managerial instruments which were applied by David to design the envisioned organisational structure. He did so by constantly recounting in meetings or discussions the stories of how they decided to work together. In relation to this 'form-giving process' (Yoo et al. 2006), Weick (2004) talks about "the charm of the skeleton" which defined at local.ch the purpose (creating a completely new search engine), principles (ground rules; Skype use), people (selection of partner organisations; highly talented people; digital avant-garde), and concepts (bazaar approach in a dispersed organisational network) but left it to the team members to create the required structure and practices. Design can therefore be understood as "the bare bones framework on which a more organic, emergent social structure develops as people interact, argue, fall out, come together and otherwise manage their day-to-day situation" (Bate et al. 2000: 199). Importantly, within the imagined organisational design, management already considered the role RTC was supposed to play. That is, David suggested that in order to replicate the bazaar approach in a dispersed setting, RTC was required for enabling and promoting constant communication and collaboration among the team members. As part of the organisational design, Skype should serve as the primary communication tool. The skeleton at local.ch not only represented a shared understanding of how to go about doing and organising work, it also provided (especially for the developers) the legitimacy to enact particular social practices. For example, in relation to RTC use developers sanctioned communicative practices as they lay down norms for institutionalized chats. The asymmetric power relations and the preferences for technical rather than business aspects were therefore reflected in the use of institutionalized chats.

Organisational designing as management practice was continuously enacted and contained the opportunity for change. Rather than being static, the organisational construct was redesigned when management or team members saw the opportunity or necessity for adjustments. Similar suggestions have been made for the use of groupware technology (Malhotra et al. 2001). For instance, Benjamin at Namics faced challenges in the local.ch project that diverged from the traditional project management style. Rather than working with detailed requirement specifications and distant relationships between customer and supplier, local.ch emphasised close collaboration among participants irrespective of organisational affiliation. Even across distance, team members were organizing themselves with Skype without demanding any direct managerial involvement. Rather than persisting with traditional routines of supervision and coordination, management purposefully introduced new modes of managerial control. Direct control was replaced by trust based management, enabling David and Benjamin to concentrate their activities on strategic decision making. Management needs to relate to and reflect upon the everyday activities of those people who engage with the design in social practices and are therefore influenced by it to different degrees (Orlikowski 2004). Management needs to show a commitment to co-create the organisational design together with those whose lives are affected by it (ibid.). Importantly, a link needs to be created from the design to the team members as people need to care about the design to produce and re-produce it as part of their everyday social practices (ibid.). During the process of organisational designing, management should enter into a free relationship with the Ge-stell to envision innovative forms of utilizing the Ge-stell. In this context, openness stands for an appreciation for the enabling and constraining capabilities of the Ge-stell. Releasement suggests not to overrate the Ge-stell and conceive it as one part of a more comprehensive socio-organisational structure.

Openness to innovate practices. Organisational designing is more concerned with principles and concepts than with direct collaboration. Team members at local.ch on the other hand displayed an impressive openness to innovate and to constantly reflect upon existing practices. More precisely, team members had the ability to continuously reflect upon, innovate, or adapt practices while learning about the Ge-stell and their work context. Management played no active part in delineating favoured work practices, conceding to developers the right to independently adjust situated work practices within the limitations of the organisational design.

Consequently, the use of Skype constantly changed at local.ch. Users reflected about the implications Skype had on their work practices and made their own adjustments. Releasement towards Skype, displayed by team members and management alike, was one attitude which facilitated the reflective attitude within the team. Benjamin for instance did not slavishly adhere to Skype use but deliberately set his status on unavailable or disengaged from institutionalized chats. Furthermore, while Skype was regarded as the glue that kept the organisational network together, team members did not limit their social engagement to Skype use. Rather, social face-to-face encounters during office days or meetings at the offices of partner organisations had paramount importance for the functioning of the organisational network. Openness towards technology was demonstrated in the way people dealt with institutionalized chats. The blinking chat windows became a latent source of interruptions over time as their popularity within the teams increased. However, rather than accepting the state of disturbance or rejecting institutionalized chats, team members chose a different path. They not only found several new institutionalized chats to channel communication according to subject areas but they also developed and enforced sets of norms which alleviated the level of interruption. For example, different strategies were applied to cope with interruptions, such as managing status information, leaving chat channels, applying hard- and software to bring disruptions under control, or developing appropriate communication norms. That is while still taking advantage of the pointing-at/ pointing-out characteristic of RTC they adjusted their work practices to accommodate for the specifics of the Ge-stell. As part of this, team members showed an openness to learn about and use technology in different ways. Besides the different institutionalized chats that emerged over time, group chats or the escalation of communication through media switching were further communicative practices produced and reproduced by team members. In doing so team members learned more and more about the enabling and constraining characteristics of the Ge-stell. As a result, an understanding developed of how RTC can facilitate collaboration within a dispersed organisational network. Developers within and across sub-teams continuously interacted proactively and organised their work in a self-responsible manner. Communicative practices such as the institutionalized chats were not known to them before. Rather, they emerged out of a constant struggle to explore new forms of interacting and constantly improve existing ones. In this context, releasement means not to become too attached to an application

but to critically reflect about its advantages and disadvantages within a particular context, to bear in mind that technology extends but at the same time reduces the experience of the life world, and to adjust its use accordingly. Openness describes a curiosity to continuously innovate and adapt the use to the organisational and contextual requirements.

