Helpdesking

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Helpdesking

Knowing and learning in IT support practices

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Abstract

The background of this doctoral thesis is an interest in work achievement over extended time periods in specialized and technology-infused workplaces. Globalization, digitalization and increased focus on customer services are constituent aspects that have been claimed responsible for the current changes in the way work practices and teamwork are organized. In IT helpdesk work, which is the object of study in this thesis, challenges including dissemination of information, keeping up-to-date with technological changes and coordination of people and tasks have been identified as critical. The aim of this thesis is to illuminate how knowing and competence are maintained and shared as participants engage in backstage activities in helpdesk work. The focus is on the nature of the activities that unfolds when employees engage in activities that include interaction as well as artefacts. The empirical material comprises video- and audio-recorded activities of a second-level helpdesk in a large multinational IT provider. Targeted 'hot spot' activities are shift changes, quality discussions and introductions of newcomers. Based on a sociocultural perspective, the (re)production of professional practices is understood as continuous negotiations between participants and tools within a situated framework. Methodologically, this implies detailed investigations of authentic activities where interactions and tool use are analysed from the participant's perspective.

Three studies are included in the thesis, each of them provide insights into the organizing of shared knowing and competence. Study One focuses on how tasks and information are communicated between shifts and transformed into workable units and knowledge. Study Two addresses the role of activities specifically arranged for learning and separated from other work tasks. In Study Three, the focus is on introductions of newcomers and what can be learned from interactions with experienced participants and technological tools. The analyses show that knowledge work is a continuous and communicatively-based undertaking. Continuity across shifts relies on several documenting routines and procedures, but shift change meetings provide opportunities for interpretation and negotiation of information as well as coordination of tasks. Talking about work provides a space for reflection and reformulation of team-related quality norms and values as shared foundations for work. Furthermore, inducting newcomers to the specialized and situated practice brings about the very detailed procedures involved in managing everyday work and technological tools. By describing the reasoning and knowing displayed by helpdesk employees, the thesis contributes to discussions about knowledge work and sharing in organizational settings, teamwork, system design and lifelong learning. To conclude, it is suggested

that sharing and reproduction of knowing in practice is a collective effort that entails creative involvement by members of the practice.

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Norrköping, March 2015
Ann-Charlotte Bivall

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Part One
HELPDESKING

Vignette

It is eight o'clock on a Thursday morning and the four support engineers on the morning shift of the Global Help Desk[1] (GHD) are seated in front of their computers. Around them, in the open plan office area, other IT employees of the Global IT Support (GITS) arrive. In the corner, where GHD team members have their desks, Ida and her colleagues have already been in charge of the ongoing support activities for an hour. She has taken over and continued work on some customer queries, or cases as they are known locally, from the preceding night shift, and she has also started to work on two new ones. These have been referred from the frontline helpdesk to the second-level support GHD is in charge of. So far, Ida, having nearly four years of experience, does not seem to have had any particular difficulties in pursuing her work. She has relied on her relatively extensive experience, and searched for and found the information she needs in the team's information-sharing systems. Ida continues her work, and she checks in PIVE, the Case Management System (CMS) the support team uses to keep track of cases. She picks one case that has been updated with new information. It turns out it is the STT back office, another team within the company, that is requesting information to clarify a case. Ida reads through the previous documentation of the case, and she even starts formulating a response to the team, when she discovers a mistake in the written communication. She involves Aron, one of the other support engineers on the shift. Together they discover that the customer request had been written in Danish, which they react to as a deviation from the use of English, the official company language. Nonetheless, Ida is able to correct the mistake by clarifying the mix-up in the response to the STT group. Work continues; so far this morning has been calm.

When Ida returns after getting coffee for herself and Aron, who stayed behind to supervise telephones and network systems, her attention is drawn to one of the monitors on the long side of the office area, where an alarm has just started to sound. Ida's task as helpdesk engineer is to establish the nature of the alarm and the seriousness of the matter. She walks over and checks the error messages on the screen and realizes that a small part of a website is down in eastern USA. She looks up at the wall above the monitors to check the local time, and assesses whether it affects many users or not. This is one aspect that determines the severity of the problem. Now, Ida's responsibility is to solve the problem. In her analysis of the error messages, using the logs, she concludes that a simple action probably will solve the problem. She asks the others on the shift if they think her con-

[1] All names and acronyms are fictitious due to confidentiality issues.

clusion is correct and they agree. She then contacts the relevant back office, where programmers carry out her instructions.

A while later, Ida receives an e-mail from the back office that the system should be up and running again. Being responsible for the solution, she checks and double-checks that the website functions satisfactorily. Her coffee is nearly cold, as she finally remembers to drink it. The flow of cases showing up in the PIVE CMS is constant; some are new issues, others are in progress waiting for further information, yet others are currently dealt with by back offices but kept within the helpdesk team's systems for overseeing until solved. The calm does not last long before Ida notices a high-priority case. She opens it, reads the incident description and marks it as accepted before she engages in any problem-solving actions. The problem described is new to Ida and she searches for information in the web hosting that can help her in troubleshooting the problem. She does not find a direct solution, but nevertheless she picks up a piece of information that prompts her analysis of the situation, and she realizes they need information not included in the problem description. She writes back to the user and asks for additional information. But she does not leave it at that; she continues to search for information that might lead her in the right direction. She even tells Rune, the shift leader, that she will need to spend some time on the problem and solution, and that she therefore cannot take other cases. Fifteen minutes into searching through the team and company intranets, she starts to suspect that the case could be an indication of a potentially large problem. That is, one that could affect many users worldwide. However, whether this is the case or not can only be established when they receive the answer from the customer. Ida informs Rune of the case and the result of her search, and he, in turn, makes a note about it on the shift report. Ida then knows that if they do not receive an answer before the end of their current shift, following shifts will be informed and keep an extra eye on the case.[2]

The research presented in this thesis is an empirical study of helpdesk engineers at a second-level helpdesk and how they achieve continuity in their activities in an information intensive work practice. This work, which is going on behind the more public scene of seeking and getting help with technical problems of which most people have some experience, is concealed from most customers. To use Goffman's (1959) dramaturgical metaphors of social interaction and team performance, the ethnographic illustration above describes a few snapshots of what is going on *backstage* during a regular morning shift. While the team on the *frontstage,* towards customers, officially perform helpdesk support, the backstage setting setting provides a place for actors to

[2] This vignette aims to provide the reader with a glimpse of what work is about in the helpdesk. It should be read as a condensed general description of some activities that form part of everyday support at an advanced helpdesk. The narrative is reconstructed from ethnographic data, video and audio recordings of *in situ* helpdesk work activities.

refine, coordinate, discuss and challenge their performance as they prepare for frontstage activities.

The vignette provides initial glimpses of the support engineers' activities when dealing with customer queries and system breakdowns, and it illustrates that support is an investigative kind of work where team members have to show creativity. It also shows that there are several layers in the organization of support: the frontline constituting the initial point of contact between customer and support staff, a second level of support which is the focus of this study, and a third level with back office teams that represent specific types of expertise. It is also possible to notice that support work and problem-solving in this environment are collaborative enterprises. Finally, and most important to the present study, the vignette shows that *tools* and *textual practices* are substantial aspects of work in helpdesk service provision and that team members rely on continuous access to *knowledge* and *information* in order to proceed with their work. It thus seems that qualified helpdesk support is a complex process involving multiple physical and symbolic resources, and it relies on communication between team members and with other stakeholders. A general interest of the present study is to gain insight into the organization of work and learning that is taking place backstage, in order to understand how the team members achieve continuity, conformity and quality of services 24/7 all year around.

CHAPTER ONE – Introduction

So, why dedicate a dissertation to studying how knowing and learning unfolds at an IT helpdesk? There are several possible backdrops to why such a study might be of relevance. Perhaps the most salient is our dependency on the smooth functioning of technologies in most of our daily activities. In a normal day of family life, for example, digital technology is used on repeated occasions and for various purposes. Children use laptops to log in to the school's web-based application where teachers upload test results and school assignments; parents of young children report nursery school attendance hours via their smartphones; the family coordinates its activities through synchronized calendars. Similarly, digital technology is involved in our daily activities at work. As a researcher I continuously use computers for writing and sharing texts with others, I use web-based search engines to find relevant literature and, when I teach, I communicate and coordinate student activities through the university's Learning Management System (LMS). Travel between home and work also includes contact with technologies. In the car, the internal navigation system might help finding new locations, and, as we travel by train or public transport, tickets and departures can be managed remotely through specialized applications. When we are about to go by air, we can check in on-line prior to leaving our home, and at the airport we manage the printing of baggage tags by ourselves. The adoption and proliferation of digital technologies are facts today that extend throughout our lives, involving people of all ages and backgrounds, in professional settings and in the private sphere.

As digital resources, such as computers and networks, are integrated into an increasing number of societal functions, the need for technical support has grown rapidly (Knapp, 2011), especially in the business sector, where digital resources have become an important factor of success, and where unplanned downtime[3] causes great losses in productivity and profit. By creating in-house helpdesks or by buying the services from specialized support companies, businesses and institutions have found an approach to taking advantage of sophisticated technologies yet minimizing negative effects caused by malfunctioning systems and technologies.

[3] Downtime is the time during which users cannot perform operations due to malfunctions of technologies or systems.

As technical support has been pinpointed as a critical resource in organizational settings, management of knowledge has also become a prominent issue to handle in businesses and industries. In engineering and business communities, a great interest has been evident in the development and use of information systems for knowledge management (Alavi & Leidner, 1999; Swan, Scarbrough, & Preston, 1999). Such systems have been seen as modes for storing and making information available across physical space and over time. However, the main line of research that focuses on technologies and system design has been criticized for not taking the practices of use into account (Stenmark & Lindgren, 2008). It is argued that the research overlooks the fact that there are people using the systems (Swan et al., 1999) and that the system designs consequently fail to support the kind of emergent knowledge processes that appear in organizational contexts (Markus, Majchrzak, & Gasser, 2002). Such a bias, in focussing on the technologies *per se*, has been referred to as technological optimism by researchers in the social sciences (Sørensen & Lundh-Snis, 2001). Arguments have been raised for a greater focus on the social and the human aspects, including issues of learning. To engage in these discussions *per se* is not the intention of the present work. However, studies on helpdesks and in what ways technology and knowledge are framed, provide important insights into the practices of work as well as into how such work previously has been approached in research. The issue of how IT support practices are organized with regard to knowing and learning, that is, how they actually manage to maintain continuity over time in this regard is, accordingly, an important question to address; and this is precisely what this thesis sets out to do. Before delving deeper into what the present work is about, however, some introduction to IT helpdesks as practice and field of research is necessary.

It goes almost without saying that technical systems and networks need to be maintained and users need help with problems. In the early days, employees who were proficient users themselves helped their colleagues out. They were typically administrators (McKoen, 2000) or system developers and programmers (Knapp, 2014). As technical systems increased in complexity, and the range of hardware, software and networking technologies expanded, it became increasingly difficult for organizations to keep up with the development (Prescott et al., 2001). Proper helpdesk service provisions were formed providing single points of contact for help.[4] What initially had been

[4] For a more extensive description of the historical development of IT helpdesks, and the use of different terminologies, see Knapp (2014). To a certain extent, favoured concepts follow the overall development of helpdesk service provisions and reflect current priorities in the helpdesk community. Customary are "help desk", "technical support", "IT support" and "customer support". Currently, the concept "service desk" is increasingly used, emphasizing current trends in customer relations and delivery of services (Knapp, 2014). In the present study, IT helpdesk, helpdesk and helpdesk service provisions are used interchangeably.

ad-hoc solving of problems now became the focussed work object of clearly defined groups. Early on, this new kind of organization recognized the need for information repositories as means of supporting helpdesk staff in troubleshooting and diagnostic activities. Initially these consisted of collections of product manuals, system specifications and other kinds of documentation. Helpdesk employees' experiences from hands-on work with problems were then also seen as valuable for collection and re-use as resources in forthcoming analytical and problem-solving activities. The need for information coordination and organization has thus prevailed since the early days of systematic helpdesk support.

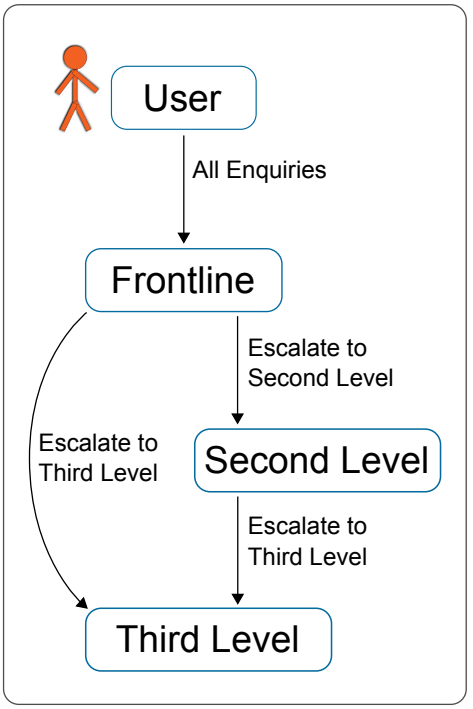

Figure 1. The three level support structure. Adapted from Leung and Lau (2007).

The variety in customer groups, from in-house to external, from SME's (Small to Medium-sized Enterprises) to mega-conglomerates implies that helpdesk service provisions have to prepare for differing needs, requirements and qualifications. Depending on the nature of the problem, it will be dealt with on different levels in a chain of specialized support teams, which in the literature is often divided into first, second and third level of support (e.g. Knapp, 2014; Leung & Lau, 2006). The first level, the frontline, constitutes users' first point of contact where routine problems are dealt with. The

frontline staff refer, or escalate (Leung & Lau, 2006; Pentland, 1992), more complex and demanding problems to the second or third level of support. At the second level, in-depth troubleshooting is performed, but also on-site services can be provided. The third level, as described by Leung and Lau (2006), is constituted by database administrators, developers and so on. The interrelations between these levels are normally not linear but rather decided on by considering the types of problems, areas of responsibility and the local organization of support (see Figure 1).

What staff in helpdesk service provisions have to know extends over several areas of competence. Most obvious is perhaps the great spectrum of technical skills they have to master, like proficiency in varied applications and operative systems. Being in the midst of the technological development, this body of work is furthermore in continual flux where new products are introduced and old ones are changed, new problems are encountered and new forms of documentation appear (Davenport & Klahr, 1998). This implies a need for storing and sharing information within teams of support employees. However, with an increased focus on IT service management (Winniford, Conger, & Erickson-Harris, 2009) and on helpdesks as service providers (McBride, 2009), relational and social skills are equally emphasized. In particular, abilities to collaborate with others, being flexible and customer-oriented have been pointed out as essential qualifications (Connor, Hillage, Millar & Willison, 2001). Expertise, as argued by Das (2003), then, is dependent on the ability to efficiently navigate both the material and the social environment in helpdesk support. When customers turn to helpdesks, they do so because they experience some kind of problem, but it cannot be assumed that they know how to communicate it. Helpdesk agents need to be able to listen to their customers and ask appropriate questions (Knapp, 2011) in order to grasp and adequately frame the problems. They also have to be responsive to customers' experiences of what they describe as problematic, even if it does not qualify as a problem when seen from a technical point of view. Troubleshooting activities then typically involve negotiations of social positions as well as problem content, turning support also into a social endeavour (Quayle & Durrheim, 2006). To conclude, a review of the challenges of what needs to be known in support work conducted by Davenport and Klahr (1998) is illustrative as it summarizes the issues: "perhaps no other type of organizational knowledge derives from so many different sources, comes from so many different media, and is applied to so many different purposes" (p. 199).

Whereas the need for and reliance on helpdesk support are growing, the work carried out within such groups still appears unknown or abstract to people outside the support community. There is also a lack of theoretically informed research that provides insights into the complexity of activities that

are involved in performing helpdesk support. Yet, as I alluded to earlier, questions of how to organize for successful management of unexpected problems and disruptions that people working within IT support have to deal with, have occupied several research communities. In the next chapter this research, which is guided by different approaches and foci, will be addressed in three sections. In the first field of research, the primary focus has been on developing decision support systems for knowledge engineering in support environments. It is the technology that is in focus in this line of research with specific attention to strategies in designing efficient information systems. A general objective is to design automated systems for information categorization and processing. In the second section, a body of research within the sociotechnical paradigm is presented, that provides a contrast to the research in the first section. The point of departure of sociotechnical research is to investigate technology in use, which implies that technologies are related to tasks at hand, to people working and organizational structure. By analysing relationships between technologies and their situated use, better understanding of organizational change and development is accomplished (Coakes, 2002). The object of study is thus moved from topicalizing information systems *per se* to "human agency and the enactment of emergent structures in the recurrent use of technologies" (Orlikowski, 2000, p. 421), that is, practices of technology use in organizations. Research on helpdesks and the management of knowledge from this perspective includes exploration of theoretical issues as well as software design. In the third section, one seminal study is presented that can be associated with the sociotechnical paradigm – the anthropological study of support technicians by Orr (1996). Providing insights into activities where support technicians share stories with one another about problems, machines and customers, the study deepens the understanding of knowing as an outcome of narrative practices in organizational settings. This study is of particular interest as Orr's perspective lies close to the sociocultural perspective adopted in the present work. Particularly, it points to the importance of acknowledging the interactional practices taking place in backstage technical work as means for sharing and negotiating information.

Similar to that in Orr's work, the point of departure in the present work is how people maintain support activities by coordinating and operating tools and problems together – in other words, how the practice of *helpdesking* is organized. In the chapters to follow, helpdesking will be explored as the focus is turned towards the practice in which helpdesk employees participate, collaborate and negotiate work activities. What the participants and their team learn from participating in such activities, and the manners in which they share their experiences so that they become accessible for the team, will also be explored.

Aims and scope of the study

In this study, attention is directed towards the nature of helpdesking as backstage work. A prominent part of my study concerns what members of helpdesk teams need to know to be able to perform and coordinate such work. However the emergence of helpdesk service provisions also raises a number of epistemological questions, i.e. problems of how people come to know in this sort of collective practices, how they develop individual and shared knowledge, and how learning is organized as part of daily practices. In this study, I will address these general topics by exploring activities where helpdesk professionals perform, document and coordinate work, and how they learn to do so.

Grounded in a sociocultural approach to learning and development, this implies that the interests are conceptualized as issues that revolve around how helpdesking is achieved and re-constituted over time in contemporary society. The overarching aim of this study is to scrutinize how knowing and competence are maintained and shared as an intrinsic aspect of helpdesk work. By gaining insight into professional work at a second-level helpdesk, this thesis provides details about what particular forms of knowing and communication are emerging, and how work is organized to sustain professional activities. In other words, this thesis may also inform general topics in educational science such as lifelong learning, collective knowing and the production and reproduction of skills. Consequently, a particular interest in the empirical investigation lies in the characteristics of learning and knowing as they unfold when participants engage in work-related activities. More specifically, I have studied how such communicative activities become resources for organizing continuous learning and sharing of knowing within a team of helpdesk engineers. My research questions are:

- How is continuity achieved in helpdesking as a collaborative practice?
- What specific arrangements are involved in organizing for learning in helpdesk support?

