INTERCONNECTEDNESS AND CONTINGENCIES:
A STUDY OF CONTEXT IN COLLABORATIVE INFORMATION SEEKING

A Dissertation in
Information Sciences and Technology

by
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ABSTRACT

Collaborative information seeking (CIS) is an important aspect of work in organizational settings. Researchers are developing a more detailed understanding of CIS activities and the tools to support them; however, most studies of CIS focus on how people find and retrieve information collaboratively, while overlooking the important question of how context affects CIS activities. This dissertation focuses on unpacking the concept of context to understand how contextual factors affect CIS.

Although context is an important topic in numerous disciplines, a common definition in the research is difficult to identify. Broadly, context includes the circumstances and conditions that surround and affect a phenomenon. These circumstances and conditions may be tangible or intangible and could include location, position, people, objects, function, purpose, meaning, or time.

In this dissertation, I address two important gaps in current research on CIS as related to context. First, there is limited research on the contextual factors that can affect collaborative information seeking activities. Second, there is a lack of understanding on how contextual factors influence collaborative information seeking activities.

To address these research gaps I conducted an ethnographic field study of the CIS activities of information technology teams in two hospitals. In this field study, I used qualitative methods including interviews, observations, shadowing, and artifact collection to examine the contextual factors impacting CIS activities and how these contextual factors impacted CIS practices.

Through this investigation, I contribute to the research field by offering a conceptual understanding of the contextual factors affecting collaborative information seeking activities in
organizational settings. Specifically, this study (i) identifies categories of contextual factors impacting CIS activities, (ii) explains how the contextual factors impacted those CIS activities, and (iii) develops a framework of contextual factors and their impact on collaborative information seeking in organizations.

The research presented in this dissertation helps us extend our conceptual understanding of context and collaborative information seeking and also highlights the importance of studying context as an aspect of CIS.
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Chapter 1. Introduction

This chapter introduces the central problems addressed in the dissertation and lays out the research objectives and related questions answered herein. Additionally, I describe the approach used to fulfill the research objectives. Finally, I present an outline of the dissertation.

1.1. Problem Motivation

Information technology departments are very dynamic in nature, characterized by a constant need for information, time-pressured decision making, distributed work activities, and functionally diverse teams. The vignette below illustrates how collaborative information seeking activities are central to the IT issue resolution processes used to address clients’ problems and how contextual factors can impact these activities.

**Location: IT Department, Regional Health System (pseudonym)**

*Richard, the on-call analyst on the Clinical Software Services team, is assigned a client issue. Although Richard is able to determine the cause of the problem, he does not know how to resolve it. Therefore, he decides to ask other people to help him find the needed information to tackle the problem. Richard has several people from which to choose, so he considers each person’s availability, reputation, and the quality of information they can provide before pulling together his ad hoc team. Once together, the team works together to find and share information until they can resolve the issue. (Field notes)*

Research in collaborative information seeking (CIS) has traditionally focused on how people find and retrieve information collaboratively, while overlooking the important question of how context affects CIS activities. However, in recent years researchers (Dervin, 1998;
Hyldegård, 2009; Zach, 2005) have explicitly considered how context impacts CIS activities and processes, while other researchers (Chen & Huang, 2007; Greer et al., 1998; Yang, 2007) have done so only implicitly. As the vignette illustrates, contextual factors, such as a person’s availability, reputation, and the quality of information they can provide, can impact collaborative information seeking activities. Further these contextual factors are interconnected such that several factors can play a part in impacting CIS activities, in this case the creation of an ad hoc team.

Gaining a conceptual understanding of these various contextual factors and how they impact CIS activities is important. Such an understanding can help organizations to develop more effective organizational policies and systems to support CIS practices. To gain this understanding, this dissertation looks to (i) identify categories of contextual factors impacting CIS activities, (ii) explain how the contextual factors impacted those CIS activities, and (iii) develop a framework of contextual factors and their impact on collaborative information seeking in organizations.

Overall, if we are to understand how effective collaborative information can be facilitated in an organization, we must first understand the impact that contextual factors have on the collaborative information seeking practices of team members (Reddy, 2003).

1.2. Research Motivation

Historically, researchers have looked at several aspects of information seeking from models of the individual information seeker to the information seeking activities itself (Ellis & Haugan, 1997; Kuhlthau, 1988). However, as organizational work has to become more collaborative, we are not only seeing individuals seeking information, but there is a rise in collaborative information seeking in groups. For example, healthcare providers might collaboratively search for information to diagnose and treat patients in a hospital (Reddy &
Spence, 2008), while engineering design teams might collaboratively search for information to uncover design constraints (Poltrock et al., 2003). With this shift from individual- to team-based work, researchers have followed suit by moving away from studying information seeking where the work itself is de-emphasized to studying information seeking in context where the work activities are central to the research.

Collaborative information seeking has broadly been defined as “activities that a group or team of people undertakes to identify and resolve a shared information need” (Poltrock et al., 2003, p. 239). More specifically collaborative information seeking includes elements such as “information access activities related to a specific problem solving activity that involves people interacting with each other directly or indirectly” (P. Hansen & Järvelin, 2005, p. 1102), or as Sonnenwald and Pierce suggest, CIS is a dynamic activity in which “individuals must work together to seek, synthesize and disseminate information” (2000, p. 462). CIS is more than asking questions and receiving answers. It starts with an information need and is a dynamic and engaging process where two or more people together look for and communicate information to solve a shared information need.

There are numerous studies on collaborative information seeking. These studies of CIS focus on how people search for information collaboratively—from both an organizational work perspective and from a technical perspective (Reddy & Spence, 2008; Shah & Gonzalez-Ibanez, 2010).

Researchers in the organizational stream conduct detailed ethnographic studies aimed at uncovering the everyday work practices associated with collaboration and information seeking. Researchers in the technical stream conduct user studies and design, build, and evaluate systems aimed at better supporting collaboration and information-seeking activities. Both streams of research are interested in the “collaborative information seeker”; however, the distinction between them is the nature of the phenomena being studied. Researchers with a technical focus
examine how, whether, and the extent to which technologies support the CIS activities studied (Fu, Goh, Foo, & Supangat, 2004; Golovchinsky, Qvarfordt, & Pickens, 2009). On the other hand, organizational researchers focus on how CIS occurs in organizational settings, explicating the activities and processes that take place during collaborative information seeking (Bruce et al., 2003; Hyldegård, 2006; Paul & Reddy, 2010). Studies from both streams have taken place in various domains including military, educational, engineering, and healthcare contexts.

Organizational studies focus on a wide variety of collaborative information seeking practices in organizational settings (Hertzum, 2008; Hyldegård, 2009; Poltrock et al., 2003; Sarcevic, 2009; Spence & Reddy, 2007). Several studies highlight how information is used and reused (Cabitza & Simone, 2009; Lutters & Ackerman, 2007; White & Lutters, 2007), whereas others emphasize expertise location during CIS activities (Ackerman, 1994; Ackerman & Malone, 1990; Dörner, Pipek, & Won, 2007; Ehrlich, Lin, & Griffiths-Fisher, 2007; Greer et al., 1998; McDonald & Ackerman, 1998). Still others have identified typical tasks and activities performed during collaborative information seeking (Saleh & Large, 2011; Shelby & Capra, 2011).

Some researchers in information seeking have discussed the importance of context. For example, in a study of sensemaking, knowledge seeking, and use, Dervin (1998) explains that the application of sensemaking to the design of information communication technologies (ICTs) must not only be responsive, iterative, and open, but it must also conceptualize “knowledge making and using” in a way that “unleashes sensemaking for the realities of human situation-facing” (p.44-45). Further, Zach (2005) uses a contextual approach to the study of the information-seeking practices of senior arts administrators. What these and others studies have in common is “a move away from research that does not account for the here and the now (i.e., time and space) to research that does” (Dervin, 2003, p. 114). In essence, they take into account the situation or context of the information seeking activities and make it a central “actor” in the study.
However, many studies and models have implicitly included contextual factors affecting the collaborative information seeking activities of knowledge workers (Ju & Pawlowski, 2011), this has not been their focus (Goggins & Lewis, 2010). Instead, these studies underscore how individuals in a collaborative setting seek, retrieve, and share information, rather than how contextual structures and policies might affect these activities. This is acutely problematic in settings where teamwork is an essential aspect of the work and thus the success of an organization, such as it is in IT teams in healthcare, clinical healthcare teams, and military command and control environments.

Therefore, it is important that we not only study CIS processes and activities but also the context in which the activities take place. This understanding can help lead to the better design of processes, policies, and technologies that enable collaborative information seeking.

I have identified two important gaps in the current research on collaborative information seeking that motivate the research presented in this dissertation:

i. **Limited research on the contextual factors that can affect collaborative information seeking.** There is currently little research on the contextual factors affecting collaborative information seeking. This lack of research has far-reaching negative consequences for team success in domains in which teamwork and collaboration are required in order to ensure the delivery of safe and reliable services, such as in healthcare and in the military.

ii. **Lack of understanding regarding how contextual factors influence collaborative information seeking.** Though it is important to know about the contextual structures in and of themselves, we must also understand how these structures, alone and in combination with each other, influence CIS activities. Before we can design policies and procedures, we must first understand the organizational contexts in which teams work together to seek, share, and manage information.
1.3. Research Objectives and Questions

The two main research objectives of this dissertation study are (i) to identify contextual factors that can affect collaborative information seeking activities and (ii) to understand how these contextual factors affect collaborative information seeking activities. Thus, I investigated the following research questions about contextual factors with regard to collaborative information seeking in order to address the research objectives of the study:

RQ1: What contextual factors impact CIS practices?

RQ2: How do these contextual factors impact CIS practices?

Answering RQ1 will help achieve the first research objective (i) of the study, whereas the second research objective (ii) will be addressed by answering RQ2. Table 1-1 provides a mapping of the research gaps to the research objectives and questions.

Table 1-1. Map of Research Gaps to Research Objectives and Research Questions.

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<th>Research Objective</th>
<th>Research Question</th>
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<td>To identify contextual factors that can affect CIS activities</td>
<td>What contextual factors impact CIS practices?</td>
</tr>
<tr>
<td>Lack of understanding on how contextual factors influence collaborative information seeking</td>
<td>To understand how contextual factors affect CIS activities</td>
<td>How do these contextual factors impact CIS practices?</td>
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By answering these research questions, this investigation contributes to the research field by offering a conceptual understanding of the contextual factors affecting collaborative information seeking activities in organizational settings. Specifically, this study (i) identifies the key factors likely to influence collaborative information seeking activities, (ii) explains how the contextual factors impact those CIS activities, and (iii) develops a framework of contextual factors and their impact on collaborative information seeking in organizations. In order to answer these research questions, I conducted a qualitative study employing ethnographic methods.
(Strauss & Corbin, 1998) including observations, formal and informal interviews, and artifact collection. The next section describes my approach to answering the research questions.

### 1.4. Research Approach

To answer my research questions, I examined collaborative information seeking in the rich and information-intensive environment in which hospital IT teams operate through a qualitative research study.

#### 1.4.1. Healthcare Teams

Healthcare IT teams work in a setting that is ideal for the study of collaborative information seeking in an organizational environment. First and foremost, such teams work in information-rich environments in which they must collaborate to carry out their work activities. Further, these IT teams are composed of IT professionals from a number of disciplines (e.g. enterprise architecture, network systems, applications development, etc.); such that each team member brings his/her own particular expertise, experience, and perspective to the team. Moreover, these teams perform a common task, software and technology support and implementation, in a somewhat similar fashion; therefore, by studying them, I can generalize across these teams. Finally, nearly every business organization has an IT team because such a team “houses critical data, drives the analytical capabilities of other departments and [thus] plays a crucial role in the communication network of the company” (Bart, 2007).

IT teams in healthcare play an even more important role in the organization than in other contexts because they are essentially the front-line information workers. Hospitals are information-intensive, safety-critical, high-reliability organizations, and the growth of IT in this
setting is such that the technology and information systems are pervasive in patient care (Bates, 2002). Information gaps and errors can lead to inappropriate patient care decisions. Therefore, IT teams play an important role in ensuring the safety of patients because their work in supporting all hospital IT systems and ensuring their availability has a direct impact on patient care.

Given these characteristics of healthcare IT departments, IT team members with varying experience, skills, and roles often collaborate in order to find and share information. Using ethnographic methods such as observations, interviews, and artifact collection, I examined IT team members’ interactions as they collaboratively found, retrieved, and shared information during their daily organizational work. This study provides insight into the occasions and characteristics of collaborative information-seeking activities in organizational contexts. This study also lays the foundations for a conceptual understanding of which contextual factors affect CIS work activities and how they do so and how collaborative information seeking can be supported in organizational settings using information technology.

1.4.2. Research Settings

For this ethnographic field study, I collected data at one primary site and later collected data at a second site to confirm my findings from the first site. Collecting data at the first site allowed me to study the CIS activities of teams working in the information technology (IT) department of the Regional Health System (pseudonym). Using interviews, observations, and artifact collection, I examined how teams collaboratively find, retrieve, and share information “in the wild.” The findings provide a conceptual understanding of why and how contextual factors affect collaborative information seeking.

Drawing on the findings and design implications that arose from the primary data collection site, I then collected data at a second site in order to confirm the findings from the first
site and to further examine collaborative information seeking and contextual factors as well as CIS-enhancing design features in organizational information systems. I once again selected an IT department, this time at the Teaching Medical Center (pseudonym). Again, through observations and artifact collection, I examined how people find, retrieve, and share information during collaborative organizational work and the challenges faced during such tasks.

Thus, through this comprehensive field study, I examined collaborative information seeking in the organizational context of healthcare IT teams from both a conceptual and a design perspective. This research approach was helpful in providing a holistic understanding of the contextual factors that affect collaborative information seeking.

1.5. Dissertation Roadmap

The remainder of this dissertation is organized as follows:

- Chapter 2 Background: provides a review of relevant research studies of collaborative information seeking and knowledge sharing.
- Chapter 3 Study Design and Methodology: describes the processes and methods used in the research project, focusing on the data collection and analysis methods used in the study.
- Chapter 4 Research Setting: provides an overview of the research settings and the participants.
- Chapter 5 Findings: presents the main findings regarding the contextual factors impacting collaborative information seeking.
- Chapter 6 Discussion: describes the implications of the results of the study.
- Chapter 7 Conclusion: briefly summarizes the findings as they relate to the goals of this research and offers directions for future work.
Chapter 2. Background

Research on context is touched on by many different communities including, but not limited to, Computer Supported Cooperative Work (CSCW) (McDonald & Ackerman, 1998; Paul & Reddy, 2010; White & Lutters, 2007), Information Sciences (Bruce et al., 2003; Fu et al., 2004; Hyldegård, 2006; Shah & Gonzalez-Ibanez, 2010) and Organizational Studies (Alberts, 2007; Boh, Ren, Kiesler, & Bussjaeger, 2007; M. Hansen, Mors, & Løvås, 2005). My interest lies in identifying a phenomenon, the contextual factors that give rise to it, and how it affects collaborative information seeking specifically.

Therefore, I focus this literature review on three communities—Computer-Supported Cooperative Work, Information Sciences, and Organizational Studies—because these communities include studies of collaborative information seeking and/or behavior. I begin this review by explaining context and contextual factors, as they pertain to my research and how other researchers have discussed this phenomenon. I then describe prior research on collaborative information seeking and contextualization, including an examination of research on contextual factors as they relate to information seeking.

2.1. The Importance of Context

In academic research, the concept of context is everywhere and at the same time it is nowhere. Context is everywhere, particularly in the literatures of the social sciences and humanities where the focus is on how people make sense of their world. And context is nowhere, mainly because there is no term that is “more often used, less often defined, and when defined, defined so variously” (Dervin, 2003). However, what is generally accepted about the notion of
context is its importance. Across disciplines including law (Heilbrun, 1997), healthcare (Draisma et al., 2009) and management (Steelman & Mandell, 2003), the importance of context is highlighted in numerous research studies.

Although context is an important current topic in numerous disciplines, a common definition in the research is difficult to identify. Broadly, context includes the circumstances and conditions that surround and affect a phenomenon (Dewey, 1960; Pettigrew, 1988; Salber, Dey, & Abowd, 1999). These circumstances and conditions may be tangible and/or intangible in nature and could include location, position, people, objects, function, purpose, meaning, or time (Pascoe, 1998; Schilit & Theimer, 1994). In this research, I share Dourish’s (2004) view of the association between context and the phenomenon of study. This view is outlined as follows:

- Relational: something may or may not be contextually relevant to the phenomenon;
- Dynamic: the possibility of contextual factors is active and changing;
- Occasioned: context is specific to each instance of activity or action; and
- Enacted: context arises from the activity and, therefore, is inseparable from the phenomenon.

This perspective on context guided my research of the contextual factors impacting collaborative information seeking activities.

According to Dervin (2003) and other researchers (Bazire & Brézillon, 2005; Dourish, 2004; Foster, 2006), context is part and parcel of the design of collaborative information seeking organizational policies and systems. First, because context is situation specific, organizational policies and procedures must be drafted such that they are adaptable according to who is looking for information, where collaborative information seeking activities might take place, and how information is sought, retrieved, and shared, as well as changes to these over time.

Second, because context is contingent on the phenomenon of study—in this case CIS—which contextual factors impact CIS depends on the CIS activities themselves. Dervin (2003)
emphasized that “the importance of context is rarely an issue” (p.112) and that researchers in information seeking are starting to focus on context, “a move away from research that does not account for the here and the now (i.e., time and space) to research that does” (p. 114).

However, we have seen little evidence of this focus on context applied to collaborative information seeking research. Instead, studies on information seeking, whether they consider it as an individual or collaborative enterprise, have focused primarily on the activities, processes, and technologies related to how people search, retrieve, share, and use information (Raya Fidel, Pejtersen, Cleal, & Bruce, 2004; Golovchinsky, Qvarfordt, & Pickens, 2009; Morris & Horvitz, 2007; M. Reddy & Spence, 2008; Shah & Gonzalez-Ibanez, 2010). From these studies, various frameworks and theories of information behavior have evolved including Kuhlthau’s (1988) model of information search process, Reddy and Jansen’s (2008) collaborative information behavior model and Shah’s (2008) model for collaborative information seeking.

2.1.1. Contextual Factors

In this research, I am interested in uncovering the contextual factors that impact collaborative information seeking activities. However, I first had to define the term contextual factors, which would then be used to guide the research from data collection through analysis. Drawing on the concepts of context, factors and collaborative information seeking, I synthesized a working definition of contextual factors as the characteristics, conditions, or set of circumstances (either tangible or intangible) in which a particular phenomenon—in this instance an episode of collaborative information seeking—is embedded¹ that can interrupt, enhance, or impede the phenomenon (Gray, 1985). The first part of the definition emphasizes that CIS

¹ http://dictionary.reference.com/browse/context
activities are situated and therefore do not take place in isolation. The second part of the definition emphasizes the interactive and enactive nature of work and context.

2.1.2. How is Context Studied?

With the communities of Computer Supported Cooperative Work, Information Sciences and Organizational Studies, the notion of context varies in both meaning and importance. Dervin (2003), Dourish (2004), and Talja et al. (1999) have each discussed the different perspectives on and research approaches to context. Both Dourish and Talja group academic researchers’ views of context according to two distinct categories: the objectified or positivist view and the interpretative or phenomenological view (Dourish, 2004; Talja et al., 1999).

In their meta-analysis of information needs and seeking, Talja et al. (1999) found that the objectified/positivist view of context is more common than the interpretative or phenomenological view. In the objectified/positivist view, context is seen as a way to provide a background for the study of information behavior. One way of understanding the phenomena that is CIS is to define the activities as patterns of behavior; another way is to understand the activities as phenomena mediated by social and cultural meanings and values. A large proportion of current theory and research in CIS studies is located within the behaviorist framework, which has become so common that it is rarely seen as a paradigm (Talja et al., 1999). To this point, most studies of information seeking, sharing, and retrieval do not explicitly reference context and contextual factors and their impact on CIS phenomena. Rather, the effects of context and contextual factors on CIS are implicitly discussed as part of CIS practices, processes, or technology functionality (Dörner et al., 2007; Paul & Reddy, 2010; Saleh & Large, 2011; Shelby & Capra, 2011; Tamaru, Hasuike, & Tozaki, 2005).
However, the common view in CSCW is that context is not an independent entity that is separate from activities. Sharing this opinion, Dourish offers a third view of context: the interactional view. As posited by Dourish (2004), “context and content (or activity) cannot be separated. Context cannot be a stable, external description of the setting in which activity arises. Instead, it arises from and is sustained by the activity itself” (p.23). This is important because work practices (activity) evolve and adapt with new forms of action and meaning emerging from this process; thus, the context does as well.

Consequently, I believe that we must not only understand the work practices themselves, but also the evolution of those practices and the context surrounding them. For that reason, it is important to bring the study of context and contextual factors to the forefront of CIS research by explicitly studying and highlighting the ways in which practice and context are interactive, intertwined, embedded, ever changing, brought about, and acted out. This study represents my efforts to do just that. A move toward this interactional view of context would allow us to develop better policies, procedures, and technologies to support CIS work practices.

In summary, there are three perspectives on the study of context: the objectified, the interpretive, and the interactional views. The objectified view sees context as providing for the background for the study of information behavior, whereas the interpretive view sees context as social reality as opposed to a straightforward description of reality. The third view, interactional, is the view that I am taking for this research in order to move the study of collaborative information seeking forward. With this view as a guide, it is possible to further the study of collaborative information seeking activities by asking questions such as, “how and why, in the course of their interactions, do people achieve and maintain a mutual understanding of the context for their actions” while seeking, sharing, and retrieving information? (Dourish, 2004, p. 22)
2.2. Studies of Collaborative Information Seeking

Collaborative information seeking is an interdisciplinary phenomenon; research into which has been conducted by several academic communities in a variety of settings. Therefore, relevant work can be found in Information Science, Human–Computer Interaction, and Computer-Supported Cooperative Work. Domains that provide a setting for such research include healthcare, the military, higher education, and engineering. Further, definitions of collaborative information seeking vary by research community. Depending on the discipline, the definition emphasizes information handling, search and retrieval, storage, or the seeking and retrieving of information in support of collaborative work tasks.

As previously mentioned, studies of collaborative information seeking focus on how people search for information collaboratively from both an organizational work perspective and a technical perspective (Reddy & Spence, 2008; Shah & Gonzalez-Ibanez, 2010), where the distinction between these two streams is the nature of the phenomena being studied. Researchers in the technical stream examine how technologies can support CIS activities (Fu et al., 2004; Golovchinsky et al., 2009; Shah, 2010; Shah & Gonzalez-Ibanez, 2010), while researchers in the organizational stream study the activities and processes that take place during CIS as part of everyday work practices (Bruce et al., 2003; Hyldegård, 2006; Paul & Reddy, 2010).

Further, in some studies of collaborative information seeking, from both the organizational and the technical research perspectives, researchers consider context as an aspect of the research either explicitly (Dervin, 1998; Hyldegård, 2009; Talja, 2002; Zach, 2005) or implicitly (Alberts, 2007; Cabrera & Cabrera, 2005; Chen & Huang, 2007; Ehrlich, 2003; Goh, 2002; Greer et al., 1998; Joshi, Sarker, & Sarker, 2007; McDonald & Ackerman, 1998; Sveiby & Simons, 2002; Yang, 2007). Both types of studies of CIS (organizational and technical) and studies of context in CIS are discussed in the following sections.
2.2.1. Organizational Studies of Collaborative Information Seeking

Organizational studies focus on a wide variety of CIS practices in organizational contexts (Hertzum, 2008; Hyldegård, 2009; Poltrock et al., 2003; Sarcevic, 2009; Spence & Reddy, 2007). Several studies highlight the ways in which information is used and reused (Cabitza & Simone, 2009; Lutters & Ackerman, 2007; White & Lutters, 2007), whereas others emphasize expertise location during CIS activities (Ackerman, 1994; Ackerman & Malone, 1990; Dörner et al., 2007; Ehrlich et al., 2007; Greer et al., 1998; McDonald & Ackerman, 1998). And, still others have identified typical tasks and activities performed during collaborative information seeking (Paul & Reddy, 2010; Poltrock et al., 2003; Reddy & Spence, 2008; Saleh & Large, 2011; Shelby & Capra, 2011; Talja, 2002).

To date, organizational studies of collaborative information seeking have focused on the stages in the CIS process including triggers for CIS and the activities that take place during the collaborative seeking and sharing of information. Specifically, researchers have identified situations that trigger collaborative information seeking activities (Reddy, Jansen, & Spence, 2010; Reddy & Spence, 2008; Spence, Reddy, & Hall, 2005), team information needs (Reddy & Spence, 2006, 2008; Spence et al., 2005), team characteristics that affect CIS (Reddy et al., 2010; Spence & Reddy, 2007) and technological characteristics that support CIS (Reddy et al., 2010). Bringing result from many of these studies together, Reddy and Jansen developed a model of collaborative information behavior (CIB) that considers behavior, context, and the characteristics of the environment (Reddy & Jansen, 2008; Reddy et al., 2010). Several organizational studies of CIS are described next.

The University of Washington’s Collaborative Information Retrieval (CIR) project (Bruce et al., 2003; Fidel et al., 2000, 2004; Poltrock et al., 2003) placed an early emphasis on the conceptual understanding of collaborative information seeking. Their cognitive work analysis approach highlighted the important interactions that take place between team members as they
seek and retrieve information to complete their tasks. In examining the CIR activities of design teams at Boeing and Microsoft, the researchers found that team members collaborated when developing information seeking and retrieval strategies to address an information problem in the team. Their research revealed factors such as communication patterns and work activities that influence the need for information and for collaboration during information searching. Similarly, Hansen and Jarvelin (2005) discussed the CIS practices of information workers in patent offices. They found that workers’ awareness of each other’s work activities and tasks plays an important role in determining how successful an organization’s CIS activities are.

Highlighting the collaborative nature of the work task activities, Sonnenwald and Pierce’s (2000) study of information behavior in a hierarchical work environment (i.e., a military command and control) describes information seeking as a dynamic task activity in which “individuals must work together to seek, synthesize and disseminate information” (p. 462). They placed collaborative information seeking within the wider context of the group communication process. Sonnenwald and Pierce examined how team members maintained awareness of each other’s information activities and how this awareness influenced how they shared information with each other as they worked on completing tasks.

In addition, Hertzum’s (2008) study of collaborative information seeking emphasizes the need to conceptualize CIS in such a way as to avoid both individual and group reductionism, where the focus is either too heavily emphasized on the individual or the group leading to collaboration either being neglected or black-boxed. His solution is to define CIS as a combination of information seeking and collaborative grounding, which leads to information sharing among collaborative actors as a means to maintain a common understanding and grounding of the collaborative tasks that comprise their work.

In a longitudinal project involving two case studies, Hyldegård (2006, 2009) looked at extending Kuhlthau’s Information Search Process (ISB) model (Kuhlthau, 1991) in order to
address collaborative information seeking. Hyldegård examined the ability of the model to explain collaborative information behavior activities in an educational setting of student teams. According to Hyldegård, the complexity of academic team tasks and the problem solving needed to complete these tasks meant that it was necessary to extend the ISB model in order to support information seeking in a collaborative setting with complex tasks.

Focusing on temporality, Reddy and Dourish (2002) described the role that work rhythms played in team members’ CIS practices in an intensive care unit. The rhythms provided team members with information about each other’s work activities. Therefore, when team members understood the rhythms of the unit, they also knew when information was needed to complete a task. Also, in the medical domain, Forsythe, Buchanan, Osheroff and Miller (1992) examined the information needs of a patient care team’s work activities. They focused on the information seeking questions that these team members asked in an effort to move forward with their work tasks. In another study of an intensive care team, Gorman et al. (2000) observed how team members worked together to find and share needed information during the process of completing a task. They concluded that it was important for team members to consider different sources of information together in order to answer questions.

Lastly, Reddy and Spence (2008) identified a key component of collaborative information behavior activities when they defined a trigger as an external event in the environment that initiates CIB among a formal or informal group of people. For instance, the need to access and understand information that has multiple components in order to work on a task or solve a problem is a typical trigger; however, other triggers may also occur, such as lack of access to needed information and lack of domain expertise. Bringing together many of the findings from organizational studies on CIS, Reddy and Jansen (2008) presented a CIB framework that demonstrates the shift from individual information behavior to collaborative
information behavior incorporating the context of the task, information behavior, and characteristics of the environment (including task, interaction, and context).

