Situating CIS – The importance of Context in Collaborative Information Seeking

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Abstract

Collaborative Information Seeking (CIS) is common in many professional contexts. This chapter discusses CIS from four different perspectives – education, healthcare, science research and patent research. We first introduce the CIS context, focusing on Evans and Chi’s proposed model of social search. We highlight the ways contextual factors relate to the search process, in particular noting the role of communication in CIS processes. The four example professional contexts are discussed with reference to the ‘medium’ of collaboration, the ways CIS is conducted, the tools used and physical setting of CIS, and the ‘context’ of CIS, the purposes for which an instance of CIS occurs in that discipline. We suggest that these contextual factors can be aligned with, but are additional to, the existing Evans and Chi model of social search, and that their addition in a ‘pre- and post-model’ extension could provide a shared framework for researching contextual features of CIS. In highlighting commonalities and contrasts across the disciplinary contexts we suggest that a developed model, and further research, is needed to understand the relationship between motivations in these different disciplines and the evaluation of CIS episodes, and the role of processes, particularly communication, in those episodes. In order to evaluate CIS in different disciplines future research should focus on the between, and within discipline differences in the purposes of CIS. Characteristics of success in different disciplinary contexts may relate both to the consideration of the collaborative context, and the information need; developing deeper understanding of this point.

Keywords: Collaboration, Context, Professional disciplines, Communication, Search, Information seeking, Csl, Cscw

Introduction to CIS

Collaborative Information Seeking (CIS) has a high incidence in many professional contexts. The authors of this chapter come from a different professional background including
education, healthcare, science and patent research from different countries (UK, Canada, Germany and Sweden respectively). It seems natural that researchers interested in CIS actually collaborate to examine the importance of context.

There is a growing interest in CIS research, including the workshop (Shah, Hansen & Capra, 2013) from which this chapter stems. In that workshop, we discussed two factors which form the focus of this chapter – the role of context, and the difficulty of evaluating the success of a CIS episode. These two factors are related: Evaluation is a difficult concept to pin down, especially across various contexts (e.g., workplaces). People may seek different outcomes from both collaboration and information seeking episodes – for example, in some contexts, the collaboration and effective group work is crucial, in others we seek a shared understanding, while in others the sum of knowledge (but not each individual’s knowledge) is crucial. Thus, context defines the required outcomes and evaluative standards of any CIS incident.

Despite the growing interest in CIS, and the key role of context in examining the success of any given CIS activity, relatively little by way of comparative disciplinary analysis has been conducted. Yet, we have reason to suppose that different disciplines might adopt different standards for collaborative achievements. This is a fundamental issue:

…if two people working together can find twice as much information as either of them working independently, was that a good thing? How about the amount of time they spent cumulatively? The participants may not be able to find twice as many results, but what if they achieved better understanding of the problem or the information due to working in collaboration? Then there are other factors, such as engagement, social interactions, and social capital, which may be important depending upon the application, but are usually not looked at in non-interactive or a single-user IR [Information Retrieval] evaluations. (Shah, 2012, pp. 115–116)

Consider Evans and Chi’s (2010, p. 661) proposed model of social search, which offers a focal point around a specific element of collaborative information seeking – the search process. That model indicates various ways, and stages at which, collaboration might occur including:

1. The defining of information needs and exchange of relevant information surrounding those, such as important URLs and keywords,
2. The search processes itself, such as shared understanding of information found – both the short previews given by search engines, and deeper information from websites
3. The evaluation, and ‘use’ stage, such as organising information into various shared tools, and perhaps dissemination

At each stage, it should be clear that contextual factors will play a key role – how URLs are passed, and to whom is different in: article writing; classroom; medical; and patent office contexts. Librarians – as information retrieval experts – returning snippets to students, play a fundamentally different role to researchers offering a research précis to a medical professional. And the co-writing, or software development context in which research is conducted on the fly to solve problems is again not the same as a classroom task in which students might seek their colleague’s assistance to find ‘good’ websites and write a class presentation. This raises an important point – communication provides an important context for collaborators to work in. Hertzum (2008) discusses the role of this shared motivation towards knowledge accumulation alongside the types of communication which facilitate such CIS activities.

In a collaborative context, information is typically distributed unevenly across actors, and they may interpret the information known to them in different ways or be unable to make coherent sense of it. On the one hand, this is what makes communication and information seeking worthwhile activities. On the other hand,
it also emphasizes the considerable work and constraints involved in making coherent sense of information within a group of actors. (Hertzum, 2008, p. 958).

Hertzum suggests, as the collaboration becomes closer, the ‘common ground’ underpinning both the communication of collaboration and the shared understanding of the information need should also increase, while in looser collaboration such common ground can be more temporary and may require more continual effort. Below, we present our four disciplinary contexts. In each of the cases presented, the context, and the language used in that context – the way collaborators speak to each other, and for what purposes – varies; understanding that variation is likely to assist us in comprehending how to evaluate the quality of the CIS encounter. The examples given here are intended to motivate a focus on context and its role in defining the evaluative standards for CIS, with a core focus on understanding where the ‘C’ of collaboration, and ‘IS’ of information seeking come together; a role we suggest may be particularly well understood through analysis of communication.