Outline of the thesis

This thesis consists of two parts. In the first part, the theoretical and methodological underpinnings of the study are presented and discussed. The second part consists of three empirical studies. In the background chapter, Chapter Two, a review of relevant research on helpdesk service provisions is presented. The focus in this review is on three areas of research that relate to issues of knowledge-sharing. Chapter Three outlines the conceptual framework employed in this study. Here, relevant theoretical concepts, with

departure from a sociocultural framework, are presented to frame the research interests in this thesis. In Chapter Four, the nature of the empirical context is presented. This is followed by descriptions of methods adopted and analytical approaches of the empirical work. In Chapter Five, I present the three empirical studies. Chapter Six discusses the main results of the study that will provide further insights into the implications of textually mediated work practices. Chapter Seven is a Swedish summary of the thesis.

CHAPTER TWO – Research on helpdesk service provision

As outlined in the previous chapter, the interest in this thesis revolves around issues of how people achieve work 24/7 in technology-intensive practices and, in particular, how individuals and collectives maintain, share and develop professional knowing in everyday work and over time. IT helpdesks and support providers started to attract the attention of researchers in the early 1990s, particularly in terms of knowledge management.[5] At that time, the research involved several academic disciplines and areas such as computing, information science and service management (Marcella & Middleton, 1996). Since then, the focus on knowledge management and work achievement has prevailed, though also expanded to the social sciences, leading to new approaches and new kinds of questions. In this chapter, which provides a background to the present work, this research will be presented thematically. First, I present studies that take their point of departure from a techno-centric view on knowledge, and where the demands and challenges of IT helpdesks to deal with large masses of information are approached as issues of engineering. The primary effort in this line of work is to develop efficient technical tools for information-gathering and -sharing. The aggregation of computerized information will, it is argued, enhance and lead to more efficient work performances. In the second group of studies, knowledge work is approached from a sociotechnical perspective. This body of research, from the field of Computer Supported Cooperative Work (CSCW), approaches knowledge management as interplays between people and technological resources. To do so, empirical studies of how technologies are used in authentic settings are performed and the research interests concern both the social practices of sharing knowledge and development of systems to support it. Finally, the point of departure is the seminal study already mentioned, where the outset is on knowledge-sharing as an outcome of narrative practices. Narratives, and storytelling in particular, are approached as means of establishing and creating resources for work in technical support. The

[5] The terms knowledge and information are oftentimes used interchangeably in the reported research. This differs from the point of perspective adopted in this study. Implications of making, and not making, such distinctions between the terms are considered at the end of this chapter. The discussion then continues in Chapter Three as the concept of knowing is properly introduced and advocated.

chapter is then concluded with comments on the research outlined above in relation to present interests of knowing and helpdesking processes.

Research on helpdesk efficiency from a systems design perspective

To address knowledge-related concerns, research in computer science and artificial intelligence has focussed on design and development of information systems. Studies have, for example, concentrated on development of so-called decision support tools which are aimed at computerized identification of different kinds of failures (Simoudis, 1992), the use of information systems to automatize knowledge-seeking processes (Chang, Raman, Carlisle, & Cross, 1996) and how to develop centralized databases of information in order to avoid replication in diagnostic work (Heras et al., 2009). The proposed gains from such systems are that the handling, organizing, storing, searching and sharing of information can be facilitated – thus, in short, an increase in work efficiency will be achieved. This is something that has been acknowledged as particularly important for first-level helpdesks. The design approaches, including the choice of suitable algorithms, to accomplish such objectives, vary between the studies. Schematically the systems involve some form of information capturing or input, data processing, and an outcome in the form of information.

One issue addressed is how to retain knowledge within the organization as staff members change. In their study, Chan, Chen and Geng (2000) attended to this problem by developing an automated problem diagnostic software to reduce extra costs and time involved in prolonged problem-solving periods for the frontline support. The researchers were interested in the system engineering processes and developed a prototype helpdesk system that was designed to match new problems with descriptions of previous ones in order to find appropriate solutions. This method is known as a case-based reasoning (CBR) model. Descriptions of previous cases and their solutions are organized in database format, which constitutes the information base of the system. The objective for this kind of system is to retrieve similar cases by analogy as help in diagnostic work. Upon entering a description of a problem, helpdesk staff are presented with sets of questions that gradually frame the problem, culminating in a list of viable solutions; or, 'knowledge', in the language of the authors. The research design included creation of the case base, system implementation and evaluation tests. The case base was manually created by researchers together with support experts through analyses of symptoms, diagnostic features and repair procedures of already-known cases. These analyses were then used in building the system and choosing appropriate system principles and algorithms. Informal tests of verification and validation

were then conducted. According to the researchers, the results were positive in the sense that the system principle made use of all cases in the case base, and that the average number of questions produced (four) was regarded as an appropriate number. Experts involved in the project evaluated the outcome of the system as satisfying. The researchers' conclusions are that the case-based reasoning approach, though arduous, is productive for developing automated systems. Comments are also made about the need to create systems integrated with other sources of information that might be useful in diagnostic procedures. The researchers furthermore address the laborious work of manually formulating case bases: "a future objective is to develop knowledge acquisition methods that will reduce and eventually eliminate the need for a manual approach to system maintenance" (Chan et al., 2000, p. 132).

Although case-based reasoning is a popular expert system method, it has been acknowledged that diagnostic and problem-solving work is complex and that other sources of information are also needed (Chan et al., 2000; González, Giachetti, & Ramirez, 2005; Heras et al., 2009). González et al. (2005) argue that a sole focus on cases leaves out important sources of information and knowledge, such as file databases, web resources and other experts. They furthermore argue that cases that per definition have already been solved, and therefore are known, are better suited for solving recurring problems rather than providing useful information for dealing with unknown problems. Taking a critical stance to case-based reasoning, the researchers furthermore point out that, in terms of useful information, case bases run the risk of becoming outdated as they are often updated on top of support tasks and not prioritized.

González et al. (2005) therefore take their point of departure in how support staff seek out and make use of technologies and information that go beyond known cases. From their work with a frontline IT helpdesk in the entertainment industry, they propose development of a knowledge management system that coordinates several sources of information and knowledge, and which is integrated into daily helpdesk operations of a frontline IT helpdesk in the entertainment industry. The researchers aim at specifying a so-called knowledge management-centric system using a single interface approach to increase the quantitative and qualitative performance of the team. In the study, a prototype system is theoretically developed and tested by making use of an established simulation tool. The system integrates various resources such as case-based reasoning systems, expert people finders and group-ware systems. It thus enhances the possibility of finding appropriate information through technological resources as well as from knowledgeable people. The data used for evaluating the model were collected from an existing support tool that gathered information about cases and included information about time spent on working with cases, priority levels, problem

category and description of problem. The new system as well as the existing support tool were modelled in the simulation tool, which resulted in comparable test results based on the same set of data. The findings indicated that the knowledge management-centric system would significantly decrease the time spent on working with cases (more than 50 per cent) and the throughput of cases would increase by nearly 20 per cent. The research contributions are presented as twofold. First, they argue that the system becomes productive by how it organizes the search for information from various sources in such a way that it will be well-adapted for dealing with known as well as new problems. They also argue that the planned integration into the everyday processes of support ensures continual maintenance, as it becomes a natural part of these activities. Second, the contributions concern the quantitative comparison between the existing and the new system tools. The researchers argue that the positive results from the simulation in terms of efficiency increase justify a forthcoming implementation of the knowledge management system.

Technology-centred approaches to knowledge and information-related issues in organizations like these have had large impacts both commercially and in research communities. Perhaps part of their appeal lies in the idea of system designs replicating human reasoning (Riesbeck & Schank, 1989) and the possibility to operationalize human activity. However, as has been mentioned in passing, critique has been raised against over-optimistic doctrines of technological solutions for administering knowledge and people in organizations. Voices have been raised within the Information Systems domain, as well as in other fields, about how social dimensions, and in particular the people using systems, have been neglected as actors (Stenmark & Lindgren, 2008; Swan et al., 1999; Sørensen & Lundh-Snis, 2001).

Helpdesking in a sociotechnical perspective

In the system-based research outlined above, the studies conducted rely on a particular way of conceptualizing knowledge, namely as an entity that is transferable via technological means. The theoretical and conceptual origin of system-based design research and knowledge management have been questioned by research adopting sociotechnical perspectives on work achievement. Critique has been raised about such research being prescriptively oriented, lacking an empirical perspective of knowledge-sharing and work and not having a proper design orientation (Ackerman, Dachtera, Pipek, & Wulf, 2013). From a practice perspective, Orlikowski (2000) emphasizes people's use of technologies and how such use is structured by technologies and contextual aspects in the organizational settings. Technologies are perceived as created and changed in and through people's actions, yet they are also

perceived as resources used in actions. Rather than focussing on technologies and how such artefacts shape human action, Orlikowski (2000) argues for "human agency and the enactment of emergent structures in the recurrent use of technologies" (p. 421). Similar arguments are raised in the research field of Computer Supported Cooperative Work (CSCW), where it is argued that to study knowledge management it is essential to explore the work relationships between people, technologies and tool use in practice (Cabitza & Simone, 2012; Castellani, Grasso, O'Neill, & Roulland, 2009; Halverson, Erickson, & Ackerman, 2004; Normark & Randall, 2005). Research in this field is interdisciplinary and both theoretically- and design-oriented. In order to understand processes of how knowledge is shared and used in and through activities, these researchers conduct empirical investigations of the relationships between people and technologies. CSCW studies have thus investigated the social practices of how knowledge is shared and the technological means involved in such processes (Ackerman et al., 2013). In helpdesk settings, such concerns have, for example, been studied as embedded resources for troubleshooting (Castellani et al., 2009) and FAQs within teams (Halverson et al., 2004).

A distinct problem of knowledge management is how organizations accomplish activities by keeping and reusing knowledge. Conceptualised as *organizational memory*, studies have provided theoretical illustrations of knowledge at an organizational level, typically denoting one single kind of memory, or they have examined technical systems designed to increase an organization's capacity to store information in digital form (cf. Ackerman & Halverson, 2004). Noticing a lack of detailed empirical studies as ground for theoretical development, researchers including Ackerman and Halverson (2004) aimed at expanding the concept of organizational memory by empirically exploring processes of information and knowledge reuse. In their ethnographically-based study, they followed employees in a telephone hotline team (comparable with the first level of support), and their everyday use of physically and socially mediated information and knowledge while performing work. Video recordings of hotline call work were made to record how one hotline agent managed information and communicated with customers and colleagues to get the job done. Drawing on distributed cognition theory (Hutchins, 1995a), the researchers point out that the hotline agent used several sources of information in only a few turns of conversation. These so-called "memories" used as resources were referred to as a) personal/individual, referring to cognitive activities like personal memory but also the use of notes on paper, and b) group/public, like documentation in software systems where the agent had access to the team's collected documentation of previous work. Another finding concerned the complexity involved in knowing how to document and use different kinds of 'memories'.

This complexity, they assert, concerns contextualization processes of making information suitable for tasks at hand.

> To use information as a memory, one must remove the detail that provides context, making the information into a boundary object. However, at the same time one must consider how others will use it later as a resource in their processes; otherwise, subsequent users of the memory will not be able to properly recontextualize it. (Ackerman & Halverson, 2004, p. 177)

The notion of information use and reuse as depicted by the researchers implies the recognition of the vital role played by knowledgeable users. They argue that memory is a socially organized phenomenon tied to others' work processes, thus transcending individuals' use of artefacts and cognition. 'Organizational memory' is said to be distributed on multiple levels, including multiple people and multiple artefacts, and to be "complexly distributed, interwoven, and occasionally overlaid" (Ackerman & Halverson, 2004, p. 184). The researchers therefore argue that the metaphor wrongly denotes the existence of one single organizational memory. Memories as resources, they continue, ought to be seen as objects as well as processes, as opposed to views of organizational memory as repositories of transferable experience objects.

Another example of a theoretically-, rather than design-oriented study, is one that focuses on informal knowledge-seeking activities and collaboration practices within and between IT teams (Spence & Reddy, 2012). Three IT teams (first- and second-level), co-located in an IT department at a hospital, were studied. The researchers' interest was to identify "team and organizational characteristics affecting the practices of seeking and sharing informal knowledge in these teams" (Spence & Reddy, 2012, p. 289). In this ethnographic study, they observed team members' daily work and interviewed them about their knowledge-seeking activities. The researchers argued that their analyses showed that knowledge-seeking and -sharing were fundamental in daily activities at work, and that local practices of collaboration were developed. Teams that shared the responsibility for solving problems showed more of informal knowledge-seeking practices than teams where individual experts were accountable for their solitary work accomplishment only. In the latter case the participants, for example, created ad-hoc teams whereby team members would evaluate problem solutions collaboratively. Another example was the use of e-mail, which team members preferred when dealing with urgent cases. An important aspect brought up concerning the practice of informal knowledge-seeking was that the team members needed a shared common basic understanding of aims and scope of the systems. Such an understanding facilitated and helped the participants to develop collaborative practices whereby they were able to share and apply knowledge so as to resolve problems.

These examples of studies from the sociotechnical paradigm thus inform us about the need to include a focus on sociotechnical relations when investigating knowledge management in practice. Likewise, the pursuit of empirical investigations is important in relation to practice-oriented understandings of work which exist within the framework of CSCW.[6] Related to such empirically-based studies of work, knowing and learning, are anthropologically-based studies of the organizing of work, here represented by Orr's study, which I will now discuss in some detail.

Narratives and sharing of knowing in helpdesk practices

There has been a long tradition of ethnographically-based case studies of work that sets out to describe work as it unfolds from the participants' perspective, which is important when theorizing organizational behaviours (Barley, 1996). The most significant in relation to the present research, in my opinion, are anthropological studies carried out at the Xerox Palo Alto Research Center, many of which have adopted an ethnomethodological approach to the study of participants' interactional accomplishment of work (e.g. Orr, 1996; Suchman, Blomberg, Orr, & Trigg, 1999; Szymanski & Whalen, 2011). In his seminal ethnographic study of experienced service technicians (second level of support[7]), Orr (1996) addressed talk and narratives in work as resources for work activities. His study was organized around the "triangular relationship" (Orr, 1996, p. 1), which implies that he characterized work as skilled interplays between technicians, users and machines. After following the work of a group of service technicians in the field as they performed diagnostic work, Orr (1996) argued that such work to a large extent is based on narrative practices. Of particular interest to the present study is how the telling of stories between team members comes to constitute and reconstitute the local practice of work. Orr (1996) described oral practices as the means through which technicians preserved and shared information that was not documented elsewhere. Technical knowledge, then, is described primarily as a socially shared resource. Sharing stories, he argued, was an inherent and important part of the technicians' daily work practices, as they shared meaning and knowledge of machines, users and problems upon which the technicians drew when diagnosing problems and repairing machines in the field. The collective experiences of the technicians were thus

[6] See Addleson (2013) for a discussion about CSCW and a practice perspective.

[7] The service technicians performed on-site diagnosis and repair of photocopiers. They thus functioned as helpdesk specialists in the field, which accordingly to the categorization by Leung and Lau (2006) would be equal to second-level helpdesk. The on-site work was mostly individually performed, but the group studied was based at the same headquarters.

produced and reproduced as narratives. Orr (1996) also showed how the technicians used narratives to create coherence and meaning from diverse pieces of information. Furthermore, sharing of stories was claimed to be a way into membership in the community and to the identity of being a technician.

Orr (1996) thus emphasizes such talk as a crucial dimension of the technicians' work practice. In fact, he argues that the "[t]echnician's stories *are* work" (Orr, 1996, p. 143). Orr concluded the study with a discussion about liaisons between understanding problems and having control. The technician cannot be sure that available documentation or machines, or users for that matter, present them with correct and sufficient information for diagnosis. It is at this point, Orr writes, where sharing of knowledge becomes vital as the "technicians pool their knowledge" (Orr, 1996, p. 160). The interrelation between control and understanding is established

> through a coherent account of the situation, requiring both diagnostic and narrative skills. Understanding is maintained through circulation of this knowledge by retelling the narratives to other members of the community, and this preservation of understanding contributes to the maintenance of control. (Orr, 1996, p. 161)

Having control and being apt at problem-solving thus require technical skills but these skills are created and recreated in team members' talk about work.

Helpdesking as processes of knowing and learning

By focussing on three key issues in the research presented above, I will elaborate on how research in the field can advance further by reformulating knowledge to knowing, by continuing to focus on participants and their use of resources in and through work, and, finally, by focussing on backstage work in teams on the second or third level of support handling demanding problem-solving tasks.

In the techno-centric and sociotechnical research above, knowledge management strategies were salient. At the core of knowledge management, lies a pragmatic need (Alavi & Leidner, 2001) to understand the mechanisms through which knowledge can be collected, processed, organized, distributed and used to support work activities. While a technology-centred focus on administering and managing knowledge in organizational settings provides insights into computer-based systems as means for storing and organizing information, such a perspective risks decontextualizing knowledge from its situated practice of use. Part of this problem is an outcome of the way 'knowledge' is treated conceptually. Knowledge is primarily described as

textual information entered, saved and made retrievable in systems. Such a conceptualization of knowledge implies viewing it as static transferable entities (cf. Chan et al., 2000; González et al., 2005; Heras et al., 2009) and seems to be a prerequisite for the operationalization of knowledge as shareable via technological media in these studies.

However, I argue that this has consequences for the view on how work practices are achieved over time, and by whom. Making distinctions between 'knowledge' and 'information' is consequently relevant, particularly as the terms are used rather haphazardly (cf. Stenmark, 2002). When the term knowledge is used to represent what is found in textual format in digital systems, there is a risk that knowledge and information are viewed as equivalent, disregarding important resources that people bring to everyday work. As knowledge distribution is referred to as transfer of information, relations between human processes of sharing and maintaining knowledge are made invisible. Such an epistemological confusion disguises the processes through which people act creatively when using and producing information system content. For example, it has been discussed that the tasks of sorting and categorizing information when dealing with problems at work need proper attention (Quayle & Durrheim, 2006) as classification of problems is not the kind of straightforward processes envisioned in system design research. Information is thus regarded as the representation of content in written form, whereas knowledge is thought of as a "much more elusive entity" (Stenmark, 2002, p. 929). However, in line with other research in organization science and social sciences, the concept of *knowing* (e.g. Blackler, 1995; Bruni, Gherardi, & Parolin, 2007; Cook & Brown, 1999; Gherardi, 2001; Nicolini, Gherardi, & Yanow, 2003) is preferred as it emphasizes the actions of coming-to-know in practice. I will develop this conceptual demarcation in the following chapter.