Lifestyle which is open towards technology. In the developer community at local.ch the shared lifestyles resulted in overlapping narratives of self-identity. Referring to themselves as digital avant-garde and embracing attributes such as accountability, responsibility, commitment, and autonomy was part of their self-identity and had the following two implications. First, people associate themselves with organisations that have an attractive identity (cf. Dutton et al. 1994; Kunda 2006). At local.ch developers could easily associate themselves with positive cultural vales, such as elitism, innovativeness, and meritocracy. Second, for the narrative of the digital avant-garde to be plausible, it was part of developers' life style to be open to new technologies and discover and experiment with new applications, especially web 2.0 applications. Supported by the managerial discourse, developers not only evaluated a suite of instant messaging tools before choosing Skype but also enthusiastically welcomed other applications which were then implemented. For example, Wiki was implemented as a knowledge management system within the organisation. As the previous discussion on innovative practices showed, team members were more than willing to experiment with the Ge-stell. This might suggest that the narrative of developers' self-identity and associated lifestyles as its material form give indications about an inclination to host novel technology. For people who regard themselves as digital avant-garde, accepting, experimenting with, and embedding novel technologies in their work practices is an essential thread of their self-identity. As Alexander remarked, 'people have to want the new' which they did at local.ch. Rather than relying on e-mail as a means for communicating in the organisational network, developers adjusted their work practices and committed to using Skype for software development. In addition to Ciborra (2004a) or Barrett et al. (1996; 2001) who argue that hosting new technology redefines people's identity, the analysis of local.ch shows that the act of accepting technology formed an integral part of the developers' lifestyle and reconfirmed the narrative of their self-identity.

Lifestyle which is sceptical about technology. In the business community at local.ch, team members were less willing to host novel technology. The level of ambiguity associated with new technology and the required changes of established work practices resulted in a tendency to encounter novel applications rather sceptically. In the business community, e-mail and the landline phone were still predominant and broadly established means for contacting business partners. Indeed, telephone and email have remained the predominant means to contact people outside of local.ch. Consequently, the requirement for compatibility with external communicative practices prompted the business community to rely on broadly accepted technological devices. The motivation, the necessity, and the attempts to experiment with new technology were therefore less distinct. On the contrary, new technologies could have threatened established practices and infringed codes, norms and rituals. The business community was therefore sceptical about the positive contribution Skype could make to their work. Depending on how far potentially threatened practices are sedimented in people's lifestyles, that is the intensity with which they are constantly invoked in the course of day-to-day activities, affects the degree to which technology is experienced as dangerous. Technology not only poses a threat to a person's lifestyle but simultaneously affects her feeling of ontological security by questioning established daily routines and a person's practical consciousness (Giddens 1990; Giddens 1991).

Resentment to alter established practices. Openness towards the Ge-stell was less common in the business community, which retained established work practices in the face of the new technology. In general, the pointing-at/ pointing out characteristic of RTC was appreciated for enhancing the contact with external business partners, getting instantaneous feedback on technical questions from developers, or negotiating availability in the business community. However, people were less willing to experiment with RTC and to adjust it to their needs. For example, while the 'New stuff' channel was intended to function as a boundary object (Wenger 1998) to inform the business people about ongoing activities and new features in the developer community, the channel fell short of the organisation's high expectations and in the end was not used by the business people. In particular, restricted communicative norms and unfamiliarity with technical terms repelled the business community. The absence of attempts by business people to influence the use of institutionalized chats can be explained partly by the dominant role of developers in

sanctioning communicative norms which were most suitable for their own needs. Rather than facilitating discussions, institutionalized chats emphasised the dissemination of information and business people found them therefore to be less useful for their own work. Furthermore, while management defined principles and concepts for the developer community, this organisational design was less suitable for the work practices of the business community. Business people not only had to collaborate with people within local.ch but also with external business partners. The landline phone and email were the two most broadly accepted communicative devices and RTC use was not compatible with these communicative practices. In this context, RTC was only regarded as a supplementary medium which did not really affect the main work practices. Management did not try themselves to come up with a context specific organisational design where RTC could be beneficial for the situated work practices of the business people. The business people themselves were less enthusiastic about envisaging innovative forms of RTC use in the business community. In general, as the benefits of Skype were not apparent to them, business people reflected less about existing practices or ways of utilizing the technology for their own means. Openness to learn about the Ge-stell and its capabilities to enact innovative practices was less distinct among the business people.

IBM: PAF team

In contrast to local.ch, the analysis of the PAF team depicted a more conservative picture regarding the engagement with the Ge-stell. Experimenting with the Ge-stell was less common and existing technological frames of IM were accepted without reflecting upon their appropriateness for RTC use within the particular context. Furthermore, the analysis showed examples where people openly resisted the implications of the Ge-stell on their work practices. On the other hand, I argued that some people in the PAF team entered into a free relationship with Sametime,

Practices	Description
Free relationship	
Organisational designing as management practice	Organisational designing only happened occasionally on a small scale within sub-teams. Basic principles of how people should work together are explicated with Sametime being an integral component of the design.
Openness to innovate practices	Open engagement with the Ge-stelll was impelled by organisational constraints. Experimenting with innovative practices was not combined with a reflexive attitude. Releasement towards the Ge-stell enabled managers to control the topics and timing of interactions with others.