2.2.2. Technical Studies on Collaborative Information Seeking

Many researchers are also exploring collaborative information seeking from a technical perspective in regard to how technology can be used to support the collaborative nature of information seeking, including such matters as interface design details and the specific functionality to be included. This includes design as it pertains to organizational memory, expertise recommender, knowledge management (KM) and collaborative information seeking and retrieval systems (Bandini, Colombo, Colombo, Sartori, & Simone, 2003; Cabitza & Simone, 2009; Ehrlich et al., 2007; Morris & Horvitz, 2007; Pipek & Wulf, 2003; Shah, 2010; Twidale, Nichols, & Paice, 1997).

In a study aimed at designing interfaces to support collaboration in information retrieval, Twidale and Nichols (1998) argued that support tools must provide a visualization of a search process that can be discussed and changed by users. In addition, they took the position that “information retrieval systems should acknowledge the existence of collaboration in the search process” (p. 177) and argued further that by collaborating users can learn how to use and better understand a given system. In the same vein, Krishnappa (2005) designed a collaborative information seeking and retrieval prototype: MUSE (Multi-User Search Engine). During the process of evaluating the prototype, Krishnappa found that MUSE’s collaborative features, specifically the chat function, played an important role in enhancing the information seeking and retrieval process for the collaborative work teams in her study. The use of a chat function by participants led to a better understanding of both the search process and the search findings.
Researchers have designed several systems to support information practices in collaborative environments, including Answer Garden (Ackerman & Malone, 1990), SmallBlue (Ehrlich et al., 2007), the Active Knowledge Artifact Management System (Cabitza & Simone, 2009) and Coagemento (Shah, 2010). These systems include functionality that supports information seeking, retrieval and sharing activities. These functions enable users to (1) automatically forward a question to a person with the expertise to answer it (Ackerman & Malone, 1990); (2) find experts including the location of that expert in the user’s social network (Ehrlich et al., 2007); and (3) combine archival documents with contextual information in order to promote workers’ summoning of knowledge when coordinating team activities (Cabitza & Simone, 2009).

Some systems, such as Ackerman’s Answer Garden (Ackerman & Malone, 1990), are organized around a subject area (customer service issues) consisting of a database of answers to questions, both frequent and rare. In addition, Answer Garden includes an important feature relating to process whereby if the user cannot find an answer or cannot find a satisfactory answer, the question is automatically forwarded to a subject matter expert. Once the question has been answered, it is both included in the database and sent to the person who asked the question originally. This system allows users to gather the information needed to solve a problem without having to seek out a collaborator or an expert. This is helpful to users who do not know where to find experts and for processes that do not support lengthy collaborations, such as customer service hot lines.

Other systems, such as Ehrlich’s SmallBlue (2007), use social networks to help users find experts with whom to collaborate. The tool not only enables users to see their own small, personal work-related networks, but also to see the network of all the experts in the organization. The user must first enter a search term, in response to which SmallBlue returns a list of people in the organization ranked according to the relevance of their expertise to the search term. Alternatively,
the user can enter a topic and see a list of the top 100 experts for that topic. Information seekers can quickly and easily find experts and see how they are socially connected to those experts before they reach out for assistance. In essence, this tool facilitates information seeking across broad topics in a large organization.

Coagmento, a browser add-on developed by Shah (2010), allows users to work on multi-session and/or multi-user projects using the Mozilla Firefox web browser. The system is a “combination of a browser plug-in, which includes a toolbar and a sidebar, and CSpace, an online collaborative space” (p.527). The system allows users to engage in several collaborative activities related to information seeking including collecting, sharing, and recommending webpages and researching and reusing information while also adding value to found information by tagging and adding notes. The CSpace online collaborative space provides users with a place for organizing the collected information and for compiling a report based on that research.

To date, a few commercial systems have implemented functionality to support some aspects of collaborative information retrieval. For example, the now defunct Netscape browser allowed team leaders to share their web pages with multiple users, and similarly Chat in Context by Enlista allowed users to browse and share information while chatting. In addition, IBM offers a number of products that allow colleagues, whether customers, business partners, or suppliers to collaborate. These products offer instant messaging, web conferencing and presence awareness, which is information about other users and their activities. In May of 2012, Microsoft released a revamped Bing search engine with social features called So.cl. This social search network allows users to share information and meet people with common interests. Users can share addresses for websites, and they can also share, comment on, and tag other people’s posts. Users can also host a “video party” that lets them incorporate videos into their chats.

3 http://isp.netscape.com/
4 http://download.cnet.com/Enlista/3000-2654_4-10256292.html
5 http://www.lotus.com/lotus/offering2.nsf/wdocs/rttc
6 http://www.bing.com/
Investigations into such collaborative information-seeking systems can provide us with a better understanding of what is required to design CIS systems to support collaborative work.

2.2.3. Studies of Context in Collaborative Information Seeking

Collaborative information seeking practices are deeply embedded in organizational work activities. These practices range from identifying who has the required information to determining how that information is shared across organizational boundaries. Individuals seek information and apply it to a problem or situation. However, contemporary work is increasingly complex as individuals must “make full use of their knowledge, skills, and abilities, continuously learn about new technologies and procedures (Kozlowski & Hults, 1986), and collaboratively share their knowledge and skills with their co-workers (Man & Lam, 2003)” (Zacher, Heusner, Schmitz, Zwierzanska, & Frese, 2010). This complexity of work has created a need for more teams in the workplace, as is made apparent by the emergence of project teams, focus groups, autonomous work groups, and multifunction work teams (Guzzo & Shea, 1992), teams that also seek, share, and use information to solve a shared problem (Hackman, 1990). In order to problem-solve effectively, team members must share and process information, jointly assess a given situation, work through ideas with each other in order to develop a useful solution, and monitor that solution (Oser, Gualtieri, Cannon-Bowers, & Salas, 1999). Additionally, many individual and team information practices are supported by a variety of technological systems that are in turn embedded in a specific work context.

As stated, many researchers studying collaborative information seeking focus on how people search for information collaboratively in order to (1) uncover and understand the activities and processes that take place during collaborative information seeking as part of everyday work practices (Hyldegaard, 2006; Lutters & Ackerman, 2002; Paul & Reddy, 2010; Prekop, 2002) and
(2) examine how technological systems can support CIS activities (Amershi & Morris, 2008; Blackwell, Stringer, Toye, & Rode, 2004; Fu et al., 2004; Golovchinsky et al., 2009; Shah, 2010; Shah & Gonzalez-Ibanez, 2010).

However, very few studies on collaborative information seeking explicitly consider how context impacts these activities and processes (Cho & Lee, 2008; Dervin, 1998, 2003; Hyldehgård, 2009; Miller & Jablin, 1991; Savolainen, 2006; Talja et al., 1999; Zach, 2005). One possible explanation is that research into collaborative information seeking is still nascent; therefore, researchers continue to lay the foundation for understanding the broad basics of the phenomenon, leaving deeper issues to future research. For example, collaboration, information seeking, and teamwork—all key aspects of collaborative information seeking—are complex processes that are difficult to dissect and unpack. As a result, researchers continue to study these phenomena in an attempt to model activities and behavior as only a few high-level models of collaborative information seeking/retrieval/behavior have been put forth thus far (Blake & Pratt, 2006; Evans & Chi, 2008; Reddy & Jansen, 2008; Reddy, Karunakaran, & Spence, under review).

Another explanation for the lack of research into how contextual factors might influence CIS activities has to do with the way that context is abstracted. Often times, “context is conceptualized, usually implicitly, as a kind of container in which the phenomenon resides” (Dervin, 2003, p. 112). At other times, “context is the carrier of meaning and research must be contextualized” (Dervin, 2003, p. 113). At one end of this continuum, “context is defined as chaos” (Dervin, 2003, p. 114)—as unmanageable. At the other end of this continuum, “context is defined as amorphous and fragile” (Dervin, 2003, p. 114)—as insubstantial. In either case, researchers seem to find directly studying the relationship between context and CIS activities to be extremely difficult.

However, some researchers examining information seeking have explicitly made context a focus of the research. For example, in her study of sensemaking, knowledge seeking, and use,
Dervin (1998) explained how the application of sensemaking to the design of information communication technologies (ICTs) must be not only responsive, iterative, and open, but it must also conceptualize “knowledge making and using” in a way that “unleashes sense making for the realities of human situation-facing” (p.44-45). Further, Zach (2005) used a contextual approach to studying the information seeking practices of senior arts administrators, whereas Hyldegård (2009) explored group members’ information behavior in context and found differences in information behavior compared to Kuhlthau’s ISP model (1991). These differences in information behavior were associated with contextual and social factors beyond the mere search process.

Further, in their field experiment Cho and Lee (2008) found that social context significantly constrained the flow of information across intercultural computer-mediated communication (CMC) groups. Their findings demonstrated significant influence of the social context on the emerging patterns of CMC interactions and how those constraints on interaction are socially rather than technologically imposed. While Savolainen (2006) highlighted the significant role of temporality as a contextual factor impacting information seeking by explicating three approaches to the temporal context of information seeking, specifically, temporal factors as attributes of situation and context, temporal factors as qualifiers of access to information and temporal factors as qualifiers of the information-seeking process.

What these and others studies have in common is that they represent “a move away from research that does not account for the here and the now (i.e., time and space) to research that does” (Dervin, 2003, p. 114). In essence, these studies take into account the situation or context in which the information seeking activities and make it a central “actor” in the study. This review of the literature shows that in examining collaborative information seeking, sharing, and retrieval activities, researchers have identified, even if implicitly, aspects of the context that impact CIS activities, including a collaborative culture (Chen & Huang, 2007), close working relationships
(Yang, 2007), and the organizational process of asking for help (McDonald & Ackerman, 1998) to name a few. I have organized these contextual factors into four categories: organizational, team, individual and technological. These factors and categories are discussed in the following sections.

### 2.2.3.1. Organizational, Team, and Individual Characteristics

Researchers who have studied how contextual factors might impact collaborative information seeking have highlighted aspects of the environment that impact CIS activities and processes in terms of organizational, team, and individual characteristics. For example, a collaborative culture (Chen & Huang, 2007; Ehrlich, 2003; Sveiby & Simons, 2002; Yang, 2007) not only fosters information sharing, but also enables information seekers to find and select information sources through trust, communication, and coordination. Additionally, close working relationships, which tend to give rise to spontaneous conversation among co-workers, provide a better medium for information and knowledge sharing than do formal meetings or social events (Yang, 2007). Further, according to Talja (2002) information sharing, whether it be “supersharing” or “nonsharing,” is affected “by factors other than individuals’ attitudes, attributes, and information seeking styles” instead it is affected by social and cultural factors within the context of the situation (p.146). For this reason, Talja suggests that researchers “distinguish between the different goals, purposes, and tasks accomplished by information sharing practices in different contexts” (p.146).

How people seek information is affected by many contextual factors including organizational, team, and individual characteristics. For example, identifying experts is not sufficient to find information; i.e., the information seeker must also select an expert from among those so identified. However, certain contextual factors can influence this selection process:
• The organizational process of asking for help: an individual first asks team members for information, and then goes outside to other departments (McDonald & Ackerman, 1998);

• The personal characteristics of each expert including his/her general helpfulness, general knowledgeability, overall willingness to help, history of helpfulness (Greer et al., 1998), and reputation with regard to skills, interests and credentials, as well as credibility (Ehrlich, 2003);

• The workload and performance of the expert (McDonald & Ackerman, 1998). The performance of the expert is particularly interesting, as it includes specific individual characteristics such as attitude, the ability to comprehend problems, and the ability to provide a useful explanation; and

• The accessibility of the expert including practical accessibility (availability and preferred method of contact), organizational accessibility (the extent to which organizational barriers prevent or inhibit contact with the expert) and functional accessibility (the value of the conversation with regard to success including elements of communication style such as timeliness, complexity of response, etc.) (Ehrlich, 2003).

The contextual factors highlighted above affect the CIS practice of selecting an expert with whom to collaborate. Other researchers have also studied the challenges of information seeking in teams and found specific contextual factors around teams that affect these work practices. The working environment of the team includes several contextual factors that can impact CIS activities; therefore, it is important to identify the key components of the context in which the team functions including “characteristics of the group members, the settings in which they operate, the type of problems they encounter and the range of solutions or outcomes they will accept (Taylor, 1986)” (Zach, 2005, p. 24). For example, Alberts (2007) found that team member support, as an aspect of team function, is very important to managing information in teams as it requires team members to help each other find, share, and evaluate information. In
addition, characteristics of the team members themselves affect processes such as information seeking and sharing. Specifically, the reliability, objectivity, capability, credibility, trust in the source and degree of communication of an information source in a team will determine the extent to which information is sought and shared (Joshi et al., 2007; Zach, 2005).

Several organizational characteristics have also been found to impact collaborative information seeking activities. For example, cross-training individuals in order to establish a shared understanding of tasks, skills, and procedures has been found to facilitate information and knowledge sharing (Cabrera & Cabrera, 2005). Further, Goh (2002) and Zach (2005) highlight the need to consider key organizational factors likely to enable or hinder knowledge transfer and information sharing. These organizational factors include time and budgetary limitations; leadership serving as role models by modeling a culture of information sharing; encouragement of problem-solving/seeking behaviors in order to drive an information-sharing culture; and structures to facilitate information sharing, such as seamless technology that supports horizontal communication and employee training on technology, problem-solving, and group interactions.

2.2.3.2. Technological Characteristics

Many researchers have studied the impact of technological characteristics on collaborative information seeking activities and processes. Huysman and Wulf (2006) discuss the ways in which information sharing tools such as knowledge management systems (KMS) are meant to support “informal emergent knowledge sharing within communities” (p.40). They point out that such systems must take into account social factors such as the social capital of the group itself in order to be successfully adopted by users. Not only are contextual factors important to the design of KM/CIS systems, the functions of the system itself can affect system use and acceptance. For example, certain elements of cross-organizational memory and expertise
recommender systems are important for the success of these systems—particularly, the inclusion of personal and location information, methods of establishing trust, and a flexible ontology built using methods of social tagging (White & Lutters, 2007).

CSCW researchers also highlight contextual factors that impact how individuals identify the “experts” with whom to collaboratively seek information. One CIS practice includes the use of an “expertise concierge,” a person within the organization who can direct an individual to the person with the required information (McDonald & Ackerman, 1998). Another CIS approach is to first learn the competencies of others using an “expertise awareness client” such as eXacT (Dörner et al., 2007). This “intelligent” awareness system is integrated into an organization’s groupware and offers its users’ notifications of others’ competencies based on their use of existing organizational systems. Without both a collaborative culture and technology to support such a culture, it would be difficult to find collaborators with whom to seek information.

Information that is codified and included in a technological support system comes from individuals within the organization, and others then look for that information and access it as needed. The information seeker may have multiple sources of information from which to choose. Therefore, the characteristics of a system’s sources can affect how the information in these systems is accessed. For example, the capability and credibility of an expert together with level of communication affects the extent to which information is transferred using the system (Ackerman, 1994). The more capable, credible, and communicatively literate an expert, the more likely it is that information seekers will address questions to that expert and the more successfully information is transferred.
2.3. Chapter Summary

2.3.1. Limitations of Research to Date

Though many of these studies and models pertaining to CIS implicitly include contextual factors affecting the collaborative information seeking activities of knowledge workers (Ju & Pawlowski, 2011), context is not their focus (Goggins & Lewis, 2010). Instead, these studies underscore how individuals in a collaborative setting seek, retrieve, and share information, rather than how contextual structures and policies might affect these activities. This is acutely problematic in settings where teams and teamwork are an essential aspect of organizational work, as it is in IT teams in healthcare.

It is important that we not only study CIS processes and activities but also the context in which they take place. Such an understanding would contribute to better processes, policies, and technologies intended to foster collaborative information seeking. From the analysis of the research on collaborative information seeking, I have identified two significant gaps as related to context. First, research on contextual factors as they affect collaborative information seeking is limited. Second, there is a lack of understanding on the impact of contextual factors on collaborative information seeking. To address these gaps, this research study focuses on contextual factors and their impact on collaborative information seeking.

2.3.2. Addressing the Limitations of Research to Date

The literature does include studies that highlight contextual factors and their impact on collaborative information seeking activities (Dervin, 2003; Hyldegård, 2009; Talja et al., 1999; Zach, 2005). However, this research is limited and there is still a lack of understanding of a larger range of contextual factors that might affect CIS activities. I address this research gap by
answering my first research question (RQ1: What contextual factors impact CIS practices?), by identifying the contextual factors that can impact CIS practices that are central to organizational work in dynamic team contexts.

Further, although there are studies on the influence of contextual factors on collaborative information seeking activities (Alberts, 2007; Dörner et al., 2007; Sveiby & Simons, 2002; Yang, 2007), there is still a need to investigate more deeply into how contextual factors impact CIS practices. This lack of understanding adversely affects the ability of time-critical organizations (such as those in healthcare) to rapidly respond to problems by undermining such an organization’s ability to meet its information needs. The answer to my second research question (RQ2: How do these contextual factors impact CIS practices?) will help develop this understanding.
Chapter 3. Study Design and Methodology

In this chapter, I provide details about the research methodology used in the study. This includes a discussion of the rationale governing my decision to use a qualitative methodology and the sites I selected. It also includes a description of the methods used respectively to collect the data, to perform the analysis, and to establish the validity and reliability of the study.

3.1. Research Approach

Qualitative methods are widely used in a variety of settings (Hyldegård, 2009; Lutters & Ackerman, 2007; White & Lutters, 2007). In the context of the present study, it is particularly important to note that such methods allow for a situated, in-depth evaluation of the IT department’s collaborative information-seeking practices: that is, they are well-suited to a study focused on the details and complexities of interactions between people, technologies, and organizational structures (Morgan & Smircich, 1980). In this study, I employed qualitative methods for data collection for the following reasons:

- The phenomenon under study, contextual factors affecting collaborative information seeking practices, is nascent and poorly understood. Further, the nature of my research is open-ended, because my research goal is to identify and understand the contextual factors that affect collaborative information seeking and CIS. Additionally, I do not have any a priori research hypotheses as I would like findings to be derived from the data. In such cases, Edmondson and McManus (2007) suggest that any given phenomenon be explored using qualitative methods, as these allow the researcher to identify the general themes and iteratively refine them and thereby produce concrete theoretical ideas.
• The natural setting, i.e., information-rich setting, diverse workers, highly collaborative, of the study played an important role in my choice of method. In this study, I view collaborative information seeking as a social activity, embedded in the context of everyday work. CIS activities are interactive because they arise from exchanges between team members. Qualitative methods are a good choice because they allow researchers to capture the factors related to the intricate and dynamic nature of the work, the processes, and the patterns of interactions involving several components including people, artifacts, and organizational structures (Miles & Huberman, 1994). It was on this basis that I chose qualitative methods in accord with my purpose of gaining a deeper conceptual understanding of CIS by studying these interactions in a natural setting.

• Further, qualitative research methods allow for an in-depth and thick description of a phenomenon, getting beyond what the participants want to share by identifying what they actually do share but do not directly articulate.

Using the research questions as a foundation, I established and followed a research approach based on Lincoln and Guba’s ten elements of naturalist inquiry (Lincoln & Guba, 1985a).

1. Determine a focus for the inquiry;
2. Determine fit of paradigm to focus;
3. Determine fit of inquiry paradigm to theory selected to guide the inquiry (if applicable);
4. Determine where and from whom data will be collected;
5. Determine successive phases of the inquiry;
6. Determine instrumentation;
7. Plan data collection and recording;
8. Plan data analysis procedures;
9. Plan for logistics; and

3.2. Research Site Selection

The selection of a research site(s) is a crucial step in field study research. According to Lofland and Lofland (1995), the researcher, when evaluating sites for qualitative data collection, should select a site that allows for a number of purposes to be fulfilled. That is, the site should allow the researcher to:

- collect the richest possible data,
- become intimately familiar with the setting, and
- engage in face-to-face interactions in order to become well-acquainted with the participants.

In evaluating potential research sites, I used these criteria as a basis for my search and subsequent decision making. Furthermore, because I am interested in examining contextual factors that impact collaborative information seeking in the everyday work of teams, I needed sites where the work was characterized by strong collaborative aspects. After examining various sites, I selected the information technology departments at the Regional Health System and the Teaching Medical Center (pseudonyms). I use pseudonyms in place of hospital names in order to provide anonymity and confidentiality to study participants.

The Regional Health System is an integrated health system that provides healthcare services to patients throughout central Pennsylvania. It has a total of 228 licensed acute beds and 22 bassinets and 138 long-term care beds in the Skilled Nursing Unit. The organization admits more than 13,000 patients annually, and performs more than 7,500 outpatient surgeries and more than 4,400 inpatient surgeries each year. The Teaching Medical Center is an integrated medical center that includes not only state-of-the-art hospital facilities, but a children’s hospital, a cancer
center and a medical school advancing medical through practice and research. It has a total of 494 licensed beds, admits more than 29,000 patients annually, performs more than 27,000 surgical procedures annually and has over 61,000 emergency room as well as 882,000 clinic visits per year.

The IT departments of these hospitals not only met Lofland and Lofland’s (1995) criteria, but also met the additional criteria of my own:

- Information-rich setting: The IT department is an information-rich environment. It has a wide range of information resources that departmental staff access on an ongoing basis. Information permeates and is central to the work in the department. It is stored in multiple sources and forms but must often be found quickly because IT issues must be solved in a timely way, as the proper functioning of the technologies it supports are crucial to patient care.

- Diverse workers: The IT department has a wide variety of workers—integration specialists, software analysts, PC technicians, database specialists, network administrators, managers, etc.—each with specific domain knowledge. Even within a single team, members may have diverse expertise. For instance, the software analysts in the IT department have expertise in technologies and areas ranging from pharmacy to lab orders. In addition to differing domains of expertise, there are also various levels of expertise e.g. novice, advanced beginner, competent, proficient, expert or master (Dreyfus, 2004).

- Highly collaborative: Because of the complex nature of information and communication technologies, software analysts, data specialists, and hardware technicians must continuously collaborate on and coordinate their work to ensure that the information and communication technologies are maintained, supported, and thus in good working order at all times.
The richness of the work settings in the two IT departments selected for this study provided me with the opportunity to explore in full detail the collaborative information-seeking activities of the IT professionals.

3.3. Immersion in the Field

The use of ethnographic data collection methods requires an “immersion” in the field in order to understand the experiences and practices of the participants (Seale, Gobo, Gubrium, & Silverman, 2004). However, certain challenges arise with qualitative research including gaining access to the sites and ensuring that participants feel comfortable with the researcher.

3.3.1. Access to Sites

In conducting qualitative research, a researcher may not find it easy to get access to the study sites. At the primary, the Regional Health System, the IT administrative director afforded me unlimited access to the four IT teams (Clinical Software Services, Financial Software Services, Network Services, and the Customer Service Center). The IT administrative director introduced me to other top-level administrators and directors in the IT department who, in turn, introduced me to their staff. Each director walked me around the office to meet their respective teams, to explain my research study, and to explain what I would be doing in the office. The directors also set up preliminary interviews with key members of their teams.

In order to gain access to the second research site, Teaching Medical Center, I worked with one of the directors of information technology who introduced me to the chief information officer of the Teaching Medical Center and to the other IT directors. I attended one of their weekly administrative meetings where I explained my research objectives and asked for access to
observe, shadow, and interview their staff. With the support of the CIO, I gained unlimited access to several IT teams including Clinical Information Systems, Customer Service Delivery, Production Control/Operations and the Technical Support Center. Each IT director introduced me to his/her staff and explained my research and request to observe the staff as they worked.

3.3.2. Learning the Basics

In order to understand the work of the IT department, I spent the first few months at each site following individual IT team members (shadowing), alternating between teams. This afforded me an understanding of the terminology, general process flow, and responsibilities of the respective teams and team members.

Through the time I spent shadowing the teams, which included one-on-one interactions, the IT staff became comfortable with me such that we built some rapport and a level of trust. During the initial stage of my data collection at each site, the team members felt uncomfortable with me recording details about their actions. They were under the impression that their work was being evaluated. However, when I explained to each team member that the purpose of my observations was to better understand if and how contextual factors impact collaborative information seeking practices, they relaxed and became open to my questions. After the first month, they started to involve me in some of their social activities such as going out to lunch. I also helped the IT staff solve some of their client issues, suggested resources they might find useful, and fetched other team members when the team was particularly busy.
3.4. Data Collection

I focused my data collection on gathering evidence about contextual factors impacting collaborative information seeking activities in and across teams. At each site, I collected multiple forms of evidence from several sources. Typical data sources included collecting artifacts, conducting interviews, and making direct observations (Stake, 1995; Yin, 2003).

Preliminary data collection took place at the Regional Health System where I spent over 250 person-hours observing the IT department, interviewing personnel and collecting artifacts. I also distributed a brief, demographic survey at the end of my observational period to better understand the participants’ perspective on collaborative information seeking in team settings. The observations and interviews yielded more than 400 pages of transcribed field notes and interviews for analysis. Secondary data collection took place at Teaching Medical Center where another 240 person-hours were spent observing and interviewing IT staff members and collecting organizational artifacts. Secondary data collection yielded another 175 pages of transcribed field notes and interviews for analysis. See Table 3-1 for more details about the data collection methods.

Table 3-1. Data Collection Methods.

<table>
<thead>
<tr>
<th>Site</th>
<th>Method</th>
<th>Time/Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional Health System</td>
<td>Observations</td>
<td>18 months, ~ 250 hours</td>
</tr>
<tr>
<td></td>
<td>Meetings</td>
<td>15 meetings</td>
</tr>
<tr>
<td></td>
<td>Interviews</td>
<td>15 interviews</td>
</tr>
<tr>
<td></td>
<td>Artifacts</td>
<td>26 documents</td>
</tr>
<tr>
<td></td>
<td>Survey</td>
<td>39 complete responses</td>
</tr>
<tr>
<td>Teaching Medical Center</td>
<td>Observations</td>
<td>12 months, ~ 240 hours</td>
</tr>
<tr>
<td></td>
<td>Meetings</td>
<td>31 meetings</td>
</tr>
<tr>
<td></td>
<td>Interviews</td>
<td>3 interviews</td>
</tr>
<tr>
<td></td>
<td>Artifacts</td>
<td>17 documents</td>
</tr>
</tbody>
</table>
3.4.1. General Observations

As observing a group in a natural setting is a key aspect of qualitative research, I employed observational techniques to gain a better understanding of each group’s work practices and interactions (Lofland & Lofland, 1995). Employing observational techniques proved useful for a number of reasons. The observations allowed me to examine, first-hand, the work practices and processes in the IT departments. Additionally, I was able to capture unanticipated and non-routine events that arose during those work activities. Lastly, observational techniques allowed me to investigate not just collaborative information seeking, but also the activities involved in this process and the contextual factors surrounding it, which provided further details and insights pertaining to the central topic of my research (Denzin & Lincoln, 1994).

The focus of this study was to provide insight into the contextual factors impacting the collaborative information-seeking practices of the IT staff. Therefore, I employed general observations to gain an understanding of the following:

- The processes participants followed to complete their tasks and solve client issues, including how the team members interacted each with other, with the technologies, and with the artifacts;
- What prompts collaboration with regard to information seeking between IT staff members;
- The details of collaborative work within and between teams in the IT department;
- The ways the IT staff members collaborated with each other; and
- The role of artifacts and technology in collaborative information-seeking activities within and across teams in the IT department.

Even though collaborative information-seeking practices in a team setting constituted the focus of this study, during initial observations I paid attention to individual team members as they carried out their work. This allowed me to gain a sense of the roles and responsibilities of various
actors in the IT department. Later in the study, I placed more emphasis on observations relating directly to collaborative information seeking.

I conducted observations by standing in areas of the IT department where the key activities of each team took place. These areas included each team’s cubicle offices, the front desk of the IT department, the break rooms, the meeting rooms, and the training rooms. During observations, I took notes using a notebook and pen and sometimes also audio taped conversations. These small, unobtrusive tools made it easy for me to take notes as I moved around each department. I later transcribed my notes and audio files into electronic documents.

During my observations, I made notes about how the team members engaged in issue resolution activities such as information confirmation, problem verification, and information gathering. I also made notes about their software configuration activities such as gathering client specifications, software editing, testing, and troubleshooting. I also noted interactions between teams and with outside specialists and their interactions with various technologies.