The second point concerns the way the target groups of technological systems, the users, are detached from the creation of information systems in the technology-focussed studies. Issues of usability are reduced to discussions about correctness of algorithms and computation possibilities. This seems problematic, as people rely on social interactions and considerations for categorizing problems (Quayle & Durrheim, 2006). This implies that technical systems in and of themselves cannot create new definitions in the ways that knowledgeable people are able to. Consequently, the kind of all-encompassing automatization opted for stands out like a utopian hope of profit-driven businesses. This is further evident in and through the system design in the study by Chan et al., which depended on support staff's expertise to manually formulate and update case categories and solutions (cf. Chan et al., 2000). Note that whereas the researchers describe the necessity of negotiating case-based content with expert employees, they also dissociate themselves from

such processes by envisioning future systems that take on this work by themselves. From the perspective of the present work, this points to a) how knowing ought to be seen as embedded in and constitutive of particular practices, and b) that participants are key actors in the processes of valuing information, with or without technological means. In the CSCW studies reviewed, Ackerman and Halverson (2004) opened up the perspective of knowledge work in organizations by acknowledging that helpdesk team members rely on multiple sources of information and knowledge when performing work activities. The perspective of identifying different kinds of 'memories', however, overshadows questions of participants' need to learn in order to achieve continuity. In line with the work by Orr (1996), the present study sees the narrative practices of work as essential when it comes to formulating and understanding what work in practice entails. By engaging in talk about work, participants are able to learn things that are not covered in system details.

Research on helpdesk service provision in general seems to focus on first-level support work and commonly on the interrelations between helpdesk staff and user. Studies concentrating on backstage activities between team members are more difficult to find. There is only a small number of studies focussed on interests concerning knowledge as generated, shared, performed and maintained in and through experienced and qualified support work. To better understand the activities of how helpdesk work is achieved over time, there thus seems to be a need for research that focuses on the backstage work of support teams on the second level of support, and which approaches work as constituted by the employees, their actions, their use of tools and their orientation within the context of continuous support.

Whereas I expressed criticism above towards single-handed foci on technological means, there is no doubt that helpdesks to a very large extent rely on systems throughout their work and that the first body of research provides valuable insights into such systems. Technologies provide both the object of their work (normally in the form of problems) as well as means for systematizing work activities. Without the affordances that well-designed systems offer in terms of possibilities for saving and disseminating information, helpdesk staff would soon find themselves having to 'reinvent the wheel' with every new case. Without databases and systems, helpdesk staff would be incapable of meeting demands of delivering expedient and professional services. There is a need for multiple kinds of systems and multiple sources of information, which González et al. (2005) as well as Ackerman and Halverson (2004) and Spence and Reddy (2012) suggest in their studies. In the two latter, carried out within a sociotechnical perspective, the researchers acknowledge ranges of resources that not only include information in systems but also individual experiences, colleagues' knowing,

notes on pieces of paper, e-mails and so on. The point I want to emphasize is that working with technologies requires other resources as well. Even though Ackerman and Halverson (2004) do not speak in the terms of sense-making, they allude to the processes whereby participants in a practice come to understand each other and systems at hand. Spence and Reddy (2012) also touched upon similar issues as they discussed collaboration and the need for teams to share a common ground in order to be able to work together towards finding problem solutions. This is not dissimilar to the observations made by Orr (1996), where particularly the importance of the working team stands out as important for how knowing (in the form of narratives) is established as resources for work. Orr has even in a later comment on his study (Orr, 2006) emphasized the group as the core for understanding the kind of knowledge work going on.

In this final section of the background, I have started to formulate a view on helpdesking as an outcome of the interplays between participants and their use of tools for remembering, collaborating and communicating in context. Whereas technical information in support practices is evolving and needs active handling and structuring, I argue that in order to understand the complexity involved in (continuing) helpdesk work, we need to turn the focus towards the participants and study how they communicatively operate in the everyday accomplishment of activities. We need to know more about how helpdesk teams employ and make use of what they know about their practice to create continuity in their work and how communication forms such practices, both at the immediate moment and for the continuation of the practice. Even if this work predominantly focuses on the practices of helpdesk work, such understandings are also applicable to other kinds of settings where work is dependent on close collaboration around work tasks.

CHAPTER THREE – Researching helpdesking: theoretical framework

The theoretical backdrop of this study is a sociocultural understanding of knowing and learning as integral aspects of participation in work activities. In a broad sense, such a perspective implies that people, tools and sociocultural context are seen as mutually constitutive. A particular focus is given to activities as enacted by participants using different kinds of cultural tools. In this chapter, core concepts for studying and explaining backstage activities will be introduced. These concepts have proved useful in gaining an understanding of the processes of knowing and learning in the helpdesk practice studied, and they have been fruitful for analysing specific activities and tools.

First, I will address the concept of collective knowing as achieved and negotiated within social and cultural settings. I will argue that using the concept of collective knowing provides an analytical lens for studying the coordination and negotiation of tasks and experiences and the handling of dilemmas in the interaction. Here, I also introduce the concept of cultural tools and their relation to human action as coordinated over time. Second, the analytical concept of mediated action is presented and made relevant for analysing how documentary practices and remembering become essential points of entry to the empirical case. Third, learning in relation to the use of artefacts will be discussed. In this section, the concept of white-boxing and the role of narratives are discussed as central for the study of how learning emerges and is arranged for in the helpdesk. Furthermore, learning in terms of mastery and appropriation of mediational means is introduced. Ending this chapter is a synthesis of the unit of analysis guiding this thesis work.

Achieving and maintaining collective knowing

From a sociocultural standpoint, knowledge is perceived as intrinsic to the practices in which it appears. In helpdesk support, for instance, certain traditions of discerning work tasks, relations with others, organizing work and so on have developed whereby participants make sense of their practices. This implies that what is constituted as relevant knowledge at a given time in a given situation needs to be understood in relation to the context in which it is used. In line with research carried out in such diverse traditions and fields as ethnomethodology, sociology of knowledge, symbolic interactionism, cultural

anthropology and actor-network theory, this study emphasizes knowledge practices and situated action as socially and materially grounded and maintained. Conceptually, the term *knowing* is preferred in the present work, to avoid connotations of knowledge as something static, abstract or residing as entities within individual minds and to emphasize notions of knowledge as achieved. Knowing is seen as "dynamic, concrete and relational" (Cook & Brown, 1999, p. 387) and as "an ongoing social accomplishment, constituted and reconstituted in everyday practice" (Orlikowski, 2002, p. 252).

In and through activities, collective knowing[8] will gain specific functions in maintaining a social practice. At the same time, knowing is continuously re-negotiated in the course of people pursuing activities and encountering new issues to be dealt with. Building on the work of Orlikowski and others (Gherardi & Nicolini, 2003; Hutchins, 1995a; Lave, 1988; Orlikowski, 2002; Suchman, 1987), the concept of knowing is accordingly used in the present work to address issues of how members in the helpdesk setting achieve and maintain collective resources for action over time through on-going use of cultural tools, interactions with colleagues and involvement in joint work activities. Knowing how to perform activities then implies knowing how to interpret the practice, and how to reconstitute the practice over time in a system of distributed cognition (Hutchins, 1993, 1995b). This kind of functional system is what Hutchins (1993) exemplifies in a study of naval vessel navigation, which is a practice that has developed over many centuries. The manners in which navigation computations are performed, how landmarks are detected in the surroundings and so on go far back in history. In order to understand how navigation is accomplished, Hutchins argues, it is necessary to acknowledge the different parts that make up the system of knowing how to navigate as it is dispersed between people and tools. Consequently, in order to understand how participants learn to perform specific operations in the navigation chain, it is essential to acknowledge that those operations are situated in a long historical tradition of navigation as well as in navigators' descriptions of the activities and uses of tools.

In a sociocultural perspective, knowing is perceived as intrinsic to social practice. For research, this implies that gaining access to such knowing is possible by studying the accounting practices that accompany situations when members of a team pursue their daily work activities as responsive and responsible professionals (Mäkitalo, 2003, 2012). A corollary of this assumption is that what constitutes relevant knowledge at a given time and situation needs to be understood in relation to the context in which it emerges and in what ways these experiences are drawn on for pragmatic purposes (Vygotsky,

[8] From a sociocultural perspective, knowing is per definition perceived as collective as it is socially accomplished and developed and, thus, shared. At times I use the term collective knowing to emphasize knowing as something members of the practice do in and through collaboration.

2012; Wertsch, 1998). This implies that knowing is achieved as part of those practices and, consequently, what counts as relevant forms of knowing will differ between settings. What is seen as a relevant way to proceed within the helpdesk practice is accordingly understood as the result of continuous developments and negotiations to meet pragmatic concerns. In my study of helpdesk work, I treat situated activities as established, shared, challenged and maintained, that is, as accountable ways of pursuing work (Edwards, 2010; Mäkitalo, 2012). The communicative activities and means through which team members achieve this include both physical and symbolic resources – or cultural tools – as I refer to them.

Coordinating tasks, routines and values

The role of mediational means or *cultural tools* in social activities (Vygotsky, 1978; Wertsch, 1991, 1998) is fundamental when taking a sociocultural perspective as point of departure. This means that the ways in which we act and think are shaped by the cultural tools we use, and that our use of such tools, in turn, dynamically alters our possibilities in and for actions. Thus cultural tools and artefacts, such as for instance means for documentation, specific software applications or established professional jargon, will play a fundamental role in the coordination of activities and the social practice as a whole. By relying on the affordances of texts as cultural tools, meaning and action are made durable and possible to share, as experiences of team members are made accessible to others. It is however important to note that how such texts, and systems of inscriptions (Säljö, 2005), are perceived may vary as text and language characteristically are open to various interpretations.

Analytically, different forms of documentation can also be seen as core activities in their own right. This implies that participants in helpdesk support need insight into the practices of documenting daily activities and experiences as inscriptions (Säljö, 2005) in digital form. Helpdesk settings, like all professional work practices, rely on collective forms of knowing as "problems or tasks are to be defined, categorized and consequentially treated as an instance of this or that 'kind'" (Mäkitalo, 2012, p. 64). How daily experiences and activities ought to be documented and materialized in text is a matter of professional judgement in combination with proficiency in the particular genre. To produce relevant forms of documentation, that is, to formulate oneself in relevant ways, is in most work practices a critical element for being acknowledged as a professional. When such textual accounts are collectively produced, as in the work at the helpdesk, the team becomes accountable for the work pursued in response to customers, frontline teams and other stakeholders.

The work of coordinating perspectives is essential here. Shared views on how to define problems and tasks are either already established (and may be taken for granted) or may need to be addressed as participants engage in joint activities. Detailed analyses of interactions have shown the importance of and expectations on members to act in what is situationally perceived as comprehensible and accountable ways (Buttny, 1993; Mäkitalo, 2003). Within the ethnomethodological research tradition, discrepancies between actions and expectations have been studied in terms of how participants themselves observe and attempt to bridge gaps by providing some kind of account (Antaki, 1994; Garfinkel, 1967). For employees engaging in support work this implies that actions are scrutinized against what is locally understood as appropriate actions and frames of the setting. When actions are pointed out as not meeting the expectations of that situation, the activity transforms and focus of attention is moved towards attempts to resolve this situation. This, in turn, is what enables the activity to go on.

This way of reasoning shares similarities with analyses presented by Lave (1988) and her discussion of how people respond to and overcome dilemmas in interactional encounters. Similar to gaps, dilemmas, according to Lave (1988), are seen as the result of discrepancies between people's expectations and actions. That is, there is some kind of mismatch between participants' views of what they expect of a particular situation and what constitutes that particular situation. As dilemmas occur, Lave argues, the imbalance of the situation normally makes people strive to overcome the gap. Participants' negotiations in such situations reveal the kind of sense-making processes whereby dilemmatic situations may become dissolved. In professional settings this implies that simultaneously as it is professionals' knowing and understanding of their practice that in the first place cause dilemmas to occur in the flow of activities, they also constitute the resources participants lean on to resolve the dilemmas (Lave, 1988). Sense-making thus includes the work participants do when coordinating their understandings by drawing on situated and accountable ways of reasoning in the practice. By drawing on situated knowing and experience, participants are provided with means to analyse, negotiate and overcome dilemmas that occur. Gap-closing processes in organizational settings can then be described as being about institutional creativity whereby participants, by drawing on shared resources and negotiations, manage to handle unforeseen actions. Within the boundaries of professional work, this creativity concerns finding accountable and interactionally relevant ways of proceeding and overcoming disturbances. When this occurs, what is collectively known is approached and developed, or, in other words, collective knowing is coordinated, negotiated and maintained.

Acting through mediational means

A central concept, that is relevant for the analyses in this thesis, is *mediated action* (Wertsch, 1998). This implies that action is understood as an outcome of the interplay between cultural tools and actors in the context of some kind of activity. When we pursue activities, we thus do so through the lenses of accumulated experiences and knowledge mediated by language as in narratives, documentation, manuals, technological artefacts and so on. Such cultural tools enable actions by providing a framework that helps "set the scene within which human action will occur" (Wertsch, 1998, p. 166). In this sense, participants who share and maintain an understanding of local mediational means are provided with a foundation that makes collaborative actions possible. In a Vygotskian line of reasoning, understanding the meaning and role of cultural tools is a process that emerges at the intersection between individual and collective action (Wertsch, 2007). This implies that the perception by helpdesk employees of what constitutes cultural tools is developed through continuous encounters between the individual and the collective. In the present study, the analytical focus is therefore not on cultural tools *per se*, but rather on the interplay between user, tools and context where actions are accomplished.

The notion of mediational means relates to how such resources gain specific meaning and function in the coordination of situated practices (Wertsch, 2007), and, as such, how they will also often be accompanied by local standards and assumptions of 'how we do things here'. Similarly, a text, as an artefact, may come to organize and change ongoing activities. A list prepared for grocery shopping, for example, will help you remember what products to buy. You may also use a pen to score items out as products are put into the shopping cart. The list can also be organized in such a manner that it is consistent with the route through the supermarket so that various products may be picked up without too many detours. Another example is how agendas in meetings come to organize discussions. Facilitators of meetings can steer and moderate topics in assemblies, by, for example, pointing out when discussions deviate from subjects inscribed in the agenda or as help to close a discussion and to move on to another issue. When participants share cultural experienes of this sort of text, it can thus be used as a means for structuring meeting activities. This function of meeting agendas can be called upon by mention of the text content or by a gesture towards the document. To sum up, artefacts such as shopping lists, agendas and the like contribute to the organizing of many of our activities. Externalization of information in this way makes what we know possible to share and rely on in ongoing activities, and, in this sense, cultural tools contribute to acts of remembering.

What then is it that makes cultural tools such powerful tools? To elucidate Vygotsky's sometimes complex writing on *mediation*, Wertsch (2007) makes a distinction between what he refers to as implicit and explicit mediation, respectively. Wertsch argues that mediation often takes place through the use of signs in everyday oral language and communication. In such encounters, the mediating function is often overlooked because communication appears as natural and as involving signs whose meaning is taken to be obvious. People simply do not reflect upon their use of language to accomplish actions as signs are part of a "preexisting, independent stream of communicative action that becomes integrated with other forms of goal-directed behavior" (Wertsch, 2007, p. 181). Explicit mediation, on the other hand, takes place when signs are purposively introduced in discourse, such as for instance when a teacher introduces concepts in the context of grammar or science in class. Such concepts then come to function as means for elucidating meaning and understanding of a content. In short, signs purposively introduced come to change the activity at hand.

Wertsch's distinction between implicit and explicit mediation is analytically interesting in this study. In organizational settings, the interrelations between implicit and explicit forms of mediation are relevant to the understanding of how mediation transforms activities qualitatively. This is particularly true in relation to text which has become a prominent tool in today's work settings. Textually mediated activities help professionals "build up intellectual resources for defining, remembering, reporting and accounting for their everyday work" (Mäkitalo, 2012, p. 64). When acknowledging implicit as well as explicit mediating functions of text, it becomes possible to discern the backdrop against which participants understand, talk, think and act in situated manners. Cultural tools consequently organize our activities as we come to think and understand in terms of them, or rather, in terms of their meaning in use.

Learning and mediation

Learning to see and use tools in highly specialized work practices like second level helpdesks depends on presence in the setting and accessibility to tools and experiences. From a sociocultural perspective, learning is seen as taking place through participation in social practices where we encounter cultural tools (Vygotsky, 1978). Such tools imply certain potentials for action as they mediate knowing that has been accumulated over time. In contemporary calculators, for example, algorithms based on knowledge of counting and how to do mathematics, gained over thousands of years, have been built into their design. A consequence of the externalization of calculations and mathematical operations into calculators is that processes, which were once cognitive func-

tions (Säljö, 2010) of a select few, have become available to a larger public. Calculators, as mediating resources, provide individuals with possibilities to perform calculations they otherwise would not be able to do (Säljö, Eklund, & Mäkitalo, 2006). In essence, calculators, and many other tools, may provide us with shortcuts to collective knowing within particular knowledge areas.

Mediating resources thus are possible to use in and for activities without having to engage in their full historical development. This implies a division of labour between artefacts and humans, where some operations carried out by means of the artefacts are black-boxed[9] in the sense that the regular users do not notice them. Mediational means enable us to take advantage of the potentials built into them, and "in this sense, we are unreflective, if not ignorant, consumers of a cultural tool" (Wertsch, 1998, p. 29). Yet, using mediational means, such as calculators or computer software, implies that we become familiar with how to make them work for a specific set of tasks in a situated practice. We learn to use them for the purposes and needs of the practice in which they will attain their function.

In technical support settings, it is essential that helpdesk engineers discern those technical aspects that are black-boxed[10] to normal users. For newcomers to such a practice, the technology thus has to become at least partially transparent and made sense of as means in and for work. Such processes have been referred to as *white-boxing* (Huh, Newman, & Ackerman, 2011), that is, the process of opening up and making black-boxed inner workings obvious from a local point of view. In this study, this is translated into learning to see and understand what is not apparent by mere inspection of technological interfaces and has to be narratively unpacked. Unpacking technological systems and tools is thus necessary when newcomers to a practice are to learn about their functions and how to use them. In other words, the systems are unpacked as relevant for the work that the helpdesk staff is responsible for pursuing. In the present study, the concept of white-boxing, or unpacking, makes it possible to unveil some aspects of enculturation processes whereby knowing-how-to-use technologies in local and accountable ways is developed.

Learning as mastery and appropriation of mediational means

In a sociocultural perspective, learning is, as mentioned earlier, an emergent property of participation in social practices, where participants come to

[9] See for example actor-network theory and Latour (1999) for further discussions of black-boxed technologies.