Conservative engagement	
Blindly obey	Generally, existing technological frames of IM were adopted. No openness to fathom and to learn about how the Ge-stell could be utilized in order to innovate or adjust work practices. The unsupportive organisational design and culture resulted in a conservative engagement with the technology.
Rebel against RTC	Colleagues resisted against the implications of the Ge-stell on their work practices. Establishing concepts of RTC use across time and space failed due to the lack of involvement of the decision makers. Consequently, collaboration in some contexts suffered.

Table 11: Practices of relating to the Ge-stell at IBM

experimented with the Ge-stell, and came up with innovative practices. Table 11 presents an overview of the practices which are discussed in more detail below.

Organisational designing as management practice. Reflecting upon the actual work processes was less common at IBM and software development was organised more hierarchically. The software architect roughly defined features and their functionalities which were then further refined by the technical lead and senior developers. Clearly separated work packages were then allocated to the developers who were responsible for writing or debugging the code. Apart from this top-down approach of organising software development work practices were not further explicated. Instead, people either argued that everybody shared the same objectives and thinking about the socio-organisational arrangement was therefore unnecessary, or people wandered into projects, left the organisational structure unspoken, and waited for work practices to emerge and stabilize. Generally, each developer's deliverables were clearly defined, interactions among team members were problem directed, and the main emphasise was on fulfilling the specifications rather than developing innovative solutions. Instead of perceiving discussions and close collaboration as fundamental elements in order to create innovative solutions, the interdependencies in the PAF team were limited. Management did not engage in explicating or negotiating an organisational design which set out forms of working together and managing expectations. For instance, forms of collaborating with colleagues in the US were completely under-specified. Besides weekly team meetings no decisions were made as to how awareness could be maintained or which ICT was supposed to be used. As the argument of protecting people's time took on such a high priority, weekly team meetings remained the only platform for social interaction with colleagues in the US. Beyond such meetings, no other

communicative practices were established so that it comes as no surprise that the atmosphere was generally regarded as rather formal.

The test team with Michael as the team lead represented an exception. Here, the formation of a dispersed team required a more proactive design of the organisational structure as team members relied on ICT for their daily communication. Michael engaged in a form-giving-process to design and explicate, to some degree, basic principles of how the team should work together (emphasising the importance of strong social ties; regular team meetings; help-giving). Sametime was an integral component of the design in that it enabled team members to stay in contact and ask impromptu questions even when Michael was in Cork. Michael found the way he worked in the test team very productive. The combination of close relationships, weekly team meetings and regular Sametime interaction created the context for constant social interaction. However, Michael's measures of organisational designing were limited in scope. In contrast to the local.ch project, Michael was not in the position to define the purpose, principles, people, and concepts of the test team. Michael had to take the existing organisational context of the project with its methods, regulations, and deadlines into account which strongly influenced the processes within the test team.

Openness to innovate practices. Forms of experimenting with RTC were especially observed in the test team. While co-located team members in the PAF team preferred face-to-face discussions, the test team relied on Sametime to stay in contact when Michael was in Cork. The organisation of the test team fostered an open engagement with the technology. In addition to phone or e-mails, Sametime was regarded as a supplemental technology for staying in touch with colleagues. Team members experimented with group-chats to find new ways of working in the dispersed setting. However, they did not routinely reflect upon established communicative practices in order to adjust them to the current contextual and organisational needs. For instance, while team members frequently applied group chats in an impromptu and unplanned manner, they disputed the usefulness of group chats as they often resulted in lengthy and unfocused interactions. However, no initiative took place to adjust the existing communicative norms of the group chats. While developers at local.ch constantly experimented and modified communicative practices to mitigate the obtrusiveness RTC, PAF team members did not engage with the Ge-stell in such an open way.

An attitude of releasement towards RTC was displayed by Donna. Her opinion of Sametime changed significantly over time. In the beginning, Donna regarded it to be inappropriate for a person to signal her unavailability although she was at the desk. However, over time Donna reflected more about the implications of Sametime on her work and started to manage her engagement and disengagement with Sametime. Consequently, she switched off Sametime or set the status information to not available. Using Sametime in this way gave Donna space to address only topic specific issues in chats without being sidelined into further minor details. Consequently, her reflective engagement with Sametime allowed Donna to control both topics and timing of her involvement. More established team members felt similarly free to opt-out while junior developers were mostly online.

Blindly obey. Releasement and openness towards the Ge-stell was not broadly cultivated in the PAF team. Rather than capitalizing on the enabling and constraining capabilities of the Ge-stell and embedding them in social practices, team members applied existing technological frames of instant messaging for RTC. As Paul remarked, Sametime crept up on IBM as an organisation. People were not discursively able to express how it affected their work and they showed less enthusiasm to actively fathom forms of RTC use. Attempts to reflect upon, innovate, or adapt social practices as they learned about the Ge-stell of RTC were less common. Consequently, Sametime was not regarded as a source for organisational innovation. By and large, RTC was used for short interactions like instant messaging and almost no use of group chats was reported, the test team being the only exception. In general, PAF team members in the DSL preferred face-to-face discussions over Sametime. An organisational design which did not include RTC as a central component and an organisational culture focused on getting work done rather than reflecting upon forms of doing work resulted in a situation in which junior developers did not see the benefits RTC could have for their day to day work.