Through my observations, I gained an understanding of how the teams in the IT department work, the kinds of issue resolution, software configuration activities they perform, the main actors involved in the issue resolution process, collaborative information seeking, retrieving and sharing practices, and the challenges they faced during issue resolution. For example, I observed an interesting event that affected issue resolution. An analyst on the network services team at the Regional Health System was given an issue to resolve. He was told that users of the NextGen software were logging into the software multiple times on different devices and that existing log ins were not being “killed”—a situation that was leading to printing issues. The analyst conferred with three other IT team members to discuss probable causes and potential solutions. After several discussions, scenarios tested and hypotheses rejected, they called the analyst on the Clinical Software Services team responsible for NextGen to confirm the issues reported that day. The clinical analysts offered a clarification, stating that the issue was not that
the users were connecting to the software on many devices simultaneously, but that the users could not connect to the software on many devices simultaneously. When users who were already logged in, logged in again on another device, they were “kicked off” the initial device. The lack of communication about the issue led the network services team to initially attempt to solve a problem that did not exist.

As part of my general observations, I also attended formal and informal meetings in each of the focal departments. For example, the administrative director of IT software support meets with analysts from both the Clinical Software Services team and the Financial Software Services team on a regular basis. At these meetings, information pertaining to hospital and department policies, procedures, and standards is disseminated. In addition, staff concerns and issues are discussed. These meetings were useful to me in that they provided a way to better understand the function of the IT department as a whole. During these meetings, I observed discussions about persistent and cross-team issues. For example, the discussions focused on obstacles to resolving the issues, outstanding information about the issues, etc. Often times, the directors of the teams were asked to remove these obstacles and/or to provide assistance in moving the process forward.

3.4.2. Informal Interviews

Observation alone often cannot provide enough detail about a situation or activity as it takes place. In these cases, informal interviews are useful in providing more information in regard to the context of and the background for an activity or decision. Therefore, during observations, after the fact I often asked the participants questions in order to learn more about what I had just observed. For instance, when I noted one side of a telephone conversation, I waited until the participant had hung up the phone to ask questions such as: Who were you talking to? Why did you call that person in particular? What will you do with this information? These “interviews”
often took the form of informal chats with participants as they worked. I noted the answers to my questions, as well as any additional information participants provided about their work. I recorded these informal interviews initially as field notes and later transcribed them using a word-processing program.

3.4.3. Shadowing

Shadowing techniques require a researcher to closely follow a participant over an extended period of time in order to learn to “become the other” (Anzul, Ely, Freidman, Garner, & McCormack-Steinmetz, 1991). Compared to the process of making general observations, shadowing is more focused on collecting data about a single participant, focusing on activities performed by that participant. For example, a researcher can capture data on the participant’s use of artifacts, the locations the participant visited, the time the participant spent on each activity, and the names of people the participant talked with, etc. (Anzul et al., 1991).

Shadowing not only afforded me an understanding of specific roles in the IT department (such as analyst or technician), it also provided insight into how the people in these roles intersected with each other. For instance, at the Regional Health System, I frequently shadowed the on-call IT Clinical Software Services analyst because this analyst was responsible for resolving all new clinical IT issues that arose. Additionally, the on-call IT Clinical Software Services analyst interacted with various other actors while attempting to resolve these issues.

A typical shadowing session with an on-call IT Clinical Software Services analyst followed this pattern: It would begin with the analyst reviewing all the new issues assigned via the HEAT customer service and support software. The analysts would review the list of new issues, contact the clients individually to discuss each issue in more depth, and then attempt to resolve each issue. Sometimes the issues could be resolved quickly while talking to the client.
Some of the issues were well known and/or occurred frequently. In these cases, the analyst would draw on his/her prior knowledge of the issue to walk the client through to resolution.

Other issues, however, were uncommon and/or complex, such that collaboration amongst team members was necessary. In such cases, a pattern emerged: First, the analyst would try to understand the problem by re-creating it in the software and viewing the actual error. During the issue resolution process, the analyst would frequently talk with other analysts not only to find the needed information but to request help in analyzing what was already known in order to determine next steps, information needs, or to further troubleshoot the problem. Next, the analyst would work closely with other analysts to test different resolution scenarios. Once a solution was found, the analyst would contact the client to discuss the solution and confirm that the issue had indeed been resolved. I would follow the analyst through this process and observe her activities and interactions with others.

3.4.4. Interviews

I used semi-structured interviews to collect data on the roles, responsibilities, goals, and collaborative behaviors of the participants in the IT department. Interviews were also useful in obtaining the perspectives of the participants in the research study. These interviews provided deep insights into the implicit work practices that may be relevant to understanding collaborative information-seeking activities and the contextual factors impacting those activities. The interviews were guided conversations, during which I asked broad questions and new questions that arose during the discussion (Preece, Rogers, & Sharp, 2002). I audio-taped the interviews and later transcribed them.

Initial formal interviews were conducted to obtain participants’ perspectives on collaborative information seeking, information sharing, and respective challenges associated with
these processes. The interview questions focused on two areas: (i) why and how collaboration takes place as part of information seeking and (ii) how technology is used during the process. The formal interviews were semi-structured, allowing participants to discuss issues relevant to information seeking and sharing. First, a few background questions were posed, followed by questions relevant to information seeking and sharing related to specific themes such as the sources used, triggers to collaboration, challenges to the process, and technologies used during the process. The formal interviews were audio recorded. I obtained oral permission from each person to audio record the interviews.

I conducted secondary formal interviews to obtain more details about collaborative information seeking and sharing. The interview questions were based on months of observations regarding collaborative information seeking. The questions focused on the participants in regard to their understanding of collaborative information seeking and sharing, their motivations for these activities, and why and how they used technology during these activities. Again, the formal interviews were semi-structured, and they were audio recorded with the oral permission of the participant.

At the Regional Health System, I performed both types of interviews. Initial interviews were performed at the beginning of the project and another set of secondary interviews were performed one year later. Appendix A presents the interview protocol for the initial interview, and Appendix B presents the interview protocol for the secondary interview. The initial formal interviews were conducted with fifteen IT department staff, and each interview lasted between 20 and 60 minutes. The secondary formal interviews were conducted with six IT department staff members, with each interview lasting between 20 and 30 minutes. At the Teaching Medical Center, three initial interviews were performed in order to compare the two sites in regard to the roles, responsibilities, and work activities of the respective employees. Each interview lasted between 20 and 60 minutes. See Table 3-2 for details regarding interviewees.
Table 3-2. Formal Interviews.

<table>
<thead>
<tr>
<th>Site</th>
<th>Type of Interview</th>
<th>Interviewee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional Health System</td>
<td>Initial formal</td>
<td>Admin director of NW services</td>
</tr>
<tr>
<td></td>
<td>interview</td>
<td>Clinical Software Services analyst</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Financial Software Services analyst</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IT integration specialist</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Customer service representative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Director of Clinical Software Svcs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Director of the CSC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Director of Financial Software Svcs PM</td>
</tr>
<tr>
<td>Regional Health System</td>
<td>Secondary formal</td>
<td>Director of the CSC</td>
</tr>
<tr>
<td></td>
<td>interview</td>
<td>Financial Software Svcs PM PC technician (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Telecom specialist</td>
</tr>
<tr>
<td>Teaching Medical Center</td>
<td>Initial formal</td>
<td>Manager</td>
</tr>
<tr>
<td></td>
<td>interview</td>
<td>Team leaders (2)</td>
</tr>
</tbody>
</table>

3.4.5. Artifact Collection

Artifact identification plays an important role in the data collection process. By identifying artifacts embedded in work practices, I gained an understanding of the role the artifact plays in supporting work activities. Further, having access to formal documentation including procedures, standards, internal communications, organizational charts, flowcharts, job summaries, and performance appraisals allows for an understanding of how day-to-day work differs from documented procedures, because in qualitative research, the researcher is interested in “everyday practices rather than the idealized account” (Preece et al., 2002).

At both sites, during other forms of data collection such as general observation and shadowing, I routinely came across various artifacts being used in the IT department, specifically forms and paperwork for various processes. I collected these artifacts and asked the participants questions regarding them in order to better understand how the artifacts were being used. Among the artifacts used for information sharing within and across teams were the IT Computer Access Form (CAF), the IT Report Request Form, and the Network Services IT Job Status Form.
Procedural documents such as job descriptions, organizational charts, and information relating to a ticket flow process were also collected and reviewed.

3.4.6. Survey

To support and validate the empirical evidence found using qualitative methods, I employed a short survey at Regional Health System. The members of the IT department were emailed a request to participate in the survey, which included an email link to an online survey.

The survey instrument consisted of 28 questions, including an administrative human subjects agreement, demographic questions, an open ended question for comments, and a question regarding a follow-up interview. The remaining 22 questions dealt with aspects of collaborative information seeking divided into the following sections with number of questions in each section: sources (1), motivation (3), role (4), technology (6), and context (8). The survey was estimated to take approximately 15 minutes to complete. Appendix C includes the survey consent form and introduction as well as the survey protocol itself.

Sixty members of the IT department received the email request to participate in the survey. Of those 60, there were 51 respondents to the survey (85% response rate) with 39 surveys being completed (65%), so I believe that our instrument has good internal credibility. Of the respondents, 62% were male and 28% were female. Respondents were from all six teams within the Regional Health System IT department, specifically Network Services (32.6%), Clinical Software Services (20.4%), Financial Software Services (16.3%), Management (16.3%), and Customer Support Center (14.3%). The median age was 35 – 49 years (55.1%).
3.5. **Data Analysis**

Throughout the field study, I iteratively performed data collection and analysis using a theoretical sampling technique (Charmaz, 2006). As I analyzed the data, themes emerged, and in this way I was able to identify gaps in my data and to consider additional questions to ask in further data collection efforts. Because of the exploratory nature of the present research, I used an interpretive analysis approach (Charmaz, 2006; Creswell, 1997; Lofland & Lofland, 1995; Walsham, 1995) to analyze the data. I performed the analysis by closely reviewing the transcripts of the individual interviews and the field notes using the steps explained in next section. I performed the coding using NVivo7 software. Teams were the unit of analysis, specifically focusing on episodes of collaborative information seeking, where a CIS episode is instance chain of events or sequence of steps where two or more people come together to identify and resolve a shared information need (Poltrock et al., 2003).

3.5.1. **Interpretive Analysis Approach**

Interpretive methods are well suited to analyzing data collected from multiple sources and drawing on multiple perspectives. The underlying assumption of interpretive methods is that scientific knowledge of reality is a social construction by human actors (Walsham, 1995) and that a deep understanding of social phenomena can only occur from real-world observations. It is an approach for analyzing qualitative data that foregrounds the data and helps create an evolving hypothesis through systematic data coding, as opposed to imposing a hypothesis upon evidence. In the course of this coding, patterns become visible that subsequently give rise to hypotheses. In turn, these hypotheses are strengthened or dismissed via further coding of the data and, in some cases, through additional data collection. The strength of using an interpretive approach lies in the interaction between the data collection and the coding. The coding is a continual process that
occurs not at the end of the data collection but during it: categories (e.g., themes) emerge from the data and are strengthened, modified, or discarded as more data is collected (Creswell, 1997; Lofland & Lofland, 1995).

3.5.2. Coding the Data

Once the field notes and interviews were transcribed, the triangulated data was analyzed. The first step in the coding process was to identify episodes of collaborative information seeking. Using the definition of CIS as a guide, I coded all episodes of CIS by hand using pen, paper, highlighters and post-it notes. Each episode was bound at the onset by an information need/CIS trigger, using known triggers from other CIS studies (Reddy et al., under review; Reddy & Spence, 2006, 2008), and on the outset by either finding or not finding the needed information.

Once episodes of CIS were identified, I engaged in initial or open coding during which concepts were uncovered, named, and developed by analyzing the data and exposing relevant ideas and meaning (Charmaz, 2006). To do this, the data were analyzed paragraph by paragraph, and at times, line by line, and even word by word, to identify concepts and categories, and their properties. I particularly focused on characteristics of the environment or context, CIS practices and information needs. The next step in the coding process was focused or axial coding that required me to reassemble the data, which had been segmented during open coding. The purpose of this focused coding was to systematically develop initial hypotheses about categories, particularly about relationships between categories (Charmaz, 2006). The final step in the coding process was selective coding, during which I performed further analyses to strengthen or dismiss these initial hypotheses and identified core categories (Miles & Huberman, 1994). In addition, I reviewed the literature again once my hypotheses were formed and strengthened as sources for
comparative analysis. This allowed me to organize the core categories such that I could leverage
the frameworks and models of other researchers who have studied contextual factors.

Due to the voluminous nature of the data requiring analysis, I initially performed the
coding manually and then I used NVivo7 software. Through the manual coding, I developed an
overview of the data, and through the NVivo7 coding, I analyzed recurring themes and patterns of
behavior across the data recorded in multiple documents. Table 3-3 provides an overview of some
of the codes developed in the analysis with respect to research question RQ1.

Table 3-3. Examples of Analytic Codes.

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Open Code</th>
<th>Axial Code (Contextual Factor)</th>
<th>Selective Code (Category of Contextual Factors)</th>
</tr>
</thead>
<tbody>
<tr>
<td>What contextual factors impact CIS practices?</td>
<td>Need for complementary expertise</td>
<td>Cross-team communication</td>
<td>Organizational characteristics</td>
</tr>
<tr>
<td>What contextual factors impact CIS practices?</td>
<td>Complex data issues</td>
<td>Integrated systems</td>
<td>Organizational characteristics</td>
</tr>
</tbody>
</table>

3.5.3. Qualitative Software

Software is useful in assisting with manual data analysis. The software program I used to
help me in the coding process was NVivo7 developed by Qualitative Solutions and Research
(QSR). All the data and artifacts were imported into the software as documents with a rich
description of their use and contents. Then, as I manually reviewed and compared the data and as
categories emerged, I created nodes in the software and “coded” the text on the respective
node(s). This allowed me to easily compare text coded on the same node and across nodes. As my
analysis progressed, I documented memos within the software of emerging hypotheses at both the

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7 Qualitative Solutions and Research (QSR International), Doncaster, Australia, copyright © 2008,
www.qsrinternatinal.com
document and node level. As hypotheses were tested and strengthened, I modified the nodes (ordered, combined, collapsed). The software allowed this functionality without any loss of coding.

3.5.4. Further Data Analysis

Once the data was coded and categorized, I further analyzed the data to understand the relationships between contextual factors, CIS practices, and impact on the outcome. To do this, I reassembled the data in two different ways. First, I organized the data by impact and then by contextual factor(s). Second, I organized the data by CIS practice(s), then by impact, and then by contextual factor(s). Next, I used pivot tables to analyze the data. This analysis uncovered certain prevalent contextual factors as well as a correlation between factors impacting episodes of CIS. The outcome of this analysis is presented in chapter 5, Findings, of this dissertation.

3.6. Validity and Reliability

The trustworthiness of a research study is often discussed in terms of its validity and reliability. Further, a research study must be both internally and externally valid. Therefore, this study used several methods to increase the validity and reliability of its findings. First, in order to strengthen the internal validity of the research findings, I performed both triangulation and member checking (Lincoln & Guba, 1985b) of the data. Second, to ensure external validity, I collected enough data to provide a thick description of the nuances of the context and the assumptions of the research study (Erlandson, Harris, Skipper, & Allen, 1993). Third, to increase reliability, I used two case study tactics suggested by Yin, a research project protocol and a
research project database (Yin, 2002). These tactics for validity and reliability are detailed in Table 3-4.

Table 3-4. Tactics for Validity and Reliability.

<table>
<thead>
<tr>
<th>Test</th>
<th>Tactic</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal validity</td>
<td>Triangulation</td>
<td>Multiple methods to collect data on the same research topic from multiple sources</td>
</tr>
<tr>
<td></td>
<td>Member checking</td>
<td>Test data collected with those from whom the data were originally obtained</td>
</tr>
<tr>
<td>External validity</td>
<td>Thick descriptions</td>
<td>Thorough details of the data collected and analysis allows an individual to check for appropriateness of findings in other settings</td>
</tr>
<tr>
<td>Reliability</td>
<td>Research project protocols</td>
<td>Protocols guide the research and provide a way to maintain the “chain of evidence,” allowing another individual to examine in detail the data and follow the logic of the analysis</td>
</tr>
<tr>
<td></td>
<td>Research project database</td>
<td></td>
</tr>
</tbody>
</table>

3.6.1. Internal Validity

To render the research findings internally valid, I triangulated and member checked (Lincoln & Guba, 1985b) the data. Triangulation is the collection of data on the same research topic from multiple sources using multiple data collection methods (Lincoln & Guba, 1985b). The data sources used were interview transcripts, observation transcripts, and artifacts collected. The data collection methods used herein are described in the Data Collection section of this chapter. These sources and collection methods were used in conjunction with each other to ensure robustness of the data collected.

Member checking, used to test data collected with members of those groups from whom the data were originally obtained, was also used for internal validity (Lincoln & Guba, 1985b). This allowed me to confirm with participants that the data collected were accurate and to verify
my understanding of the data. For this reason, I sent each interviewee’s transcription to him/her and allowed each to make changes, including deleting statements as each thought necessary. Further, I discussed my understanding of the collaborative information-seeking activities with the observation participants each day. I also asked the participants questions about these CIS activities. Thus, both triangulation and member checking contributed to the robustness of my data.

3.6.2. External Validity

To achieve external validity, whether what we have learned is applicable in other situations, I collected enough data to provide a thick description of the nuances of the context and the assumptions made in the study (Erlandson et al., 1993). Ethnographic techniques usually present thick descriptions of a phenomenon that occurs in a particular setting. Both the details of the data collected and the analysis allow an individual to check for the appropriateness of the findings in other settings.

In the present study, the specific findings about how IT team members collaborate for the purpose of information seeking are particular to the IT departments at the Regional Health System and the Teaching Medical Center. However, my goal was to find the general in the particular. In other words, I drew out some of the features surrounding collaborative information seeking in teams, especially the contextual factors that affect CIS, through the descriptions of specific information-seeking events that took place in the settings studied herein. I discuss this further in Chapter 5 where I present my findings and discuss the contextual factors impacting collaborative information seeking.
3.6.3. Reliability

Finally, the reliability of a research study is judged by the consistency and accuracy of the methods used. Because I was a single investigator collecting and analyzing the data, I increased the reliability of the study in several ways. First, I had a prolonged period of engagement in the field at both sites, 18 months and 12 months respectively. Second, I persistently took notes and transcribed them a short time later, maintaining meticulous records of interviews and observations and documenting the process of analysis in detail. Third, I used two tactics suggested by Yin: a research project protocol and a research project database (Yin, 2003).

It is the record of the formal research project protocol itself that provides the reliability required for multi-study research because such a record allows for the same data collection procedures to be followed for each study (Yin, 2003). The research project protocol for this project is described throughout my dissertation and includes the following:

- an overview of the research project (Chapter 1);
- a description of field procedures (Data Collection and Data Analysis sections of Chapter 3); and
- the research project questions (Appendices A and B).

The research project database allows for the organization and documentation of the data collected (Yin, 2003). The database is a location where interview transcripts, observational field notes, other notes, and physical artifacts are stored. As discussed, I used NVivo7 software to store all the data for this research project. Further, the functionality of NVivo7 allowed me to create and store annotations, memos, and codes developed while I performed detailed data analysis.
3.7. Chapter Summary

The IT departments at the Regional Health System and the Teaching Medical Center were selected as the sites for this research study, as they allowed for the observation of multi-disciplinary IT teams. The predominantly qualitative study employed ethnographic methods such as observation, formal and informal interviews, and artifact collection in order to provide a basis for better understanding the collaborative information behaviors of these teams. Lastly, interpretive analysis was used to analyze the volumes of data collected. Now that the groundwork has been laid for how the study was conducted, the next chapter will discuss the research sites and participants in more detail.
Chapter 4. Research Settings

In this chapter, I provide an overview of the research sites including details about the IT staff, physical workspace, and information and communication tools, as well as the respective goals of the departments and teams.

4.1. Site 1: Regional Health System

The IT department at the Regional Health System is made up of approximately 60 employees who are responsible for all information technology systems, data, and voice and image network systems. The IT department at the Regional Health System manages everything from problems pertaining to printing a document to entire clinical system outages. It is a very busy department dealing with approximately 120 calls per day, and sometimes as many as 250 calls per day during, for example, an upgrade of Siemens Soarian or an unanticipated system-wide application outage. The department is staffed 24 hours a day by a team of specially trained IT professionals. Client issues remain open an average of 4.25 days.

The IT department at the Regional Health System is overseen by the chief information officer and is divided into four teams: Clinical Software Services, Financial Software Services, Network Services and the Customer Service Center (Figure 4-1). Clinical Software Services and Financial Software Services are responsible for the development, implementation, and support of all the IT systems that service the needs of the Regional Health System and its partner organizations. The Network Services team ensures that all data, voice, and image network systems are maintained and augmented at appropriate service levels. Additionally, Network Services ensures that the physical hardware used in the campus network is uniform, used in a
logical way, and is consistent with industry standards. The Customer Service Center serves as the link between the customers (technology users) and the IT department regarding issues that arise, taking customer calls, documenting issues, and forwarding issues to the appropriate IT team.

![Organizational Chart]

Figure 4-1. Regional Health System IT Organizational Chart

4.1.1. Site 1: Regional Health System Participants

The IT department staff at the Regional Health System consists of IT and healthcare professionals, each of whom brings his/her own particular expertise and experience to the department. Team members quickly learn who has the knowledge needed to deal with a particular issue (Reddy, Pratt, Dourish, & Shabot, 2002). In this respect, it is a rich collaborative environment in which multidisciplinary experts work together. The chief information officer and two administrative directors oversee the department.
Each team in the IT department at the Regional Health System is composed of IT professionals each with his/her own specific expertise. The Clinical Software Services team consists of a director who manages the team, a project manager who oversees the implementation of large-scale clinical software roll outs, software analysts who specialize in certain clinical software packages, and integration analysts who specialize in understanding how data are passed between software applications. The Financial Software Services team supports financial software packages for the health system, and like the Clinical Software Services team consists of a director, a project manager and software analysts. The Network Services team is directly overseen by one of the administrative directors and consists of network administrators, hardware specialists/technicians and architecture specialists. Finally, the Customer Service Center consists of a director and customer service representatives. See Table 4-1 for an overview of the teams and their members.

Table 4-1. Regional Health System IT Teams and Members

<table>
<thead>
<tr>
<th>Team</th>
<th>Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Software Services</td>
<td>Director (1)</td>
</tr>
<tr>
<td></td>
<td>Project manager (1)</td>
</tr>
<tr>
<td></td>
<td>Software analysts (8)</td>
</tr>
<tr>
<td></td>
<td>Integration specialists (4)</td>
</tr>
<tr>
<td>Financial Software Services</td>
<td>Director (1)</td>
</tr>
<tr>
<td></td>
<td>Project manager (1)</td>
</tr>
<tr>
<td></td>
<td>Software analysts (10)</td>
</tr>
<tr>
<td>Network Services</td>
<td>Admin director (1)</td>
</tr>
<tr>
<td></td>
<td>Network engineer (1)</td>
</tr>
<tr>
<td></td>
<td>Network technician (1)</td>
</tr>
<tr>
<td></td>
<td>System programmer (1)</td>
</tr>
<tr>
<td></td>
<td>PC technicians (9)</td>
</tr>
<tr>
<td></td>
<td>Project manager (1)</td>
</tr>
<tr>
<td></td>
<td>Telecom specialist (1)</td>
</tr>
<tr>
<td></td>
<td>Telecom technicians (2)</td>
</tr>
<tr>
<td>Customer Service Center</td>
<td>Director (1)</td>
</tr>
<tr>
<td></td>
<td>Customer service representatives (4)</td>
</tr>
</tbody>
</table>


4.1.1.1. Management

There are two administrative directors overseeing the IT department at the Regional Health System are responsible for providing leadership, strategic planning, and budgeting and operation oversight to the Software Services (Clinical and Financial) and Network Services (includes the Custer Service Center) divisions of the IT department, respectively. They are ultimately responsible for all the technology and architecture used in the health system. Though the administrative directors do not deal with customer issues on a daily basis, other team members do seek their opinions and guidance on issues involving large-scale system outages or partner organizations.

The three directors in the IT department at the Regional Health System each oversee one of three teams: the Clinical Software Services team, the Financial Software Services team, and the Customer Service Center. The director of the Customer Service Center is responsible for overseeing the daily operations of the Customer Service Center, directing and assisting technicians to ensure prompt and correct responses to reported issues, and prioritizing support activities. The directors of the Clinical and Financial Software Services teams are responsible for managing and directing their respective teams in an effort to efficiently and accurately meet the installation and support needs of the health system’s technology users. They are also responsible for ensuring that all projects are implemented successfully and for managing their personnel in such a way as to foster timely and accurate services and pleasant and effective customer support. The directors are not directly responsible for resolving customer issues; however, their staff members do consult them on issues that are proving difficult to resolve.

The two IT project managers in the IT department at the Regional Health System are responsible for clinical and financial software projects, respectively. They provide overall project management for major implementation initiatives, as assigned, including project work plans, software and hardware requirements, and setting/managing project expectations. They are
responsible for all the activities involved in ensuring that a project is delivered on time, completed within budget, is well documented, of high quality, and results in satisfied customers. As new technology is implemented, the project managers may be called on to deal with issues that arise for their respective software projects. In such cases, they work closely with the analysts and specialists to resolve software issues regardless of area or specialty. They often have a broad knowledge of the software, including its purpose, main functionality, platform, and interfaces.

4.1.1.2. Software Analysts

There are 18 software analysts in the IT department at the Regional Health System, 8 on the Clinical Software Services team and 10 on the Financial Software Services team. They are responsible for providing programming and software support for all the clinical and financial system applications, respectively. The software analysts play a central role in resolving customer issues and managing existing systems.

Each analyst is expected to become an expert in at least one IT system. For example, on the Clinical Software Services team, all the analysts are trained in and expected to support Soarian Clinicals software, which is the electronic medical record software used by the entire hospital. However, each analyst on that team is also expected to be an expert and to support one of the other software packages used by the health system. One analyst is expected to be the MAK (Siemens Pharmacy and Medication Administration Check) expert, whereas another analyst is expected to be the expert in NextGen (the practice management and electronic health record software used by admitting physicians), etc.

The analysts on the Financial Software Services team are not cross-trained to support Soarian Financials software, i.e., the accounting system used by the health system; however, several of them are expected to become expert in this software and to support it. Other analysts on
the Financial Software Services team are responsible for specializing and supporting other financial and human resources software packages used by the health system such as Lawson, the human resources and payroll system, and Signature/SWIM, the software packages used for scheduling, registration, charges, and payments by physician offices.

4.1.1.3. Integration Specialists

There are four integration analysts in the IT department at the Regional Health System, all of whom report to the director of Clinical Software Services. They are responsible for providing programming and software support for all clinical and financial system applications and interfaces. And, they are principally responsible for overseeing and maintaining the application interfaces, i.e., the movement of data from one system to another. The integration analysts rarely “own” customer issues, as issues are usually specific to a software system and are thus assigned to a software analyst. However, software analysts often collaborate with integration specialists to troubleshoot issues; therefore, they can play a central role in resolving customer issues.

4.1.1.4. Customer Service Representatives

The four customer service representatives in the IT Customer Service Center at the Regional Health System report directly to the director of the Customer Service Center. They are the link between the customers (IT users) and the IT department and are expected to deliver prompt, efficient customer-focused service with regard to customer issues and requests relating to information technology. The representatives are responsible for taking customer calls, documenting issues, and forwarding issues to the appropriate IT team. If the issue is simple and
well known, they may help the customer to resolve it during the initial call. However, if the issue is complex or not easily resolved in a few minutes, they are expected to document it in the HEAT software and to assign it to the appropriate IT team or team members. Because of their role in the issue resolution process as issue documenters rather than as resolvers, Customer Service Center representatives rarely collaborate with other IT team members.

4.1.1.5. Network, Hardware, Architecture, and Telecommunications Specialists

The Network Services team at the Regional Health System consists of 19 engineers, technicians, and specialists who are responsible for all the data, voice, and image network systems and the physical hardware used throughout the health system. The team consists of one network Engineer, one network technician, one system programmer, eight PC technicians, one project manager, four personal computer technicians handling projects, one telecommunications specialist and two telecommunications technicians.