[10] By processes of black-boxing I here refer to how technical aspects are packaged and become invisible to users, which at the same time is an essential condition of using technological tools today; if knowing needed for usage becomes far too great, people are excluded from use.

develop and learn local ways of acting and reasoning by engaging with peers and mediational means. To Vygotsky, internalization,[11] or mastery, of mediational means thus begins on the social arena. This means that newcomers to a practice successively learn to master situated ways of working. They appropriate mediational means by interacting with and by observing more knowledgeable and experienced people. What is learned thus reflects local conditions of work (Wertsch, 1998). How people come to learn can be conceptualized as processes of *mastery* and *appropriation* that deal with the developing relationship between actors and mediational means. In Wertsch's (1998) interpretation, mastery of mediational means refers to the ways in which people start participating in unfamiliar practices and successively become proficient members. Mastery is described as learning how to[12] use mediational means. The concept helps us understand how it is possible to actively participate in action and use concepts and vocabularies materialized in tools and systems without sharing the full contextual background with experienced members of a practice. This implies that when newcomers to a work practice engage in interactions with colleagues and put cultural tools into practice, they thereby "leverage their way up through increasing levels of expertise" (Wertsch, 2007, p. 188). Becoming a member of a practice thus implies participation without necessarily understanding the full implications of the actions. Appropriation deals with the processes whereby we make mediational means our own (Wertsch, 1998). Building on the work by Bakhtin (1981), Wertsch argues that appropriation concerns how we come to learn to use mediational means, including language, in specific and situated ways where we as users also add to their use and understanding. Wertsch points out that appropriation of mediational means has to be seen as an active process as it involves agents operating under certain conditions and with specific motives (Wertsch, 1998).

[11] Following the argumentation by Wertsch (1998), the term mastery is preferred over internalization as the former carries with it strong everyday and professional connotations of a polarity between external and internal processes through which it becomes difficult to appreciate the variety of interpretations of the terms. Wertsch's ambition is to avoid the image of how processes on the external plane "come to be executed out of sight on some kind of internal plane" (Wertsch, 1998, p. 50) as it would disappear. This image, which is similar to Vygotsky's (1978) discussion of internalization, provides us with a metaphor of, Wertsch (1998) argues, "something that often does not happen" (p. 50).

[12] Wertsch (1998) borrows this terminology from Ryle (1949) who makes a distinction between "knowing how" and "knowing that", emphasizing the need for activity in generating "knowing how". Others, like Orlikowski (2002) and Brown and Duguid (1998) have used the same distinctions in discussions about organizational knowledge.

Unit of analysis

The focus of this study is on how members of a second-level helpdesk team achieve continuity in work. The research questions, as mentioned in Chapter One, concern how continuity is achieved in helpdesking as a collaborative practice and what specific arrangements are involved in organizing for learning in helpdesk support. These foci imply that the unit of analysis concerns relations between the individual and collective. At the core of helpdesk work is the problem-solving activities of individuals where they continuously share what they learn and know through narration. In this chapter, I have outlined a theoretical perspective with core concepts that are central to how team activities can be understood in the light of continuity. In the studies, it is not troubleshooting of system problems and the solving of customer queries that are the main interest. Instead, focus is turned towards the team members and the activities they engage in when creating and re-creating their practice. That is, how they negotiate, align and collectively deal with ways of perceiving and understanding work. In the conceptual framework, I have pointed out that the unit of analysis is mediated action (Wertsch, 1991, 1998), or, the 'irreducible tension' (Wertsch, 1998) between people and mediational means as they continuously interact within a situated framework. Such a unit of analysis implies the use of specific empirical data, which need to provide the analyst with an opportunity to study how learning and communication unfold by means of mediational means. In the next chapter, such issues of empirical data material and research methods will be discussed.

CHAPTER FOUR –
Research site and methods

In this chapter, focus is on the research design. First I present the research site and the organization of work to provide the reader with a background of the kind of setting studied. Reflections are also made in relation to how access was gained to the setting and ethical considerations. This leads on to considerations concerning data collection. The empirical methods that provide the backdrop of the present studies constitute *in situ* studies of workplace activities where complementary kinds of data are used. The different kinds of data used in the present and how they were produced will thus be presented. Then follow characterizations of the three activities studied in detail. The focus is then shifted towards analytical undertakings. After considerations concerning analytical choices and ways of working with interactional data, the chapter is ended as analytical foci of the three activities are elucidated and accounted for.

The helpdesk setting

In this first part of this chapter, I will thoroughly present the kind of work setting studied. This is particularly pertinent, as helpdesk practices to most people constitute an unfamiliar and new kind of work environment. First I will add on to the vignette that opened up this thesis, by providing details of the team and its work and atmosphere. As with the vignette, this illustration is based on ethnographic descriptions relying on fieldwork over several years, which is discussed further on in this chapter. In this first part, I will also describe relations between the studied team, other support teams and the company to provide the reader with insights of the context. This first part then ends with a presentation of the team and its members and of their work assignments in order to clarify who and what the team is.[13]

The GHD team and their work: entering the field

When opening the doors to the second floor in the building where the company, GITS, "The Global IT Support" is located, a muffled sound of

[13] See the appendix for a summary of artefacts used in and for work mentioned throughout this section.

voices from the open-plan office is heard. On the way to the GHD team's corner space, I pass other IT teams and the coffee room and lunch area. As I enter the team's area in one of the corners, I say hello to the team members, who quickly look up from their computers and greet me with smiles but then promptly return their focus to the screen. I feel welcome and the atmosphere feels relaxed and friendly, yet I also sense their focus and concentration on their work tasks. The team members sit close to each other (see Figure 2) and it is easy for them to communicate over the computers. As they perform their support activities they continuously ask questions, either to a specific individual or openly, to all the other members. At times, two team members coordinate their activities and then inform each other of how the work is progressing, and at other times they appeal to the knowledge and experience in the team. I also observe how they inform each other about something they seem to just have learned by saying it out loud.

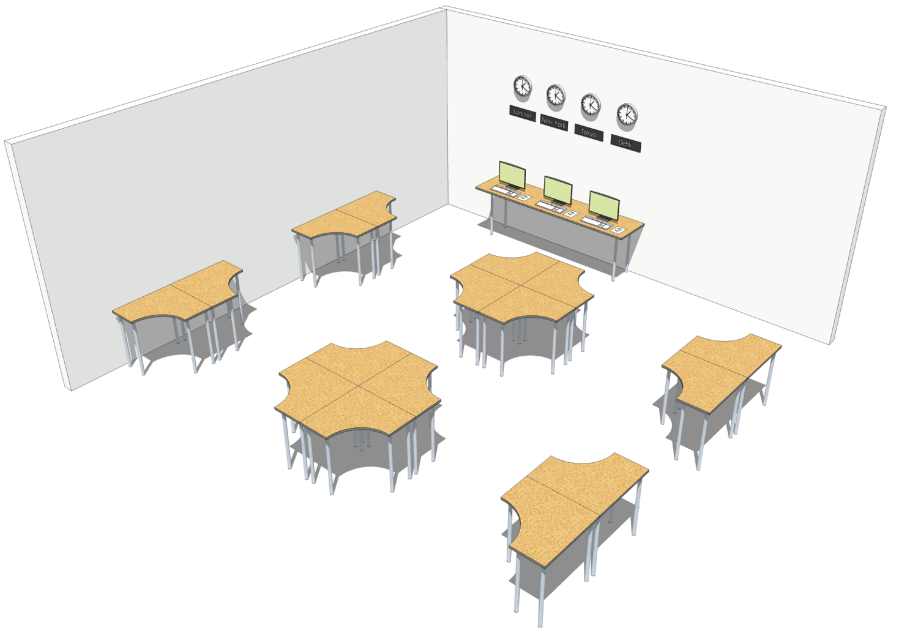

Figure 2. Sketch of GHD's office area. The desks, equipped with computers and chairs, are non-personal and more than what is needed for each shift. This excess of work surfaces enables members of shift to choose seatings next to each other. The placement of members thus differs over a day. On the wall, clocks show present time in different parts of the world. The monitors beneath are for surveying the functionality of network systems.

The inbox in the Case Management System (CMS), or "the box" as the team members call it, where cases are communicated between the first, second and

third level of support, is continuously updated. The flow of cases never ceases, and there are both new ones (from the frontline) and others where professionals on the third level, the back offices, have performed actions asked for by GHD and referred these back. The team members tell me they look out for the most serious cases with short problem-solving time limits when they choose cases. I observe that the team members communicate about cases in the inbox and that choosing cases to work on is a collaborative and coordinated effort.

When a team member opens up a case, he/she is quiet and reads through the available information in the form of notes. The first time a case is opened by any member of the team, the information might just include the customer's problem description. At other times, when the team has started to work on it, the information also includes notes made by team members of what actions they have performed and with whom they have communicated.

What is at stake for the team member when reading through the case is to understand what the problem is about and what the next action towards a solution may be. The most common activities team members then engage in are a) proceeding with the case directly when they know the solution from previous experiences, b) searching for information in the team's internal information-sharing tools, c) performing system operating tests, d) talking to other team members and e) making phone calls to back offices. These actions and results are noted, in English, in the case and signed with the team member's name. The case is then sent back to the customer and the frontline, sent off to the back office, or is put on hold in the team's inbox (awaiting information from somewhere or someone) depending on the status of the case.

The team members seem to be very focussed on their tasks when they are seated in front of their computers. They talk mostly about work, but at times they also talk briefly about non-work related issues, like family life or re-creational activities. The team members seem to know each other rather well, and I realize that several of them see each other also outside work. During my time in the setting, communal coffee breaks (which are otherwise common in Swedish work settings) in the adjacent lounge, occurred only a handful of times. But even then the team members continued to watch their assignments, and a phone was always present. Similarly, around lunchtime, the team members organize themselves so that someone is always available to respond immediately to acute problems.

The analytical lens that influences what I see in ongoing activities and how I describe events is based in the sociocultural perspective adopted in this thesis. This implies a predisposition to recount events as they appear *in situ* with a particular focus on what participants do, how they communicate and use tools. The participants in the studied setting were dedicated to their

assignments and there was a noticeable culture of doing one's best, of being efficient and of approaching work as collective concerns. This is also reflected in the report of this research.

GHD – organizational aspects and support chain

The studied team, the Global Help Desk (GHD), is one of several specialized helpdesks at a large support-provider company, here called the Global IT Support (GITS). The company, which includes developers, programmers, technicians and other IT groups, develops, sells and supports IT solutions on the global market, primarily for other businesses. This means that other businesses buy IT solutions, and that detailed service level agreements regulate the provision of support. GHD provides support of software related to vehicles and logistics systems for ordering, manuals, networks and so on.

The support chain is organized into three levels (see Figure 3). First-level helpdesks are dispersed around the world to provide users with support in their own language and local time. This level of support, also referred to as frontline helpdesks or online helpdesks, constitutes users' point of contact when in need of support. Staff at this level deal with certain kinds of troubleshooting and user handling problems. As I have pointed out, GHD belongs to a second level of support, which is in charge of more technically complex problems. Specialized teams with specific areas of expertise make up the helpdesks on this level, also referred to as offline helpdesks; there are thus several teams but all with unique responsibility areas. Generally, this second level of support implies more advanced troubleshooting, and specialized knowledge of IT systems is required. Employees have to be skilled in making diagnosis, searching for information and deducting solutions. Once a frontline helpdesk has identified a problem as being the responsibility of GHD, the problem, or the case as it is referred to, is transferred to them via the CMS. From this moment the team remains responsible for solving it, within the time frames specified in agreements between GITS and the customers. For GHD this implies providing services of support 24/7 and handling on average 800 cases per month. As I have already mentioned, there is also a third level of support at GITS, which is constituted of teams of system developers, programmers and technicians. These teams, referred to as back offices or simply BOs, are mainly situated in Sweden. GHD collaborates with such teams of specialists, yet even as cases momentarily are transferred via the CMS to back offices, the responsibility for solving the case remains with GHD (see Figure 4).

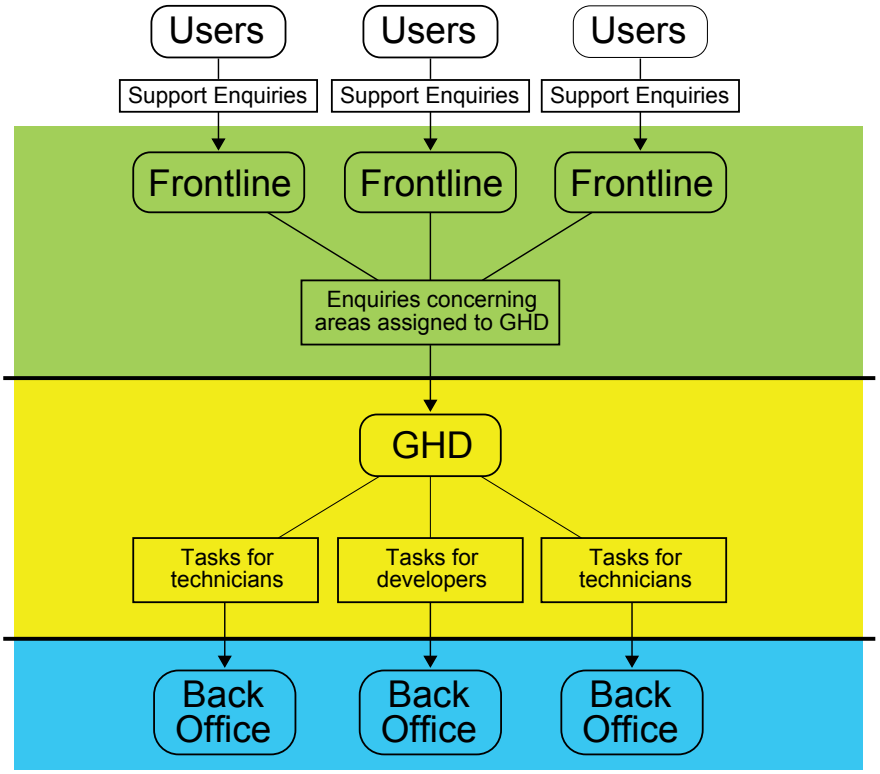

Figure 3. The support chain with the three levels of expertise.

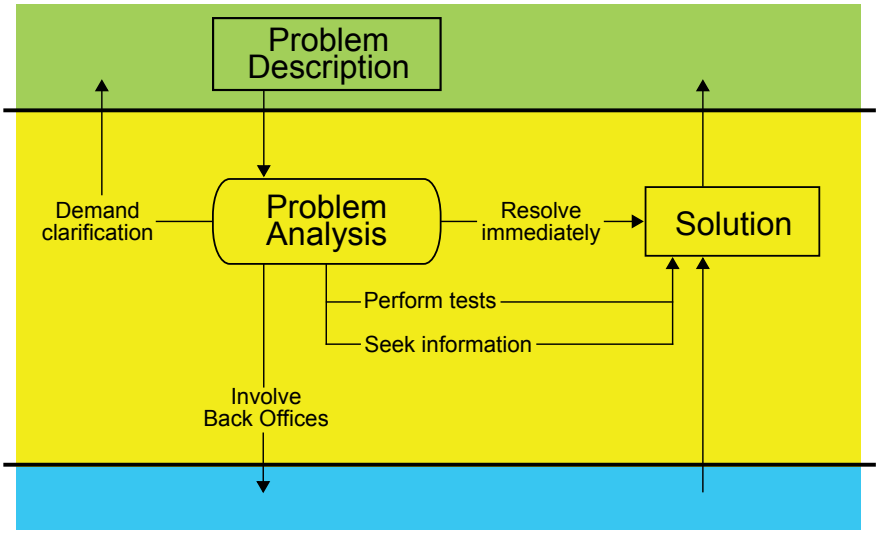

Figure 4. Flow chart of casework between the three levels of support as described in Figure 3.

GHD – team and responsibility

During the period of fieldwork, an average of 15 team members constituted the support team. They were aged between 25 and 50, with an equal representation of women and men, and they had varied professional backgrounds. The majority had educations in computer science or equivalent fields, but not all of them. One notable exception was a woman in her early 30s, who had studied social science and humanities but nevertheless had been appointed to the work after interviews and psychological tests; her colleagues acknowledged her as a skilled team member. In a conversation with me, she emphasized how the local structure of networks and systems supported by the team motivated a long period of learning the work on-site, irrespective of background or previous experiences in IT, and that qualities beyond technical skills were regarded as equally important. Beside the team members, GHD included a Head of Division who, among other tasks, was responsible towards the organization for the team's performance. Two employees specifically working with developing the team's qualitative and quantitative work achievements were known as the Quality Team and were also part of GHD but did not work with everyday support. As the studies in this thesis focus on the work carried out by the shift members, the acronym GHD and team member is used throughout the text to denote the 15 support engineers involved in the actual work of providing support.

The team members rotated between three shifts to ensure support availability to users 24/7. Monday through Friday, three to four team members worked on the morning and the day shifts, and one team member during the night shift and during weekend shifts. Shift constellations changed in such way that all team members eventually worked with all others. Within the team, there was no division of work tasks or specialization areas. The organization of work implied that all members had to be able to deal with the team's appointed responsibilities, for example, when working alone at night or during the weekend. However, team members had special areas of responsibility that concerned surveying the updating of information in the web hosting for information-sharing, attending meetings and keeping contact with teams of developers and so on. In practice it thus seemed that some individuals were acknowledged as having special expertise about certain kinds of problems and were turned to for help when needed. An aspect of the idea of the team members as equally knowledgeable was that the responsibility of leading the work during shifts rotated. All team members (except new employees during their first year of apprenticeship) were assigned the role of shift leader on a rotating schedule.

Data collection: access and ethical considerations

The data drawn on in this thesis were collected between 2003 and the end of 2006.[14] During these years I carried out fieldwork observations and three sets of video/audio recordings. When I initially approached the Head of Division at GHD, it was through a personal contact and as a student at the programme in Human Resource Development and Labour Relations, seeking an empirical setting to collect data for a Bachelor dissertation.[15] After having agreed to let me study the team, the Head of Division and I approached the security department to obtain special permission for using video-recording equipment that is prohibited in the company building. As I found both academic research and the empirical setting highly interesting, I continued collecting data in hope of continuing with a PhD.[16] The Head of Division and the Security Department also agreed to this continuing pursuit. GITS and their internal work are surrounded by strict regulatory and protection principles to prevent industrial espionage. It is not unlikely that this initial set of data collection and reporting was fundamental for gaining further access and permission to continue studying the team's work and using recording equipment.