Rebel against RTC. The mainly conservative use of RTC was even expressed as open resistance in one case. US colleagues rebelled against Sametime and restrained others from contacting them with Sametime. PAF team members did not have the influence to establish a shared understanding of RTC use across time and space. Caroline and Michael, for example, could not directly derive any power from their job roles rather they had to apply strategies of control to position and to present

themselves as central and respected figures in the project. However, attempts to establish accepted concepts of collaboration across time and space failed. Co-workers in the US restrained Caroline from contacting them with RTC and asked her to use e-mail instead. But this choice did not simply impede the exchange within the team but it also affected how influential Caroline could be as a project manager. The scope of communicative practices to span across time and space was therefore limited.

Comparing the local.ch and IBM case, I attempt to crystallize the findings of the previous discussion on Ge-stell in a more abstract manner. The engagement with the Ge-stell differed from openness to resentment. Openness towards the Ge-stell is exemplified by an attitude of curiosity, the willingness to continuously experiment, and to innovate social practices. In relation to organisational designing, openness implies an appreciation for the enabling and constraining capabilities of the Ge-stell. The design is continuously adjusted to the current situational requirements. Openness to innovate practices refers to people's curiosity, their potential to continuously innovate and adapt work practices. Releasement on the other hand describes a critical engagement with the Ge-stell. While caring about the Ge-stell, agents do not overrate its potential or slavishly adhere to it. Rather, releasement concerning organisational designing means that the Ge-stell is conceived as only one part of a more comprehensive organisational structure. Releasement as part of innovative practices means that people do not solely rely on the Ge-stell but look for different ways of doing things of which the Ge-stell can but must not need to be a part. Releasement illustrates that people do not become too attached to an application but critically reflect about its use within a particular context.

Both releasement and openness towards the Ge-stell are marked by reflexivity. Releasement and openness exemplify this examining and reforming of practices which is a constitutive element of reflexivity as people engaged with RTC. On the other hand, a lack of openness and releasement more likely results in conservative RTC use as existing technological frames are unquestioned when produced and reproduced.

Chapter 8

Conclusions

In this chapter, I shall summarize the main results and evaluate my achievement in answering the previously outlined research questions. I will also point out weaknesses, shortcomings and limitations of the work. Furthermore, based on the empirical findings I will delineate some suggestions for practitioners who intend to implement and use RTC. Finally, I will propose directions for future research on RTC technology and social practice theory.

8.1 Empirical and theoretical contribution

The research project intended to evoke a more mature understanding of RTC, its implications on social practices and *vice versa*. Attempting to better comprehend RTC, the thesis makes a theoretical and empirical contribution. Theoretically, I extended and developed practice theory in two realms, namely concerning awareness/ co-presence and materiality. First, I discussed the terms presence, presence availability and co-presence which, in comparison with other concepts of Giddens' theory of structuration, have not received much attention in the IS literature. Additionally, I review the literature on awareness and develop a practice theoretical understanding of awareness. At the core of such an understanding lies the argument that awareness is an integral part of social practices which needs to be produced and re-produced over time. Second, following Reckwitz's advice, I integrate Heidegger's understanding of the worldhood with a practice theoretical understanding of the material artefact. By so doing, I proposed to re-emphasise and elaborate on the role of things in practices. People encounter equipment as they engage as part of the concernful dealing in particular practices. Signs were introduced as a specific form of equipment which direct social practices and thereby bring other things and people closer. The discussion on signs and things in more general tried to explicate the enabling and constraining capabilities of material artefacts on social practices.

Empirically, the thesis makes a contribution by providing two in-depth case studies on RTC use. Both cases give an empirically informed understanding of RTC mediated work practices by describing the outer and inner organisational context and

the evolving process of RTC implementation and use. As mentioned before, such empirical accounts are always selective as the researcher's theoretical predisposition, beliefs, values, and interests affect how the research fields are approached and the cases presented. Nonetheless, I am confident that both cases and the analytical discussion gave rich descriptions of RTC use which cover important themes.

Finally, by combining the theoretical perspective and the empirical findings from the two cases, I set out to answer the research questions and thereby develop some of the theoretical concepts. Hence, I contribute to the discussion on materiality, co-presence/ awareness, and provide one potential approach for using Heidegger's concept of *Ge-stell* with a practice theoretical perspective. In the following, I shall present these contributions in more detail.

One of the main theoretical contributions of the thesis was to extend previous work on social practice theory. In particularly, I elaborated on the role of **material artefacts in social practices**. Giddens conceives technology as structural properties which need to be implicated in the actions of human agents to have any effect (Giddens et al. 1998). As such, technology is **enabling** and **constraining**: it is constraining as routines are ways of doing things in relation to technological artefacts, however, at the same time technology enables those actions.