The network engineer is responsible for the design and overall implementation of local area networks and network links to corporate hosts, including overall adherence to standard configurations, performance, data access, operational support, and maximization of network computing power. Additionally, the network engineer is responsible for direct communication with network teams to review and implement networks to provide fully tested, secure, and functional support for the management of information in the health system and for the development of network administration and security standards. Because the networks at the Regional Health System are crucial to the use of nearly all the software implemented therein, the network engineer can is often brought in to collaborate on resolving issues.

The network technician is responsible for the installation and support of network devices (workstations, hubs, routers, switches, etc.) under the direction of the network engineer. The
network technician also assists in the implementation of local area networks and network links to corporate hosts, assists in the development of network administration and standards, and fulfills all the duties of a PC technician (see below). Clearly, the network technician works closely with the network engineer and is often assists with application problems arising from connectivity and printing issues.

The system programmer provides computer programming support to all hardware and operating systems located in the main IT data center and analyzes and maximizes the efficiency of all the associated CPUs and disk drives. Because the data on these servers are accessed by users via the existing networks, the system programmer not only works closely with the network engineer and technician, but also with other members of the IT department as issues regarding data access arise.

The eight PC technicians and four personal computer technicians on the special projects team provide technical support for, install, upgrade, and repair personal computers (PCs) and peripherals. Also, they are responsible for helping to train PC users and for assisting with the configuration and development of PC networks. Very often, PC technicians are asked to collaborate on application issues when the cause of the issue cannot be confirmed as a software issue alone. In these cases, the issue is complex and may involve not only the software itself, but also the configuration of the hardware.

The technical project manager is responsible for coordinating all aspects of the IT Network Services and Telecommunications projects as assigned. Responsibilities include determining requirements, specifications, and required resources; identifying and assigning projects tasks; and coordinating implementation. It falls to the technical project manager to develop a plan to ensure that the project is scheduled appropriately, is completed within budget, is well documented, of high quality, and results in a successful project and correspondingly satisfied customers. As new hardware is implemented, the technical project managers may be called on to
deal with issues that arise for technical projects. In these cases, the technical project manager works closely with technology and software analysts and specialists to resolve technology issues regardless of area or specialty.

Finally, the telecommunication specialists oversee and coordinate the telecommunications responsibilities of the health system with the direction and guidance of the administrative director of Network Services. They manage the activity of the telecommunications vendors and service providers including cellular telephone service coordination, telephone company invoice/billing audit and reconciliation, and radio paging system oversight. The telecommunication specialists also operate and maintain the PBX hardware and peripherals and the telephone key system equipment, and they also participate in data, voice, and image technology planning and installation. Because the nature of their expertise is so specific to telecommunications, the telecommunications specialists rarely collaborate with other members of the IT team. When a telecommunications issue arises, the nature of the problem falls within the purview of the telecommunications specialists is self-evident. Additionally, these issues are usually not complicated by further software or hardware problems.

4.1.2. Site 1: Overview of Technology Used in the IT Department at the Regional Health System

In order to resolve a wide range of information and technology issues, the IT department at the Regional Health System is equipped with sophisticated software and technology tools including the following:

- Microsoft SharePoint: A browser-based collaboration and document-management platform that allows users to access shared workspaces, documents, wikis, and blogs. Though this software is available for use by IT department staff members, they rarely use it.
• Microsoft Office Outlook (Figure 4-2): A personal information manager used mainly as an email application, but it also includes calendar, task manager, contact manager, note taking, journal, and Web browsing functions. MS Outlook is used by all IT department staff members not only to share information, but also to ask questions, set up meetings and to “chat” with coworkers. MS Outlook is central to the work performed by IT department staff members.

• VNC: A remote control software that allows users to view and fully interact with one computer desktop while working from another computer desktop.

• Telephones and Pagers: Several members of the IT staff are also equipped with Smartphones, direct connect phones, and pagers that they use to make contact with potential collaborators and share information during collaborative information seeking activities.

• HEAT (Figure 4-3): A customer service and support software used by the Customer Service Center to capture customer issues. The issue is then assigned to an analyst on one of the other IT teams based on the nature of the issue, and a notification email is sent to the assigned person and/or team. As the issue is advanced, the analyst provides updates and resolution in the software system.
Figure 4-2. Regional Health System MS Outlook.

Figure 4-3. Regional Health System HEAT Software.
Navigating the diverse information environments to locate needed information is a challenging task requiring collaboration. IT staff members used these technologies to support their collaboration and work goals.

4.1.3. Site 1: The Workspace at the Regional Health System

The IT department at the Regional Health System has office space in two adjacent buildings on the medical center campus. The Network Services and Customer Service Center teams are both located in one building, whereas the Clinical and Financial teams are located together in an adjacent building. The Clinical team is in a large open space on the first floor, and the Financial team is directly above on the second floor. Each team is set up in cubicles that are open to a central corridor (Figure 4-4). Like many customer support settings (e.g., Ackerman & Halverson, 2004), the cubicles are arranged in such a way that it is easy for team members to hear each other’s conversations and activities. The layout provides a segregated, semi-private workspace and simultaneously offers an environment in which it is easy to collaborate.

![Diagram of the Clinical Team Workspace at Regional Health System](image)

Figure 4-4. Layout of the Clinical Team Workspace at Regional Health System.
4.1.4. Site 1: IT Department Goals at the Regional Health System

Although providing appropriate IT support is at the heart of the department’s work, each IT team at the Regional Health System has different objectives that guide their daily work. For the Customer Service Center team, the objectives include issue documentation and surge management. For the Clinical and Financial Software Services teams as well as the Network Services team, the critical objectives are issue management and resolution.

The Customer Service Center team’s main goal is not to solve the customer’s problem. Rather, it is to identify and document the client’s issue so that it can be assigned to a specialist on one of the other three IT teams for resolution. The Customer Service Center must manage the flow of issues into the Customer Service Center and out to the appropriate IT team. However, the timing and flow of issues into the Customer Service Center is very unpredictable. Therefore, the Customer Service Center team must manage the surge of issues to ensure that they are assigned and subsequently resolved in a timely way. On the other hand, the goals of the Clinical and Financial Software Services teams and the Network Services team are slightly different. In these teams, the goal is not to document the client issue but to resolve the issue as quickly as possible. However, these teams must balance the need to address critical issues in such a way that sufficient attention is also paid to the non-critical issues.

These objectives naturally influence the four teams’ information needs as well as their knowledge sharing, creation, and reuse activities. In many cases, collaboration is essential to meeting their team and to fulfilling their individual and organizational goals.

4.2. Site 2: Teaching Medical Center

The IT department at the Teaching Medical Center is made up of approximately 190 employees who are responsible for all information technology systems and data, voice, and image
network systems at the medical center. Like the IT department at the Regional Health System, the IT department at the Teaching Medical Center manages everything from printing issues to entire clinical system outages. But, because the IT department at the Teaching Medical Center supports both the medical center (hospital) and the college of medicine, it is also responsible for the oversight and management of all patient health records, educational computing, data mining of clinical data, technology, and data used at the Teaching Medical Center’s Cancer Institute. Further, the IT department is also responsible for IT projects delivering new and enhanced software functionality to all areas of the medical center. The department is staffed 24 hours a day in order to offer on-site and on-call information technology support.

The IT department at the Teaching Medical Center is overseen by the chief information officer and is divided into eleven teams: privacy, security, IT Administration and Finance, IT Infrastructure, Educational Technology, Clinical Information Systems, Medical Image Management, Data Mining, IT Planning and Design, the Cancer Institute, and Research and Technical Services Delivery (see Figure 4-5).

Figure 4-5. Teaching Medical Center IT Organizational Chart.
Although the IT department at the Teaching Medical Center consists of eleven large teams, we focused on two teams due to the limited scale and scope of the research project: the Clinical Information Systems team and the Technical Services Delivery team.

Clinical Information Systems is responsible for the development, implementation, and support of all the center’s Cerner clinical IT systems. Cerner, a leading U.S. supplier of healthcare information technology solutions, is the main software vendor for the clinical applications used at the Teaching Medical Center. The Technical Services Delivery team includes Technical Support, which runs a helpdesk, Production Control & Operations, which oversees the daily IT data jobs and functions, and Customer Service Delivery, which is responsible for hardware and PC support.

4.2.1. Site 2: Teaching Medical Center Participants

Much like the IT department at the Regional Health System, the IT department at the Teaching Medical Center consists of both IT and healthcare professionals and each team is composed of professionals with different expertise. The Clinical Information Systems team consists of a director and an assistant director who manage the team, a staff physician who serves as the liaison between the clinical staff and the IT team, three managers who oversee the sub-teams (including Connected Projects, Connected Support, and Interfaces) within the Clinical Information Systems team (a coordinator who is responsible for communication from the Clinical Information Systems team to the hospital staff, analysts who specialize in certain clinical software packages and in understanding how data are passed between software applications, and tech educators who are responsible for developing information technology training for the hospital staff.
The Technical Services Delivery team consists of an assistant director, two managers, one team lead, seventeen support specialists, five computer operators, three systems analysts, and nine client support representatives. This team supports all the information technology needs that arise at the Teaching Medical Center and includes a technical support helpdesk, oversight of all technical systems, and field support for hardware issues. See Table 4-2 for an overview of the teams and their members.

Table 4-2. Teaching Medical Center IT Teams and Membership

<table>
<thead>
<tr>
<th>Team</th>
<th>Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Information Systems</td>
<td>Director (1)</td>
</tr>
<tr>
<td></td>
<td>Assistant director (1)</td>
</tr>
<tr>
<td></td>
<td>Staff physician (1)</td>
</tr>
<tr>
<td></td>
<td>Managers (3)</td>
</tr>
<tr>
<td></td>
<td>Coordinator (1)</td>
</tr>
<tr>
<td></td>
<td>Systems analysts (34)</td>
</tr>
<tr>
<td></td>
<td>Programmer analysts (4)</td>
</tr>
<tr>
<td></td>
<td>Tech educators (2)</td>
</tr>
<tr>
<td>Customer Service Delivery</td>
<td>Manager (1)</td>
</tr>
<tr>
<td></td>
<td>Support specialists (11)</td>
</tr>
<tr>
<td>Production Control &amp; Operations</td>
<td>Manager (1)</td>
</tr>
<tr>
<td></td>
<td>Support specialists (6)</td>
</tr>
<tr>
<td></td>
<td>Computer operators (5)</td>
</tr>
<tr>
<td></td>
<td>Systems analysts (3)</td>
</tr>
<tr>
<td>Technical Support Center</td>
<td>Team lead (1)</td>
</tr>
<tr>
<td></td>
<td>Client support representatives (9)</td>
</tr>
</tbody>
</table>

**4.2.1.1. Clinical Information Systems (Clinical IS)**

The Clinical Information Systems team is responsible for the delivery, enhancement, maintenance, and support of all clinical software information systems at the Teaching Medical Center. This includes electronic medical records, lab software, anesthesia software, emergency room software, etc.
4.2.1.2. Customer Service Delivery

The Customer Service Delivery team is responsible for resolving customer technology issues that require hands-on, on-site hardware manipulation such as reimaging computers and installing printers.

4.2.1.3. Production Control & Operations

The Production Control & Operations team is responsible for monitoring backend information technology jobs and reports and resolving issues as they arise. They are also responsible for resolving technical issues forwarded by the Technical Support Center.

4.2.1.4. Technical Support Center

The Technical Support Center is responsible for the intake of technology user issues that arise, e.g., taking client calls, documenting issues, resolving them if possible and forwarding unresolved issues to the appropriate IT team.

4.2.2. Site 2: Overview of Technology Used by the IT Department at the Teaching Medical Center

Much like the Regional Health System, the technology used by the IT department at the Teaching Medical Center to facilitate work and issue resolution also included Microsoft Office Outlook, Microsoft SharePoint, and CITRIX, a tool for remotely viewing another person’s computer screen, as well as Remedy, a customer service and support software program used to capture and document IT issues from inception to resolution. Further, team members used communication tools such as Smartphones and pagers to collaborate while in their offices or in
the field. Additionally, each team in the IT department at the Teaching Medical Center also had office space set up in cubicles laid out in a large open floor space. The only closed offices belonged to upper management.

4.2.3. Site 2: IT Department Goals at the Teaching Medical Center

The IT department at the Teaching Medical Center has a number of goals that tend to differ by team. For instance, the objectives of the Customer Service Delivery team included issue documentation and surge management, as they did for the Customer Service Center at the Regional Health System. However, the critical objectives for the Clinical Information Systems team, the Technical Support Center, and the Production Control & Operations teams are application development, maintenance and support—all of which include issue management and resolution.

As with the Customer Service Center team, the Customer Service Delivery team’s main goal is to identify and document client issues so that they can be assigned to a specialist on another IT team for resolution. Also, to ensure that issues are assigned and subsequently resolved in a timely way, the Customer Service Delivery team manages the flow of issues and any surge of issues that occur. On the other hand, unlike the Customer Service Delivery team, the shared goal of the Clinical Information Systems team and the Technical Support Center and Production Control & Operations teams is to resolve issues as quickly as possible and to also fulfill their other IT responsibilities such as IT development and maintenance. Additionally, these teams must balance the need to address critical issues in such a way that sufficient attention is also paid to non-critical issues and to their other everyday work activities.

As is the case with the IT department at the Regional Health System, these IT team objectives naturally influenced the teams’ information needs as well as their information seeking
activities. In many cases, collaboration was essential to meeting their individual, team, and organizational goals.

4.3. Chapter Summary

In the present chapter, I described the research settings, including the departments’ participants and roles, the technology used, workspaces, goals, and information flows. My research findings are the focus of the next chapter, including the contextual factors that affect collaborative information seeking activities as well as an overview of how those factors affect CIS activities.
Chapter 5. Findings

In this chapter, I present findings from the study of contextual factors impacting collaborative information seeking in the information technology department at two hospitals. I begin with an overview of the nature of the work in the IT departments at the research sites, with a specific focus on the information seeking activities in those departments. Then, I describe the CIS workflow/process as well as provide an example episode of CIS. Next, I describe the contextual factors impacting collaborative information seeking activities and explain how these contextual factors affect CIS activities by highlighting certain CIS practices.

5.1. Issue Management and Resolution Workflow

The IT departments at both research sites are responsible for all IT systems throughout the medical centers. The overall objective of each department is to have all technology systems up and running 24 hours per day, 7 days per week, 365 days per year. Therefore, as issues (i.e. problems) arise, the IT department is responsible for resolving these issues as quickly and efficiently as possible. Below, I present a workflow example from Regional Health System.

When a problem or question arises with any software and/or hardware used within the medical centers, the client (user) contacts the Customer Service Center via telephone, email, fax, interoffice memo or walk-in. The Customer Service Center representative greets the client, gathers needed information—documenting the information in the HEAT system—and takes appropriate actions to answer the question or resolve the issue when possible. The representatives use immediately available resources such as manuals, resolved HEAT tickets and training
documentation as reference during issue resolution. If the issue is immediately resolved, the rep.
updates the ticket in the HEAT system with the resolution information and closes the ticket.

However, the Customer Service Center representative only has 10 minutes to resolve the
issue per organizational guidelines. If the issue is not resolved within 10 minutes, the
representative must escalate the issue to the next support level. In this case, the representative
notifies the client of the assigned issue number and assigns the appropriate issue type based on
severity of the issue with regard to patient care and number of clients affected. The representative
then assigns the issue to the appropriate second level support team. Finally, the representative
advises the client that another IT staff member will be in contact regarding the issue in a
timeframe based on the issue type. The issue type translates into expected resolution time. The
more critical the issue, the faster it should be resolved.

Depending on the software type, the escalated issue is then assigned (i) directly to the on-
call analyst on the Clinical Software Services, (ii) to the Financial Software Services team’s
director, or (iii) to the Network Services team analyst. It the issue is assigned to either the
Financial Software Services team’s director or the Network Services team analyst, it is then
reassigned to the analyst or technician on the respective team who is best suited to resolve the
issue based on specialization. Once the issue is assigned to an analyst or technician, the client is
promptly contacted to acknowledge receipt of the issue and to confirm issue details. If possible,
the issue is resolved during the initial contact; however, this may not always be possible. The
following describes how an on-call analyst at the Regional Health System on the Clinical
Software Services team would respond to issues assigned to her.

As new issues are assigned via the HEAT customer service and support software, the on-
call analyst receives a page as well as an email notification. The analyst then reviews the
issue in HEAT, contacts the client to discuss the issue in more depth and then attempts to
resolve the issue immediately. When an issue is well known or has occurred frequently, the analyst may already have the knowledge to talk the client through resolution.

However, sometimes the issue cannot be resolved during initial contact with the client. In this case, the analyst reviews the issue type to determine how long she has to resolve the issue. The more critical the issue, the faster it has to be resolved.

When the issue is uncommon, complex, or outside the analyst’s expertise the analyst may need to collaborate with others. In this situation, the analyst tries to understand the problem by re-creating the issue in the software and viewing the actual error. During the issue resolution process, the analyst frequently talks to other analysts not only to find needed information but also to request help in analyzing what is already known in order to determine next steps or to further troubleshoot the problem. Next, the analyst typically works closely with other analysts to test different resolution scenarios. Once a solution is identified, the analyst contacts the client to discuss the solution and to confirm that the issue is resolved to their satisfaction. Upon resolution, the analyst updates the ticket the HEAT system with the resolution information and closes the ticket.

This vignette highlights that collaborative information seeking plays a central role in resolving IT issues and addressing clients’ problems due to the dynamic nature of IT work.

However, the issue management and resolution process is not always executed in a straightforward and efficient manner. Instead, contextual factors often influence these CIS activities, impacting the process as well as the outcome.
5.2. Episodes of Collaborative Information Seeking

To provide an understanding of the collaborative environment in the IT department, I present a workflow explaining the process of collaborative information seeing and how contextual factors impact CIS activities throughout the process. Then, I briefly describe an episode of collaborative information seeking as an example of this process. Lastly, I provide tables explicating CIS episodes by outcome, contextual factors impacting CIS episodes by outcome and contextual factors impacting CIS practices by outcome.

5.2.1. Collaborative Information Seeking Workflow/Process

Collaborative information seeking is a critical but often overlooked aspect of work in an organizational setting. CIS is the interplay between collaboration and information behavior and consists of certain activities that unfold in a specific sequence (Figure 5-1). An episode of CIS begins with an information need and is triggered by an external event, where the trigger is a transition point from individual information seeking to collaborative information seeking. CIS is comprised of three micro-level activities, namely seeking, retrieving and sharing, that unfold in an iterative fashion. That is, once triggered to collaboratively search for information, actors seek information, retrieve the information, share it with each other, and continue this iterative process until the needed information is found. These ‘micro-level’ activities are enacted when actors interact with one another and with systems (Karunakaran et al., accepted).
Figure 5-1. CIS Episode Process.

CIS Episode

CIS TRIGGER

CONTEXTUAL FACTORS IMPACT +/-

RETRIEVE
• Determine which info may be relevant
• Retrieve info

SEEK
• Select collaborator(s)
• Search for info

SHARE
• Share info with collaborators
• Evaluate info for usefulness

INFORMATION USE
At each step in the CIS process, decisions are made. For example, during the “seek” step in the process, the information seeker must first decide with whom to collaborate to find the needed information. Certain contextual factors can impact this decision negatively or positively including the expertise or information that a potential collaborator(s) can bring to the process, the availability of a potential collaborator(s), and the reputation of the potential collaborator(s).

Additionally, decisions are influenced by contextual factors during the “retrieve” step in the CIS process. Information seekers must determine which information (re)sources may be relevant when retrieving information. This determination may be influenced (again, positively or negatively) by availability of a resource(s), ability to find and access a resource(s), and knowledge of a resource(s).

Finally, collaborative information seekers must share information with each other. The act of sharing may be impacted by the communication channels available to do so—for example, is simultaneous remote collaboration available if needed, and if not, how will the information be shared? Further, collaborative information seekers must also evaluate the information for usefulness. This is a subjective activity and is influenced by the experience, expertise and personality of the actors involved. If the collaborators deem the information as lacking or not sufficient to solve the problem, they continue this iterative process until the needed information is found. The decision to stop searching for information may also be influenced contextual factors. For example, if an issue is of high priority and must be resolved quickly, finding information that is “just good enough” may suffice. However, when time is a luxury, collaborative information seekers may continue through the CIS cycle until a thorough search for information is completed and a more complete solution is found.
5.2.2. Example of Collaborative Information Seeking Episode

The following is a descriptive scenario illustrating the collaborative information seeking process.

Julia, a member of the Clinical Information Systems team, walks into the office at 6:45 a.m. and sits down at her desk to prepare for her morning (from 7:00 a.m. until noon) as the on-call analyst for the Connected team. Julia opens Remedy to see if there are any issues that may spill over into her on-call shift. After grabbing a cup of coffee, Julia reviews her emails and works on other tasks until an issue is assigned to her.

Julia receives a ticket in Remedy regarding SurgiNet documents not finalizing. The user tried to finalize a few cases, but they continue to show up on the list as unfinalized. Julia looks on the intranet “Connected On-Call Help System” and finds the SurgiNet folder. She sees a document entitled “OR Nursing record will not finalize – all segments completed”. Julia reviews this document to familiarize herself with this type of issue before calling the user to discuss the issue. Julia calls the user and uses LANDESK to remotely connect to the user’s PC. The user shows Julia the data in question in both the Connected system and the SurgiNet system. Julia notes the two case numbers in question and tells the user that she will be back in touch. Julia updates the Remedy ticket with the information obtained from the user.

Even after reviewing documentation and talking with the user about the problem, Julia is not sure how to fix the problem. She needs more information about finalizing documents in SurgiNet. Therefore, Julia walks over to Dollie’s cubicle to explain the SurgiNet finalize case issue and to ask if Dollie knows any information that might be helpful in
solving the problem. Dollie is Julia’s friend, but also has a good reputation for her willingness to help with on-call issues.

While Julia and Dollie are talking, Eleanor, who knows a lot about SurgiNet, happens to walk by and overhears the conversation. She offers her opinion that some data may be missing from the system. Therefore, Eleanor, Julia and Dollie walk to Julia’s cubicle to look at the cases in question. Upon review, Eleanor realizes that for each case, some data was entered and was then backed out. Therefore the cases have “N/A” data and cannot be finalized. Based on this assessment, Dollie believes that the records need to be terminated. However, this should first be discussed with Carmella, the team leader overseeing SurgiNet. However, Carmella is not available this afternoon.

Julia thanks Dollie and Eleanor for their help making sense of the problem. Julie then calls the user to let her know what she has found thus far and that she will be back in touch tomorrow after talking with Carmella about the suggested solution.

The scenario describes the CIS activities that closely reflect the CIS process outlined in Figure 5-1. In particular, the scenario highlights the impacts of contextual factors on CIS activities. The contextual factors impacting CIS activities include:

a) Reputation of an individual when selecting collaborators. Julia selected Dollie because of her reputation as a willing participant in issue resolution. However, Dollie is not the expert in SurgiNet, therefore selecting a collaborator on reputation alone can hinder the CIS activities.

b) Team workspace. Because of the physical layout of the team workspace, all team members sit in cubicle in one large room and can easily overhear what others are talking about and working on. This workspace allowed Eleanor to realize that she had the expertise to help solve the problem.
c) Collaborative climate. Due to the team’s value system and willingness to share, without solicitation Eleanor offered her assistance in finding needed information.

d) Quality of information individual can provide. Since Carmella is the team leader for the SurgiNet application. She has the expertise to confirm the potential solution is valid and accurate. Therefore, when Carmella returns to the office, Julia will ask her to participate in the CIS process.

e) Availability of individual. Carmella was not immediately available to confirm the potential solution, which drew out the CIS process.

f) Issue Priority. The issue did not have a very high priority and could be resolved over a longer period of time. Therefore, Julia had the luxury of waiting to confirm the potential solution with Carmella. If Carmella does not agree with the proposed solution, the CIS process will continue with information seeking activities.

As highlighted in Figure 5-1 and the example CIS episode, one or more contextual factors may impact the activities in the CIS process. Furthermore, these impacts can be positive or negative. Finally, which contextual factors impact the CIS process depends upon the situation. Consequently, episodes of CIS and the contextual factors impacting CIS activities, while varying greatly, still need to be understood and managed. The following section outlines the various types of CIS episodes and contextual factors that impacted each and how.

5.2.3. CIS Episodes, Contextual Factors and CIS Practices

In total, I observed and analyzed ninety (90) episodes of collaborative information seeking. I organized the CIS episodes by the trigger that initiated the CIS process and then analyzed each episode further to understand the CIS practices impacted by the contextual factors
and whether that impact was positive or negative. A positive impact suggests that the contextual factor(s) had a good effect on the CIS process itself and/or its outcome (i.e. information need met). While a negative impact implies that the contextual factor(s) had an unfavorable or adverse effect on the CIS process itself and/or its outcome (i.e. information may not have been met).

Table 5-1 provides a summary of episodes of CIS by outcome.

Table 5-1. Episodes of Collaborative Information Seeking by Outcome.

<table>
<thead>
<tr>
<th></th>
<th>Lack of domain expertise</th>
<th>Complexity of information need</th>
<th>Fragmented information resources</th>
<th>Lack of immediately accessible information</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>8</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Positive</td>
<td>57</td>
<td>19</td>
<td>4</td>
<td>1</td>
<td>81</td>
</tr>
<tr>
<td>Total</td>
<td>65</td>
<td>20</td>
<td>4</td>
<td>1</td>
<td>90</td>
</tr>
<tr>
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<td>72%</td>
<td>22%</td>
<td>4%</td>
<td>1%</td>
<td></td>
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<tr>
<td>% negative</td>
<td>12%</td>
<td>5%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>% positive</td>
<td>88%</td>
<td>95%</td>
<td>100%</td>
<td>100%</td>
<td>90%</td>
</tr>
</tbody>
</table>

Table 5-1, episodes of CIS by outcome, breaks down the CIS episodes by the trigger that initiated the CIS process. The table highlights that 72% of all CIS episodes where triggered by “lack of domain expertise”. This highlights that the different team members bring their own particular expertise and perspective to the team. When a member seeks information outside her domain of expertise, s/he can often turn to another team member for help. These different expertises play an important role in the collaborative information seeking activities of the team.

Further, the data highlights that the vast majority of all CIS episodes observed (81/90 = 90%) had a positive outcome, meaning that the CIS process itself and/or its end result was successful in that information was found and the information need was met.
Next, I further analyzed the data to understand which contextual factors were most prevalent based on their impact on the CIS episodes. Those results are displayed in Table 5-2 below.