The general ethical guidelines set up by the Swedish Research Council (2011) have been used. Before the data collection began, all GHD members were informed about the purpose of the study, first in writing distributed via the team's internal news information page in the web hosting. Shortly before starting the fieldwork I attended a staff meeting. I was then able to clarify that the material would be used for research purposes and would not be given to the company and that I was not interested in evaluating their work nor in their individual performances *per se* but rather in the collective actions of the team. They were also informed about their individual choices to participate. Everyone gave informed consent but one team member wanted to be kept out of the picture on the recordings. Before the second set of recordings this member approached me and agreed to full participation. As new employees arrived over the time of data collection, they were informed about the study

[14] The extended time of data collection is valuable in that data covering a longer time span is congruent with the focus on continuity. In the time that has passed between data collection and final publication the technological development has continued and work in the helpdesk has changed. At the core of this thesis lie precisely issues of how participants manage everyday work throughout adjustments to new conditions.

[15] The first set of data collection was executed with the intention of writing two student essays (Eklund, 2003, 2004). The collected material was of good quality and two examples from Eklund (2004) were later reworked and appear in Study One.

[16] In 2006, my supervisor, Åsa Mäkitalo, received a grant from the Swedish Research Council for the project *Learning to Support: Bridging Educational Knowledge Traditions and Situated Knowing in Technologically Intensive Work Practices* which enabled me to finalize the data collection.

and their participation in a similar fashion, and informed consent was obtained.

A concern raised by the manager and the team members was how their participation would interfere with their, as they described it, 'hectic work situation'. I explained that my interest was not to perform interviews, for example, which would directly interfere with their work but rather to make observations of what was going on as they performed work activities. When I started the fieldwork I knew nothing about what the team supported or its function within the company; this I instead had to learn through extensive periods of attendance in the setting. I learned from sitting next to team members, observing their activities on screen, and from talking to them about their work. Initially I asked few or no questions, but the team members soon took initiatives and began explaining their actions on the screen to me, and as time went on, they also took the time to tell me more about the systems and the organization of work that went beyond the actions they were actually performing. This has turned out to be extremely valuable to me throughout this work.

As mentioned above, the use of any photo, video or audio equipment was normally prohibited in the company building. The permission[17] I was granted by the security department to use recording equipment for research purposes required that I recorded only the work of the GHD team members. I was allowed to make recordings in the enclosed conference rooms and in the corner of the open-plan office space where GHD was located. Making video recordings in an open-plan office area with restrictions of what to record necessitates certain arrangements. Cameras had to be directed away from the adjacent areas. To avoid recording of unauthorized content or people, I put up posters at the entrances to GHD's office space announcing on-going recordings. It seemed that people in the environment were accustomed to protecting the content of the company and I was approached and questioned by passers-by about my use of recording equipment. To verify the security department's permissions to record, I wore a specially issued pink badge around my neck together with a corporate identification card. An agreement with the company included that original data were shared only within my research team, as a precaution to avoid circulation of classified information.

Empirical methods

Researchers have emphasized the advantages of combining ethnographic fieldwork and video recordings when studying work practices *in situ* (Jordan &

[17] Permission to record was renewed over the years. For the last data collection I was authorized to use audio equipment and a camera for photography due to last-minute opportunities for collecting the data.

Henderson, 1995; Luff, Hindmarsh, & Heath, 2000). First, fieldwork provides the researcher with an overview and general understanding of the setting whereby it is possible to identify overall actions of a practice and the participants' situation, interplay with others and their use of artefacts. Then, video recordings provide access to participants' talk and actions that are not possible to capture in field notes. Such a combination of methods was used to gain both a general understanding of the team members' activities and to provide access to the participants' concrete activities while working.

Fieldwork observations and other ethnographic data

Fieldwork has been described as a prerequisite for formulating relevant analytical foci and analysing interactional data (Jordan & Henderson, 1995). In this thesis I have relied on fieldwork observations to both gain a general comprehensive understanding of what was going on in the team and to learn about the content, which was not otherwise available to me as a visiting researcher. I visited the site regularly in 2003, 2004 and 2006, and continued observing also after recordings were made. In periods I made observations several times per week alternated with periods of occasional visits. The fieldwork focussed on the team members' work. I followed their activities on the computers but also how the team members worked together and communicated with others by talking directly across the room or through written means such as email or instant messaging. During the observations, the team members often talked to me, and it was possible for me to ask questions about their work. The observations were documented in field notes, and sketches were made of the physical space they occupied. As a result of the observations, I distinguished pertinent and important activities in relation to the general aim of the study and chose those for further study. The selection of this kind of interactional *hot spots* (Jordan and Henderson, 1995) constitutes a choice of activities that is regarded as particularly promising in terms of analytical potential. The activities I followed and collected further data from were a) shift change meetings, b) quality discussions and c) introductions of newcomers.

Documents that the participants used as part of these hot spot activities were collected. In activity a) these were reports, locally known as shift reports, and in activity b) I collected printouts of cases from the CMS. In activity c) no particular documents were used.

Recordings

Researchers have stressed recordings, and particularly the use of video, as positing analytical advantages compared to other forms of data (cf. Heath & Luff, 2000; Hindmarsh & Llewellyn, 2010; Jordan & Henderson, 1995). One

reason for this is how work in progress is captured as it happens and how it allows the researcher to discover details in conversations and use of other tools that are impossible to register on the fly. Even though recordings are restricted to include what can be captured with the equipment at hand, their level of detail is rich and they are preserved for repeated scrutiny. Recordings can also be shared with other researchers whereby analyses of the interaction can be discussed and evaluated.

In the present study, both audio and video recordings were used. The main reason for using recordings was to capture the richness of ongoing activities. The most obvious is the possibility to capture participants' oral interaction with the richness of intonations and pauses preserved. Video recordings were also used and, in addition, made it possible to capture gestures and use of resources such as sheets of paper and overhead projectors. As such aspects are not covered by audio recordings which were used in activity c), photos were taken of the content on the computer screen as help in the analytical work.

Selected hot spot activities

An early observation was that the team members frequently oriented towards and addressed issues of dissemination of knowledge and information within the team. Troubleshooting of cases, for example, included attending to systematic documentation in the CMS that constituted the basis for continuing work that had been initiated by others. While performing their support activities, it was also common that team members shared new experiences by telling about them or documenting them in the web hosting. The team members thus oriented their actions during shifts towards sharing what they knew. However, there seemed to be important information that did not fit into prescribed spaces for disseminating information between shifts. Such information was documented in a shift report.

The shift changes constituted crucial moments of the workday where possibly vital information could be forgotten or lost as one set of members was replaced by another. From an analytical perspective these moments were important as the team members verbalized and made explicit what was relevant to notice for the coming shift. To capture the activity and progression of shift-change handovers, I video-recorded morning and day shift changes for seven days. Each shift change included two handover meetings; in the first, the shift leaders from the finishing and starting shifts attended, and in the second, the starting shift leader and arriving members attended. The camera captured all of the participants (except the team member who initially did not want to participate on-screen) and the shift report. The video data include 27 meetings (160 minutes). The shift reports were also collected.

Whereas shift change handovers were about ensuring daily dissemination of information and knowing, other activities focussed on maintaining the quality of the support services. In the so-called Case Studio that occurred two to three times per year, I observed how the team members gathered around documentation that was retrieved from the CMS (i.e. where they documented steps taken in their everyday work of troubleshooting). The Case Studio was described to me as an occasion for learning and reflection. It was based on the documentation in the CMS, and the team members were presented with a selection of cases that constituted the starting point for discussions about work. From an analytical perspective this activity was highly interesting to study as the helpdesk itself organized it for the purpose of team development. I made video recordings of five Case Studios that covered discussions of about 46 cases (500 minutes of video data). Two cameras were used, where one focussed on the participants and the leader, and the second captured the case documentation as it was shown on an overhead projector screen. The case documentation that supported this activity was also collected.

The third activity that I studied more closely concerned how new team members were introduced to helpdesk support. Such introductions are in an important sense vital for the continuity in the long run. This was manifested in the arrangement of introduction activities but also in an apprenticeship program that stretched throughout a newcomer's first year. During the first three weeks, the newcomers engaged in several kinds of activities where experienced team members introduced newcomers to systems and tools used in and for work. All experienced team members were involved in this activity and took turns in explaining systems and applications from the perspective of the team's support duties. From an analytical perspective these introduction sessions were interesting as the experienced members had to verbalize essential aspects of work and technologies and what kind of knowing being a member of the practice implied. Data were collected on two occasions; first I followed one new team member during her first three weeks, and then I followed a pair of new employees during their first two weeks. The data collected were field notes from observing the newcomers' activities during these weeks. Audio recordings and photos were made of 27 conversations (generating 1440 minutes of audio data) where experienced members introduced the newcomer/s to the team's systems.

Analysing recorded data

The materials from the three activities have been analysed separately, one at a time (see Table 1 for an overview of the data material). At the first stage, when I started analysing the material, I primarily looked through the data to get into it and logged general activities. At a second stage, where more

substantial analyses were carried out, I categorized and labelled recurrent similar sequences of interactions into what I labelled themes. The themes were thought of as affording particular analytical potential in relation to the research questions posed towards each of the activities. To further substantiate the analyses, I transcribed large parts of the materials,[18] and by doing so, the analyses were further corroborated or, at times, refuted and reworked. At a final stage, I reviewed themes and instances that were most interesting and productive in relation to the research questions of each material. At this stage I chose episodes for reporting and started to write up the analyses. As those excerpts originated from the themes, they constituted examples of events that were recurrent in the separate materials. In the next section, I will provide further accounts of the individual analytical foci.

Some of the analytical work in the third stage took place in collaborative efforts in data sessions with research colleagues. Doing part of the analysis together with other scholars has become praxis of close-up studies of *in situ* institutional activities (Heath, Hindmarsh, & Luff, 2010; Jordan & Henderson, 1995). This mode of working strengthens the analyses of events as multiple perspectives and interpretations are discussed. In line with the agreement with the company, the recorded material was only shown in my research group. What could at first be apprehended as a limitation, in fact turned out to be valuable. It soon became clear that while the researchers in the data sessions were both dedicated to and experienced in analysing video data and interactions, the helpdesk setting and local language proved to be challenging. Initially the data were inaccessible to the researchers, and the threshold for understanding the technically-charged distinctions in the setting was high. Only as data were viewed and discussed repeatedly with the same researchers was it possible to produce qualified interpretations.

As transcripts have been presented and discussed in seminars and conferences (then anonymized), I have learned that readability of excerpts was an issue to consider in order to communicate analytical findings. The possibility to communicate arguments where both content of participants' talk and interactional accomplishment could be made sense of have thus been important for the final selection of examples reported from the three studies. It should be noted that the foci of the studies originated from the themes and that multiple examples were scrutinized in detail before finally deciding which to select for the purpose of reporting the results.

[18] The transcribing has been done by the researcher, which was insightful in terms of understanding of the material (cf. Jordan & Henderson, 1995) as repeated listening to the material provided more and more details of what was going on.

Table 1. Overview of the data material (a total of recorded data of approximately 35 hours).

Study One		
Type of data	**Description**	**Status of data**
Video recordings	Recordings of morning and day shift changes. 27 meetings/160 minutes in total. Capturing discussions between shift leaders and shift leader-shift members when handing over responsibility and informing about special issues.	Core data
Documentation	Shift reports. Documentation prepared by shift leaders each shift. Used in the meetings.	Additional data
Study Two		
Type of data	**Description**	**Status of data**
Video recordings	Five learning forums/conferences. In total 500 minutes. Two cameras capturing projection screen, leader and participants discussing previously performed case-work.	Core data
Documentation	Case documentation. Material printed from Case Management Systems. Prepared by leaders by removing names of the support engineers.	Additional data
Study Three		
Type of data	**Description**	**Status of data**
Audio recordings	27 introduction episodes, in total 1440 minutes. Involving newcomer/s and one experienced engineer. One set of recordings involving one newcomer (18 occasions), a second set involving two newcomers (9 occasions).	Core data
Photos	Photographs of content on monitor	Aide-memoire for analysis

Selecting episodes for close-up analysis and reporting

When analysing the data material with a focus on the team members' engagement in activities and their use of cultural tools (Wertsch, 1998), observations were made of different practices relating to learning and knowing. From the material collected from shift change meetings, we made early observations of how participants called attention to information that was missing or did not make sense, and how they then engaged in discussions about it. Particularly in the meetings between the starting shift leader and the new shift, we noticed moments where the participants reacted to the information provided. We identified two kinds of gaps – gaps in the interaction with team members, and

gaps in the interaction with the shift report. Such gaps require some kind of "bridging" to overcome uncertainties that might jeopardise the efficiency of the teams' work. The gap-closing concept (Lave, 1988) was used to investigate the interactional work the participants engaged in to overcome the disturbances. Two excerpts representing each of these categories were selected for publication. They were chosen as they were pertinent to the matter, and presented examples that could be rendered comprehensible to readers of the article (see Study One).

In the data from the second activity studied, the quality discussions in the Case Studio, an initial cross-case analysis of all data showed that the discussions followed a recurrent pattern, a sequential discursive organization which we described in terms of five phases. The case chosen as an example to illustrate the kind of work that played out in each of these phases was deemed useful as an example of how the case documentation was re-used in the activity. From an analytical perspective, it constitutes an example of semiotic remediation (Prior, Hengst, Roozen, & Shipka, 2006) as the case documentation was re-purposed to accomplish learning (see Study Two).

An empirical observation in the data material of the third activity, of introducing newcomers, was that the experienced team members included situational aspects when explaining system functions to the newcomers. By analysing these instances as processes of white-boxing (Huh et al., 2011), I distinguished two kinds of unpacking practices where the technology was made sense of in relation to the local context. Firstly, the experienced members used narratives from past and forthcoming developments when explaining relations between system categories and work assignments. Secondly, the experienced team members engaged in narratives that displayed team values and needs in relation to the use of tools developed for multiple professional categories. The three excerpts finally chosen as examples came from recorded introductions of the single newcomer (see Study Three). These examples were considered to be the most comprehensible for non-technical readers, partly because the leaders' narratives were lengthier and more developed than in the introductions of the new pair of employees. An observation regarding the difference between the two sets of data is that the lone newcomer provided only small interactional responses that allowed the leaders to extend their descriptions, whereas the pair of newcomers took up more of the interactional space.

In this chapter I have described the setting and methodological concerns that constitute the backbone of this research. In the following chapter, the three studies will be summarized.

CHAPTER FIVE – Summary of the empirical studies

Noticing the past to manage the future

Published as Eklund, A-C., Mäkitalo, Å., & Säljö, R. (2010). Noticing the past to manage the future: On the organization of shared knowing in IT-support practices. In S. Ludvigsen, A. Lund, I. Rasmussen & R. Säljö (Eds.), *Learning across sites. New tools, infrastructures and practices* (pp. 122-137). London: Routledge.

This study provides an initial account of how learning and continuity are organized in a helpdesk setting in an IT company. As mentioned earlier, a challenge in this setting is how the team provides support on a global market and organizes work in shifts 24/7. Moreover, the team works with problem-solving in the context of new or continuously changing IT solutions and applications. An increasing number of organizations share these kinds of characteristics on the global market, which gives rise to questions of what kind of organizing of knowing is needed.

The analytical focus in this study is on the development and maintenance of collective and individual knowing, reflecting both a theoretical interest in knowing as social accomplishment and an empirical interest in how the help-desk activities are arranged to enable continuity of its practices. The concept of gap-closing (Lave, 1988) is used as an analytical lens to highlight aspects of the interactional work team members perform to overcome disturbances and to negotiate collective knowing (Vološinov, 1986; Vygotsky, 2012; Wertsch, 1998). As a means for coordinating work, collective knowing thus provides participants with means to continue work as well as insights into shortcuts. A shared common ground implies that the participants can take many things for granted. These issues oriented us to research questions such as what organizational activities for sharing and negotiation of knowing are present in the setting? And how do participants negotiate collective knowing?

The empirical study commenced with ethnographic observations of the team's work organization and activities. The result was the identification of a number of activities that seemed critical for achieving continuity. Among these were the use of documentary resources such as intranets for sharing information about supported systems, and case management software. The

team members used a Case Management System (CMS) to share details about ongoing cases. The members documented their problem-solving actions in the software so that each case appeared in the software as a time-stamped step-by-step description of activities. As the CMS enabled team members to backtrack previous actions and continue what other members of the team had started, this software constituted a resource for coordinating actions between team members and over shifts.

Another activity identified through the observations was the arrangement around the changes of shifts. At the end of shifts, the leader summarized work actions in need of special attention in text. This documentation, called a shift report, was then used when discussing forthcoming activities in two subsequent meetings at the intersection of shifts. Based on the outcome of the observations, video recording equipment was used for a close-up study of shift change meetings and the use of the shift report.

The analysis sets out to describe aspects of gap-closing practices occurring repeatedly in the full material. In the study, two sets of examples are used where a shift leader and team members on shifts that just started discuss details on the shift reports. In the first example, gap-closing activities between participants are analysed as diverse perspectives on what constitutes a problem from the team's perspective are verbalized. On the one hand, the shift leader formulates one text entry on the shift report as referring to something that was not, technically speaking, to be regarded as a problem from the team's perspective. On the other hand, a shift member argues that it is a client problem and, consequently, an issue of the team. Described as a technical problem it would lie beyond the scope of the team, whereas, if seen as a client problem, it is one the team needs to attend to. It seems that something is at play here. The participants relate to and acknowledge the importance of the information as they scrutinize, rather meticulously, possible interpretations. The shift report thus seems to be a forceful artefact as it is treated as a mediating tool of importance to their forthcoming activities. Furthermore, this kind of gap-closing activity reveals a continuous dilemma in the helpdesk, acting as a team of expertise and being service-minded. The team continuously orient to and negotiate the boundaries of the team's service engagement as they have to deal with what they are assigned to do, but cannot engage in problems that fall outside those boundaries.

Secondly, the results highlight the importance of mobilizing collective knowing when the team encounters ambiguities, which are considered potentially risky. The team members respond to a piece of text on the shift report, which neither the shift leader nor the shift members can explain fully. The gap-closing activities show how the participants draw on collective knowing in order to make sense of the text and understand the implications of it. We argue that they establish the text as vague and not meeting the team

members' expectations of clarity. Yet, they continue elaborating on what it will imply in terms of actions.

The focus on continuing work and responding to details on the shift report is recurrent in the material. The level of detail on which the team members read the shift report and discuss particular text entries calls attention to the team as accountable for its actions; not understanding a piece of text on the shift report will lead to consequences for the team. This points to the conclusion that the shift report constitutes a powerful artefact for communicating and co-ordinating actions between shifts. It thus comes to structure collective action in a very concrete sense as it mediates team concerns.

In other words, the shift report as well as other local documentation constitute the material basis for institutional remembering. Theoretically this is described as a case of distributed cognition across the material and social environment (Hutchins, 1993). Yet this study contributes to such research on knowledge-sharing through the way the participants continuously orient to the body of collective knowing as an activity in itself. Instead of referring to systems as made up of common experiences and pre-understandings of a situation (Hutchins, 1993; Hutchins & Klausen, 1996), this article shows that sharing knowing *is* the system. By studying organizational aspects in general, and shift change meetings and shift documentation in particular, we show how potentials for work continuity are built into the everyday organization of work – as encounters between people and artefacts.