The theoretical discussion on the material artefact which I proposed complements previous work on groupware. Digiscribing was intended by Kelly (2004) as a concept which explains specific characteristics of asymmetric groupware applications, such as Lotus Notes. This research extends the discussion on the materiality of groupware by introducing a conceptualisation which takes particular account of the characteristics of RTC. I demonstrated that social processes are qualitatively altered due to the implementation of RTC. By so doing, I provided one potential answer to how RTC use can be conceptualised. The proposed attempt is not limited to either the individual user or the artefact. Rather, it tries to comprehend the material existence of artefacts as a phenomenological experience of human beings who are thrown in the world and thereby constantly encounter and live with equipment.

More specifically, while building upon previous conceptualisations of technology in practice theory, I attempted to go beyond these accounts. I did so by introducing

Heidegger's conceptualisation of **worldhood of the world** and embedded his **fundamental ontology** in a practice theoretical understanding. By doing so, Giddens' **ontology of potentials** was extended to give an explicit account of people's orientation towards things and others. Theorizing about technology with such a perspective, I argued that social practices are always already directed. **Signs** are a particular form of equipment which, due to their characteristics, bring other equipment to the fore, de-sever, and direct human agents' engagement with the world and others. With such an understanding, I tried to give a more theoretically grounded interpretation of **status information and blinking chat windows**. So far, research has rather intuitively argued that status information provides a social affordance that makes people aware of opportunities to collaborate and brings about a feeling of connectedness even if people are not directly collaborating (Nardi et al. 2000; Quan-Haase et al. 2005). To extend previous discussions, I suggested the terms **pointing-at/pointing-out**, which focuses attention on the status information and blinking chat windows as two particular forms of signs introduced by RTC. To paraphrase Introna "In virtually mediated environments, the Other disappears from an immediate face-to-face encounter, but simultaneously appears on our screens in ways that cannot be ignored" (Introna 2007: 168). Such signs have implications for the dynamics of social interaction by directing communicative practices and altering the modes of care in which others are encountered. However, signs do not determine the behaviour of human agents. Rather, the diverse results of RTC use can only be explained by taking account of the extended context and the situated practices people engage in.

Furthermore, I tried to answer how RTC affects forms of organising work in dispersed/ co-located organisational settings. The resulting discussion concentrated on aspects such as co-presence and awareness. I demonstrated that communicative practices which draw upon chats are a useful means to produce and reproduce awareness within teams. However, as pointed out, **communicative practices of awareness production** need to be interpreted within the whole nexus of doing and saying. Such a comprehensive perspective emphasises the importance of **co-presence in physical settings** to strengthen social bonds and to foster trust-based communication. Interaction in situations of embodied co-presence, that is verbal and non-verbal interaction in face-to-face settings, also brings about an appreciation for people's extended context and current activities. Based upon stabilized relationships, **supplementary RTC-mediated communicative practices** can be produced and re-

produced. Through monitoring and displaying activities, such communicative practices not only produce and re-produce awareness but also help to sustain a sensation of co-presence in dispersed settings. On the other hand, the sensation of co-presence affects the quality of these communicative practices. By so doing, I pointed out that co-presence has a volatile state and degenerates if it is produced and re-produced over time. However, the analysis also showed that a sensation of co-presence can be sustained in dispersed settings through established social practices. While reconfirming that awareness needs to be produced and re-produced over time, the thesis extends earlier research by linking and highlighting that awareness and co-presence are interrelated concepts.

I furthermore demonstrated the volatile state of awareness and co-presence in dispersed settings. Thus, the discussion revealed for a selected set of communicative practices their **temporal dimension**. Communicative practices with two kinds of temporal experience were explicated which revealed the different rhythms underlying their production and re-production, namely normal and flexible time. The appropriateness of these practices depended on the interdependencies between tasks within a certain subject area and the need for constant engagement and impromptu feedback.

I pointed out that in order to initiate practices of awareness creation, rules need to be developed. **Norms need to set** expectations concerning the communicative style, topics of conversations, conversational coherence, and the scope of group chats (i.e. inclusion vs. exclusion). Depending on the context in which group chats are used, **awareness can be established at different levels of granularity**. That is it can concern aspects of the extended social or organisational context or reveal information as people closely collaborate on specific tasks.

The recursive relationship between co-presence and awareness together with the directedness of communicative practices opens up new avenues for experiencing the self, the environment and others. **RTC qualitatively alters the sensory-extension-reduction relations** and therefore the experience of the life world. That is, RTC amplifies the way people experience and interpret their dispersed and co-located work setting. On the other hand, physical presence reveals experiences of the life world which are marginalized in RTC-mediated interaction. Consequently, **RTC is non-neutral** as it transforms the experience of the life world. The discussion

therefore resulted in a comprehensive elaboration on how RTC affects forms of organising work in dispersed/ co-located organisational settings.

In the final part of chapter seven, I tried to understand and conceptualise the enabling and constraining implications of the socio-organisational dimension on RTC use. By so doing, I addressed the role of managers in facilitating RTC use and the challenges users encounter while embedding RTC in their work practices. In contrast to asymmetric groupware applications such as Lotus Notes, RTC is not radically tailorable. Rather than adjusting features of RTC, people in each case put RTC in different uses. However, in applying a practice theoretical perspective, I suggested that the implementation process of RTC is akin to that of Lotus Notes open-ended and consists of anticipated, opportunity based and emergent changes. I proposed Heidegger's concept of **Ge-stell to theorize about the whole nexus of practices which affect the implementation of RTC**. In particularly, I identified social practices which describe forms of **engagement with the Ge-stell ranging from openness/ releasement to resentment**. Openness towards the Ge-stell is exemplified by an attitude of curiosity, the willingness to experiment and innovate social practices. Releasement refers to a critical engagement with the Ge-stell where people know about the sensory extension-reduction relations that come with any tool and reflect about its use within a particular context. Releasement and openness are two attitudes which facilitated the implementation of RTC. Even within the same organisational culture both innovative and conservative forms of RTC use exist depending on people's engagement with the Ge-stell.