Table 5-2. Contextual Factors Impacting CIS Episodes by Outcome.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Outcome</th>
<th>Lack of domain expertise</th>
<th>Complex info need</th>
<th>Fragmented info sources</th>
<th>Info not immediately accessible</th>
<th>Total</th>
<th>% Neg</th>
<th>% Pos</th>
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</thead>
<tbody>
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<td>Collaborative Climate</td>
<td>Pos</td>
<td>43</td>
<td>13</td>
<td>3</td>
<td>1</td>
<td>60</td>
<td>95%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>Neg</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>5%</td>
<td>95%</td>
</tr>
<tr>
<td>Quality</td>
<td>Pos</td>
<td>35</td>
<td>15</td>
<td>4</td>
<td>1</td>
<td>55</td>
<td>95%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>Neg</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>5%</td>
<td>93%</td>
</tr>
<tr>
<td>Team Culture</td>
<td>Pos</td>
<td>38</td>
<td>11</td>
<td>2</td>
<td>1</td>
<td>52</td>
<td>93%</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>Neg</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>7%</td>
<td>93%</td>
</tr>
<tr>
<td>Team Workspace</td>
<td>Pos</td>
<td>26</td>
<td>7</td>
<td>1</td>
<td>0</td>
<td>34</td>
<td>92%</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>Neg</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>8%</td>
<td>92%</td>
</tr>
<tr>
<td>Temporality</td>
<td>Pos</td>
<td>22</td>
<td>9</td>
<td>1</td>
<td>0</td>
<td>32</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Neg</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>Availability</td>
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<td>0</td>
<td>0</td>
<td>18</td>
<td>69%</td>
<td>31%</td>
</tr>
<tr>
<td></td>
<td>Neg</td>
<td>7</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>31%</td>
<td>69%</td>
</tr>
<tr>
<td>Integrates Systems</td>
<td>Pos</td>
<td>9</td>
<td>9</td>
<td>2</td>
<td>0</td>
<td>20</td>
<td>91%</td>
<td>9%</td>
</tr>
<tr>
<td></td>
<td>Neg</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>9%</td>
<td>91%</td>
</tr>
<tr>
<td>Cross-team Communication</td>
<td>Pos</td>
<td>10</td>
<td>9</td>
<td>3</td>
<td>0</td>
<td>22</td>
<td>91%</td>
<td>9%</td>
</tr>
<tr>
<td></td>
<td>Neg</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>Reputation</td>
<td>Pos</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Neg</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>Team Communication</td>
<td>Pos</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Neg</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>Issue Priority</td>
<td>Pos</td>
<td>5</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Neg</td>
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<td>0</td>
<td>0</td>
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<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>Simultaneous Remote Collaboration</td>
<td>Pos</td>
<td>10</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Neg</td>
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<td>0</td>
<td>0</td>
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<td>100%</td>
</tr>
<tr>
<td>Common Ground</td>
<td>Pos</td>
<td>6</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Neg</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>Awareness</td>
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<td>0</td>
<td>0</td>
<td>7</td>
<td>88%</td>
<td>13%</td>
</tr>
<tr>
<td></td>
<td>Neg</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>13%</td>
<td>88%</td>
</tr>
</tbody>
</table>
Table 5-2 provides an overview of the individual contextual factors impacting CIS episodes by outcome. The table lists all the contextual factors observed as having an impact on collaborative information seeking activities. Please note that contextual factors impacting CIS episodes are not mutually exclusive. Therefore, several factors may impact a given CIS episode; however, certain contextual factors may have a greater impact on CIS episodes than others. Of the contextual factors listed, five factors tended to be present most often when CIS episodes had a positive outcome. Those contextual factors are collaborative climate, quality of information a potential collaborator can provide, team culture, team workspace and temporality. Conversely, one contextual factor tended to be present most often when CIS episodes had a negative outcome. That contextual factor was availability.

Lastly, I analyzed the data further to understand which contextual factors were most prevalent based on impact on CIS certain practices by outcome. Those results are summarized in Table 5-3.
<table>
<thead>
<tr>
<th>Factor</th>
<th>Outcome</th>
<th>Creation of ad hoc team</th>
<th>Creation of ad hoc team &amp; Adaptation of technology</th>
<th>Creation of ad hoc team &amp; Evaluation of information</th>
<th>Creation of ad hoc team &amp; Use of stopping criteria</th>
<th>Creation of ad hoc team &amp; Evaluation of information &amp; Adaptation of technology</th>
<th>Creation of ad hoc team &amp; Evaluation of information &amp; Use of stopping criteria</th>
<th>Evaluation of information</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability</td>
<td>Pos=18</td>
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<td>0</td>
<td>8</td>
<td>0</td>
<td>1</td>
<td>3</td>
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</tr>
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<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Awareness</td>
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<td>0</td>
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<td>0</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Neg=1</td>
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<td>0</td>
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<td>1</td>
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<td>1</td>
<td>7</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Neg=3</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
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<td>Common Ground</td>
<td>Pos=10</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Neg=0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cross-team Communication</td>
<td>Pos=22</td>
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<td>12</td>
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<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Neg=0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Integrated Systems</td>
<td>Pos=20</td>
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<td>0</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Neg=2</td>
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<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
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<td>1</td>
</tr>
<tr>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>Quality</td>
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<td>1</td>
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<td>0</td>
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<tr>
<td></td>
<td>Neg=0</td>
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<td>Simultaneous Remote Collaboration</td>
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<td>4</td>
<td>0</td>
<td>6</td>
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<td>0</td>
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<tr>
<td></td>
<td>Neg=0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Team Communication</td>
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<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Neg=0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Team Culture</td>
<td>Pos=52</td>
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<td>0</td>
<td>21</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Neg=4</td>
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<td>0</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Team Workspace</td>
<td>Pos=34</td>
<td>11</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Neg=3</td>
<td>0</td>
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<td>2</td>
<td>0</td>
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<td>0</td>
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<td>1</td>
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<tr>
<td>Temporality</td>
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<td>0</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>2</td>
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<tr>
<td></td>
<td>Neg=0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
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<td>0</td>
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</tbody>
</table>
Table 5-3 provides an overview of the contextual factors impacting CIS practices by outcome and highlights the presence of several contextual factors when certain CIS practices were enacted. The table lists all of the contextual factors observed as having an impact on certain collaborative information seeking practices. Please note CIS practices are not necessarily mutually exclusive. Therefore, contextual factors may impact more than one CIS practice in a given episode. Further, again note that contextual factors impacting CIS episodes are not mutually exclusive.

For example, collaborative climate, quality of information and team workspace existed in the environment when creation of an ad hoc team was enacted and the outcome was positive. Of the contextual factors listed, availability and team culture tended to have a larger negative impact on CIS outcomes, particularly on the practices of creation of ad hoc team and evaluation of information. However, collaborative climate, quality of information a person can provide and team culture tended to have a positive impact on several CIS practices across the board. All these findings will be reviewed further and in more depth throughout chapters 5 and 6 to follow.

5.3. Contextual Factors Impacting Collaborative Information Seeking

In order to address the research question (RQ1): “What contextual factors impact CIS practices”, I examined how IT teams collaboratively sought and retrieved information. Using the working definitions of collaborative information seeking (see p. 3) and contextual factors (see p. 12), I identified several contextual factors that impact CIS practices. As I focused on these factors and tried to better understand them, I was able to find connections between these factors and group them together. This analysis led to four broad categories of contextual factors that impacted collaborative information seeking practices including individual, team, organizational, and
technological characteristics. These categories of contextual factors as well as examples are summarized in Table 5-4.

Table 5-4. Contextual Factors Impacting Collaborative Information Seeking Activities.

<table>
<thead>
<tr>
<th>Category</th>
<th>Factor</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual Characteristics</td>
<td>Quality of information the individual can provide</td>
<td>Expertise</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General Knowledgeability</td>
</tr>
<tr>
<td></td>
<td>Reputation of the individual</td>
<td>Ease of interaction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Insightfulness</td>
</tr>
<tr>
<td></td>
<td>Availability of the individual</td>
<td>Workload</td>
</tr>
<tr>
<td>Team Characteristics</td>
<td>Team communication</td>
<td>Team meetings</td>
</tr>
<tr>
<td></td>
<td>Team culture</td>
<td>Sense of shared responsibility</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Issue assignment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Team-wide software training</td>
</tr>
<tr>
<td></td>
<td>Team Workspace</td>
<td>Adjacent cubicles</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non/collaborative workspace</td>
</tr>
<tr>
<td>Organizational Characteristics</td>
<td>Cross-team communication</td>
<td>Departmental meetings</td>
</tr>
<tr>
<td></td>
<td>Integration of systems</td>
<td>Tightly vs. Loosely integrated</td>
</tr>
<tr>
<td></td>
<td>Issue priority</td>
<td>High vs. Low importance</td>
</tr>
<tr>
<td></td>
<td>Reputation of a team</td>
<td>Technical knowledge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Willingness to assist</td>
</tr>
<tr>
<td>Technological Characteristics</td>
<td>Simultaneous remote collaboration functionality</td>
<td>CITRIX®</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WebEx™</td>
</tr>
<tr>
<td></td>
<td>Social functionality</td>
<td>Telephone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Instant Messenger</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adapted Email</td>
</tr>
</tbody>
</table>

5.3.1. Individual Characteristics

One type of contextual factor found to affect CIS activities is the individual characteristics of a potential collaborator. These characteristics include social and psychological features of an individual such as aspects of a person’s personality, intellect and personal work circumstances. In a collaborative environment, it is important to identify collaborators that are best suited to help find the information needed to carry out the particular activity or solve the
specific problem. Consequently, certain individual characteristics can influence the selection process. As highlighted in Table 5-4, I found the following individual characteristics impacted CIS activities: (i) quality of information the individual can provide, (ii) the individual’s reputation, and (iii) the individual’s availability. Further details about these contextual factors and their empirical examples are outlined below.

5.3.1.1. Quality of Information the Potential Collaborator Can Provide

One illustration of an individual characteristic that can impact collaborative information seeking activities is the quality of information the potential collaborator can provide, for example their area of expertise or their general knowledgeability about a topic or topics of interest. This is not surprising as CSCW researchers have examined what people know and the location of experts through either personal social networks or organizational social networks similar to Facebook (Ackerman, 1994; Ehrlich et al., 2007). However, information seeking involves more than identifying the expert. It also involves selecting an expert that the information seeker can work with.

In a survey of the IT department at the Regional Health System, participants were asked why they choose to collaboratively seek information when solving a problem. Respondents answered that the potential collaborator(s) had either the technical or the domain expertise needed to help resolve the issue. Further, when asked specifically how they choose an expert with which to collaborate, the Director of the Customer Service Center, explained it as follows, “Aside from the things we already talked about as far as skill, reputation, competence, rapport … I will go to somebody that will [help] me [with] the answer [quickly] because I need to get it done.” While there may be several experts from which to choose to participate in collaborative information
seeking activities, those experts that are known for their proficiency as well as those who are amiable and have good relations with others are usually ones that people seek. Therefore, this results in other experts not being brought in to participate in the CIS activities. Additionally, in the survey, when asked their primary motivation for choosing an expert collaborator, respondents answered overwhelmingly that reliability was the main motivation (Figure 5-2). This makes sense because an expert is someone that is an authority or specialist, thus offering reliable information on the subject of interest.

In the following vignette, Kim, a software analyst on the Clinical Software Services team, pulls together a team of experts to solve a pharmacy order issue.

As the on-call analyst for the electronic medical record system, Kim receives a new ticket regarding the ancillary number for a pharmacy order. After logging into the system and reviewing the medication order in question, Kim calls the client and asks for the order number of the medication in question. Next, Kim calls the pharmacist to discuss the ancillary number error. They discuss the potential of resending the medication order. With this in mind, Kim brings Matt (a project manager and integration specialist) into
the discussion to determine if the order can even be re-sent. Kim asks Matt not only because he is generally knowledgeable in the electronic medical system and understands data integration, but because he is also known to be a very friendly, helpful teammate.

Matt investigates the issue in the interface application. Together, they find the pharmacy transaction and Matt suggests that they resend the transaction. They do, however this does not solve their problem. Matt suggests that Kim once again call the pharmacists to ask if the time on the medication can be changed so that the ancillary number can be generated. She does and the pharmacist says that this is possible.

The medication order issue was complex because it involved data sent across two different systems. While Kim is very knowledgeable about the electronic medical record system, she is not an expert in either data interfaces or the pharmacy system. Therefore, she pulled together a team of experts including herself, a pharmacist, and an integration specialist to collaboratively seeking and share information. Kim selected Matt in particular to participate in collaborative information seeking activities because he was an expert in data integration and is known to be a very cooperative teammate. Together, they used their respective expertise to diagnose the problem, offer potential solutions, and troubleshoot the issue, finding a solution to the problem.

5.3.1.2. Reputation of the Potential Collaborator

Another observed example of an individual characteristic impacting collaborative information seeking practices is reputation, including perceived ease of interaction and insightfulness of the potential collaborator.
“Ease of interaction” is a term I use to refer to the degree of effort an information seeker believes would be required to interact with a potential collaborator. I derived this definition from an adaptation of the terms “ease of use” and usability. Davis’ (1989) definition of ease of use is “the degree to which a person believes that using a particular system would be free from effort” p.320, while Quesenbery’s (2003) dimensions of usability include several aspects of a person’s reputation, mainly the ability to be efficient, effective, engaging, error tolerant and easy to work with. These multi-faceted characteristics of a person, in combination with perceived effort required to interact, can be used to describe an information seeker’s requirements for success and satisfaction when engaging with a potential collaborator in CIS activities. Therefore, taken as a whole, the characteristics listed above make up a person’s reputation for ease of interaction, which can impact whether an information seeker chooses to engage the potential collaborator in CIS activities.

Furthermore, a variety of trade-offs may occur during the process of selecting a potential collaborator. For instance, while it may take less effort to work with a particular individual, that person may not be the most capable in assisting with these particular collaborative information seeking activities. While engaging in collaborative information seeking activities with this individual may not lead to the optimal solution, it may still lead to a solution that will solve the problem, which in the end is the ultimate objective.

In an interview, a director at the Regional Health System comments on how the individual contextual factor, ease of interaction, influenced his selection of a network administrator with whom to collaboratively seek information.

*In a perfect world where we are all automatons, if you went to the diagram and its saying you must go here. This is the path of least resistance. But sometimes, somebody might be the authority but you might not be able to interface with them. You might not be able to*
talk short-hand with them. For example, we have three network administrators. We have James, who I think is the most competent of the three and the most knowledgeable. Then there is Ralph who is sort of in the middle. And then I have Albert, [who] has a reputation with me personally of being too slow and methodic and plotting. His sense of cautiousness, because he is afraid of doing anything that might get him in trouble, is a determinant to our business. You would think if you are methodical, at some point and time there is a point of overkill and there is no way of being able to break him without being rude or seemingly rude to try to cut through to the answer. So, in that case, there is a hierarchy. But [our boss] has also asked that we don’t go to James because James has been pulled on other projects. So then I split the difference and I go to Ralph. It might not be the best thing, but it is the best given the circumstances. And I want to get the issue done and move on with the greatest amount of success.

In the vignette, the director at the Regional Health System highlights that if a person is too slow and methodic and plotting, he is not efficient and therefore not a good choice for an information collaborator. As an information seeker, the director at the Regional Health System points out that he is looking for the path of least resistance while also finding the needed information. Using the definition of ease of interaction employed in this study (the degree of effort that the information seeker believes would be required to interact with a potential collaborator), as well as the aspects of a person’s reputation (the ability to be efficient, effective, engaging, error tolerant and easy to work with), we can see from the example above that reputation, as an individual characteristic of a potential collaborator, matters when selecting someone with whom to engage in CIS activities.
5.3.1.3. Availability of the Potential Collaborator

Finally, I observed that a potential collaborator’s personal work circumstance, such as their availability, is an individual characteristic that can impact collaborative information seeking activities. When a person is readily available and accessible, they can participate in collaborative information seeking activities more readily and without much resistance. Knowing what other people are doing is important during information seeking activities. Therefore, it is important to know not only who has the expertise needed and a good reputation as a collaborative information seeker, but also presence awareness information for potential collaborators. In organizational settings with a formal mode of interaction, this is extremely useful and important.

Based on the issue, an information seeker may have many potential experts with whom to collaborate when seeking information. Knowing which of these experts are and are not available could help determine with which expert to collaborate, helping to streamline the process. Not only is an available resource more likely to be asked to engage in CIS activities, an available resource is more likely to accept the invitation. However, the “first choice” collaborator may not have the time to participate in CIS activities. In this case, a less qualified collaborator may be selected or the information seeker may work through the process alone.

This finding was confirmed in a survey of the IT department at the Regional Health System. When asked what prevents them from collaborating when searching for information, respondents answered that other’s availability is the most likely reason for not collaborating, even when they would like to do so (Figure 5-3).
In the following interview excerpts, two IT staff members comment on what influences their decision with whom to collaborate.

**PC Technician:** “Availability of resources...Even if they’re here, do they have the time to help me with this? Or if it is a vendor, do they have the parts in a warehouse near here?”

**Telecommunications Specialist:** “Now, sometimes it is difficult getting a hold of people. And, it is really difficult getting a hold of me because we are not always [in the office]. I think we are kind of lacking in a telecommunications presence sort of way. Where everyone isn’t always easily available.”

These insights touch on an interesting point. The availability of the potential collaborator can be translated into the workload of a potential collaborator. If a potential collaborator has a heavy workload, they may be less willing/likely to agree to participate in collaborative information seeking activities (McDonald & Ackerman, 1998). However, the information seeker must first be aware of the availability of potential collaborators in order to make an informed decision when deciding with whom to collaborate.
5.3.2. Team Characteristics

A second category of contextual factors found to affect collaborative information seeking activities is team characteristics. Teams often differ based on several features such as location (co-located, virtual), permanence (ad-hoc, permanent), level of knowledge, skills and abilities (expertise, training), experience (tenure), homogeneity of members, formality of interactions, size, purpose, and configuration (self-directed, hierarchically managed teams) (Campion, Papper, & Medsker, 1996). These team features, along with many other features of teams and team work, can impact collaborative information seeking. In this study, I found that the following team characteristics had an impact on collaborative information seeking activities: (i) team communication, (ii) team culture, and (iii) team workspace. Below, are further details about these team contextual factors. These team contextual factors highlight the importance of team structures, features and configurations when discussing the collaborative aspects of information seeking.

5.3.2.1. Team Communication

One example of a team characteristic that can impact collaborative information seeking activities is communication within a team. Team communication can vary by communication modality, for example information sharing in team meetings versus email messages, and frequency (Leenders, van Engelen, & Kratzer, 2003), as well as other parameters such as cooperation, intensity, dominance, formality and task orientation (Wish & Kaplan, 1977). Open, flexible and trusting lines of communication between team members allows potential collaborators to not only be aware of the information needs of information seekers, but
alternatively, allows information seekers to determine who may be a potential collaborator. For example, in weekly team meetings at the Teaching Medical Center, team members are asked to discuss all open client issues that might be of interest to others or client issues where others might be able to assist.

The Remedy Ticket meeting is held twice per week. The meeting is facilitated by an IT lead analyst who prints the Remedy reports for each day. These reports include the details of all client issues encountered since the last meeting, whether or not they were fixed/closed. All Clinical Information Systems analysts are in attendance. Since each day a different analyst is on-call, each takes their turn reviewing tickets from their on-call day sharing details about the problem, the solution (if applicable) and background as to why/how the issue came to be. Other analysts who find the issues interesting or have applicable expertise add more details and share information as needed.

These twice weekly team meetings were found to enable collaborative information seeking activities, because they serve as a forum for discussing issues, asking questions and finding potential information seeking collaborators. After the meeting, the information seeker and potential collaborators pair up (or gather in teams) to work together to collaboratively find information to resolve open issues that were discussed during the meeting. Without the weekly, face-to-face team meetings where all team members are encouraged to share problems and ask questions, information needed to resolve client issues may not be found as easily or as quickly.

5.3.2.2. Team Culture

Both team structure and team culture have been shown to influence team performance (Orchard, Curran, & Kabene, 2005) as well as individual job satisfaction (Glisson & James,
2002). I found that team culture also impacts collaborative information seeking. The definition of culture used in this study is based on an early anthropological definition put forth by Tylor (2012) where culture is an integrated system of shared ideas, including thoughts, ideals and attitudes, actions, and objects. I applied this definition to account for the “subcultures” of teams in organizational settings where norms, behaviors, and artifacts in team cultures determine how work is organized, coordinated, communicated, and monitored (Daft, 2003; Hofstede, 1998; O’Hara-Devereaux & Johansen, 1994). Using this definition as a guide, team culture can also include a team’s work processes and work practices, which can drive a team’s work activities (Campion et al., 1996). I found three aspects of team culture in particular that impacted collaborative information seeking activities. They were sense of issue assignment, shared responsibility, and team-wide software training.

5.3.2.2.1. Issue Management

One important team process that affected collaborative information seeking activities was the way issues were assigned to team members. For example, at the Regional Health System, the Clinical and Financial Software Services teams differed in their approach to issue assignment. When the Customer Service Center passed a helpdesk ticket to the Clinical Software Services team, it was assigned to the on-call analyst regardless of functional issue type. On the other hand, tickets assigned to the Financial Software Services team were first assigned to the team’s director who then reassigned the issue to the analyst with specialized training and knowledge to resolve it. When it came to issue resolution, management’s expectations regarding responsibilities differed across teams. The Clinical Software Services team’s management expected team members to handle client problems regardless of area of expertise, while the Financial Software Services
team’s management emphasized specialization. These opposing expectations led to differing work practices within each team that in turn affected collaborative information seeking activities.

For example, the Financial Software Services team assigned issues based on expertise. In contrast, the management of the Clinical Software Services team assigned issues based on who was on-call that day, regardless of expertise, which led to Clinical Software Services team members taking turns having issues to resolve, but where those assigned issues may be outside their expertise. The degree to which team members were assigned issues outside their expertise affected the collaborative information seeking and sharing activities of the team as demonstrated in the following vignette. Jill, Kelly, and Claire, members of the Clinical Software Services team, work together to troubleshoot a prescription print issue.

Jill is assigned a new client issue. The nurse is having a problem printing a prescription. Because, Kelly is a pharmacy expert and understands the issue better, Jill asks Kelly to help find information to resolve the issue. Kelly logs into NextGen and looks at the patient data. It appears that the patient has a large number of allergies. Because of the numerous allergies, the nurse cannot print a prescription using the existing Crystal Report.

Kelly walks over to Claire’s cubicle and explains the problem. (Claire is a Crystal Report specialist and helped Kelly with these reports in the past.) Kelly tells Claire that a patient has 38 allergies and the print preview won’t even populate. Claire asks Kelly to go into Crystal Reports. They found the Rxprint.doc report and together they review the allergy sub-report. Kelly tells Claire of a past prescription print problem and they realize this is the opposite problem. Claire tells Kelly that something (a setting) is preventing the report from growing past a certain point.
Claire makes a change to the report, saves it, and tests it with the actual patient data. It still does not work. Claire goes back into Crystal and removes her changes.

Claire believes that the problem is that she made the page too long. She reduces its size and reformats the layout. Claire steps away for lunch, and while she is gone, Kelly tests the changes to the report. Kelly adds data to test a person with excessive allergies and prints the changed report with test data. She continues to make minor changes and tests again, but does not solve the problem completely so she continues to tweak the report and test.

After lunch, Claire returns to help Kelly. Kelly thinks she has the report formatted as needed. Yet, she still needs to test other scenarios. Therefore, she needs to add more data. Claire and Kelly have found an acceptable work around for patients with a large number of allergies. They debate whether to put this solution into the production environment. Kelly believes they are missing some fields in the header. So, they make the needed field changes and test. Kelly moved the updated report file to Production, tested it and it worked. Kelly and Claire then talk with Jill to explain the solution so that the client can be informed of the fix.

While Jill was originally assigned the issue due to the fact that she was on-call, she sought out the experts who then collaboratively worked together to find needed information and solve the problem. While the spirit on this team is one of cooperation, the fact that the analysts take turns being on-call is an enabler of CIS. Each analyst knows that they themselves will be on-call one day soon and that he/she may need to ask for help with issues. This allowed collaborators to be willing to engage in information seeking activities.
5.3.2.2. Sense of Shared Responsibility

Responsibility for issue resolution is an example of an aspect of team culture impacting collaborative information seeking activities. For example, on the Financial Software Services team, the director believed that issue resolution was an individual responsibility; therefore, there was neither expectation for assistance from nor any incentive to assist teammates.

In contrast, issue resolution on the Clinical Software Services team was viewed as a shared responsibility. Because of this, teammates took the initiative to share information to resolve an issue without first being asked for assistance. This was in stark comparison with the Financial Software Services team, where issue resolution was seen as an individual activity—leading to a lack of information sharing among team members.

The vignette below illustrates how a sense of shared responsibility on the Clinical Software Services team acted as an enabler for collaborative information seeking activities. In the vignette, Laney, Katherine, and Danielle, members of the Clinical Software Services team, came together in an impromptu manner to troubleshoot a computerized physician order entry (CPOE) print issue.

Laney and Katherine share a large cubicle. They are discussing a CPOE printer where print jobs sent to the CPOE printer are always sent to the manual feed tray. Another analyst, Danielle, happened to be walking by the cubicle and overheard the conversation. Danielle stopped to participate in the troubleshooting discussion because she is very experienced in dealing with printing issues. Danielle suggested that further information was needed to determine the cause of the problem. What are the settings on the CPOE reports? Have the settings on the printer in question been changed? Danielle logged into
the electronic medical record to review the report settings while Katherine called the on-site PC technician to find out if the printer settings had been changed.

Both Laney and Katherine, CPOE functionality experts, worked together to troubleshoot the CPOE issue at hand. Yet, because of the sense of shared responsibility and the helpful nature of the Clinical Software Services team, Danielle also offered her expertise because she happened to overhear the conversation and knew that she could offer useful and relevant information to solve the problem. The cooperative spirit and shared sense of responsibility in solving client issues within this team allowed for additional collaborators to be involved in information seeking activities without the need to explicitly ask them.

5.3.2.2.3. Team-wide Software Training

Each team within the IT departments supported a particular area of IT (clinical, financial, etc.), and within each team, members specialized in a specific piece of software or technology. However, every member of the clinical IT teams was also trained on the basic functionality of the clinical software package. All software packages have two major components. One component is the basic package, which includes the core functionality of the system. The second component includes select add-on modules for specific functional areas.

At both sites, all members of the clinical IT teams were trained in the basic packaged functionality of the Electronic Health Record (EHR)—an electronic version of a patient’s medical history. The basic package included functionality dealing with demographics, progress notes, problems, medications, vital signs, past medical history, and immunizations. Further, each member also received additional training in a specific clinical add-on module such as laboratory, pharmacy, computerized physician order entry and reports. Consequently, every Clinical analyst
was trained in and expected to support the basic functionality of the electronic health record while also specializing in an area of expertise in one of the add-on modules. This practice of offering basic package training for everyone on the team led to clinical IT team members having a common understanding about the EHR.

Basic package training for all clinical IT team members allowed them to have common ground when discussing client issues (Clark, 1996). This common ground made it easier to engage in informal collaborative information seeking activities due to the common terminology and understanding across the team. As the following vignette highlights, a shared understanding of the basic software package allowed for more seamless communication and ease of interpretation between team members working together to resolve an issue with an interface used by nurses.

*It is brought to Danielle’s attention that part of the Clinical Summary data, the Medical Orders, is not populating for some patients while they are for others. Danielle walks into Edith’s cubicle to let her know about this issue since she is the Clinical on-call support analyst. They discuss what information is needed to diagnose the problem. Is there a pattern in the patient data that will explain the discrepancies? Is the most up-to-date filter configuration implemented in the production environment? They split the information search with Edith reviewing the patient data in the electronic medical record and Danielle comparing the view filter setup in development to the one in production. Danielle goes back to her cubicle to search for this information and realizes that the filter on the Medical Orders in production is set to a specific value rather than showing all orders. Danielle walks back to Edith’s cubicle to share this information. They decide to change the filter setting in production and test it to determine if this is the root cause.*
Both Danielle and Edith had a shared understanding of the basic clinical software package while also serving as “experts” in particular sub-functionalities of the software. Danielle’s specialty was orders while Edith’s specialty was pharmacy. While they each had an area of specialization within the clinical software, their common understanding of the basic software package allowed them to identify where their specialized expertise overlapped. Each of them was able to understand the issue from their particular perspective, which in turn made it easier to share relevant information with their collaborator. Therefore, as client issues arose with this software, Clinical analysts needing help to solve an issue could turn to teammates for assistance. This collaborative information seeking practice was supported by a shared baseline knowledge in the software, which allowed team members to have a common understanding and terminology to collaboratively “make sense” of the issue and the potential solutions (Paul & Reddy, 2010).

Unlike the clinical IT teams, the financial IT teams were much more specialized. Very few members of the teams were trained in the basic financial software package functionality. While the other team members were only given specialized training in specific add-on modules, such as claims and reports. Therefore, unlike the clinical IT team members, the lack of basic package training left the financial IT team members unwilling to turn to teammates for assistance because they believed that their teammates did not have the relevant information to help them. Instead, members of the financial IT teams tended to only turn to specialists in the same add-on module of the software when needing help.

For example, Kelly is the claims specialist on the Financial Software Services team. While she expressed interest in collaborating with others when claims issues arise, she also admitted that she was limited in her information seeking activities because she is “on [her] own” since no one else on her team specializes in the claims functionality of the software. On this team,
collaboration during information seeking activities was not prevalent. Given a lack of common
knowledge across the team, the team members tended to work independently.

The different teams’ approaches to training their staff members led to different
information seeking practices. For instance, on the clinical IT teams where all members were
trained on the basic software package, collaboration was the norm due to a common
understanding and terminology across the software system. On the other hand, on the financial IT
teams where each member was a specialist in only one aspect of the software, there was very little
overlap in system understanding and terminology and information seeking and sharing activities
were much less prevalent.