In the remainder of this chapter the discussion will: (1) introduce some research describing the role of communication, and how it relates to CIS tasks; which we then relate to specific professional contexts – healthcare, science research, education and patents; (2) additional considerations for context specificity to model of social information seeking; (3) draw some commonalities and distinctions between those domains; (4) finally conclude with some remarks on the importance of further analysis of context, and the role of communication both as a medium of collaboration, and as a fundamental component of the creation of context.

### Communication

We noted above the importance of communication to managing the CIS process, and understanding the sense-making context in which (and through which) CIS occurs. Despite this important role of communication, relatively little work has been conducted on the specific types of communication engaged during CIS. Studies have instead tended to focus on the use of chat, for example: after results are found but without considering how the chat helps build knowledge (Yue, Han, & He, 2012); as a task oriented tool tending towards the division of labour (Shah, 2013); as a proxy for communication (via a simple message count) without looking at content (Shah & Marchionini, 2010); and as an indication of particular stages of the Information Search Process (Shah & González-Ibáñez, 2010, p. 7).

To give a more detailed example which illustrates some contextual factors (in this case, around task orientation) in recent work (Shah, 2013) participants were asked to collaborate on an exploratory search problem in which they were asked to address particular issues, and to find as many relevant snippets as they could (but not to write these up into a report). These chat messages were then coded for coordination purpose messages involving asking for a collaborators status, responding to that question, a confirmation or reaction. These were further coded as being past oriented, current status oriented, or future actions or strategies oriented. Shah (2013) reports that most chat was not coordinating in nature, but that the baseline group engaged in more coordinating talk, significantly more of which was past oriented, in contrast to the third group which was more present and future oriented.

On the basis of coordination cost – number of messages exchanged, inaccuracy in reporting status, and time taken to coordinate with teammates – Shah concludes that communication alone (as in the control group) is not enough to facilitate coordination, and thus support effective CIS. Correspondingly, those in the shared awareness group were able to best coordinate their efforts, and communicate their activities. While this study provides further support for the consideration of awareness in CIS system designs, the constraints of the task design introduce at least three concerns. First, asking participants to find “as many” snippets as possible emphasises factual recall over sensemaking and, arguably, truly exploratory search. This may impact on the nature of coordination required, and CIS. For example, (as noted by Shah) the provision of ‘issues’ participants were required to cover facilitated the
division of labor, and reduced the need to ‘make sense’ of their information needs. Second, asking participants not to write up their snippets alters participant’s own understanding of ‘success’ thus changing their work context. Finally, the coding of talk as only ‘coordinating’ or not, limits our understanding of the ways in which coordination occurred, and users made sense of information together. This point is of central importance to this chapter – the role of communication, both in terms of task (or work) context, and in terms of its role in sense-making – is key, but understudied in CIS. The point here is not to critique the particular study, but to note that the key role of contextual factors in defining the outcomes from that study, and highlight that these factors may not be instantiated in the same way in many other contexts. This highlights the need to further explore the particular functions of the communication. While this point has been noted by a number of CIS studies, addressing it is a complex issue.

– Context: Through the Disciplinary Lens

CIS in Healthcare

The medium of collaboration

The first of our practical examples, healthcare workplaces, are obvious contexts in which information is often distributed, its sharing – and the roles of those doing the sharing – is of fundamental importance, and this sharing occurs in a variety of media from formal notes to spoken conversation. Communication is the platform through which individuals make sense of situations; interpret surroundings and their collective circumstances to actively pursue answers to their information needs. Healthcare providers usually work with others in their practice and their communication has a role in sense-making. How practitioners sense-make in these CIS tasks is crucial to the completion of tasks, and solving of problems in healthcare contexts. Communication is key and there are many different mediums where information can be sought such as patient paper charts, electronic medical records, white boards, telephone communication, emails, texting, video conferencing or face to face dialogue. It is also important to consider the patient or family as part of the healthcare team so that the patient’s input can be considered when making decisions; exchanging, and understanding information between diverse stakeholders is crucial.

Healthcare organizations sometimes provide support through educators, librarians or other specialists to communicate evidence informed practices to healthcare professionals. The communicated experiences or advice of other providers may also be held to a higher value and trusted more readily by healthcare providers. Evidence informed practice includes the use of research or evidence to make practice decisions through, for example, the use of standardized guidelines or databases to access journals. It should be noted though that evidence is not always used, since the easiest retrieved information resource may be the most useful one (for example, outdated guidelines) for the healthcare professional team. Communication technologies and quality, accessible resources need to be supported by the organization to positively influence sense-making and CIS by healthcare providers.