The **degree of reflexivity**, which is a constitutive element of openness and releasement, had implications on the use of RTC. In particular, I argued that RTC is not a radically tailorable tool but rather a general-purpose technology which can be used in different ways. RTC use is therefore a collaborative achievement as people within groups or communities make sense of the technology and establish RTC-mediated social practices. A high degree of reflexivity in relation to RTC-mediated practices brings about and guarantees that these practices are altered in the light of incoming information. The reflexive probing, testing, and experimenting enables new forms or alters existing modes of RTC use which take account of the changing task characteristics, situational requirements, and related work practices. At local.ch, developers reflected upon the level of interruption or the aptness of existing chat

channels and adjusted the RTC-mediated practices accordingly. Contrastingly, at IBM the degree of reflexivity in relation to established work practices was less distinct. Forms of experimenting with RTC, as they happened in the test team, had therefore less far-reaching implications. Users were not too much concerned with reflecting about (RTC-mediated) practices and therefore either rejected RTC use altogether or only applied the technology in a conservative manner. Consequently, reflexivity is a fundamental for the effectiveness of (innovative) social practices as they are constantly altered in the light of incoming information.

Malhotra et al. (2001) illustrated the relevance of management practices for the use of groupware and the success of dispersed teams in more general. I identified **organisational designing as a management practice** which seems to have significant implications on RTC use. Management facilitates an organisational arrangement which can capitalize on the enabling and constraining capabilities of the Ge-stell by specifying (1) purpose, (2) principles, (3) people, (4) concepts, and (5) the role of technology. Functioning as the premise for the opportunity to enact forms of organizing, the Ge-stell can enable an organisational design which would not be possible without it. Explicitly considering the role of technology in the organisational design is therefore an important part of the associated management practice. Organisational designing as management practice also highlights the fact that **design is not static**. Rather the practice of organisational designing needs to be continuously produced and reproduced in order to adjust the design to the changing organisational context or internal needs.

For organisational designing to be effective, however, the affected people need to care about it and **produce and re-produce the design as part of their everyday social practices**. People who do not care about the design and the role of RTC may use the technology only in a conservative manner or even restrain themselves from using the application for collaboration altogether. Curiosity and an interest in adapting and innovating practices are required to avoid the myopic **downside effects of the sensory extension-reduction transformation of technology**. I suggested **lifestyle as one indicator for people's willingness to integrate novel technology** in work practices. For technological enthusiasts accepting technology is part of and reconfirms their lifestyle and the narrative of their self-identify. Contrastingly, other groups can experience technology as potential threats to established social practices.

Depending on how far the threatened practices are sedimented in the day-to-day activities, people might feel that new technology significantly affects their lifestyle which can in extreme cases impinge on feelings of ontological security.

The organisational design should take account of and address the requirements resulting from the **task characteristics and organisational objectives**. At local.ch for instance, the objective was to produce innovative software in a creative environment. Consequently, specific requirements resulted in relation to the concepts, people, and principles that directed the work. The organisational concept needed to promote an understanding which perceived software development as a collaborative achievement and appreciated the need for constant learning and interaction. Such a concept had significant implications on the people who worked in the environment and the technology which was applied. First, RTC had to enable communicative practices which facilitated collaboration across time and space. Second, people had to be willing to work in such a flexible and dynamic environment. Consequently, their lifestyle and aptitude should demonstrate openness and an inclination to host novel technology. In contrast, at IBM a highly structured approach of software development with a pre-defined organisational structure and clearly separated work packages did not require a similar organisational design. Instead, a more structured organisational approach proved to be an efficient method for writing code for pre-defined features and functionalities. In this environment, developers did not have to come up with innovative work practices and forms of RTC use. This might suggest that organisational designing, practices of software development, and people's lifestyle are only separated for analytical reasons. In fact, they form a nexus of practices which stabilise or destabilise each other. The suitability of such a nexus seems to depend, first, on the homogeneity of the practices within such a nexus. For example, at local.ch the organisational design and the developers' work practices and lifestyle corresponded with each other. Second, the nexus of practices needs to appropriately address the organisational objectives and task characteristics. The latter aspect might explain why the software development projects in both case studies were regarded as a success despite the different organisational designs, work practices, and lifestyles.