5.3.2.3. Team Workspace

Team workspace is an additional team characteristic found to impact collaborative
information seeking activities. Aspects of team workspace can include, but are not limited to,
layout of the space, proximity of the individual workspaces (Hoegl & Proserpio, 2004), closed or
open workspaces (Brennan, Chugh, & Kline, 2002) and formal or informal atmosphere. Aspects
of a team workspace make up the physical structure of the team and have been shown to
“influence or regulate social interaction” (T. Davis, 1984), as past research proposes that physical
structure can influence how people interact and communicate within and among teams (T. Davis,
1984; Souder, 1981). These findings suggest that team members are most likely to interact,
communicate and collaborate when the workspace encourages them to do so (Peters, 1990).

For example, adjacent cubicles can facilitate CIS practices as potential collaborators may
overhear a teammate discussing a client issue and share information that might be useful.
However, even when adjacent cubicles exist, a more formal workspace atmosphere can constrain
CIS practices when a quiet, respectful, orderly work environment is expected because it is difficult to have impromptu meetings or interruptions that could lead to CIS.

While both the Clinical and Financial Software Services teams worked in a large room with cubicles separating individual workspaces (see Figure 4-4, p. 65), the Clinical Software Services team’s work environment expectations were that of informal atmosphere while that of the Financial Software Services team was of a much more formal atmosphere. In the Clinical Software Services team, it was perfectly acceptable to interrupt a team member to ask a question or ask for assistance. Quite often, meetings of as many as five team members were held in a cubicle, raising the noise level in the room. Speakerphones were also used allowing other team members in the room to overhear the conversation and offer assistance when needed. The layout of the workspace, along with the informal atmosphere of the Clinical Software Services team, allowed for the potential of more collaborative information seeking.

However, the opposite was true for the Financial Software Services team. Their workspace layout offered the opportunity for collaborative information seeking; however, the formal work atmosphere negated that opportunity. The work environment of Financial Software Services team was one of a quiet atmosphere where there was no loud talking in the work area, no use of speakerphones, nor any impromptu meetings or interruptions. This atmosphere made it nearly impossible to overhear conversations and offer assistance if the opportunity arose.

The Financial Software Services team, with their formal atmosphere, had less opportunity for collaborative information seeking. Consequently, potential collaborators to engage in the issue resolution process could easily be overlooked. In this team, the analysts first had to determine with whom it would be most beneficial to collaborate, then formally request their assistance via an email for phone conversation, then set up a time to discuss the issue. This sometimes took hours if not days, slowing the issue resolution process or stifling it all together.
At 10:00 a.m., Jeni, a financial software services analyst, receives a new HEAT ticket stating that the physician scheduling software is running extremely slowly. Jeni cannot do anything about this issue herself as the server most likely needs to be rebooted. Therefore, Jeni emails Randy, a network administrator, to let him know of the issue and to ask for his help in solving the problem. An hour later, at approximately 11:02 a.m., Randy responds to Jeni’s email and suggests they the server be rebooted at 12:30 p.m. over the lunch hour. In the meantime, Jeni receives more HEAT tickets from other clients complaining that the system is slow and that other users cannot even log into the system. Eventually, at approximately 11:30 a.m., Jeni calls Randy to discuss their options for fixing the connectivity issues.

This finding was confirmed in a survey of the IT department at the Regional Health System. When asked how the culture/atmosphere of the team affects the level of collaboration, respondents answered that the more informal the culture/atmosphere, the more collaboration is likely to take place (Figure 5-4).

![Figure 5-4. Level of Collaboration by Culture/Workspace Atmosphere.](image-url)
The formal, quiet work atmosphere of the Financial Software Services team led Jeni to first determine from whom to seek expert information in solving the connectivity problems and then to formally request assistance via email. If the work atmosphere of the Financial Software Services team was more similar to the Clinical Software Services team, Jeni might have called Randy directly or even stopped by his desk to discuss the problem and request assistance. Instead, Jeni used more formal channels that led to an extended (1.5-hour) turn-around time in solving the problem.

5.3.3. Organizational Characteristics

Organizations have factors that derive from the structure, culture, processes, policies, and procedures implemented across the institution. The organizational structure itself can be highly varied (Child & McGrath, 2001). In addition, organizational culture is a broad factor that has a number of attributes such as values, visions, norms language, habits and levels of cooperation and collaboration (Smircich, 1985). The features of an organization found to impact collaborative information seeking activities are highlighted in Table 5-4. They are (i) cross-team communication, (ii) integration of systems, (iii) issue priority, and reputation of a team. Below, I offer further details about these organizational contextual factors. These organizational characteristics remind us that organizational structures, policies, and procedures are significant when discussing the collaborative aspects of information seeking.
5.3.3.1. Cross-Team Communication

One example of an organizational characteristic that can impact collaborative information seeking activities is cross-team communication. Much like intra-team communications, inter- or cross-team communication can vary by communication modality and frequency (Leenders et al., 2003), as well as other parameters such as cooperation, intensity, dominance, formality and task orientation (Wish & Kaplan, 1977). Open, flexible and trusting lines of communication across teams allows potential collaborators to not only be aware of the information needs of information seekers, but alternatively, allows information seekers to determine who may be a potential collaborator on another team. Organizational structures and policies concerning cross-team communication can either reinforce or overcome existing organizational boundaries (Swan, Newell, Scarbrough, & Hislop, 1999), which in turn can enable or inhibit collaborative information seeking activities.

An example of cross-team communication found to impact CIS activities is information sharing in departmental meetings where several or all teams from a department come together to discuss issues, trends, roadblocks, and information needs. Large, institutional IT systems are complex, particularly electronic health records and the financial systems that integrate with them. So when an IT issue arises in the financial area of the software, it may affect or be affected by data entered into the clinical area of the software. I found that departmental meetings facilitate CIS practices because they are a forum for information technology staff members across teams to discuss issues that may cross team boundaries. Having a monthly, joint software services meeting allows analysts from all IT team to share their most important client issues, leading other staff members to realize that they may have information to offer and/or may be working on a similar issue. Many times, a member of one IT team did not know that someone from another IT team
was working on a similar issue or an issue where they could offer useful information in solving the problem. However, discussions during these cross-team meetings allowed members from different teams to talk about issues. As one analyst at the Regional Health System stated, “They seem to catch a lot [during these cross-team meetings], put a lot of pieces together when something is going wrong.” These discussions enabled CIS activities and led to cross-team collaborations. What is important to note is the “type” of meeting held, not the fact that a meeting was held across teams. These monthly, joint software services meetings were a forum for information sharing and seeking as well as a place to find potential collaborators.

5.3.3.2. Integration of Systems

Another organizational characteristic found to impact collaborative information seeking activities is the level of integration of the IT systems. In healthcare, information technology systems are modularized but tightly integrated. There is a base electronic health record that integrates with several functional modules such as scheduling, registration, lab, pharmacy, billing, etc. Therefore, all IT support teams must work together to keep the systems working properly. Additionally, the teams responsible for data integration must understand all modules of the system, while the teams responsible for all hardware and network issues are responsible for maintenance and support across the system regardless of business functionality. Therefore, IT teams are expected to work together regardless of system functionality to resolve all user issues. This leads to interaction, information seeking, information sharing and collaboration across IT teams with regard to system integration, data integration, hardware and other complex information technology issues.
The fact that IT “data integration” teams support data across all business functions and IT “network” teams support all hardware systems enables collaborative information seeking activities because there is an expectation of joint responsibility when issues arise regarding data moving across systems or connectivity of systems. For example, at the Regional Health System the integration specialists support all Clinical and Financial systems and they also work the network services team on PC, hardware and networking issues. Essentially, the integration specialists work with every IT team to resolve issues, even though they are on the Clinical Software Services team. The same is true for the Technical Services Delivery team at the Teaching Medical Center, who work with members of the Clinical Information Systems and IT Administration & Finance teams on a regular basis to resolve client issues and assist with IT projects.

When asked how tightly integrated systems impact collaborative information seeking activities at the Regional Health System, an integration specialist responded with the following example.

*I can give [the software analyst] the information that is passing through the interface so she knows what [the clinical system] is sending, how it is being translated in OPENLink and what OPENLink is sending [to the Pharmacy system]. Then, [the pharmacy analyst] knows how it is responding on [the] Pharmacy [system]. In one instance, there was actually a report in Clinicals and [the reporting analyst] [saw that] things weren’t showing up [correctly] on the reports. That was the final piece that actually made [the issue] make sense—that we needed this job added. It was the missing piece. [The clinical IT director] is usually our go-between sometimes when we need a little extra push with Siemens.*
As this example highlights, the tight integration of the information technology systems leads to collaboration information seeking when resolving issues regarding these systems because the tightly integrated systems demands that members of several teams come together to seek and share information before the problem can be solved.

### 5.3.3.3. Issue Priority

In a healthcare setting, IT issues that affect patient care are assigned a higher priority and an expectation of faster resolution times. These time restraints based on issue priority often impact how people choose to find information. For example, if there is a client IT issue that is of high priority that cannot be easily and quickly resolved by the issue owner, the issue owner then tends to seek out others as opposed to researching and working on the issue alone. Thus the urgency of the issue affects the work practices—facilitating collaborative information seeking activities through, for instance, the creation of ad-hoc problem-solving teams. Therefore, organizational policy regarding issue priority leads to temporal sensitivity which in turn impacts CIS activities. One analyst from the Regional Health System explains it as follows:

*Time limit [can impact my decision on with whom to collaborate]. If they are out that day, there is nothing I can do. If I need to know that day, I will find it one way or another, even if I have to go through all those people that I don’t want to talk to. Time restraints do sometimes cause me to cut corners and to collaborate with people I otherwise would not collaborate with. Just because it is such a fast-paced environment and obviously the high availability of our services has to be up for the most part.*

We can see from the example above that issue priority matters when looking for information. The analyst at the Regional Health System highlights that the urgency of an issue
influences the pace of the work which in turn impacts how he seeks information, particularly the selection of collaborators.

5.3.3.4. Reputation of a Team

I also found that certain aspects of the reputation of a team affect cross-team collaborative information seeking practices. Much like the reputation of an individual potential collaborator, the reputation of a team, what is said about a team but is not necessarily what is true about a team, can impact whether a member of one team chooses to engage a member of another team in CIS activities. Once again referring to Quesenbery’s (2003) dimensions of usability that include several aspects of reputation, I consider aspects of a team’s reputation to include the ability to be efficient, effective, engaging, error tolerant and with whom it is easy to [interact]. Specifically, I observed two aspects of the reputation of a team—technical knowledge (efficient and effective) and the willingness to assist (engaging)—impacted collaborative information seeking activities. Both are described further in the following paragraphs.

A team’s reputation can affect whether a member of another team chooses to engage a member of said team in CIS activities. For instance, in an IT department, technical competence is regarded as just as important, if not more so, than business competence. Consequently, an IT team with a reputation as lacking in technical knowledge, having expertise in a particular organizational area but very little expertise in IT, can constrain cross-team CIS engagement. This is because the name of a team, for example the IT Financial Software Services, implies that the team has expertise in both IT and Finance. However, if this is found to be false, the reputation of the team is tarnished. Therefore, the reputation of a team as lacking in technical competence constrains cross-team CIS activities because technical competence is of the utmost importance to
the technically minded, even though business and process knowledge can be just as useful in solving an IT issue.

Another aspect of a team’s reputation is the perception of team members’ willingness to assist in solving a problem. For example, a team that lacks a collaborative climate (Sveiby & Simons, 2002) is often perceived as difficult to work with, not cooperative and/or as only doing the bare minimum in collaborative situations. This perception of not being a “team player” constrains collaborative information seeking activities as members of other teams may avoid engaging them in CIS activities, even when their expertise is relevant to an issue. To this point, a PC technician at the Regional Health System comments on working with the Financial Software Services team. As this vignette demonstrates, the lack of reciprocity affected the Financial Software Services team’s reputation and the willingness of the Network Services team to engage them in collaborative information seeking activities.

*I would try to find anybody to ask a question to. I would try any other thing I could possibly do before I would go to the finance team and ask them a question, even if they are the experts on it. ...I will work with anyone but that particular “pack” [because] they are very myopic. They are not very team-oriented as far as everybody working together as a concerted unit. They...will only tell you and be helpful up and to the point where they think they have done enough, but they won’t catch hell for it. ...When they ask, they get answers. They get whatever they need. But it is not reciprocated. It is so much so, to such an extent that we do ourselves no favors, but everybody sort of is like, “The last thing I am going to want to do is go ask the finance team for anything.”* 

We can see from the example above that reputation matters when considering what team(s) might be helpful in finding needed information. In the above example, the member of the Network Services team at the Regional Health System points out that if a team is known for their
unwillingness to fully engage in collaboration, then there is no reason to engage the team in CIS activities because full engagement and reciprocity matters in collaborative information seeking activities.

5.3.4. Technological Characteristics

The final category of contextual factors affecting collaborative information seeking practices is related to technology. Characteristics of technologies can include physical (mobile or stationary), social (chat, sharing functionality, etc.) and accessibility (perceived ease of use) features. In a collaborative environment, technology must support easy, flexible, and seamless communication while facilitating information seeking and sharing. Consequently, certain technological characteristics can influence CIS practices. Per the listing in Table 5-4, I found the following technological characteristics impacted collaborative information seeking activities: (i) simultaneous remote collaboration and (ii) social functionally.

These technological contextual factors highlight the importance of implementing easy, flexible, and seamless technologies that facilitate collaborative information seeking activities. Information seeking and sharing technologies, as well as knowledge management systems, should not only support information seeking activities but also support collaboration amongst the information seekers and sharers.

5.3.4.1. Simultaneous Remote Collaboration

Some information technologies are inherently built to support simultaneous remote collaboration. For example, we observed collaborative information seeking activities taking place
using CITRIX desktop sharing software, which allows non-collocated collaborators to share a computer screen. It is essentially like “being there” (Hollan & Stornetta, 1992) in the same room looking at the same information together. This was also the case when collaborators used WebEx internet conferencing to seek and share information to solve client issues. In this case, WebEx allowed for the collaborators to feel like they were working together, side-by-side sharing information, testing solutions and evaluating information (Olson & Olson, 2000). The characteristics of these technologies, along with the use of a telephone or cellular phone, allow non-collocated collaborators to share information, lessening the effect of distance. The following vignette highlights the use of technology to facilitate simultaneous remote collaboration.

A customer contacts the helpdesk and the customer service representative takes the call. The client is in read only mode for a particular record, but needs to have read and write access. The customer service representative uses CITRIX to view the client’s PC screen to better understand the problem. Next, the customer service representative puts the client on hold while calling an analyst on the Clinical team to ask for advice on how to handle the issue. The clinical team analyst also uses CITRIX, this time to view the customer service representative’s PC screen which still has the client’s PC screen up via CITRIX. Using the functionality in CITRIX, the clinical analyst shows the customer service representative how to fix the problem. After completing the call with the clinical analyst, the customer service representative returns to the call with the client to confirm that the solution to the problem works.

As this vignette highlights, the CITRIX tool was used not only to facilitate simultaneous remote collaboration between a customer service representative and a client in order to share information about the issue, but also to enable simultaneous remote collaboration between a customer service representative and a clinical analyst to collaboratively seek information to solve
the client issue. CITRIX allowed for synchronous, flexible, and seamless collaborative information seeking activities from a distance.

5.3.4.2. Social Functionality

Social functionality such as instant messenger is another technological characteristic found to impact collaborative information seeking activities. For example, by using instant messaging functionality, an information seeker could initiate collaborative information seeking, getting a potential collaborator’s attention and starting the CIS process. Additionally, social functionality allows information seekers to have awareness information about potential collaborators.

As one analyst from the clinical IT team noted when asked what information technologies, if any, are used to help in collaboration, “Definitely email. Definitely phone calls, but I would [also include] something called Web Pad. It’s an area [where] you can tell people where you are, when you are and what you are doing. Each one of our names is listed and there’s a text box [next to your name] and you can say “here today until 2:00; after that in this room’. I think that’s a good way to help collaborate because you can look at that and know if somebody is even in the building today or not.” To further this point, a PC technician stated that instant messenger has social functionality that provides social awareness and availability information “as long as everyone was fairly decent about setting their in office, out of office, busy, on conference call kind of thing. That way if I see they are available, I can talk to them. If I want to talk to them in person, I can go down there.”

Social functionality in technology goes beyond awareness and availability, as it also allows for minimal work interruptions and faster, more efficient communication. As a director of
IT points out when asked why use technology when collaboratively seeking information, “I think it would be great if we did [use instant messenger] because I think it is much more on the spot. There is a certain sense to it where you don’t have to get into a protracted conversation necessarily as in a phone call, but you don’t have this sort of “I’m not really here” of sending an email, even though you might be there.” While a telecommunications supervisor highlights that the use of technology during CIS activities allows the collaboration to be, “quicker—in some cases it’s faster—most cases it’s faster. More efficient—instead of running around the department looking for someone, it is easier to pick up the phone and call or drop them an email. So I would say [social technology allows for CIS activities to have] efficiency and speed.” Further, a team manager, points out how social functionality can foster minimal work interruptions. “If instant messenger was used, I would not have to pick up the phone, no one would have to hear me. It kind of lets you run outside the lines without worry about speaking with like a manager as much.” Social functionality in technology is used not only to facilitate CIS activities, but also to enable faster, more efficient, and less obtrusive communication during CIS activities.

### 5.4. CIS Practices Impacted by Contextual Factors

In order to address the research question (RQ2): “How do contextual factors impact CIS practices”, I examined how IT teams collaboratively sought and retrieved information and used the working definitions of collaborative information seeking (see p. 3) and contextual factors (see p. 12) to identify the contextual factors themselves and to understand how the factors impacted CIS activities. From this analysis, I found that contextual factors led to certain CIS practices. These practices were the (1) creation of ad-hoc teams, (2) evaluation of information, (3) adaptation of technology, and (4) use of stopping criteria.
5.4.1. Creation of Ad-Hoc Teams

To underscore how the interplay of contextual factors can impact CIS activities, I turn our attention to a common feature in most organizations— the ad-hoc team. In the IT department, it is not just the existing teams, but the bringing together of individuals from several teams quickly, that allows IT members to successfully solve user’s technology issues. These ad-hoc teams are often created to find the information needed to solve a particular IT issue.

The IT departments at both sites consisted of several permanent teams (described in Chapter 3), each responsible for a specialized area of IT. However, because the information needed to solve complex IT issues is often spread across different people who may or may not be on the same team, ad-hoc teams are temporarily created to find and apply the information needed to solve a particular IT issue. The creation of ad-hoc teams serves two purposes: 1) to bring the experts together to find out what they know, and 2) to share and apply the information “right then and there”.

While it is relatively simple to pull together an ad-hoc team because the people with the required information are usually co-located and can meet face-to-face to work on issues, several contextual factors can impede the creation or impact the formation of an ad hoc team. These contextual factors include the quality of information the potential collaborators can provide, team culture (as this can impact cross-team interactions), cross-team communications (as this can vary across teams), and integrated systems (as the more complex the issue, the more likely the need for an ad hoc team). The following vignette highlights the practice of creating an ad-hoc team to pull together the information needed to solve an issue.

Jim, a CSC representative, cannot resolve a client issue in the time allotted; therefore, he creates a HEAT ticket and assigns it to Richard on the Clinical Software Services team.
Richard is able to determine the cause of the problem immediately (the user has access rights to the scanning folders on the network that are beyond his job need); however, Richard does not have the knowledge to determine exactly how to resolve the issue. Therefore, Richard pulls together an ad-hoc team of experts to tackle the problem. Richard calls a meeting to discuss the problem. The meeting participants include Chip, a systems programmer, Chris, a network technician, and Matt, a project manager. The meeting takes place in Richard’s office so that everyone in attendance can discuss the issue while having access to the system and network in question.

When Richard realized that he did not have the necessary knowledge to solve the access rights problem, he turned to members of the IT staff across several teams who did have the expertise needed to solve the problem. The ad-hoc team that Richard created consisted of IT department staff members with expertise and experience in the software as well as the network architecture, representing different internal IT teams.

However, while these ad-hoc issue resolution teams share information to diagnose problems, provide possible solutions and troubleshoot as needed, their actions may not be as formal and organized as a traditional team brainstorming session. For instance, the teams can be much smaller than the ideal six to twelve participants for traditional brainstorming (Rickards, 1999). Further, these ad-hoc teams often meet “on the fly” as problems arise and without any pre-warning or set agenda (Rickards, 1999). Lastly, while potential solutions are generated, the list of solutions may not be exhaustive. Solutions are brought forth and considered until one that can solve the problem “well enough” is encountered.

The study also highlighted that the effectiveness of ad-hoc teams can be severely impacted by contextual factors. First, the formation of these teams is not always straightforward and uncomplicated. Several contextual factors, such as an individual’s reputation and availability
as well as team workspace and culture, can impact the selection of collaborators to participate in
the ad-hoc teams. These factors influence the make-up of the ad-hoc team, in turn affecting what
information is sought, retrieved, shared and is brought to bear on the problem. Second, some
interesting issues may arise related to CIS activities when members of different teams interact as
contextual factors can affect the activities of these ad-hoc teams. For example, CIS activities may
be hindered by team characteristics such as reputation. Members from teams with poor
reputations may not receive as much help in the ad-hoc teams as those members of teams with
strong reputations. Therefore, inter-team activities could require the management of certain team
characteristics before CIS activities can be successfully carried out.

5.4.2. Evaluation of Information

The creation of ad-hoc teams does more than bring experts together to answer questions. Instead, these experts engage in the issue (shared understanding and responsibility) and shared
their knowledge, expertise and experience as part of issue resolution, not merely as a “work
around” to work processes (Ehrlich & Cash, 1994). Further, these ad-hoc team members resolve
the issues collaboratively. The ad-hoc teams go beyond expertise location and serve as a setting
where information is shared, evaluated and applied.

Once the needed information is found and shared, team members have to determine if the
subsequent solution will be helpful in solving the issue at hand. In essence, they have to
determine if the correct information has been found to resolve the issue. Therefore, another
important aspect of CIS activities is the evaluation of that particular information to ensure that it
is useful in solving the problem or answering the question at hand. If not, team members may
have to continue searching for the appropriate information. I observed two information specific evaluation techniques: 1) testing the information and 2) deliberation.

One way to determine if the correct information has been found is to test the resulting potential solution. When resolving a software or hardware issue, team members may perform empirical investigations based on the proposed solution. For example, they may run through a scenario to recreate the issue, and then make changes to the hardware or software based on what was learned by the gathered information. Next, they may run through the scenario again to see if applying the new solution changes the results. If the solution resolves the problem, the team is finished with CIS activities. However, if not, the team will continue working until the information needed to solve the problem is found.

Evaluation of information is relevant because the information put forth to solve the problem or answer the question can vary depending upon who is engaged in the CIS activities. And who is engaged in CIS activities is dependent upon several contextual factors including quality of information, team culture, team workspace, and cross-team communication. In addition, how ad hoc teams communicate impacts the evaluation of the information.

To demonstrate the CIS practice of evaluation of information, let us continue on with the story about Richard and his ad-hoc team attempting to resolve the folder access rights issue.

...On his computer, Richard shows the team the current permissions settings for the scan folders. They talk through what permissions should and should not be given to users based on a previous system configuration. The team discusses if the scanning groups should be broken down more granularly. After the team members share particular information on the subject, Matt says, “Why don’t we take the global group and give them read/write/modify? I could have sworn modify allows for deleting of files.” Richard suggests that they test Matt’s hypothesis. Richard edits the share permissions and then
suggests that they do a preliminary test where Chris attempts to get access to the scan folder now that the Everyone group has been removed from share permissions. Richard and Matt walk over to Chris’s desk to have him test his access. Chris’s access to the scan folder is denied. This proves that removing the Everyone group from the share permissions seems to have worked. The meeting is adjourned. At this point, the issue is considered resolved.

As described in this vignette, team members were seeking information regarding folder permissions. The collaborative information seeking activities involved an exchange between experts combined with the use of information found in an existing system. Next, they evaluated the usefulness of the information to solve the current problem through testing the potential solution generated through information exchange. Once the potential solution proved useful then the information was clearly appropriate and used to solve the problem.

Another information evaluation technique is deliberation, where different aspects of an issue are discussed. In collaborative information seeking, there are two types of deliberation. One type of deliberation is a focused discussion of the viability of a single solution—I call this “solution-vetting”. Solution-vetting can be used to appraise or validate one particular solution. The other type of deliberation takes place when there is no apparent solution, leading to a more general, open-ended discussion. During these open-ended discussion sessions, team members brainstorm to generate potential solutions, where potential solutions are presented until one arises that is sufficient.

In the instance of a solution-vetting session, a single proposed solution may be presented to the ad-hoc team members and discussed. This allows the team members to “check” the solution for application to the problem. Team members may also employ open-ended discussion sessions as an information evaluation technique. In these situations, not only might team members
exchange their views, ideas and information but they may also consider all sides of the issue when weighing the applied information for relevance or sufficiency. The team members take turns presenting information, potential solutions, and their opinions on both, eventually leading to a potential, useful solution. Whether using one or the other information evaluation technique, collaborators act as “sounding boards” for each other as a means of evaluating a potential solution. They weigh and examine the options for solving a problem or answering a question, carefully consider these options, and then make a decision. While they may not always come to an agreed upon solution, they may determine that the potential solutions will not suffice and therefore further CIS activities will need to take place.

5.4.3. Adaption of Technology

Information technologies are not always used as designed or intended, particularly when these tools do not support work practices and/or are not integrated into work routines and processes. In the IT department at both sites, there were a number of technologies available to staff members. While the organizations had a traditional, packaged knowledge management system (KMS), Microsoft SharePoint, they did not use this KMS to find information. Instead, IT staff members most often used a traditional communication tool, email. They used email both asynchronously and synchronously to support CIS activities.

There were three major reasons why Microsoft SharePoint was not widely used by the IT staff. First, when seeking and sharing information with a collaborator, the IT staff needed a medium of communication. Microsoft SharePoint, as implemented, did not allow for communication between collaborators, synchronously or asynchronously. Therefore, IT team members had to use email to seek and exchange information. While SharePoint could have
supported this type of communication, neither hospital implemented the software with this functionality enabled.

Second, the IT staff had long been using network file folders to store and share documents and other pertinent IT system information. The IT staff viewed Microsoft SharePoint as a glorified network file folder and therefore saw no benefits to changing their current work processes and practices to incorporate SharePoint. Because the staff thought it would require additional work to put information into SharePoint, they chose not to and continued to use the network file folders for document storage. Additionally, while each site used Microsoft Office productivity tools including Outlook, SharePoint was not integrated into this suite of tools. This lack of integration made it more difficult to use SharePoint seamlessly because it was difficult to link to or send information from within SharePoint to the information seeker. Therefore, IT staff members continued to use Microsoft Outlook to seek and share information as needed.

Finally, while IT staff members were encouraged to use Microsoft SharePoint, they were not mandated or incentivized to use it. Consequently when they found it difficult to incorporate into their work routines and CIS activities, they fell back to using the corporate email system.

Although IT staff members used Microsoft Outlook as the tool of choice for seeking and sharing information, they did so by adapting it to their needs. The email was adapted to be used both asynchronously to share information between collaborators and synchronously in “real time” much like an instant messenger technology, where its use took the place of traditional synchronous communications such as face-to-face and phone conversations. When used synchronously, email worked much like an instant messenger system, even though the management of the IT department at Regional Health System did not allow any instant messaging applications.
This finding was confirmed in a survey of the IT department at the Regional Health System. When asked which tool they would most likely use to share information when virtually engaging in CIS, respondents overwhelmingly selected email as the most likely tool (Figure 5-5). Further, when asked which email features they would find most useful when engaging in CIS, respondents selected notifications/alerts (Figure 5-6). This feature would enable email users to know when a collaborator needed something or updated any information about an issue without having to constantly check for updates manually.

Figure 5-5. Tool Most Likely to Use When Engaging in CIS Virtually.
While traditional knowledge management systems are often thought to be the best way of sharing organizational knowledge and information, other technologies, depending on circumstances, might be better suited for collaborative information seeking and sharing. In the case of both Regional Health System and Teaching Medical Center, email was the preferred technology for collaborative information seeking and sharing activities even when other collaborative tools were available for use. Clearly, team culture can impact how technologies are and are not used.