Re-visiting the past

Published as Bivall, A-C., & Mäkitalo, Å. (2013). Re-visiting the past: How documentary practices serve as means to shape team performance at an IT help desk. *Learning, Culture and Social Interaction, 2*(3), 184-194.

As the result showed in the previous study, documenatation plays a crucial role in the social organization of knowing in the helpdesk practice. One such practice is continuous documentation in the Case Management System (CMS) of how cases are identified and problems solved. This documentation is taken out of the everyday context and used in quality discussions about work. This study explores how such texts are repurposed in an activity explicitly arranged for learning purposes. The helpdesk arranged this activity, known as Case Studios, about three times per year. According to those in charge of organizing them, the so-called Quality Team (QT), the activity was arranged as an arena for identifying points of improvement and to discuss and modify team actions. The QT staff chose strategic examples of case documentation that illustrated, mostly, undesirable actions.

From an analytical vantage point, this kind of problem was conceptualized and analysed as a question of how text is removed from the original context of production and re-used for other purposes. Analytically, we draw on the notion of semiotic remediation (Prior et al., 2006), that is, the ways in which text is re-used and re-represented in new activities. The aim of this study is to analyse how continuous documentation of everyday actions are re-purposed in another activity as a means for learning about work. The following questions have guided the analysis:

- How is this discursive meta-activity organized?
- How is the case documentation used to mediate issues of concern?
- How is the discussion of past events used to shape future teamwork?

This study has analysed interactions from five Case Studios (46 cases). The team members, seated around a table in a conference room, faced a projection screen where the case documentation was shown. The leader used an overhead projector to uncover each text entry successively. In this way the leader recreated the chronological development and successive actions of the case. An initial empirical observation was the recurrent structure of the activity, which we describe in five phases: Categorizing the case, Articulation of past events, Pointing out the object of talk, Articulation of the general point, and Making sense of and accounting for previous actions.

The findings reveal a close interconnectedness between the phase structure and the sequential organization of the documentation. Helped by the sequentiality of the text, the leader animates and dramatizes the team's previous actions in chronological order, and her narration clarifies points of interests. What, then, did the documentation enable the leader and the team members to discuss? The dramatization of earlier events offered the team members possibilities to reflect upon and react to troublesome activities as the leader, for example through pauses and emphasis, highlighted pre-determined points. The team members displayed their expertise and collective understanding of their work as they acknowledged the problems without needing further explanations. The common ground achieved by having established a problematic area enabled the leader and the team members to collaboratively reconstitute ways of acting into changed ways of working. In this sense, collective sense-making of past actions produced formulations of work guidelines. Interestingly, the analysis also showed how the team members used the text to co-produce a collective account that explained the occurrence of the action in the first place, which emphasized team performance as a shared practice.

In this meta-activity aimed at learning, the documentation is acknowledged as providing possibilities to display gaps between performed and expected

actions. Such displays involve team members' orientation to shared expectations of work and come to make up a space for improvement. The simulation mode the team members find themselves in as the leader chronologically narrates actions seems to be important for their apprehension of the problem, and shares similarities with the function of war stories used by support technicians in Orr's (1996) study. As the local practice becomes visible through the leaders' narration of activities, the meta-activity as based on previous inscriptions constitutes potentials for re-organization of future activities.

Inducting newcomers

Bivall, A-C. (Submitted). Inducting newcomers: Unpacking categories in helpdesk support work.

In the final study, the inducting of newcomers into this highly specialized and technology-driven setting is explored. Studying how newcomers are introduced into existing work tasks, routines and systems will provide insights into what it implies, in terms of mastering team- and company-specific forms of knowing, in order to go from peripheral newcomer to a central participant (Lave & Wenger, 1991). In the setting, one year of apprenticeship was generally aloud before letting new members work unsupervised. This indicates both the amount of time needed for training newcomers as well as the extent to which team assignments and tools were specific to this practice and required on-site learning.

In helpdesk work, a range of technologies are relied upon. They function as both objects of work, for example in the form of technical problems that need attending, and as means for identifying and pursuing such work. One challenge in relation to becoming a competent member of support work concerns how newcomers are made part of and gain access to the situated practices of technology use.

The aim of this article is to explore how newcomers are introduced to local practices of helpdesk work and technologies by experienced members. This is analytically conceptualized as processes of white-boxing (Huh et al., 2011) – in other words, the unpacking of systems and system use as related to local team practices and activities. Two questions have guided the study:

- How are newcomers introduced to technologies as objects of and means for work?
- What is made relevant as essential to know, as systems are unpacked to newcomers by more experienced participants?

The processes of unpacking tools and practices are explored from the participants' perspective and by drawing on interaction analysis. The main body of data consisted of audio recordings of activities where experienced members introduced newcomers to helpdesk systems and tools. These introductions constituted newcomers' very first experiences of the technologies and took place during the first weeks at work.

The results show that the unpacking in which the experienced members engaged made explicit relations between system categories and past, present and future activities of the team. When introducing the category structure in the internal tool for information sharing, for example, the member explains and makes sense of a category that has become outdated by telling about its former function within the team's tasks. By doing so, expectations of a principle – that of keeping the information structure in line with actual work assignments – are articulated. Unpacking of system structures in applications supported is another example. By making connections between system features and coming system changes, the experienced member prepared for the necessity of knowing about future directions of systems and support.

The results also show how newcomers were introduced to work tools used throughout the organization for communication and tracking of cases and how the team used such tools in ways that enabled them to pursue their particular tasks. As such tools are developed for multiple professional groups, newcomers need to perceive the tools from a local team perspective. Based on a list of choices available in the system for accepting work on a case, the experienced member unpacks how the team uses only one of these categories and why. By doing so, the member articulates local approaches to work, such as shared access to information vital in order to assume collective modes of working rather than individual ones.

The study concludes with a discussion of how newcomers starting their position in a specialized helpdesk were introduced to the team's ways of understanding and making use of technologies as means for work. The role of narratives is discussed in relation to sense-making of systems and system use from the local perspective. The importance of guidance by experienced members is discussed, particularly in relation to doing the introductions in front of the system at hand. Unpacking categories in systems and making them understandable from a team perspective and possible to act on for newcomers, relies on the kind of situated knowing that only experienced members of the practice can contribute. It is furthermore concluded that unpacking of artefacts reveals local and situated use of categories.

The study showed that narratives are powerful means when white-boxing systems, which puts emphasis on the importance of guiding newcomers to technology-infused work settings. This furthermore emphasizes the need to regard learning specialized work as local accomplishments in and of teams.

The findings contribute to our understanding of how initial meaning-making processes of digital tools unfold on site. A conclusion is that local understanding of systems and system use implies mobilizing collective knowing, accomplished when systems are being unpacked by experienced members when introducing newcomers. Becoming a competent member of such teams then implies engaging in local practices, language and tools over a longer period of time. In this way, the studied introductions constitute a first step in a process of enculturation.

CHAPTER SIX – Discussion

The research in this thesis is concerned with understanding some of the backstage activities (Goffman, 1959) whereby second-level helpdesk support is reconstituted and accomplished as a collective effort. The research questions directed attention to identifying and exploring activities through which collaborative achievements of continuity and the local organizing for learning are achieved. More precisely, the questions were:

- How is continuity achieved in helpdesking as a collaborative practice?
- What specific arrangements are involved when organizing for learning in helpdesk support?

In order to explore these issues, I studied and recorded the ongoing work at a second-level helpdesk. In this concluding chapter, I will address and discuss research results reported in the three empirical studies. As the environment and backstage activities of this kind of helpdesk represent a new kind of changing, and not yet widely studied setting, there are potentially many questions to consider. I will discuss processes that empirically and theoretically come to make up the prerequisites of continuous support work – processes that theoretically have been described as sharing knowing, coordinating tasks and overcoming disturbances. I begin by discussing the role of text as means of creating stability and continuity. I then address how textually mediated activities provide opportunities for reflection and deliberation about the practice. Finally, I will discuss relationships between text use and guidance of new members to the practice.

Continuing work across shifts

When aiming for uninterrupted support work 24/7, the point where shifts change and one set of members is succeeded by another risk generating disturbances in the continuity of activities. Interruptions may occur in dissemination of information, in case progression and delivery of support, in ongoing conversations with back offices and so on. The kind of vulnerability this entails for the ongoing of support across shifts was in Study One explained as addressed through the use of several sorts of text-based resources and in the organizing of personal encounters between shifts. The

tools' individual specific features served different purposes and covered distinctive needs in the setting. The Case Management System (CMS), for example, constituted an essential tool for continuing work on cases across shifts. By leaning on locally developed practices of how to communicate and document case activities the team members were able to create a resource the team, as a collective, could rely on for remembering. For example, the documentation allowed the members to continue the trajectory of work that others had started as of how previous actions were displayed sequentially and logically to the participants. In this way, the case documentation enabled team members to manage and coordinate actions between them, something that is essential when pursuing tasks across shifts.

Through properties that texts offer, in terms of their durability and the possibility to be used by several people, the task of problem-solving can be argued to be made shareable and less dependent on particular individuals. The CMS can thus be argued to constitute a tool that works in favour of the organizational aim of creating stability and continuation of activities 24/7 in the helpdesk. However, the case documentation only makes up one of several textual resources and activities observed to be used for the organization of information across the team. Even though such documentation were not studied in detail in this thesis, the results show that they were complementary in terms of content and purpose of use.

As mentioned above, results across the studies point to the achievement of continuity between shifts as an outcome of interrelated tools and activities involving several kinds of resources and interactional spaces between participants. In daily work, talk between team members lets them share, reflect on and negotiate what they experience, and as such experiences are documented, resources for remembering are created and re-created over time. However, as Study One pointed out, there is always information that does not fit into existing routines for documentation, and details that have to be negotiated as shifts take over from one another.

Forming collective perspectives on work

A key finding in Study One is that shift change meetings played a significant role in coordinating information and responsibilities from one shift to another, thereby providing spaces for interaction *between* as well as *within* shifts. The two consecutive meetings in the juncture between shifts exhibited distinct yet separate communicative foci. In the first meeting that constituted the organized personal contact between shifts, leaving shift leaders focussed on handing over tasks and responsibilities. The shift reports were used as point of departure for disseminating information not captured in the team's other textual resources, and the meeting between leaving and starting shift leaders

provided possibilities for aligning understandings of the content. The analyses of the second meeting showed that this activity to a larger extent gave rise to negotiations of the information content on the shift report, apart from functioning as a means for passing on the information and for coordinating tasks between members of the team.

The individual characteristics of these meetings point out differing needs in organizing for continuity between shifts. In the first meeting it is essential that the shift leader taking over the command of work understands the implications of the information. The second meeting has more of a coordinating function of particular tasks but also of issues concerning the apprehension of the text. Important to note here is that neither of these meeting activities would work without the other and that the textual resources and people interpreting them are equally essential.

Study Two and Study Three also point to the essential function of interpersonal meetings and possibilities for discerning textual resources in order to understand details of work. What these results point to on a general level is the existence of multiple kinds of activities where textual resources come to organize discussions and activities. The need for complementing resources and spaces of interaction for creating and re-creating collective knowing challenges perceptions of knowledge transfer as accomplishable solely through technological systems. Knowledge-management systems, for example, do bring important possibilities of structuring and organizing information structures. However, studies that theorize about knowledge as transferable via documentation and systems become problematic in relation to present results because of the way knowledge is approached as entities rather than an element of activity itself.

This study reinforce the assumption that competent use of resources for documentation is an accomplishment that is based on people's local knowing of practices and tasks at hand. Making assumptions about knowledge as transferable via text fails to acknowledge the work that goes into understanding the fine details mediated by texts. Symptomatic of such studies is that the people aimed for when developing systems are disregarded in the research design. From my point of view, leaving people, i.e. users, out of the analysis of tools, is problematic as the complex processes involved in making information into useful knowledge is overlooked. To sum up, the point I want to make is that activities where members of a practice are able to get together and discuss particular subjects are productive in that they allow for close scrutiny and collective interpretation of shared resources.

Anticipating work by means of textual resources

An important finding in Study One was the mediating qualities of texts for sharing information and negotiating knowing. In essence, the shift documentation embodied the momentous actions of one shift as the time for shift change arrived, thus representing a sort of synopsis of the state of things as they handed over the responsibilities to the following shift. For the team members taking over, something was thus at stake. The results show that the text enabled the team members in the second meeting to address issues of coordination concerning information and tasks. An example was when the participants in the meeting at first apprehended a piece of information as incomprehensible in terms of what they knew about the practice. The participants agreed that the information was unfamiliar and atypical based on collective sense-making processes of a particular text entry. At this point, they rapidly negotiated and aligned towards a shared understanding of the meaning of the text. Even as they established the information as contradicting their knowledge and experience of the practice, focus remained on the task. The participants thus oriented towards the text as implying actions that the team would be accountable for.

This example point to how the text in a very concrete sense mediates not only a particular content but also ways of approaching it. The way team members, and the shift leader in particular, adopted an action-oriented approach is indicative of how each shift is is accountable for being able to handle and quickly respond to problems in the moment. However, each shift can also be held accountable if unable to satisfyingly hand over tasks to the following shift. It is also possible to say that team members, on the collective level, are responsible for what is accomplished when one is absent. In my view, the results can be interpreted as a way of orienting towards the shared accountability of the team. The text entries appearing on the report thus gain status as something the members, as a team, have to be prepared to deal with. The information on the report triggers actions and expectancies of being up-to-date and directs the team members' orientation in the shift change activity. Being up-to-date with team affairs is one aspect of managing continuity in work. From an organizational perspective, the success of the team relies on team members taking responsibility and preparing for actions – something that became visible in what the members oriented towards in the shift change activities.

Negotiating team responsibilities

Another important point to make in relation to continuity over time is how shift change activities offer possibilities for addressing and negotiating the team's role and boundaries of work. Results from Study One, for example,

demonstrated that the text on the report triggered negotiations as the team members discussed a piece of information. By this I mean that the participants made visible to one another that their interpretations of the text did not correspond. This is an example of a situation where the text gives rise to discussions that address local knowing of the work practice. Differing perspectives were displayed on whether the issue concerned a technical problem, thus being the responsibility of the team, or rather a customer problem that was outside of their duties. As gap-closing (Lave, 1988) interaction unfolded, it was revealed that both participants understood the other's perspective and acknowledged it as legitimate and accurate *per se*. In this example, the boundary of the team's focus was momentarily challenged before the team members had re-aligned towards a shared understanding and centre of attention. This implies that texts provide continuity and stability to practices in that they help organize participants' perception and give them a common point of departure on which they can rely over time and over shifts. This is, in the sociocultural tradition, understood as a form of explicit mediation (Wertsch, 2007) where the text comes to coordinate the way participants are able to discuss and negotiate content of work.

Negotiations of this kind are central for maintaining the focus of the team's service obligations and similar issues. From an organizational point of view, the team's assignments might seem clear-cut and distinct. Yet what the results show is that information has to be interpreted in order to become useful knowledge for work. As information and prerequisites for work change, new demands for negotiations appear. The processes that gap-closing give rise to are as inherent and natural to work practices as they are important for continual orientation towards issues of values and boundaries of work. When questions arise about how to perceive particular aspects of work, or interpret texts, they help recreate local knowing on which the practice relies.

Arranging for learning and team development

Moving on to the second research question, I will discuss issues relating to the organization for learning. From the sociocultural perspective adopted in this thesis, participants learn while they engage in all of the activities that make up everyday support, like using tools and interacting with associates. Learning and development are thus inherent aspects of work. In the kind of setting studied, members continuously have to maintain their technical knowledge, particularly as changing technologies and information alter the work.

Apart from such technical matters, issues concerning shared frameworks and values are important. In teamwork that is founded on shared accountability and intentions that actions are to appear as unified towards customers, this is particularly important. Results from Study Two and Study Three point

out two kinds of activities where such issues are specifically addressed. What can be learned while working differs from the focus in these activities, thus also detailing the need for activities specifically arranged for learning purposes. A notable characteristic of the quality discussions (Study Two) and the introductions of newcomers (Study Three) is their separation from everyday work. They were thus planned for, had a given agenda and took place away from where the shift normally was seated. The kind of disconnection from everyday work this entailed, together with the use of authentic documentation, created opportunities for changing the level of talk – away from talk in work, to talk *about* work. As results from Study Two showed, for example, technical content relating to casework was not focussed on in the Case Studio, neither by the leader nor by the members. Instead, the discussions addressed ways of acting and reasoning as a team with point of departure in the detailed documentation of cases. This was accomplished by how the leader oriented the participants' attention away from technical issues to more generalizable aspects cutting across technical work. The character of the activity created a space for reflection that allowed team members and leaders together to formulate and agree on fundamental aspects of team activities and values. The relations between the affordances of the text and the leaders' narration were important here and will be considered in the following sections.

Recreating actions as reflection

Results from Study Two demonstrated the affordances of using texts produced *in* work as basis for discussions *about* work as they simulated previous activities. The chronological structure of the case documentation enabled the leaders to recreate case events as they happened. For example they used this structure to animate actions as they had occurred previously in work, making it possible for the team members to experience the case *as if* they were involved in it. The text made it possible for the leaders to (re)create scenarios and actively involve team members in reflecting about the course of events. The text thus enabled situations where participants could reflect upon the team's previous actions as the textual basis offered the participants possibilities to read, pause and continue as preferred. This is not possible *in* the course of everyday actions. Such reflections were furthermore prompted by guiding questions such as 'How was it possible to know that…?' or 'What would be your next step here?'. The results showed that the team members were engaged in the minute details of the unfolding of events and responded as qualified members of the practice to the leaders' cues. As team members' answers were contrasted with the actual problematic action documented in the case documentation, the participants very forcefully acknowledged the problem occurred in the case.

The possibility to recreate events allowed the members to respond to actual problems as if they themselves were to act in the case. In my opinion, this situation with texts and narratives became powerful in that team members collectively were given the opportunity to develop situated understanding of problematic actions. In other words, in this arrangement for learning the members leaned on experience and shared understanding of the practice as resources for making sense of the course of events. The team members' way of instantaneously verbalizing their understanding of the problem, showed them as competent members of the practice, which was also acknowledged in the situation. The use of authentic documentation and animations enabled the team members to recognize themselves and their tasks, yet these means also provided the members with a context wherein meta-analytical comments regarding team norms and values could be made.

This kind of opportunity for reflecting upon one's own practice distinguishes practices that use documentation in work. It is however important that a change of focus takes place as described above, from being in and doing the documentation to talking about it and analysing it with a focus on improvement. To accomplish such retrospective review, narratives that orient participants' focus towards specific issues, as pointed out above, fill important functions. It is thus in the relationship between text and narrative where potentials lie for participants' learning and for development of the practice.