I found that conducting this research project sensitised me to the fact that the quality of access and the richness of the cases strongly affects the quality of in-depth case

studies. Approaches that attempt to depict how events unfold over time are especially dependent upon intensive exposure to activities in the field. At local.ch, field trips were planned with two months breaks in-between in order to trace temporal changes. I was fortunate to be able to develop full access to a broad spectrum of information and most key actors at local.ch and this allowed me to develop a good understanding of the communicative practices in which the technology was embedded. However, further exposure to the field might have sharpened my understanding of those rather deep-rooted practices which constituted the motivation for constant technological and organisational change. At IBM I tried to incorporate lessons learned from the local.ch case and spent up to four days per week over a two month period at the research site. However, when I joined IBM the project was well underway and had a more stable organisational structure because of the institutional regulations and practices. Informants were less clear at IBM in explicating the organisational context and their work practices, probably because work practices were rather tacit and the IBM culture did not encourage discussions on work procedures. The study may have been extended by monitoring everyday conversations on Sametime or e-mail in order to access people's practical consciousness (Giddens 1984). However, privacy concerns and technological difficulties prevented me from doing so.

One limitation of the thesis is its focus on a particular type of espoused technology, namely stand-alone RTC applications. Tools such as Skype and Sametime provide certain real-time features, such as the status information or the integration of synchronous and asynchronous communication (Riemer et al. 2007a). However, these tools do not contain more complex features of professional RTC applications, which can for example be integrated in existing ERP or CRM systems. The consequences this might have on technology-in-use are hard to tell (for example, is the perception of such systems and the working environment in more general comparable to stand-alone applications or not?). Consequently, caution is required when generalising about professional RTC solutions which deviate from those investigated in this thesis as they might affect the dynamics of social interaction in different ways.

8.2 Implications for practitioners

The business press is bullish about the potential of RTC to function as a remedy for a myriad of social, organisational, and technological problems. However, in contrast to

such uncritical accounts of RTC, this thesis attempted to develop a more sophisticated conceptualisation of RTC use. Contradicting the technological imperative, the empirical results show that RTC alone does not function as the main driver for increasing productivity, improving communications, and saving costs. Practitioners should be aware that the outcome of RTC can not be explained *ex ante*. Rather, RTC use can only be comprehended *in situ*, by taking account of people's use in particular times and places (Orlikowski et al. 2000). Questioning the impact of managers as decision-makers who choose a technology, put it to use, and thereby positively affect the productivity of the firm should not be understood as an attempt to downplay or devalue the managerial role within the implementation process of RTC. Rather, the argument suggests that for managers to be effective they need to play a much more active and central role in the implementation process in that they need to carefully design the envisioned organisational structure. However, organisational designing is a precarious and intricate management practice.

Thought must be given to striking the **right balance between organisational designing and constant opportunities for change** by those who are affected by the design. Organisational designing points to the important role management or key decision makers play in specifying planned or opportunity-based regulations and norms. Managers need to think about and continuously communicate the purpose, principles, people, and concepts that define the envisioned organisational design. Technology has a crucial role in the organisational design as it enables and constrains the enactment of social practices. To capitalize on the capabilities of technology, management should consider its function within the organisational design from the outset. Moreover, organisational designing is not a singular task which only needs to be performed at an early stage in a project. Rather, in order to be effective organisational designing has to be constantly produced and re-produced through formal or informal, written or spoken interactions among managers and subordinates. Consequently, organisational designing implies reflexivity in that social practices within the organisation need to be constantly examined and reformed in the light of new information about those practices.

The team members who are affected by the design need to be able to adjust work practices to changing contextual or organisational requirements. Consequently, the **organisational design needs to be specific enough to point out a trajectory** which

lays down commonly shared norms and interpretive schemes. On the other hand, the design should give enough leeway so as not to define ossified work practices which are unsuitable for the situated needs of the affected people. To summarize this argument, the use of RTC can have surprising, unintended, and unforeseeable outcomes which may not have been planned ahead of time. Giving users the chance to realize opportunity-based and emergent changes is vital. However, specifying an organisational design that provides a trajectory for human activities may result in forms of RTC use which would not be possible or at least be less likely without the managerial intervention. In order to do so, organisational designing needs to take account of the context specific requirements and situated work practices of different communities within the organisation. Rather than proposing a design that is universally valid, **management should allow diverse but interconnected and coordinated designs within the organisation**. The multiple designs should be sensitive to the varying objectives and task characteristics within the organisation. Additionally, the discussion pointed to the importance of selecting suitable employees who embody the pro-claimed working style and proactively come up with innovative work practices.

Furthermore, managers should be aware that the inclination of subordinates to apply RTC can be positively or negatively affected by their lifestyles. While some groups, as part of their lifestyle, might openly accept RTC and new technologies in general, other groups may care less about incorporating novel technology, even rejecting the prospect of changing previously stable and familiar work practices. A threat to established social practices can even affect a person's feeling of ontological security. Instead, a caring engagement with the technology seems to be necessary if people are to arrive at their own innovative social practices. In such cases, pressurizing team members might not be a promising strategy in order to persuade people to care more about RTC use. Rather, **cultivating trustful or safe environments** for promoting acceptance and experimentation seems to be vital (Kelly 2004).

RTC-mediated communicative practices can positively affect the awareness within teams or sub-teams. By displaying and monitoring activities in chats, team members impart news, notify each other about work related activities or events, or collaborate and coordinate their engagement. However, establishing awareness and creating communicative practices in dispersed settings presents itself as an intricate

undertaking. Dispersed teams whose time-space paths nonetheless intersect on a regular base are more likely to establish innovative practices. Managers should bear in mind **the importance of bodily presence for strengthening social bonds, developing trustful relationships, and ultimately bringing about a sensation of co-presence.** Against the backdrop of existing social relationships and knowledge about each other's extended context, RTC-mediated communicative practices are more likely to emerge. Not only do such practices produce awareness of team activities but they also compensate, in dispersed settings, for a lack of physical presence by sustaining a sensation of closeness.