5.4.4. Use of Stopping Criteria

“While expanding knowledge for its own sake may be an ideal, in reality individuals often look for information only to achieve a practical goal,” (Zach, 2005, p. 24). This was found to be the case in the IT departments at both sites. Much like the findings by Zach (2005) in the study of senior arts administrators, CIS activities continued only until the information seekers
reached an arbitrary level of comfort with the solution (brought forth by the information acquired). However, this comfort level seemed to depend upon the task environment. In this study, task environment tended to be influenced mainly by two contextual factors: issue priority and temporality. The more important the issue, the higher the comfort threshold, while the less important the issue, the lower the comfort threshold. The concept of using conditions for what information is needed and then discontinuing the search when these conditions are achieved is known as using stopping criteria in information seeking (Lancaster, 1977). However, the optimal solution is not always found. Instead, the use of stopping criteria often led to satisficing.

Simon (1971) defines satisficing as a process “through which an individual decides when an alternative approach or solution is sufficient to meet the individuals’ desired goals rather than pursue the perfect approach” (p. 71). With regard to search, March (1994) sees satisficing specifying the conditions under which the search starts and stops and as such, satisficing is more a search rule than a decision rule. From this, March (1994) identified three characteristics of a satisficing model of information seeking. First, the satisficing search is “thermostatic” in that it is started or stopped as the need arises. Second, the process is “active in the face of adversity,” meaning decisions are often made when an obstacle is met. Third, the “input is considered sequentially” in that the first piece of information is collected and evaluated and if it found to not be enough, then a second piece will be collected and so on until a satisfactory outcome is reached. Although this satisficing search process can also be applied to collaborative information seeking, the important point here is that satisficing is often a result of contextual factors affecting those CIS activities.

As highlighted above, individual characteristics can affect the selection of potential collaborators and as a result, finding information that is just “good enough” to solve the problem. In a “perfect” world, collaborative information seeking activities would take place with the best
suited individuals participating in the process, finding the most relevant information to be applied to the issue in order to find the optimal solution. However, as a director at Regional Health System commented in that section, individual characteristics such as “ease of interaction” can influence his decision with whom to engage in CIS activities, which in turn led to satisficing. The director pointed out that while he had three potential collaborators from which to choose: one clearly had the expertise and was easy to work with but was too busy with other projects, one was not easy to work with and therefore to be avoided and the third had enough expertise and was not hard to work with. Therefore, he selected the third person to engage in CIS activities. As the director stated, “It might not be the best thing, but it is the best given the circumstances. And I want to get the issue done and move on with the greatest amount of success.”

While contextual factors clearly can create limits on what types of information people can access; a satisficing solution could be more than sufficient to solve the problem. Therefore, managers must be aware of the contextual factors continually impacting collaborative information seeking in order to mitigate their negative impact on the CIS process. Whenever possible, managers should implement organizational policies, procedures and system which foster a collaborative environment that allows for awareness of available collaborators, and eases access to available collaborators.

5.5. Chapter Summary

In this chapter, I presented an overview of issue management and resolution workflow in the IT departments at the research sites, with a specific focus on the information seeking activities therein. Then, I identified categories of contextual factors that influence CIS practices and also described specific contextual factors impacting collaborative information seeking activities and
explained how these contextual factors affected CIS activities. I also outlined specific CIS practices and how they were impacted and influenced by contextual factors.

In the following chapter, I discuss these findings further by presenting a framework of contextual factors impacting collaborative information seeking in organizations, which highlights the contingent relationships of contextual factors as well as the interconnectedness of contextual factors and how this interplay contributes to certain collaborative information seeking practices. I also discuss technological and organizational implications of contextual factors impacting collaborative information seeking activities.
Chapter 6. Discussion

In this chapter, I explain how the contextual factors influence CIS activities. I do this by presenting a framework of contextual factors impacting collaborative information seeking in organizations. The framework highlights the interconnectedness of the contextual factors and how this interplay impacts certain collaborative information seeking practices. Technological and organizational implications are also presented. While the framework helps in understanding how contextual factors can influence CIS activities in a more general context of organizational work, the technological and organizational implications are useful in developing tools and policies that can fit well with existing organizational practices. Thus, the framework as well as the implications can serve as a guide when designing and developing policies, procedures and technologies.

6.1. Framework of Contextual Factors Impacting CIS in Organizations

Problem resolution in the Information Technology department of a hospital is characterized by collaboration and coordination of information seeking activities within and across IT teams. To ensure smooth CIS activities, we need to understand and evaluate the effects of contextual factors on each episode of collaborative information seeking and vice versa. Effective collaborative information seeking can result in streamlined work process, faster decision-making, increased performance and effectiveness, and higher productivity.

While past research has touched upon the importance of context and its impact on work practices (Dervin, 2003; Dourish, 2004; Draisma et al., 2009; Heilbrun, 1997; Steelman & Mandell, 2003), the tendency of many researchers has been to group contextual factors together...
as one entity without regard for how each may influence work practices (independently or contingently). Additionally, to date very few research studies have highlighted the prominence that some contextual factors may have over others when impacting work practices or how this prominence may change over time (Dervin, 2003; Dourish, 2004).

This research project specifically focused on these understudied sets of issues revolving around contextual factors and work practices, particularly with regard to CIS activities. Context is not a static concept. Instead, the notion of context is nuanced and is comprised of features at different levels, each interacting with the work activities (Dourish, 2004). Therefore, this research is setting the foundational knowledge of what constitutes context with regard to CIS activities in an organizational setting, with the findings of this study serving as exemplars.

Based on the findings from this study, I present a conceptual framework of contextual factors impacting collaborative information seeking in organizations (Figure 6-1). This framework highlights the contextual factors that affect collaborative information seeking activities and can be explained in two parts: (i) the contextual factors impacting episodes of collaborative information seeking (presented and described previously in Chapter 5); and (ii) the interconnectedness of the contextual factors and how this interplay influences collaborative information seeking practices and vice versa.

It is important to keep in mind that the relationships depicted in the framework are not deterministic and the framework does not prescribe how episodes of CIS should progress. Instead, the framework draws together the concepts that emerged from my findings about collaborative information seeking in a particular context. Therefore, not all the features described in this framework will be present during a given collaborative information seeking episode; rather the framework describes possible factors that might impact CIS activities. A bottom-up approach (using grounded interpretation of fieldwork data) was used to build this framework.
Figure 6-1. Framework of Contextual Factors Impacting CIS Activities in Organizations.

Figure 6-1 shows the details of contextual factors impacting an episode of CIS. The framework depicts the multiple levels of context that need to be considered when we investigate collaborative information seeking in an organization: time, characteristics of individuals, teams, the organization and technology, and cross-cutting characteristics. These three aspects of context represent the impact of contextual factors on episodes of collaborative information seeking. These
contextual factors can influence, reinforce or change CIS practices and conversely CIS practices can influence, reinforce or change the contextual factors.

The framework shows that the impact of contextual factors on collaborative information seeking shifts the focus of CIS from activities taking place in isolation at the team or group level, to a collaborative process taking place within a complex organization at the intersection of individuals, teams, and technology use. Second, the framework highlights that contextual factors are not independent, but instead are interconnected. Finally, as time moves forward, aspects of the individuals, teams, and technology use may impact CIS activities in different ways and to varying degrees. Conversely, while engaging in the CIS practices themselves may also impact the contextual factors differently over time.

The framework can be used in different ways:

- As a general framework for understanding contextual factors and how they affect CIS activities.
- As an abstract representation that enables researchers to describe contextual factors and CIS practices in organizations.
- To identify the effects of contextual factors on CIS practices and vice versa.
- To guide the development and design of organizational policies, procedures, structures, and tools.

6.2. Contingent Relationships of Contextual Factors

Results from this fieldwork highlighted four categories of contextual factors that can impact CIS activities. These categories included: individual, team, organizational, and technological characteristics. These categories and the contextual factors within each were described in Chapter 5 and are depicted in Figure 6-1. However, we still have little understanding
of how these contextual factors are linked to each other and how they work either in concert or opposition to impact CIS activities.

The findings of this study have demonstrated that contextual factors do not impact CIS activities equally. Further, they do not act independently and in isolation, but instead are related to one another in a contingent relationship, impacting CIS practices and outcomes. However, the relationship of these contextual factors is dynamic, not static and so therefore these contingent relationships are constantly changing.

One important point to understand about contextual factors is that they are not always equally relevant in all organizations for their relevance may change with circumstance and/or over time. As Dourish (2004) points out, context is nuanced and is comprised of contextual factors that are at different levels, each potentially impacting work activities. However, there is not a direct correlation between a single contextual factor and its impact on work activities. Instead, several contextual factors may influence work activities at the same time. These contextual factors are not working independently to affect work; some have more influence than others.

When considering their impact on work activities, contextual factors are linked in a dependent relationship—contextual factors are not equally relevant and their relevance is affected by other contextual factors. Thus, one central concept that can be applied when discussing contextual factors is the idea of contingent relationship between contextual factors. As described in the findings, there are several contextual factors that can affect CIS activities. Yet, not all the contextual factors have an equal effect on these CIS activities within the IT department, but instead their relevance is dependent upon the presence of other contextual factors. For example, if an information seeker is looking for someone with whom to collaboratively seek information there may be several potential collaborators from which to choose. Logically, the first choice would be based on the quality of information the potential collaborator can provide. However, if
the “expert” is not available to assist, then a different collaborator with less expertise may be selected. In this case, the contextual factor, availability, overrides the contextual factor, quality of information.

Further, while contextual factors do not equally impact work activities, their relationship to each other and their impact on those activities are not static. Contextual factors may have different relationships with each other based on, for instance, circumstances, practice, and time. Therefore, the nature of contextual factors in relation to work activities is contingent upon other contextual factors, yet also dynamic. Revisiting the example above, if an information seeker is looking for someone with whom to collaboratively seek information there may be several potential collaborators from which to choose. The main contextual factor impacting selection would be based on the quality of information the potential collaborator can provide, as long as that “expert” is available. If s/he is available, then the contextual factor, quality of information, overrides the contextual factor, availability, when impacting CIS activities in this situation.

As with context, the relationship between contextual factors is not fixed across organizations. Therefore it is important to recognize that these shifting contingencies exist in order to better understand how to study collaborative information and the impact of contextual factors on CIS activities. For example, in situations where team culture is more important than other contextual factors, managers should note that not only does team culture impact the CIS activities themselves, but team culture can override other contextual factors in importance potentially affecting the selection of collaborators. This can lead to a satisfactory solution to a client technical issue. However, managers may want to consider implementing team norms and practices that instead lead to more seamless collaboration between experts, leading to a more robust and complete client solution.
6.3. **Interconnectedness of Contextual Factors**

While analytically contextual factors can be categorized and grouped, in practice they are not independent. As Figure 6-1 highlights, the three areas of contextual factors impacting CIS activities (temporality, contextual factors by category and cross-cutting contextual factors) as well as the two-way arrows represent the impact of contextual factors on collaborative information seeking practices (by influencing, reinforcing or changing those practices) and conversely the impact of the CIS practices on contextual factors. While many contextual factors could be neatly categorized (individual, team, organizational, technological), others such as awareness, collaborative climate, and common ground could not. That is because contextual factors do not work independently to affect CIS activities. Instead, their connection to each other is what impacts work activities—creating cross-cutting and complex contextual factors. Therefore, it is important to understand how contextual factors are connected because of the impact that the interconnectedness of these contextual factors has on CIS practices.

Context is by nature complex and consists of a variety of factors (Dourish, 2004), each potentially impacting each other as well as work activities. This leads to the notion that contextual factors are part of a network of relationships within a given setting. Within these networks, relationships do not exist independent from each other—they are in many ways connected because a given relationship does not only affect itself, but the two contextual factors involved. A relationship between contextual factors may also have an effect on other relationships. Therefore, when considering their impact on work activities, the connection between and across contextual factors and the impact of that relationship cannot be overlooked.

Thus, another concept that I used to understand contextual factors and their role in organizational work is interconnectedness. Other researchers (Luke, 1992; Ritter, 2000) have used interconnectedness to analyze the “internal connections between the parts or elements” of a given area of study (“interconnectedness,” 2012). As described in the findings, there are several
contextual factors that can affect CIS activities. Yet, contextual factors do not work discretely to affect CIS activities within the IT department. For example, when an issue arises that involves data moving across systems, the contextual factor, integrated systems, can impact CIS activities, but other contextual factors may also impact CIS activities due to their relationship with the contextual factor, integrated systems. Other contextual factors of consequence may include quality of information a potential collaborator can provide as well as cross-team communication. Together, these three contextual factors may impact such CIS practices as the creation and makeup of an ad hoc team brought together to resolve the data issue.

Much like contingencies, the interconnectedness of contextual factors is not fixed across organizations. However, we must understand that connections between contextual factors exist when designing organizational policies regarding collaborative information seeking. For example, in situations where team communication and team culture are connected in such a way that common ground does not exist with a team, this can be a barrier to CIS activities. Managers may want to consider implementing team structure and practices that instead lead a shared understanding amongst team members, leading to more seamless CIS activities. Analytically, the importance of this notion of interconnectedness is discussed further in the next three subsections.

6.3.1. Cross-Cutting Contextual Factors

Certain contextual factors such as awareness, collaborative climate and common ground cut across the different types of factors and cannot be classified within a single category. However, these cross-cutting contextual factors have strong influences on collaborative information seeking practices. These cross-cutting contextual factors are highlighted in the framework (Figure 6-1). The interconnectedness of contextual factors manifesting as cross-cutting contextual factors is depicted in Figures 6-2, 6-3 and 6-4.
Figure 6-2. Interconnectedness of Contextual Factors: Collaborative Climate.

Figure 6-3. Interconnectedness of Contextual Factors: Awareness.
Together, contextual factors such as team culture and team workspace can foster or hinder a collaborative climate where the “values, beliefs and assumptions that influence the behaviors and the willingness to share” (Sveiby & Simons, 2002, p. 421) information and collaborate on work are observable in a team environment. In turn, a collaborative climate can reinforce or change team culture and/or team workspace as information seekers’ actions are influenced by said collaborative climate. In this study, collaborative climate had an impact on sixty (63) episodes of CIS (70% of episodes), with 95% of those episodes having a positive outcome. Further, collaborative climate influenced every type of CIS practice (see section 6.3.2.).

Together, team culture and team workspace can also foster or hinder the cross-cutting contextual factor awareness, where “awareness is an understanding of the activities of others, which provides a context for your own activity” (Dourish & Bellotti, 1992, p. 107). In information seeking activities, awareness is critical to successful collaboration. Further, team workspace and team culture can enable or inhibit common ground, where common ground allows for a certain level of agreement and shared understanding in CIS activities (Clark, 1996). Conversely, common ground can reinforce or change team workspace and/or team culture as
information seekers’ actions are influenced by said common ground. In this study, both awareness and common ground enabled CIS activities with 100% and 88% of those episodes, respectively, having a positive outcome.

6.3.2. Contextual Factors and CIS Practices

The two-way arrows in the framework represent the influence of contextual factors (in general) on CIS practices and the reinforcement or change of contextual factors as CIS practices are influenced by these factors. As a result, several contextual factors may influence collaboration seeking activities such that certain CIS practices become prevalent, and by enacting these CIS practices, those same contextual factors are reinforced or changed.

For example, the interconnectedness of several contextual factors enables the practice of creating ad hoc teams to collaboratively seek information. These contextual factors include: the quality of the information the potential collaborator can provide, team culture, cross-team communication, and integrated systems. Moreover, by engaging in the CIS practice of creating ad hoc teams to collaboratively seek information, those same contextual factors may be reinforced or changed. This is also true for the connection between the quality of the information the potential collaborator can provide, team culture and cross-team communication with the CIS practice of information evaluation.

Contextual factors can influence CIS practices at anytime; however data from this study demonstrates that the “clustering” or interconnectedness of certain factors tends to lead to the enactment of certain CIS practices. The interconnectedness of contextual factors and their relationship with CIS practices are depicted in Figures 6-5, 6-6, 6-7 and 6-8.
Figure 6-5. Interconnectedness of Contextual Factors: Creation of Ad Hoc Teams.

Figure 6-6. Interconnectedness of Contextual Factors: Evaluation of Information.
6.4. Temporality and CIS Practices

In an organizational context there are many contextual factors that affect how collaborative information seeking activities take place. However, one unique contextual factor affecting CIS practice is temporality, particularly due to the fact that temporality is everywhere and is difficult if not impossible to control. Therefore, temporality can be considered a meta-level contextual factor. First, while other contextual factors may not always exist in all organizations,
temporality does always exist and will always impact CIS practices in some way. Second, temporality as a contextual factor manifests itself in many ways and in relationship with other factors because time cannot be stopped, slowed or easily controlled. Therefore, temporality can influence the relationships between other contextual factors, both the contingent relationships and/or the interconnectedness of contextual factors. Where an episode of CIS takes place in time will impact which contextual factor is important and which contextual factor is influencing another contextual factor. Temporality can also influence the relationships between contextual factors because temporal sensitivity impacts how quickly work must get done, which in turn will impact which contextual factors are more relevant.

How does temporality play a role in impacting CIS activities? In a fast paced environment where a task has to be completely quickly, the sensitivity to temporality can override other contextual factors. In this circumstance, contextual factors other than temporality may not have as much impact on CIS activities because time is of the essence. While in regular paced environment, there is less temporal sensitivity and therefore temporality may not have as strong of an influence on CIS activities.

For example, the IT department uses “issue type” to categorize client problems based on severity (with regard to patient care and number of clients affected). The issue type then translates into expected resolution time. The more critical the issue, the faster it is to be resolved. If the problem is not immediate (i.e. non-critical), CIS activities can take place over a longer period of time. However, if the pace increases due to problem importance (i.e., critical), there is also an increased urgency in the CIS activities. Consequently, this can affect other contextual factors as well as the selection of collaborators and collaborative information seeking practices such as the creation of ad hoc teams and stopping criteria.

However, in different organizational settings, the pace and importance of work can vary dramatically. For example, in a previous study Reddy, Dourish and Pratt (2006) examined
information-intensive healthcare environments where patient care activities often required a quick pace of work. Consequently, there was urgency to finding needed information because it was critical for patient care. On the other hand, as observed in the IT departments in this study, in cases of routine or non-patient critical system issues, problem resolution can take several days.

The above examples demonstrate that the pace and importance of the work can affect collaborative information seeking activities. If a problem is not immediate (i.e. non-critical), CIS activities may take place over a longer period of time. However, if the pace increases due to problem importance (i.e., critical), there may also be an increased urgency in the collaborative information seeking activities. Consequently, this can affect (i) the selection of information sources (the type of information sought) and (ii) the modes of interaction between individuals.

First, during normal paced activities when a solution is not immediately needed, IT team members may turn to electronic and textual sources of information. Since there is little urgency, team members have the time to search through these various information sources to identify a potentially applicable solution. However, in a fast-paced environment where the task is critical, team members might instead turn to human experts as the primary sources of information (Reddy et al., 2002; Reddy & Spence, 2006). During a fast-paced work activity, turning to human experts allows team members to resolve the issue more quickly through the creation of ad hoc teams and the sharing of information between the experts. However, temporality alone does not impact CIS activities, the interplay of temporality together with individual, team, organizational, and technological characteristics, such as individual availability and reputation of the team may impact CIS practices such as the creation of ad hoc teams.

Second, during normal paced work activities, team members interact with each other in a variety of ways when collaboratively seeking information. For instance, team members may exchange information via email or voicemail when there is little need for details and explanation. In general, because there is no need for an immediate response, CIS activities can be performed
asynchronously. However, if there is a problem that needs immediate resolution and the pace of
the activities is increased, the interaction would more likely be synchronous and involve direct
communication such as face-to-face or over-the-phone discussions. The interaction mode during
fast-paced and important CIS activities is more direct than in normal paced or less important
activities. Often times when ad hoc teams are brought together, they meet face-to-face to better
understand the issue, share information and develop potential solutions. Again, temporality and
other characteristics such as team culture and team workspace play a part in how the ad hoc teams
are created and how they interact.

Other researchers (Dix, 1992; Landgren, 2006) have also highlighted how the criticality
and pace of work influences work activities. In organizational settings, the pace of work is
impacted by the importance of a particular problem. In turn, pace impacts the ongoing
information seeking activities in these settings. Consequently, managers should note that not only
does temporality impact CIS activities themselves, but temporality often impacts other contextual
factors in turn affecting both the selection of collaborators as well as the decision as to when to
stop searching for information. This can lead to a timely, satisfactory solution to a client technical
issue. However, managers may want to consider implementing follow-up processes to determine
if a more robust and complete solution can be found and implemented after-the-fact, when time
constraints are removed.

In summary, when noncritical, non-time sensitive issues arise, temporality may have
looser ties with other contextual factors and less impact on CIS activities. However, when critical,
time sensitive issues arise, the connection between and across contextual factors such as
temporality, availability, reputation and team culture cannot be overlooked or ignored. In these
scenarios, while temporality may have an overriding impact on CIS activities, several contextual
factors work together to impact the CIS practices. Further, it is important to recognize that the
impact of contextual factors can change over time.
6.5. **Impact of Contextual Factors on Collaborative Information Seeking**

As was highlighted in the findings of this study, several contextual factors impacted, either negatively or positively, episodes of collaborative information seeking. To review, a positive impact suggests that the contextual factor(s) had a good effect on the CIS process itself and/or its outcome (i.e. information need met). While a negative impact implies that the contextual factor(s) had an unfavorable or adverse effect on the CIS process itself and/or its outcome (i.e. information may not have been met). Due to the limited data set as well as the limitations of the methods used to collect said data, the existence of certain contextual factors does not necessarily imply causation either a negative or positive outcome to CIS episodes. However, there appears to be a correlation between a set of contextual factors and certain outcomes, whether positive or negative.

For example, in this study, I found a correlation between a positive outcome to CIS episodes and the existence of any of the following contextual factors: collaborative climate, quality of information a potential collaborator can provide, team culture, team workspace and temporality. Not only was collaborative climate present in 63 of the 90 episodes, those episodes had a positive outcome 95% of the time. Quality of information a potential collaborator can provide was present in 58 of the 90 episodes, with 94% of those episodes having a positive outcome 95%. Further, Team Culture was present in 56 of the 90 episodes with 92% of those episodes ending positively. Regardless of the presence other contextual factors, when either collaborative climate, quality of information a potential collaborator can provide, team culture, team workspace or temporality where present during an episode of CIS, that episode had a positive outcome over 92% of the time.

Alternatively, I found a correlation between a negative outcome to CIS episodes and the existence of the contextual factor, availability of the potential collaborator. Availability of the potential collaborator present in 26 of the 90 episodes, where 31% of those episodes had a
negative outcome. Further, regardless of the presence other contextual factors, including team culture and team workspace, when availability of the potential collaborator was also present during an episode of CIS, that episode tended to have a negative outcome.

This correlation between certain contextual factors and the outcome of CIS episodes demonstrates that in certain contexts some contextual factors may be more relevant than others with regard to collaborative information seeking activities. In the case of IT teams engaging in CIS activities as a part of the issue resolution process, collaborative climate, quality of information a potential collaborator can provide, team culture, team workspace and temporality were found to be associated with positive outcomes. On the other hand, availability of the potential collaborator was found to be associated with negative outcomes.

6.6. Implications of Contextual Factors Impacting CIS Practices

Based on the findings presented in the previous chapter as well as the framework of contextual factors impacting CIS activities in organizations, several relevant contextual features have implications for organizational work practices and the design of collaborative technologies, including:

- the dynamic and contingent nature of contextual factors;
- the interconnectedness of contextual factors such that cross-cutting contextual factors come into play;
- the interconnectedness of contextual factors such that certain CIS practices become prevalent; and
- the relevance of temporality as an ever-present, contextual factor.

These contextual features are interwoven into the work and can influence, reinforce or change CIS activities. I now address some organizational and technical design recommendations
based on the framework and the relevant contextual factors impacting collaborative information seeking activities. In so doing, I hope to open up the potential design space for explicitly considering contextual factors and features in the design of work and information and communication technologies.

6.6.1. Organizational Implications

In the previous sections, I highlighted the contextual factors and relevant contextual features that can impact CIS activities; they also serve as a basis for a set of organizational recommendations.

6.6.1.1. Manage Team Interactions

In the activities of the ad-hoc CIS teams, the collaborative information seeking and sharing aspects that are crucial to successful problem resolution were severely affected when people were drawn in from different teams. For instance, team members who come from a more “formal” team culture might react negatively to members from other teams whose team culture has more relaxed interaction methods. This negative reaction hinders the CIS activities because it required members from one team to modify their behavior to match the expectations of the other. Therefore, inter-team activities frequently require the management of different team characteristics before CIS activities can be successfully carried out. However, when collaboratively seeking information such as documentation or procedural knowledge, team characteristics are not as influential because these activities often take place via electronic means including email where the formality or informality of interactions is not as problematic.
Additionally, team structure and culture have been shown to influence team performance (Orchard et al., 2005) as well as individual job satisfaction (Glisson & James, 2002). This study demonstrates that team practices, impacted by contextual factors, can also influence collaborative information seeking. When the team workspace and culture support discussion in an open and shared office space where it can be heard by many people, this can lead to more unplanned interactions and potentially more collaboration and information sharing.

The impact of contextual factors on collaborative information seeking activities has interesting implications for managers when structuring and designing organizational policies and systems to support collaborative information seeking. Because context is ever-changing and fluid, managers must acknowledge and support the flexibility of organizational policies and procedures with regard to team interactions. In each case, the person looking for information may be different, where they turn for information may differ, where they choose to look for information may vary and how information is sought, retrieved and shared can change. Additionally, when supporting CIS practices, organizational systems must be designed with the same flexibility and adaptability.

6.6.1.2. Provide Baseline Training

This study also highlights how team-wide basic system training can play an important role in the collaborative information activities of a team, leading to more information sharing. This was due to the fact that team-wide basic system training allows for common terminology and expertise across a team. Offering team-wide basic system training to foster information sharing is not new (Cabrera & Cabrera, 2005) and it has been shown to increase interactions, provide a common language and build social ties. However, this study highlights the important role that basic training plays in supporting collaborative information seeking and sharing by
allowing for more seamless communication and ease of understanding between team members sharing information in order to resolve issues. When an entire team is trained in the basic functions, whether it is in a technology, a policy or a process, then all team members share a common terminology and baseline set of skills that they could reference when working collaboratively. Thus, team-wide system training allows more team members to be knowledgeable about a topic and therefore available for collaboration and information sharing when dealing with issues.

6.6.2. Implications for Design of Technologies to Support CIS Activities

The findings and discussion of the contextual factors impacting CIS activities provide implications for the design of technologies to support these activities. It is not uncommon for field studies using ethnographic methods to inform the design of technologies (Bardram, 2000; Hertzum & Pejtersen, 2000; Paul & Reddy, 2010), and there is well documented support for such (Dourish, 2007; Grinter, 1997). Ethnographic field studies provide comprehensive and deep accounts of the human aspects of work that go beyond the research sites themselves. These detailed and rich accounts allow for “profound design implications beyond a laundry list of features and considerations in the form of consequential, profound, and direct guidance for how to think about the issues in question” (Dourish, 2007, pp. 5, 13). Using the findings of this research project give us the understanding of when and how contextual factors impact CIS activities, enabling us to think about design features that can be incorporated into technologies to support these activities.

Organizations implement technological tools and knowledge management systems as a means of supporting information seeking and sharing as well as the creation, capture, storage, and dissemination of knowledge. Oftentimes these systems and knowledge repositories are organized
around a subject area, while others are organized around an organizational process (Kwan & Balasubramanian, 2003, p. 204). For CSCW researchers, technology development with regard to collaborative information seeking and knowledge management has focused on organizational memory and social networking systems (Ackerman, 1994; Cabitza & Simone, 2009; Ehrlich et al., 2007; Shah, 2010).

While organizational memory and social networking systems are useful, particularly in larger, more dispersed organizations, the systems are less useful in smaller, co-located organizations such as the IT departments of Regional Health System and Teaching Medical Center. At these sites, the staff knows each other quite well and has frequent face-to-face interaction. Further, their personal, work-related social networks are quite large and the organizational culture is such that collaboration is encouraged and expected. In this type of environment, easy, flexible, and seamless technologies that facilitate collaborative information seeking are preferred. In the case of Regional Health System, email served multiple purposes as an everyday communication and time management tool as well as a tool to facilitate collaborative information seeking activities.