Expressing the collective

An interesting dimension of this meta-activity in relation to expectations of continual support work is the consistent focus on the *collective*. The results showed the leader as continuously oriented towards the team as the relevant unit of discussion and analysis. The leader, for example, erased traces of individuals' actions in the documentation by replacing team members' names with that of the team, i.e. GHD. In this way focus was redirected from examining individual performances and making individuals accountable for actions. The leader furthermore instantly silenced any remarks or enquiries about the original text producer. This implies that individual actions were regarded as irrelevant and knowledge of original authors did not add to the understanding of how or why events had unfolded in certain ways.

The idea of interchangeability sets this team apart from others where individuals very well might work close together and share many paramenters of work but where individuals still become known as particularly skilled in certain areas. In such cases, like the one Orr (1996) studied, knowing the author of the narrative (or text) is something that facilitates how to interpret the story.

In the current setting, the focus on the collective as pursued throughout the activity underlines this activity as an arrangement for learning about and aligning with the *team's* routines and approaches to work. Such a focus draws attention to this activity as a way of socializing individuals into being cooperative team players who are conscious of, and concerned with, quality issues.

Guiding of newcomers

The other specifically arranged activity for learning studied was the introduction of new employees. For newcomers to this practice, challenges appear in the form of learning local work practices, particularly as the setting is heavily technology-infused and specialized, and the work is organized as collective efforts. This implies that previous experiences in similar settings only to a lesser extent provide relevant knowledge in the studied setting. Newcomers are thus always to be regarded as novices when the employment starts and as they for their full first year are regarded as apprentices under supervision there is tolerance in the setting for that learning local practices of work takes time.

Results from Study Three reveal unpacking processes as going on at a very detailed level. For example, the unfolding of one category mentioned in the information-sharing tool opened up into a narrative that revealed details of past support tasks. In another example, where system structures were explained, the experienced member developed a narrative of expected, but not yet realized, system changes. By scrutinizing such narratives, where experienced members share parts of the team's history and future, we are provided with an idea of the extent to which newcomers are presumed to learn about the team's practice. The experienced members' narratives furthermore displayed expectancies of what the newcomer ought to know about, relating to issues of how to handle and structure information content that make sense to the team.

What is at stake for newcomers is mastering technological tools both as objects of and means for work. Technological tools as objects of work concerns dealing with customer problems, and, as means for work they include learning how to make use of technical tools in work, for coordinating work, and sharing experiences between shifts and colleagues. Results from Study Three showed that the focus in the newcomers' first introductions to technological tools was directed towards learning about them as means for work.

Mastering technologies as means for work concerns learning their locally situated use. As some of the most important tools for coordinating support work in the organization have been developed to fit the needs of different kinds of work groups, it is essential that newcomers learn to perceive such

tools from the team's point of view. That is, it is crucial that newcomers understand how and why systems have to be employed in correct ways. The results show that the way the introductions of such systems is organized offer opportunities for unpacking of such rather fine lines of use. The experienced member, for example, uses the interface in the CMS as a point of departure for making important distinctions between different category uses. As the leader unpacks two categories available by choice in the system, consequences of their contrasting use reveal local prerequisites of team needs, such as the team's reliance on collective availability and visibility of cases.

The way the use of technical systems is narrated and elaborated provides newcomers with an initial point of entry into mastery and appropriation of technologies as means for work. This implies that newcomers are provided with an access point to knowing of the practice that is not available in the systems themselves. Introductions of newcomers are thus facilitated and enabled by the encounters between experienced and novices. Compare this for example with studies (e.g. Chan et al., 2000; González et al., 2005) that emphasize technological solutions as means to shorten time and reduce efforts of training newcomers. Results from the present study point in another direction, as explanations of systems use turned them into comprehensible and useful tools. The amount of time and effort dedicated to training newcomers in the studied helpdesk, and the prolonged time allowed for learning work, stress that mastery of technical tools and epistemic practices goes beyond what can be captured or transferred by technical systems. The introductions are thus detailed at a level that only those directly involved can elaborate. As an arrangement for learning, the team members give authenticity to the activity as their narratives relate system use to their daily work situation.

My conclusion regarding this is that newcomer introductions to specialized work practices depend on interactional encounters between experienced members and novices on the one hand, and their use of tools on the other. Becoming a member of this practice entails mastering the fine nuances of text-based tools in relation to the surrounding where they are used. It is directly decisive that documentation is executed in correct ways and that details are attended to meticulously. The environment fosters a kind of member who is observant to such details, who communicates with colleagues and prepares for the unknown.

To sum up, in contrast to most traditional educational situations, the two activities addressing issues of learning allow for concrete links to the practice where content and topics of talk become directly applicable in and for work. Departing from the situated practice with its content and tools allows for the team members to draw on and develop competences that are tied to the organization of work. This implies that it becomes possible to develop the local practice and the team members' orientation towards such organization as

a collective accomplishment. It furthermore implies that what team members, experienced as well as newcomers, learn from these activities is specialized and very closely tied to this particular support organization and the team's function within it. This is valuable for the organization in relation to learning and continuity. On the local level, continuous negotiation of what constitutes a shared base of understanding and making newcomers part of this is central for the establishment of collective knowing and collaborative team actions over time.

Concluding remarks

The specialized practice investigated provides insights into the knowledge and skills needed when dealing with changing technologies within the framework of collaborative and accountable teamwork. Instead of relying on metaphorical abstractions of knowledge, the empirical studies specify how participants in a specialized and changing support practice come to organize their activities and deal creatively with the variability and changeability of tasks and tools. This nature of work obliges its members to learn and refine continuously what they know in order to be in control.

A central line of reasoning in this thesis is that helpdesking is realized through tool-mediated activities whereby team members engage in collaborative sense-making. What becomes evident is the way activities are organized and how this creates spaces for contact and communication between team members. In this way, knowing is continuously addressed as part of ongoing work. When describing situated practices of knowing from the participants' perspective, it differs from dominant conceptualizations of information and knowledge dissemination. Instead of being regarded as easily or effortlessly transferrable, this study points to the intricate work it takes to coordinate knowing and experiences between members of a practice, although this is an intrinsic aspect of performing work. A consequence of this is that becoming a member of the practice is accomplished over time. It is dependent on participation in activities and guidance into local practices and conditions of teamwork and tools due to the level of detail required and associated with mastery and appropriation. What is required involves interactions with experienced members, involvement in activities, use of tools and, not least, time – something that constitutes a distinguishing feature of specialized practices generally. Thus, much of individual and collective development in organizational settings has to be appreciated as an intrinsic aspect of engaging in daily activities. This is an important point to make in relation to common ways of reasoning about learning and development in workplace settings as primarily occurring in and needing organized off-the-job arrangements or courses.

A central line of reasoning throughout this thesis has been how text-based tools provide a backbone structure in backstage activities. In everyday work, documentation helps in the coordination of tasks and information as such texts mediate local concerns of work. They do so, as they are created and read from particular positions for selected purposes. It is thus essential to think of texts as formulating processes of passing on and handling work content for specified functions in helpdesk support. As text and cultural tools in this thesis are understood as invoking both semiotic meaning and a degree of materiality, a division between the two is uncalled for as it strips away the most essential understanding of how we accomplish actions. The mediating qualities of the kind of artefacts used in the studies are what offer the team a base of stability and continuity. Yet, text developed and maintained for local purposes entail that it only helps organize the everyday work activities for members of that pratctice. Another aspect of text-based practices is how documentation offers possibilities for reflection and analysis of past activities. Results in this thesis indicate that narratives and oral coordination have important functions in the accomplishment of such deliberations. Focus has to be shifted from being in and working with a text to regarding it from a meta-analytical perspective, something that is helped by activities specifically arranged for this purpose. This is where narration becomes powerful in terms of individual members' learning and development but also in the progression of the team and the organization. Becoming a member of this practice, then, implies processes of enculturation that are informed by the text-based elements and how they relate to the practice of work.

CHAPTER SEVEN – Swedish summary

HELPDESKING
Lärande och kunnande i IT-support

Inledning

Framväxten av digitala teknologier och framförallt uppkomsten av helpdesk-verksamhet utgör utgångspunkten för denna avhandling. Digitala resurser har kommit att användas i allt fler sammanhang i de flesta samhällsfunktioner. Effektivt fungerande och pålitliga digitala system har också kommit att bli viktiga konkurrensfaktorer för globalt verksamma organisationer och företag. I takt med denna utveckling har behovet av kontinuerlig teknisk support med ständigt tillgänglig kompetent personal ökat. För några decennier sedan, innan specifika helpdeskar inrättats, hanterades tekniska problem och problem kopplade till användandet av digitala resurser inom företaget eller organisationen av den som råkade vara mest erfaren eller kunnig (Knapp, 2014; McKoen, 2000). Dessa personer hade ingen särskild utbildning och arrangemanget innebar också att hjälp fick ges vid sidan av övriga arbetsuppgifter. I och med ett ökat utbud av och växande komplexitet i hård- och mjukvaror och nätverksteknik, uppstod så småningom ett behov av att organisera och systematisera hjälpen och kunnandet. Tämligen snart växte också vad man kan se som ett eget kunskapsområde fram.

Ett utmärkande drag för supportverksamhet är de ständigt föränderliga villkor som utgör medarbetarnas vardag. Tekniska färdigheter krävs, men det speciella består också i att ständigt behöva lära och hålla sig uppdaterad när applikationer och system snabbt förändras (Davenport & Klahr, 1998). Eftersom många teknologier är lokalt utvecklade, innebär detta att medarbetarna måste besitta specifik kunskap kopplad till den verksamhet man arbetar inom. Det räcker således inte med det man får med sig genom formella utbildningar inom området. En annan framträdande sida av supportarbetet är de förväntningar som kunder och beställare av tjänsterna har. För att kunna arbeta med support betonas ofta vikten av de anställdas sociala och relationella färdigheter i bemötandet av kunder och deras problem

(McBride, 2009) men också förmågor som berör samarbete och flexibilitet inom de team som levererar support (Connor et al., 2001).

Avhandlingen består av två delar. I den första redovisas bakgrund, teoretiskt och analytiskt ramverk, studierna i korthet samt diskussion. Den andra delen består av de tre empiriska studier som utförts inom ramen för avhandlingsarbetet.

Bakgrund

Den tidigare forskning som tas upp problematiserar på olika vis frågan om arbetets organisering för att framgångsrikt kunna hantera den typ av föränderliga problem IT-support inbegriper. I det första, av tre, forskningsområden ligger huvudfokus på utveckling av datorbaserade informationssystem. Ett mål är att designa automatiserade system för lagring, bearbetning och spridning av information som ett sätt att stödja arbete inom supportteam. Dessa studier belyser frågan om systematisering och delande av information under antagandet att detta framför allt är ett tekniskt lösbart problem. Kritik mot en sådan teknologicentrerad syn på kunskapsarbete grundas framförallt i argument om att sociala dimensioner förbises, och då framförallt hur aktörer använder systemen (Stenmark & Lindgren, 2008; Swan et al., 1999; Sørensen & Lundh-Snis, 2001). Den andra forskningstradition som är relevant i sammanhanget är Computer Supported Cooperative Work (CSCW). Inom denna tradition riktas intresse också mot design av informationssystem, men med ett tydligare fokus på var de används och hur. De empiriska analyser som genomförts visar hur kunskap i supportarbete innebär ett intimt samspel mellan olika lokala kunskaps-/informationskällor. Den tredje forskningsansatsen exemplifieras i första hand av en studie som kan relateras till det sociotekniska paradigmet – den inflytelserika och ofta citerade etnografiska studien av supporttekniker som genomfördes av Julian Orr (1996). Orrs studie visar hur de anställdas muntliga kommunikation är en helt central del av det arbete som utförs och att det är genom berättelser kunnande och arbete upprätthålls. Orr beskriver kunnande som både socialt distribuerat och socialt upprätthållet. Denna förståelse av hur arbete upprätthålls och förhandlas genom kommunikation utgör en av avhandlingens mest centrala utgångspunkter.

Problemformulering och syfte

Avhandlingens övergripande syfte är att förstå och förklara hur kunnande och kompetens delas, upprätthålls och utvecklas i tjänstesektorn avseende data- och IT-frågor, eller annorlunda uttryckt, hur team och individer, och därmed verksamheten, lär. Teoretiskt tar avhandlingen sin utgångspunkt i ett socio-

kulturellt perspektiv på lärande. Detta innebär att fokus riktas mot hur människors agerande och kunnande samordnas och upprätthålls genom en ström av aktiviteter där ett lokalt språkbruk och en rad teknologier för att dokumentera och minnas tillsammans utgör grunden för ett professionellt utövande och upprätthållande av supportarbetet. Det är dessa processer jag syftar på genom termen helpdesking. Denna praktik analyseras genom tre empiriska fallstudier av centrala aktiviteter, vilka utgör avhandlingens andra del. Genom att utveckla förståelse för hur arbete på en teambaserad helpdesk utförs, dokumenteras och samordnas, bidrar avhandlingen med insikter i hur specifika former av kunnande och kommunikation uppkommer och hur arbete organiseras för att upprätthålla professionella aktiviteter och möta kunders behov. Avhandlingens övergripande syfte har brutits ned i följande frågeställningar:

- Hur upprätthålls kontinuitet i helpdesking som en kollaborativ praktik?
- Vilka specifika arrangemang etableras för att organisera för lärande i supportverksamheter?

Teoretiska utgångspunkter

Teoretiskt tar avhandlingen sin utgångspunkt i ett sociokulturellt perspektiv på lärande och utveckling. Detta innebär att de aktiviteter vi deltar i förstås som en dialektisk process som involverar individer och deras användning av redskap inom ramen för en social praktik. När vi deltar i aktiviteter gör vi det alltså med hjälp av de kulturella redskap (Vygotsky, 1978; Wertsch, 1991, 1998) som finns tillgängliga i den aktuella sociala praktiken. Samtidigt lär vi oss genom själva deltagandet, vi går från att vara perifera nybörjare till att bli alltmer kunniga och centrala för verksamheten (Lave, 1988). Detta innebär att vad vi kan och vad vi lär måste ses i relation till den kontext och de resurser som finns tillgängliga och som vi blir delaktiga i. Vidare inbegriper perspektivet att vad som ses som relevant kunnande i en viss situation enbart kan förstås i relation till praktiken och dess mål (Vygotsky, 2012; Wertsch, 1998). Begreppet kunnande används för att lyfta fram att det vi vet och använder oss av i olika sammanhang för att utföra en viss aktivitet ska ses som processer snarare än som något på förhand givet. Kunnande är med andra ord ständigt i utveckling och upprätthålls kollektivt av deltagare i en praktik (cf. Hutchins, 1995a; Lave, 1988; Orlikowski, 2002; Suchman, 1987). Kunnande ses därmed inte enbart som en bakgrund gentemot vilken individer agerar. Istället förstås kunnande som en gemensam resurs i en social praktik som fungerar som stöd för medlemmarnas agerande. I och med att omvärlden förändras och på olika sätt inverkar på till exempel arbetsuppgifternas karaktär, utvecklas och omtolkas det kunnande som en viss verksamhet bygger på.

En aspekt av kollektivt kunnande är att det, med hjälp av språket, kan organiseras och materialiseras i texter. Genom dokumentationspraktiker, görs kollektivt kunnande mer varaktigt över tid och de erfarenheter man gör i en verksamhet kan göras tillgängliga för andra att ta del av, diskutera och ifrågasätta. En aspekt av den materialitet som dokumentation av medlemmars arbetsinsatser erbjuder är möjligheten att gå tillbaka till tidigare handlingar, och att retrospektivt läsa och sätta sig in i och granska specifika händelseförlopp. Dokumentationspraktiker ger således möjligheter för verksamheter att minnas och utvecklas. Texten kan på detta sätt utgöra en bas för att dela kunnande och information till ett bredare kollektiv. En sådan gemensam materiell bas möjliggör för användning i både arrangerade aktiviteter och oväntade scenarier.

När deltagare i en aktivitet ställs inför motstridiga eller på andra sätt inte helt transparenta problem uppstår det som analytiskt kan beskrivas som ett interaktionellt glapp (eng. gap). Dessa situationer hanteras genom att deltagarna på olika sätt förklarar problem eller försvarar sina ståndpunkter (Antaki, 1994; Garfinkel, 1967). Det innebär en förflyttning av fokus från den ursprungliga aktiviteten till att istället fokusera på den uppkomna situationen. För att deltagarna ska kunna återgå och fortsätta med den primära aktiviteten krävs således att de överbryggar glappet (eng. gap-closing) (Lave, 1988). Detta är en process där deltagarna måste mötas; de behöver enas kring en gemensam förståelse i stunden. I en arbetspraktik innebär detta att samtidigt som det är de professionellas kunnande om praktiken som skapar glappet, är också kunnandet vad som används som resurs för att överbrygga det. I denna avhandling används gap-closing som ett analytiskt verktyg för att lyfta fram det kommunikativa arbete medarbetarna ägnar sig åt för att övervinna den typ av tillfällig distraktion dessa glapp innebär. På detta sätt kan förståelsen av hur deltagare förhandlar kunnande på det kollektiva planet utvecklas.

Ett centralt begrepp i ett sociokulturellt perspektiv är mediering. Vygotsky (1978) argumenterade för att allt mänskligt handlande är medierat. Med det menar han att de sätt vi agerar och tänker utifrån är formade av de medierande resurser som vi har till förfogande. Den mest grundläggande medierande resursen är språket som utgör både en kulturell och semiotisk resurs (Vygotsky, 1978). Våra handlingar bygger alltså på vår användning av språk och andra former av kulturellt genererade redskap. Annorlunda uttryckt så kan våra handlingar och det vi åstadkommer genom dem som sociala aktörer, endast förstås som ett resultat av samverkan med de kulturella redskap vi använder. Denna analysenhet benämns av Wertsch (1998) som medierad handling (eng. mediated action). De möjliga handlingsutrymmen individer har står därför i relation till de kulturella resurser de har tillgång till och förmåga att bruka dem på adekvata sätt. Utifrån ett Vygotskianskt sätt att resonera är därmed vår förståelse för den mening och funktion kulturella

redskap har en process som framträder i skärningspunkten mellan individuell och social handling (Wertsch, 2007). Det analytiska fokuset ligger därmed inte på de medierande resurserna i sig, utan på hur de bidrar till att åstadkomma något i en specifik kontext.