Practitioners should explicitly **consider different forms of RTC use** and promote them proactively. Are there any areas in which organisational news and information should be spread throughout the team or the organisation? In such cases, implementing institutionalized chats might be a promising approach. Because of the flexible temporal structure, such communicative practices display information on dedicated subject areas which then can be monitored according to the temporal availability of the subscribers. If constant engagement is required or close interdependencies exist between tasks, group chats with a normal temporal experience can be promoted. Such group chats provide the opportunity for constant engagement and collaboration. Consequently, management and users should reflect upon the areas in which the application of the two kinds of chats could facilitate forms of organising work. Together, both communicative practices provide opportunities for routinised social engagement and may bring about a high level of transparency and intelligibility.

Finally, closely knit groups provide promising settings for facilitating and bringing about innovative forms of RTC-mediated communication. It is more likely that closely knit groups have the same perception of their organisational and social situation and share a common understanding of the working environment and the tasks at hand, making it easier to mutually agree upon and establish social practices. Groups need to be committed to exclusively use RTC for particular tasks in order for it to become a reliable source of information. Moreover, excluding or including people from chats functions as a means to define the scope of the audience for which the topic is relevant. Finally communicative norms set expectations concerning the communicative style of group chats. All of the three named aspects – that is

commitment, scope, and communicative style – also function as a means to capitalize on RTC while managing the intrusive characteristics of the technology.

8.3 Future research

Although this work provides several potential starting points for future research, I would like to point out three areas in more detail. The thesis was limited to the use of stand-alone RTC applications in software development projects. It was mentioned time and again that RTC use can only be comprehended *in situ*, that is the outcome of the technology depends on the use by particular people at particular times and places. First, there is a need for more research that explores RTC use in different organisational and social contexts, such as consultancies, hospitals, the financial sector, or even whole supply chains. For instance, with internet-based services such as e-banking, e-CRM or outsourcing, the financial sector strongly depends on ICT in mediating key business practices (cf. Madan et al. 2003). Studies could focus on the constitutive and transformative role which RTC has in such settings. Furthermore, over the next couple of years, complex domain specific RTC applications will be shipped, although the pace of market penetration is expected to differ depending on the field of application (Frößler et al. Forthcoming). Research should therefore focus on such professional domain specific RTC applications which for example embed customized RTC features in organisational processes, integrate RTC in office or enterprise applications, or display context specific buddy lists (for a more detailed discussion on RTC applications, see Riemer et al. 2007a). Consequently, further in-depth case studies would be valuable resources for extending our comprehension of RTC systems in relation to a broader variety of dimensions.

Secondly, one of the main contributions of the thesis was to clearly circumscribe and relate the connotations of terms like presence, presence availability, co-presence, and awareness. The newly attained appreciation for these words opens up the opportunity to develop more refined and nuanced understandings in relation to these terms. Presence, that is people's embodied personal engagement, emphasises that even in virtual settings, people's bodily existence is a vital aspect for discerning the (computer mediated) world. This raises questions as to how RTC and signs in more general affect the way people encounter each other. How do people in a particular context envision (*Vergegenwärtigung*) others based on the signs they have on hand (*Gegenwärtigung*) (Heidegger 1988)? Presence availability describes "means

whereby actors are able to 'come together'" (Giddens 1984: 123). Research needs to elaborate on new kinds and means of coming together introduced by RTC or other technologies. What kind of different forms of coming together exist? How are these forms qualitatively experienced in the life world, how do they affect a person's emotional state? Co-presence then, refers to sensations of closeness towards others. How do variations in the number of people or signs affect a person's the sensation of co-presence? Is there anything such as 'sign overload'?

Finally, I endeavoured to integrate in the theory and analysis chapter a phenomenological and practice theoretical perspective. First, I tried to specify from the perspective of the human agent the meaning of the phrase "enabling and constraining capabilities of RTC". Signs were identified as specific equipment which directs communicative practices and modes of care. Secondly, the term Ge-stell was introduced to describe people's engagement with the enabling and constraining capabilities of RTC. In particular, I proposed releasement and openness as characteristics of social practices which constitute a free relationship with technology. In general, both attempts illustrate the benefits a practice theoretical research agenda can gain by revisiting phenomenology and the writings of authors such as Heidegger or Merleau-Ponty in order to develop new approaches for analysing the engagement of human agents with IS. As this work revealed several open questions and areas that need to be revisited, it will hopefully motivate future research in this area.

8.4 Final conclusions

In this thesis, I attempted to give a more sophisticated account of RTC that deviated from the technological imperative which so often dominates the business media. Based on two in-depth case studies, I illustrated the diverse outcomes RTC use can have in different organisational contexts. To comprehend such diverse outcomes, a practice theoretical perspective was developed and combined with phenomenological concepts. By doing so, I hoped to provide a first empirically informed conceptualisation of RTC and to answer some questions regarding RTC use.

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