Information seeking and sharing technologies, as well as knowledge management systems, should not only support information seeking activities but also support collaboration amongst the information seekers and sharers. Based on the contextual factors impacting CIS activities, I have identified several important features that organizational technologies must support. These features include: activity awareness, expertise location, expertise reviews, simultaneous remote collaboration, and social functionality. Further, I have identified three specific technological functions that facilitate the influence of these contextual factors/features on CIS activities. The relationship between these contextual factors and technological functions is outlined in Table 6-1, while the technological functions are explained in detail below.
6.6.2.1. Awareness

Knowing what other people are doing is important during collaborative information seeking activities, especially knowing if a potential collaborator has the availability to assist in CIS activities. Therefore, technological systems should provide presence awareness information for the team members (e.g., availability messages). In team settings with a formal mode of interaction, this is extremely useful and important. Based on the issue, a team member may choose to collaborate when seeking information from a potential subset of team members. Knowing which of these team members are and are not available could help determine with which expert to collaborate, helping to streamline the process.

6.6.2.2. Asynchronous collaboration

The ability to asynchronously communicate is vital in supporting collaborative information seeking activities (Edwards et al., 1997). Yet, CIS activities also take place asynchronously, often across teams. Cross-team CIS activities would benefit from technological functionality such as keeping each information seeking “stream” unique within the technology.
and easily recognizable to the user, while allowing for continuous flow of information into and out of the application. While a title or subject line is useful in this situation, other functional options might also be valuable, including tags, keywords, folders, labels or the use of an algorithm to automatically connect information seeking “streams” (Giacoletto & Aberer, 2003; Tang et al., 2008). This is especially useful when someone is collaboratively seeking information on separate issues with different people. This will allow users to distinguish between the various collaborations as they progress.

6.6.2.3. Expertise Information

When engaging in CIS activities, it is important to select collaborators who know or can find needed information. Therefore, knowing and finding the expert (quality of information) is essential to collaborative information seeking. Yet knowing the experts may not be enough. Does the expert have a good reputation? Has the expert been a willing and helpful participant in the past? Has the expert been vetted? In these instances, expertise information can be helpful to selecting collaborators. However, this detailed information about experts is usually not available through an expertise recommender system. If expertise “reviews” were added, this approach would serve much like a movie review aggregator website that aggregates film reviews and reflects overviews of critical reception by providing a score for a film based on the reviews. Instead, the expertise “review” recommender system would aggregate reviews of each expert and reflect overviews of critical reception by providing a score for an expert based on the reviews. This allows for reviews to be more dynamic as scores change with each new review of an expert. It is also a way to codify the opinions of those who have worked with each expert over time. While, expertise locator systems are not new (Ackerman, Pipek, & Wulf, 2003; Ehrlich, 2003),
their implementation is not wide-spread. However, this functionality would be useful when engaging in CIS activities across teams in a larger organization.

6.6.2.4. Chat

Clearly, one of the most important functions that technological systems need to provide in order to support collaborative information seeking activities is synchronous communication, particularly simultaneous remote collaboration capabilities. A chat function allows collaborators to interact with each other in real-time and plays an important role in enhancing the information seeking process. Collaborators could use this functionality to seek, access, and share information and to provide feedback—synchronously. A chat message is much less intrusive and more subtle than a face-to-face interruption, but more noticeable and often faster than regular email.

6.6.2.5. Challenges

The challenge in designing these and other features lies in not only developing the individual components but also effectively integrating them together into a technological system in order to ensure that the system seamlessly supports collaboration as part of the information practices of organizational teams.

Proposing features such as awareness, conferencing, chat, and visualization is not new (Blackwell et al., 2004; Ertzscheid, 2001; Morris & Horvitz, 2007; Twidale & Nichols, 1998). However, these features have been developed in systems that primarily support information seeking practices that take place via the Web, not in communication technologies in an organizational environment. Furthermore, an organization may not want to invest in a specialized information seeking and sharing or knowledge management system, but rather to incorporate
useful functionality into existing organizational technology, such as email. The design of
information seeking and knowledge management systems is predicated on the formal capture of
information and knowledge to be accessed by others in the organization at different times. What I
found was a much more subtle set of interactions taking place. I do not suggest replacing existing
organizational knowledge management systems, but rather adding features to support
collaborative information seeking practices to existing tools and communication technologies.

6.6.3. Methodological Implications

Finally, this study offers several insights about context and contextual factors for researchers interested in studying context with regard to a particular phenomenon.

While context is a large, broad concept, it can be unpacked and broken down into smaller
discernible pieces that can be identified and studied. As the framework (Figure 6-6) illustrates,
context consists of meta-level contextual factors, local-level contextual factors and cross-cutting
contextual factors. While the specific factors may vary across contexts, these types of contextual
factors are common.

Contextual factors are related to one another in a contingent fashion. Understanding these
contingent relationships allows researchers to control for this when studying a phenomenon. In
addition, in order to observe the dynamic nature of the contingent relationships between factors, it
is important to have a longer research time frame as temporality impacts these relationships.

Contextual factors do not act in isolation, but instead impact work as an interconnected
network of factors. Therefore, in order to observe this interconnectedness and the impact work
activities, it is important to pay attention to broader work activities rather than a simple work task.
6.7. Chapter Summary

In this chapter, I explained how contextual factors influence CIS activities by presenting a framework of contextual factors impacting collaborative information seeking in organizations. First, I described this framework by highlighting the ever-changing contingent relationships and interconnectedness of the contextual factors and how this interplay contributes to certain collaborative information seeking practices.

Second, I presented key organizational, technological, and methodological issues to be considered when developing tools and policies to support CIS activities based on the impact of contextual factors. Thus, the framework and the implications serve as a guide when designing and developing policies, procedures and technologies to support CIS activities. In the next chapter, I address the research questions that were raised in Chapter 1, describe my major research contributions to CSCW, Information Sciences, and Organizational Studies, and close with some concluding remarks on my dissertation and future work.
Chapter 7. Conclusions

Collaborative information seeking (CIS) is an important aspect of work in highly contextualized, organizational settings. However, most studies of CIS focus on how people find and retrieve information collaboratively, while overlooking the important question of how contextual factors impact CIS activities.

This dissertation focused on unpacking the concept of context to understand how contextual factors influence CIS activities. The objectives of this research were to provide a conceptual understanding of the contextual factors affecting collaborative information seeking activities in organizational settings by (i) identifying contextual factors that can affect collaborative information seeking activities and (ii) explaining how these contextual factors affect collaborative information seeking activities.

Through an ethnographic field study of the collaborative information seeking activities of information technology teams in two hospitals, I examined the impact of contextual factors on CIS activities. The results of this research make important contributions to our conceptual understanding of context and collaborative information seeking, and it also highlights the importance of studying context as an aspect of CIS. In this concluding chapter, I will close my dissertation by briefly recapping the aforementioned contributions and discussing future research work.

7.1. Study Contributions

I set out to answer the following research questions in my dissertation:

**RQ1:** What contextual factors impact CIS practices?
RQ2: How do contextual factors impact CIS practices?

In the following section, I answer these two research questions and describe the following research contributions:

- Identify contextual factors that can affect collaborative information seeking activities in organizational settings.
- Provide a conceptual understanding of how contextual factors can influence CIS practices.

7.1.1. What Constitutes Context with Regard to CIS Activities?

RQ1: What contextual factors impact CIS practices?

Historically, researchers have looked at several aspects of information seeking from models of the individual information seeker to the information seeking activities itself (Ellis & Haugan, 1997; Kuhlthau, 1988). However, as organizational work has to become more collaborative, we are not only seeing individuals seeking information, but there is a rise in collaborative information seeking in groups. With this shift from individual- to team-based work, researchers have followed suit by moving away from studying information seeking where the work itself is de-emphasized to studying information seeking in context where the work activities are central to the research.

While past research has touched upon the importance of context and its impact on work practices (Dervin, 2003; Dourish, 2004; Draisma et al., 2009), the tendency of many researchers has been to group contextual factors together as one entity without regard for how each may influence work practices (independently or in combination). This research project specifically focused on these understudied sets of issues revolving around contextual factors and work practices, particularly with regard to CIS activities. Context is not a static concept. Instead, the notion of context is nuanced and is comprised of features at different levels, each interacting with
the work activities (Dourish, 2004). Therefore, this research sets the foundational knowledge of what constitutes context with regard to CIS activities in an organizational setting, with the findings of this study serving as exemplars.

Through this study of how members of IT departments at hospitals collaboratively sought and retrieved information, I identified four broad categories of contextual factors that impact CIS activities including individual, team, organizational, and technological characteristics. By category, these contextual factors include:

- Individual characteristics: Quality of information the individual can provide, Reputation of the individual, Availability of the individual;
- Team characteristics: Team communication, Team culture, Team Workspace;
- Organizational characteristics: Cross-team communication, Integration of systems, Issue priority, Reputation of a team; and
- Technological characteristics: Simultaneous remote collaboration functionality, Social functionality.

By identifying and describing the contextual factors that can impact collaborative information seeking activities, I highlight the variety of factors that can impact collaborative information seeking activities.

7.1.2. Interconnectedness and Contingencies—Influences of Context on CIS Activities

**RQ2: How do contextual factors impact CIS practices?**

In order to explain how contextual factors impact CIS practices, I developed conceptual framework of contextual factors impacting collaborative information seeking activities in organizations (see Figure 6-1, p. 132). The framework highlights the interconnectedness of the contextual factors and how this interplay contributes to certain collaborative information seeking
practices. The framework helps in understanding how contextual factors can influence CIS activities in a more general context of organizational work.

The framework depicts the multiple levels of context that need to be considered when investigating CIS activities: time, characteristics of individuals, teams, the organization and technology, and cross-cutting characteristics. These three aspects of context represent the impact of contextual factors on collaborative information seeking practices. These contextual factors can influence, reinforce or change those practices and conversely the CIS practices can influence, reinforce or change the contextual factors.

The framework highlights the following about contextual factors: (1) they are not independent, but instead are interconnected, (2) they are not always equally relevant in all organizations, (4) when considering their impact on work activities, contextual factors are linked in a contingent relationship, (5) as time moves forward they may impact CIS activities in different ways and to varying degrees, and (6) engaging in the CIS practices themselves may impact them differently over time. The framework also underscores the importance of temporality as a contextual factor affecting CIS practices. While other contextual factors may not always exist in all organizations, temporality does always exist and will always impact CIS practices. Temporality as a contextual factor manifests itself in many ways and in relationship with other factors because time cannot be stopped, slowed or controlled. Temporality is everywhere and is overarching with regard to other contextual factors.

7.2. Limitations and Future Work

Problem resolution is characterized by collaboration and coordination of information seeking activities within and across teams. In the course of these work activities, people are influenced by contextual factors in the organizational setting. These factors highlight the
understated but vital role that context plays in how people search, retrieve, and share information and how they go about those activities collaboratively. Although this dissertation has expanded our understanding of contextual factors and collaborative information seeking, there is still much work left to be done.

The scope of this study is limited in three ways, each of which offers opportunities for future research. These are summarized in Table 7-1. These limitations and opportunities for future research opportunities are discussed in the following sub-sections.

Table 7-1. Opportunities for Further Research.

<table>
<thead>
<tr>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited opportunity to study the absence of certain contextual factors and how that may have affected outcomes.</td>
</tr>
<tr>
<td>Limited opportunity to study how the interconnectedness of contextual factors may change over time.</td>
</tr>
<tr>
<td>Limited opportunity to study how contextual factors interact to impact CIS activities.</td>
</tr>
<tr>
<td>Limited opportunity to study how contextual factors impact CIS activities in different settings.</td>
</tr>
</tbody>
</table>

7.2.1. Extending Dissertation Ideas Further

I am interested in further developing the framework of contextual factors impacting CIS activities. For instance, the interconnectedness of contextual factors impacting CIS activities is in its initial stages of conceptual development and would benefit from being explored further and deeper in other areas of collaborative information seeking, particularly how these connections change over time. Additionally, beyond the interconnectedness of contextual factors, it would be interesting to understanding how contextual factors interact to impact CIS activities. Further, this study did not account for the absence of certain contextual factors and how their absence may have affected CIS activities, practices and outcomes. My study did not reveal these phenomena and would require further investigation.
7.2.2. Exploring Contextual Factors and CIS in Other Organizational Settings

Although this research study examined the contextual factors impacting CIS activities in the particular organizational setting of IT departments in hospitals, context with regard to collaborative information seeking can be studied in almost any organizational environment. However, the characteristics of different organizations can affect how contextual factors manifest themselves in CIS activities. For instance, physically co-located workers were the focus of this study; therefore, their interactions were affected by this physical co-location. Very different contextual factors could influence people’s work and CIS activities quite differently in organizations with geographically dispersed virtual teams. It would be informative to see the ways in which time, contingent relationships and the interconnectedness of contextual factors display themselves in the work of these virtual teams. Expanding this research to other organizational settings will also help triangulate findings from this study and validate the conceptual framework.

7.3. Closing Remarks

Collaborative information seeking (CIS) is an important aspect of work in highly contextualized, organizational settings. However, most studies of CIS focus on how people find and retrieve information collaboratively, while overlooking the important question of how contextual factors might impact CIS activities.

This dissertation described a multi-site, ethnographic field study of the impacts of contextual factors on collaborative information seeking activities. Through this study, I examined what contextual factors impact CIS activities and how contextual factors impact those activities. The insights gained in this dissertation further our conceptual understanding of context and
collaborative information seeking, and it also highlights the importance of studying context as an aspect of CIS.
References


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doi:10.1108/13673270210417664


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Appendix A: Initial Interview Protocol

Introduction Script

[Participant’s name], my name is [interviewer’s name] and I am part of a PSU research team. We are interested in understanding how IT team members collaborate during information seeking activities. I would like to ask you a few questions about how you work with your fellow team members to search for needed information and the challenges that you face during this activities. If you have no objections, I would like to tape-record this conversation. I will turn off the tape-recorder if you do not want this interview tape-recorded or, if at any time during the interview, you want to say something off the record. Also, I would like to assure you that this interview is completely confidential and will not be released to anyone outside of our research team. We may use parts of the interview in publications but we will ensure that no identifying information is included in anything published.

Semi-Structured Interview Questions

1. How long have you worked in this IT department? (rapport building question)
2. What is your job title? How long have you been in this particular position? (rapport building question)
3. What are your tasks and responsibilities? (grand tour question)
4. What information sources do you use in completing these tasks and fulfilling these responsibilities? (mini-tour question)
5. When do you need to collaborate with your teammates to get the information you need? (mini-tour)
   a. Can you give me an example? (example question)
   b. What “triggers” this collaboration? (mini-tour question)
6. Can you give me an example of a challenging situation you and your teammates have faced while collaborating to find information? (example question)
   a. What other challenges do you face during this collaboration? (mini-tour question)

7. What information technologies, if any, do you use to help in the collaboration? (mini-tour question)
   a. Can you give me an example of how you would use an information technology in this situation? (example question)

8. What types of information technologies do you think would be helpful during these activities? (mini-tour question)
   a. Why would these types of information technologies be helpful? (probing question)

9. Is there anything else you would like to add or that you feel I should know about? (rapport building question)

**Conclusion Script**

Thank you very much for talking with me today. This interview was very informative and useful. As the next step in the process, I will type of the detailed notes from this interview. Then, I will forward those notes to you for review, at which time you will have the opportunity to check them for accuracy. Again, I appreciate your time and will be in touch in the near future.
Appendix B: Secondary Interview Protocol

Introduction Script

[Participant’s name], my name is [interviewer’s name] and I am part of a PSU research team. We are interested in understanding how IT team members collaborate during information seeking activities. I would like to ask you a few questions about how you work with your fellow team members to search for needed information and the challenges that you face during this activities. If you have no objections, I would like to tape-record this conversation. I will turn off the tape-recorder if you do not want this interview tape-recorded or, if at any time during the interview, you want to say something off the record. Also, I would like to assure you that this interview is completely confidential and will not be released to anyone outside of our research team. We may use parts of the interview in publications but we will ensure that no identifying information is included in anything published.

Semi-Structured Interview Questions

1. What does collaborative information seeking mean to you?
   a. What characteristics do you think it includes and how do you think about it?
   b. Can you give me an example?

2. When you need information and want to collaborate with others to find it, does it matter if the potential collaborator is on your team or not?
   a. Is team membership a consideration when choosing to collaboratively seek information with someone?
   b. Are you encouraged to or discouraged from collaborating with people outside your immediate team when seeking information?
c. [Depending on the answer] If team membership does not matter, what impacts your decision on who to collaborate with? Or Why do you believe team membership impacts your decision on who to collaborate with?

3. When someone needing information comes to you to collaborate, what do you believe motivates them to do so?

4. Why would you use technology when collaboratively seeking information?

5. How would you use technology when collaboratively seeking information?
   a. Do you use it to: ask for help, find information individually, find information collaboratively, share information once it is found, etc.?
   b. Can you give me an example?

6. Which tools do you find most useful when collaboratively seeking information and why?

7. Any final thoughts about collaborative information seeking that you’d like to add?

**Conclusion Script**

Thank you very much for talking with me today. This interview was very informative and useful. As the next step in the process, I will type of the detailed notes from this interview. Then, I will forward those notes to you for review, at which time you will have the opportunity to check them for accuracy. Again, I appreciate your time and will be in touch in the near future.
Appendix C: Survey of Collaborative Information Seeking Activities

Consent to Take Survey

Title of Project: Identifying Triggers for Collaborative Information Behavior: A Field Study of Rural Healthcare IT Teams

Principal Investigator: Madhu Reddy, PhD
321J IST Building
University Park, PA 16802
814-863-6316 mreddy@ist.psu.edu

Purpose of the Study: The purpose of this research is to understand how team members work together to find information

Procedures to be followed: You will be asked to participate in an online survey. The focus of the survey is to better understand how you collaborate with your colleagues as you look for information to help you do your job.

Duration/Time: You will be asked to participate in 1 survey. The survey will last approximately 15 minutes.

Statement of Confidentiality: Your participation in this research is confidential. The data will be stored and secured at 321J IST in a locked file. In the event of a publication or presentation resulting from the research, no personally identifiable information will be shared. Penn State’s Office for Research Protections, the Social Science Institutional Review Board, and the Office for Human Research Protections in the Department of Health and Human Services may review records related to this project.

Right to Ask Questions: Please contact Dr. Madhu Reddy at (814) 863-6316 with questions, complaints or concerns about this research. You can also call this number if you feel this study has harmed you. Questions about your rights as a research participant may be directed to Penn
State University’s Office for Research Protections at (814) 865-1775. You may also call this number if you cannot reach the research team or wish to talk to someone else.

**Voluntary Participation:** Your decision to be in this research is voluntary. You can stop at any time. You do not have to answer any questions you do not want to answer. Refusal to take part in or withdrawing from this study will involve no penalty or loss of benefits you would receive otherwise. We do not anticipate that there will be any discomfort or risks for participating in this study. The results of this study will help us develop better tools to support people’s ability to collaborate with each other when looking for information.

You must be 18 years of age or older to consent to take part in this research study.

Please print off this form to keep for your records.

This informed consent form (Doc.# 2) was reviewed and approved by the Social Science Institutional Review Board (IRB# 26129) at The Pennsylvania State University on 08/11/2008. It will expire on 07/01/2009. (ARS)

You have read the above description regarding the nature of this research and give the researchers permission to use data collected from this survey for publication and presentation, recognizing that your name will never be associated with these data in scoring, publishing, or presenting. You are free to stop your participation at any time.

By clicking on the button below, you agree to participate in this survey.

**Introduction to Survey**

Thank you for participating in this survey. Your feedback will help us better understand collaborative information seeking in team settings. All of your answers are confidential and will be used strictly for research. This survey will take approximately 15 minutes of your time. If you have any questions or comments about this survey, you may enter them into the form at the bottom of the survey or email them to Patricia Ruma Spence.
As a reference for answering the following questions, Collaborative Information Behavior can be defined as “activities that a group or team of people undertakes to identify and resolve a shared information need.” In the IT department at Susquehanna Health, collaboration can take place with clients or teammates using the telephone, email, HEAT or face-to-face discussions. Additionally, the SHS IT staff collaborates throughout the issue resolution process from gathering information to diagnosing the problem to attempting, testing and confirming a solution. Throughout this process you may work with others to seek information and seek, retrieve and use information to solve a problem.

Survey Questions

1. What is your gender?
   a. Male
   b. Female

2. What age group are you in?
   a. 18-24
   b. 25-34
   c. 35-49
   d. 50-64
   e. 65+

3. Indicate your team.
   a. Clinical Software Services
   b. Customer Service Center
   c. Financial Software Services
   d. Network Services
   e. Telecommunications
f. Management

4. What sources are you most likely to use when looking for information? (Please rate each individually on a scale from 1 to 5.)
   a. Books
   b. HEAT
   c. Human Expert on Team
   d. Human Expert inside SHS
   e. Human Expert outside SHS
   f. Journals
   g. Mass Media
   h. Search Engines
   i. Technical Manuals
   j. Other (Please specify)

5. When looking for information, what is your primary motivation for choosing an expert source? (Please rank order from 1-4, where 1 is lowest and 4 is the highest.)
   a. Convenience
   b. Ease of Access
   c. Reliability
   d. Other (Please specify)

6. When looking for information, what is your primary motivation for choosing a written source such as a book or manual? (Please rank order from 1-4, where 1 is lowest and 4 is the highest.)
   a. Convenience
   b. Ease of Access
   c. Reliability
d. Other (Please specify)

7. When looking for information, what is your primary motivation for choosing tools such as a HEAT or a search engine? (Please rank order from 1-4, where 1 is lowest and 4 is the highest.)
   a. Convenience
   b. Ease of Access
   c. Reliability
   d. Other (Please specify)

8. Why are you most likely to collaborate with other individuals when seeking information? (Please rate each individually on a scale from 1 to 5.)
   a. I do not have the Business or Domain expertise.
   b. I do not have the Technical expertise.
   c. Organizational Structure (You are supposed to ask this person.)
   d. The information needed is complex.
   e. The information needed is not immediately accessible.
   f. The information needed is not easily accessible.

9. Who would most likely use you as an information source? (Please rate each individually on a scale from 1 to 5.)
   a. IT Personnel outside of team
   b. IT Management
   c. Non SHS Employees (ex. Outside vendors)
   d. SHS Personnel outside of IT
   e. Teammate

10. Why would this person want to collaborate with you when seeking information? (Please rate each individually on a scale from 1 to 5.)
a. Does not have the Business or Domain expertise.
b. Does not have the Technical expertise.
c. Organizational Structure (This person is supposed to ask you.)
d. The information need is complex.
e. The information needed is not immediately accessible.
f. The information needed is not easily accessible.

11. When collaborating with others to look for information, how likely are you to interact... (Please rate each individually on a scale from 1 to 5.)
   a. Face-to-face
   b. Virtually (All non face-to-face interactions such as phone, email, etc.)

12. What tool are you most likely to use to share information with others when virtually collaborating? (Please rate each individually on a scale from 1 to 5.)
   a. CITRIX
   b. Email
   c. Fax
   d. HEAT
   e. IM
   f. Phone
   g. Texting
   h. WebEx
   i. Other (Please specify)

13. If instant messaging were to be used as a tool to support collaboration during information seeking, which features would you find most useful? (Please rank order from 1-6, where 1 is lowest and 6 is the highest.)
   a. Audio/Video chat
b. Chat History/Logs

c. File sharing

d. Real time chat

e. Search function

f. Other (Please specify)

14. If Email was used as a tool to support collaboration during information seeking, which features would you find most useful? (Please rank order from 1-7, where 1 is lowest and 7 is the highest.)

a. Automatic linking to your calendar

b. Email archiving

c. Email categorization

d. File sharing

e. Hyperlinks for web addresses

f. New email notification/alert

g. Other (Please specify)

15. Which would you prefer to use to share information with a colleague?

a. Email

b. IM

c. SharePoint

d. If you would like to provide more details, space is provided below.

16. Which would you prefer to use to get the attention of a colleague?

a. Email

b. IM

c. If you would like to provide more details, space is provided below.
17. If HEAT were to better support collaboration during information seeking, please rate the following potential features based on their usefulness in supporting collaboration. (Please rate each individually on a scale from 1 to 5.)

a. Ability to save the work
b. Ability to ‘see’ other users (see what they are searching, or have already searched)
c. Instant Messaging
d. Manual Emailing (attaching tickets, info, etc.)
e. Real time document editing
f. Search Engine

18. Which reasons are most likely to prevent you from collaborating when searching for information, even when you would like to collaborate? (Please rate each individually on a scale from 1 to 5.)

a. Lack of time
b. Other people not available
c. Physical distance
d. Rules/policies
e. Technological limitations
f. If you would like to provide more details, space is provided below.

19. What are the most likely reasons that you do not collaborate during information seeking? (Please rate each individually on a scale from 1 to 5.)

a. Lack of fundamental issue information across groups/teams
b. Prefer working alone
c. Time consuming

20. When the information you are searching for is difficult to find, what would you do to find the information?
a. Work individually
b. Work with my teammates

21. What is the culture of your team?
   a. Formal (ex: following established form, custom, or rule)
   b. Informal (ex: casual)

22. How does the culture of your team affect your level of collaboration with your teammates?
   a. Culture of my team leads to significantly less collaboration
   b. Culture of my team leads to less collaboration
   c. Culture of my team has no effect on collaboration
   d. Culture of my team leads to more collaboration
   e. Culture of my team leads to significantly more collaboration
   f. If you would like to provide more details, space is provided below.

23. When there is an issue of co-location within your team (i.e. team member physically located on another floor, in another building, etc.), how does that affect the level of collaborative information seeking within your team?
   a. Co-location within my team leads to significantly less collaboration
   b. Co-location within my team leads to less collaboration
   c. Co-location within my team has no effect on collaboration
   d. Co-location within my team leads to more collaboration
   e. Co-location within my team leads to significantly more collaboration
   f. If you would like to provide more details, space is provided below.

24. When potential collaborators are dispersed across many locations, how does that affect the level of collaboration in information seeking?
   a. Collaborators dispersed across many locations leads to significantly less collaboration
b. Collaborators dispersed across many locations leads to less collaboration

c. Collaborators dispersed across many locations has no effect on collaboration

d. Collaborators dispersed across many locations leads to more collaboration

e. Collaborators dispersed across many locations leads to significantly more collaboration

f. If you would like to provide more details, space is provided below.

25. When seeking to collaborate during information seeking activities, how much of a factor is time? (i.e. “I am short on time so I must do this myself.” or “I am short on time so I must collaborate.”)

a. Time as a factor leads to significantly less collaboration

b. Time as a factor leads to less collaboration

c. Time as a factor has no effect on collaboration

d. Time as a factor leads to more collaboration

e. Time as a factor leads to significantly more collaboration

f. If you would like to provide more details, space is provided below.

26. Please enter any questions or comments you may have about this survey.

27. If you would be willing to participate in a 15 minute follow-up interview with Patricia Spence regarding the findings of this survey, please provide your name and email address below.

Thank you for responding to this research survey. We appreciate your time and your feedback.
Patricia Ruma Spence: Abridged Curriculum Vitae

EDUCATION
Doctor of Philosophy in Information Sciences and Technology, May 2013
The Pennsylvania State University, University Park, PA, USA
Master of Science in Information Science & Technology, December 2005
Missouri University of Science & Technology, Rolla, MO, USA
Bachelor of Science in Engineering Management, December 1994
Missouri University of Science & Technology, Rolla, MO, USA

RESEARCH AND TEACHING EXPERIENCE
Penn State University Socio-Technical Systems Lab 2007-2011
Graduate Research Assistant, Madhu C. Reddy
Penn State University, College of IST 2006-2007
Graduate Teaching Assistant, Madhu C. Reddy & Steven B. Sawyer
Missouri University of Science & Technology, LITE Lab 2004-2005
Graduate Research Assistant, Madhu C. Reddy
Missouri University of Science & Technology, Dept. of IST 2004-2005
Graduate Teaching Instructor

PUBLICATIONS & PRESENTATIONS
Peer-reviewed Journal Publications (3)
Archived Conference Publications (4)
Book Chapters (1)
Workshops (2)
Non-archived Publications and Invited Talks (6)

ACADEMIC AWARDS & RECOGNITION
Consortium for the Science of Sociotechnical Systems (CSST) Summer Research Institute, 2010
Lockheed Martin Graduate Fellowship, 2008
Missouri University of Science & Technology Outstanding Graduate Student, 2005
Missouri University of Science & Technology Outstanding Teaching Assistant, 2005
Missouri University of Science & Technology Chancellor’s Fellowship, 2004