Vygotsky (1978) menar att lärande uppstår i och med att vi deltar i sociala aktiviteter och lär oss använda medierande redskap, artefakter. Datorer och digital teknik, som spelar en stor roll i denna studie, är typiska exempel på artefakter. Vi kan lära oss att använda dem och få dem att utföra det vi vill, även om deras bakomliggande funktioner inte är helt uppenbara för oss. För deltagarna i denna studie är själva förutsättningen för arbetet att förstå just det med tekniken som för andra inte är känt, dvs det som Latour (1999) benämner som det som är black-boxed i komplex teknik. Det innebär att tekniken ibland måste göras transparent för deltagarna, vilket kan beskrivas som processer av white-boxing (Huh et al., 2011), det vill säga processer som har till syfte att lära någon att se och förstå det som är dolt eller osynligt för andra. Analytiskt används begreppet för att peka på vikten av de kommunikativa, i stor utsträckning muntliga, processer varigenom de tekniska systemen görs begripliga, eller, med andra ord, packas upp. Betoningen på kommunikativa processer för begripliggörandet kan sägas ligga i linje med Vygotskys resonemang där lärande börjar på den sociala arenan; att vi lär oss använda medierande resurser tillsammans med andra. Detta innebär att nykomlingar i en praktik lär sig att hantera och bemästra (eng. master) situerade sätt att arbeta och appropriera medierande resurser genom sin interaktion med, och observation av, mer erfarna kollegor.

Empirisk miljö

Den miljö som studerats är en helpdesk på ett större globalt IT-företag. Inom företaget produceras och utvecklas olika former av IT-tjänster och relaterade produkter för vilka det också ges support. Teamet, kallat GHD, ansvarar för underhåll av nätverkssystem och support för applikationer gentemot en av IT-företagets större kunder. Supporten inom IT-företaget kan schematiskt beskrivas som bestående av tre nivåer (cf. Knapp, 2014; Leung & Lau, 2006, 2007) där första nivån består av så kallade frontline helpdesks, dit kunder i första hand vänder sig. Problem som inte kan lösas där skickas vidare till nästa instans av support. Denna andra nivå utgörs av många team av helpdeskar och det är där GHD ingår. Arbetets organisering innebär att GHD ibland även behöver involvera tekniker eller programmerare som befinner sig på den tredje nivån. Dessa grupper kallas back offices.

Under en vanlig månad hanterar GHD runt 800 ”cases” som de som team är ensamt ansvariga för inom företaget. Arbetet kan beskrivas som i hög grad specialiserat och de system och applikationer som används är lokalt

utvecklade. En grundpelare i teamets arbete är det kollektiva ansvar de delar för att support levereras dygnet runt och med minsta möjliga väntan för kunderna. Arbetet är organiserat i tre dagliga skift där de 15 medlemmarna inte har någon fast skifttillhörighet. Genom roterande scheman arbetar alla i teamet med varandra. I och med att support skall tillhandahållas inom de tidsramar som fastställts genom avtal med kunder, måste alla moment fortgå oavsett vilka medarbetare som är i tjänst. Konsekvenserna av att inte leverera tjänster inom de överenskomna tidsramarna kan bli böter för företaget.

I miljön finns en mängd olika system som används i det dagliga arbetet. Ett digitalt dokumentationssystem, ett så kallat casehanteringssystem, används till exempel för det dagliga arbetet med problem som skickats vidare från första supportnivån och som då innehåller kundens problembeskrivning. Denna beskrivning fungerar som utgångspunkt för de aktiviteter som teammedlemmarna sedan sätter igång, vilket kan innebära att direkt åtgärda problemet, att söka information kring det, att begära klargörande information av kunden, eller att involvera kollegorna på back offices. Oavsett aktivitet dokumenteras hur casen hanteras löpande och de tidsstämplas så att en kronologisk ordning med utförda handlingar sparas. Utöver detta dokumenterar teamet ny information som tillkommer kring systemen och de erfarenheter de gör i problemlösningssituationen. Ett av de viktigare verktygen för denna dokumentation är vad som kallas webhotellet, som är teamets interna informationsdatabas.

Metod

I denna avhandling består det empiriska materialet av observationer från fältarbete och video-/ljudinspelningar insamlade under flera års tid. Utifrån observationer under det initiala fältarbetet valdes tre aktiviteter ut som ansågs speciellt relevanta i förhållande till studiens övergripande syfte (Jordan & Henderson, 1995) och som därmed lämpade sig för ingående interaktionsanalys. Metodologiskt har inspiration hämtats från etnometodologiskt grundade studier av arbetspraktiker (cf. Heath & Luff, 2000; Luff et al., 2000) där problemformuleringarna bygger på det observerade, det vill säga de fokuserar de aspekter som deltagarna orienterar sig mot och hanterar i sitt arbete.

Den första aktivitet som studerats ingående är skiftöverlämningar. Dessa har dokumenterats genom videoinspelningar och genom att så kallade skiftrapporter samlats in. I fokus står frågor om hur kontinuitet och koordinering av supportaktiviteter åstadkoms och på vilka sätt kunnande delas när ett skift lämnar över ansvar och uppgifter till nästkommande. Den andra aktiviteten är arrangerade kvalitetsdiskussioner. Dessa så kallade Case Studios kan beskrivas som en organiserad meta-aktivitet där teammedlemmarna

diskuterar tidigare utfört arbete i syfte att lära hur det kan bli bättre. Datamaterialet består av videoinspelningar för att fånga diskussionen och den dokumentation från casehanteringssystemet som används i situationen och som introduceras av de som är kvalitetsansvariga och som håller i aktiviteten. Dokumentationen som tidigare skapats i det dagliga arbetet återanvänds med andra ord här för ett nytt syfte. I den tredje studerade aktiviteten, som utgörs av introduktioner av nyanställda, analyseras arbetet som erfarna medlemmar ägnar sig åt för att introducera nya medlemmar till teamets tekniska resurser och lokala system. I denna studie består empirin av ljudinspelningar samt fotografier av datorskärmarnas innehåll under introduktionen.

Det empiriska materialet har initialt analyserats i sin helhet. Successivt har snävare fokus arbetats fram och interaktionen analyserats. De excerpt som presenteras i artiklarna har noga valts ut för att representera det som iakttagits vid analysen av respektive material. De pekar därmed på återkommande företeelser. Urval har också gjorts utifrån möjligheten att begripliggöra det tekniskt täta innehåll och språkbruk som karaktäriserar den studerade miljön.

Sammanfattning av artiklarna

De tre studierna baseras på tre olika empiriska material från helpdesken. På olika sätt berör de frågor om hur teammedlemmarnas deltagande i aktiviteter relaterar till användningen av kulturella redskap. I den första studien är intresset utveckling och upprätthållande av individuellt och kollektivt kunnande. Organisering för och koordinering av aktiviteter och kunnande utforskas genom ett fokus på de resurser deltagarna använder i sitt dagliga arbete för att dokumentera aktiviteter och information, som casehanteringssystem och webhotell. Genom ingående analys av skiftöverlämningar som inbegriper två möten mellan skiften studeras deltagarnas förhandling och upprätthållande av kollektivt kunnande. En viktig aspekt av detta arbete utgörs av användandet av en skriftlig skiftrapport som utgör ett stöd i dessa båda möten.

Analysen visar hur skiftrapporten medierar aktiviteterna och hur den utgör ett redskap för att förhandla och etablera en gemensam förståelse för vad som är viktigt och vad som måste uppnås. Två exempel belyses där förhandling av det kollektiva kunnandet sker för att överbrygga det glapp som uppstår när skiftrapporten tolkas. I ett fall uppstår ett glapp i interaktionen när två möjliga, men olika sätt att tolka text i skiftrapporten verbaliseras av deltagarna. Detta görs utifrån olika perspektiv på vad ett problem utgör och vad det innebär i den specifika teammiljön. Deltagarnas gemensamma grundförståelse för verksamheten innebär att de ser och förstår den andres ståndpunkt. Det glapp som uppstår överbryggas genom förhandling om var gränserna för teamets uppgifter går. På så sätt både används och förhandlas teamets kollektiva

kunnande. I ett andra exempel orienterar sig deltagarna mot att göra ett stycke text på skiftrapporten begripligt. Här uppstår alltså ett glapp mellan deltagarna och artefakten då de kommit fram till att texten är alltför vagt skriven i relation till teamets uppdrag. Här förhandlar deltagarna textens innehåll i förhållande till hur de kan föregripa möjliga framtida aktiviteter.

Deltagarnas förhandlingar i samband med skiftöverlämningarna är grundliga vad gäller att situera mångtydig information i deras praktik. Detta pekar på att förståelsen av texten som inkluderats i dokumentet är essentiell för det fortsatta arbetet. Detta fokus på att upprätthålla arbetet och att på detaljnivå förhålla sig till texten är genomgående i materialet. Förutom att artefakten utgör ett medierande redskap vilket implicerar att olika aktiviteter ska initieras, pekar det också ut hur teamet svarar upp mot och tar ansvar för sina åtaganden. De hålls accountable (Mäkitalo, 2003), som det uttrycks i litteraturen, i relation till det som skrivits. En slutsats är därför att skiftrapporten utgör en kraftfull resurs för att kommunicera och samordna åtgärder mellan skift. Den strukturerar kollektiva aktiviteter i konkret mening då den förmedlar teamspecifika angelägenheter. Skiftrapporten, jämte andra resurser för dokumentation, utgör här en materiell grund för institutionellt minnande, som tillsammans med den muntliga överlämningen bidrar till att upprätthålla och dela kunnandet kollektivt över tid.

I avhandlingens andra studie fokuseras hur den dokumentation som producerats i dagligt arbete med case återanvänds för att föra diskussioner om och värdera kvaliteten på arbetets utförande. Denna aktivitet är med andra ord arrangerad för lärande. Mer specifikt fokuseras i denna artikel den diskursiva organiseringen i termer av hur case-dokumentationen används för att förmedla viktiga frågor om hur aktiviteter tidigare utförts. Analysen visar betydelsen av dokumentationens utformning för hur aktiviteten fortgår. Texten, som är kronologiskt ordnad, används av ledaren som genom narrativer synliggör vissa poänger. I och med att tidigare handlingar och händelser blir synliga genom återberättande av tidigare dokumenterade aktiviteter, rymmer denna meta-aktivitet en potential för lärande och omorganisering av kommande aktiviteter. Som ett verktyg för re-mediering återanvänds dokumentationen i detta fall som ett sätt att reproducera och göra ett innehåll begripligt och möjligt att värdera och diskutera. Dokumentationen från det dagliga arbetet med case fick i denna meta-aktivitet en ny funktion då den användes för att påvisa en klyfta mellan utförda handlingar och de högt ställda förväntningar som upprätthålls av teamet självt och som förväntas från organisationen. På så sätt svarar situationen också mot det uttalade syftet med lärtillfället.

I avhandlingens sista studie ligger fokus på erfarna teammedlemmars guidning av nyanställda när de ska börja lära sig förstå och använda lokala tekniska system och verktyg. Centralt i helpdeskens arbete är en rad olika

applikationer och digitala redskap som de ger support för och som används för att kunna utföra det arbetet. En övervägande del av dessa teknologier är lokalt utvecklade, vilket innebär att nyanställdas förförståelse av dessa är begränsad till vad som gäller generellt för system och systemhantering. Studien fokuserar på vilka sätt erfarna medlemmar begripliggör system och relaterar förståelsen till de lokala perspektiven. Mer specifikt innebär detta ett fokus på hur digitala system görs begripliga och vilket kunnande som görs tillgängligt för nyanställda.

De introduktionstillfällen som studerats är de nyanställdas allra första kontakt med aktuella tekniska system. Analyserna visar hur olika aspekter av teamets kunnande verbaliseras när systemen gås igenom. Genom att till exempel situera en numera överflödig kategori i systemet som en del av teamets utveckling, delas kunnande om det som tidigare föregått i verksamheten, samtidigt som det leder den nyanställda mot förståelse av själva logiken i informationsstrukturen. Vidare elaboreras vad som präglar supportarbete, nämligen att veta gränserna för vad teammedlemmarna behöver veta i relation till sitt uppdrag. Med utgångspunkt i en applikation ger teammedlemmen en kort inblick i vad brukarna använder den till, men fokus i introducerandet förflyttas till de aspekter teamet övervakar och dess nuvarande funktion i relation till framtida systemstrukturer. Sammantaget visar analysen att systemet, genom att det packas upp, situeras i teamets nuvarande såväl som förutvarande och kommande aktiviteter. Vidare visar analysen på den lokala anpassningen av systemanvändande som blir nödvändig när system är konstruerade för att möta olika professionella teams behov. Genom narrativ blir instruktioner relevanta som tillgängliga kategorier i systemet, och i sammanhanget tydliggörs också varför verksamheten använder vissa av dem men inte andra. Här framkommer aspekter som berör arbetets kollektiva organisering och ansvar.

Diskussion

Denna avhandling ger således insyn i de kunskapsprocesser och färdigheter som krävs i arbete med föränderliga teknologier inom ramen för kollaborativt och ansvarskrävande teamarbete. Istället för att luta sig mot metaforer och abstraktioner av vad kunskap är, specificerar de empiriska studierna hur deltagare i specialiserade och föränderliga supportverksamheter organiserar sina aktiviteter och kreativt hanterar ombytlighet och föränderlighet av uppgifter och verktyg. Detta slags arbete gör att deltagarna kontinuerligt behöver lära och omvärdera vad de kan för att behålla kommandot.

Kontinuitet som sträcker sig över skift och mellan olika deltagare innebär att uppgifter, kunnande och information behöver organiseras på sådana sätt att deltagarna har möjlighet att dela med sig av sina erfarenheter. Tidigare

forskning, inom CSCW till exempel, har visat att kunnande som används i supportarbete springer ur individuell kunskap såväl som sådant som gruppen lärt. Det som studierna i denna avhandling bidrar med är ytterligare insikt i de processer som ligger till grund för hur teamet skapar gemensamma resurser. En sådan aspekt är till exempel de förhandlingar som pågår under skift-överlämningarna. Resultaten visar hur olika former av skriftlig dokumentation inte bara utgör en informationskanal utan skapar en arena för gemensam förhandling av gruppens roll, uppgifter och kollektiva perspektiv. Texten blir i hög utsträckning den medierande resurs varigenom aktiviteterna förhandlas och genomförs.

Resultaten visar också att det kunnande som krävs för deltagande i helpdesken är situerat i verksamheten och därmed i stor utsträckning måste läras på plats. Deltagandet i de dagliga aktiviteterna utgör en kärna till lärande och genom att utsättas för situationer där kunnandet ställs på prov, lär sig deltagarna att uppfatta sina uppgifter på ett visst sätt. Lärande och utveckling är alltså en del av vardagen, men artikuleras i aktiviteter där kunnandet görs till objekt så som i kvalitetsdiskussioner, introduktion av nyanställda och så vidare. Analysen visar hur kvalitetsdiskussioner som utgår från tidigare dokumentation ger ett tillfälle att i detalj granska och reflektera över hur teamet hanterar arbetet med case. Som ett komplement till det dagliga arbetet formulerar sig deltagarna här kring mer generella aspekter av hur deras gemensamma arbete kan angripas och utföras för att kvalitetsmässigt bli bättre.

En annan aspekt av kontinuitet och lärande är hur nyanställda kommer att bli del av denna lokalt utformade praktik. I linje med att praktiken i stort bygger på kommunikation mellan deltagare, visar resultaten på att nyanställda är beroende av de mer erfarna medarbetarnas berättande för att få tillgång till hur systemen fungerar. Detta innebär att nyanställda måste förstå hur systemen lokalt utvecklats och hur de används för att kunna tillgodogöra sig deras struktur och funktion. Det räcker således inte att förhålla sig till nuet då det hela tiden sker ett samspel mellan befintligt teknik, dåtid, nutid och potentiell framtid.

Sammantaget visar avhandlingen på organisatoriska aspekter som främjar lärande som till exempel genom att skapa ytor för kommunikation mellan individer genom hur de fysiskt placerar sig nära varandra, hur skiften ständigt förändras och skapar möjligheter för de anställda att arbeta med alla inom teamet, muntliga skiftöverlämningar och så vidare. Genom att deltagarna delar och förhandlar om konsekvenserna av sina uppgifter skapas tillfällen att lära sig om detaljer både vad gäller tekniska aspekter och värden i arbetssituationen. Möjlighet till muntlig kommunikation framstår här som avgörande. Två av studierna pekar dock på ett behov av att organisera kommunikativa aktiviteter med ett explicit fokus på lärande. I kvalitetsdiskussionerna och

nyanställdas introduktioner är aktiviteternas själva organisering central. En slutsats är att båda dessa aktiviteter är beroende av användningen av artefakter direkt från verksamheten och att dessa åtföljs av narrativer. Detta gör, till skillnad från många traditionella utbildningssituationer, att konkreta länkar till praktiken etableras och att innehållet i vad som berättas är direkt tillämpligt i och för arbetet.

Sammanfattningsvis visar således denna studie hur textbaserade verktyg skapar stabilitet och kontinuitet i arbetet samtidigt som de erbjuder möjlighet till reflektion och analys av tidigare utförda aktiviteter. Narrativer och interaktion utgör själva förutsättningen för ett kontinuerligt lärande och utvecklande av kollektivt kunnande över tid.

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Appendix

GHD – Work resources

During work, the team members use several web-based resources and tools whereby they communicate and share information. The most used ones have already been mentioned but here follows a systematic although schematic presentation of these.

The Case Management System (CMS)

This tool is used for communication between users and GITS, between the different levels of support and between team members at GHD. The latter implies that it is used as a means for logging activities of troubleshooting and problem-solving episodes that can be accessed by following shifts. It is also used for making standard solutions available for the frontline, which instead of referring problems to GHD is able to help the user directly. The company's official language is English, which should thus be used throughout the system. The CMS is developed for use by different kinds of helpdesks with differing needs. GHD uses only certain functions that adhere to their organizational demand for a shared and collective practice. For example, cases that are awaiting further information and are not being actively worked on are accessible to all team members, while cases being actively worked on are momentarily hidden from the collective view to avoid duplication of work. Notes are used for logging and time-stamping actions taken. By using notes, written documentation of the team's work is created. This is used in everyday work to recapitulate what has been done when several team members are involved in one and the same case. The Quality Team also uses the documentation as a means of following the standard of the team's work and the documentation is fundamental in team discussions about work.

E-mail

In the beginning of the data collection e-mail was used at times for correspondence with back offices and other helpdesks that were not using the CMS. Messages were then copied from the e-mail and pasted into the system. However, the tool was spread as a result of a centralized demand to write directly into the CMS itself.

The web hosting

In a local database which was locally known as 'the web hosting', internal team information about the systems they supported was divided into four main areas with a number of subdivisions. The information concentrated on what the team members needed to know in order to perform work. It constituted elements like information about routines, how to make certain tests, educational material, contact information, and news about those systems. In the web hosting, the team members also found their schedules, the shift reports created at the end of each shift, communal passwords and a news feed that had to be read before starting work at every shift. The team members shared responsibility for daily updating or adding of possibly useful information in this tool. Some team members were given particular responsibility for one of the systems but the responsibility was foremost of administrative character and included going to meetings related to the area. In this way, those team members constituted a link between system administrators and the team.

Part Two
THE STUDIES