The context of collaboration

Issues regarding resource seeking and selection are influenced by organizational culture and contexts which shape the use of evidence informed practices, since these practices must be valued by the workplace or healthcare team in order for evidence to be integrated into the sense-making process. The specific task context in which information needs occur can also influence how information is sought to solve a problem. Reddy and Jansen (2008) studied two different healthcare teams in hospital settings, an urban surgical intensive care unit and rural
emergency department, and found that as the complexity of the information need increases, so does the likelihood that collaboration is required to retrieve the information needed.

When individuals are challenged with unfamiliar situations in which they have information needs (e.g., administrating an experimental drug for the first time), they have a tendency to approach colleagues for that information (McKnight & Peet, 2000). For example, Marshall, West and Aitken (2011) found that nurses would seek information from more experienced colleagues and seldom, if ever, from a less experienced colleague. Information needs usually occur in relation to dynamic situations, non-routine problems, conflicting information, time pressure or difficult decisions. Their colleagues may not necessarily be an “expert” in the area of their information needs. However, when faced with a complex and uncertain situation it may be necessary to seek assistance from a colleague who is immediately accessible. Therefore, the most-up-to-date or best evidence may not be used to solve the problem. Furthermore, when faced with time-pressured decisions information seekers may take the best available information at that particular time. On the other hand, healthcare providers can work as a team routinely in longer-term interactions in which collaboration is fundamental, for example, to provide quality patient care. Sharing and seeking of information, and communication around it in this context is likely very different, and potential conflicts between healthcare providers, patients, and other stakeholders in these contexts are also likely to vary.

Evaluation of the sense-making during collaborative information seeking by healthcare providers needs further examination. Understanding how healthcare providers’ communicate with each other, their sense-making processes and lines of communication that promote collaborative information seeking is important. Yet, while in some contexts facilitating communication will be a clear aid to successful outcomes, in others high quality communication is less important than is the transfer of information.

Scientific Teams and CIS

The context of collaboration

Scientific work is another example discipline in which collaboration in general and CIS in particular is a common practice. As pointed out by Spence et al. (2005, p.2), “Many academic research projects are multidisciplinary in nature and require particular knowledge that a researcher may not have.” Or, in other words, often a large variety of expertise is necessary in research contexts and a single person can usually not have all the skills needed to be successful. Accordingly one aspect which triggers CIS in scientific communities is lack of expertise. When information needs occur in research situations, most actors prefer to contact colleagues rather than other sources to fulfil that need. Besides lack of experience, the complexity of information is another common reason for CIS in scientific communities. Complex information requires people with different expertise to work together. They can all contribute pieces of knowledge, making it easier to break down complex information in smaller, manageable pieces. A third reason which calls for collaborative search is the accessibility of information. When the needed information is hard to acquire, scientists often ask colleagues for help and start a collaborative instead of an individual search. Also time pressure is a common trigger for collaboration, in scientific as well as other areas. Scientists often have to deal with deadlines for submitting papers, finishing research projects or handing in applications. In those situations they prefer to contact colleagues to get information or assistance in searching for information.

The medium of collaboration

Another interesting aspect of CIS in academic communities is that most scientists point out that they do not have difficulties to find relevant documents for their research activities. The
actual problem is to figure out which of those documents are the most relevant. To solve this problem scientists prefer to contact colleagues and search collaboratively to make sense of found information and rate its relevance for satisfying their information needs. This leads to the assumption that evaluating CIS events cannot just be a matter of retrieval, precision or simple metrics. It seems to be vital to relate CIS evaluation to sense-making activities.

Thus, of further interest are tools and media used for sharing information, talking about search activities or searching collaboratively. In scientific communities these activities usually take place via telephone, email or, in the most common case, via face-to-face communication (Spence et al. 2005) Sophisticated tools and techniques, for instance tools to support collaborative search, wikis, forums, microblogging or messengers, are seldom used. Face-to-face dialogue and therefore direct contact between people seems to be considered as the most useful and favoured way for CIS-activities. The remaining question is why face-to-face communication is actually the preferred way for collaborative searching and sense-making in scientific teams. Spence et al. (2005, p.3) suggest that “ [...] researchers orient towards the mediums that are familiar to them.” Furthermore they note that communication is an essential aspect of CIS, if participants are co-located or dispersed. Given the division of labor in scientific teams, and the ill-defined nature of their tasks it is thus interesting to note the complexity in evaluating their success, individually or collaboratively. Spence et al. (2005) used a survey in which they asked questions related to success to gain a better understanding of the field, suggesting that ‘success is indicated by: Collaborations that usually find information

- Information seeking that is easier than individual
- Information that is more relevant than that found individually
- Information found quicker than individually (Spence et al. 2005)

A 10-point scale was used for each success factor, ranging from 1 (strongly disagree) to 10 (strongly agree) with results highlighting that most researchers (Mean 8.02) agreed that they usually found the needed information when collaborating with colleagues. Further they rate CIS easier than individual IS (Mean 7.111) and leads to a higher recall and precision (Mean 7.38). Most of them also consider CIS quicker than individual IS (Mean 6.94).

**CIS in Education**

**The context of collaboration**

In many cases of CIS, the context is a more or less formal learning environment. In learning environments CIS is of particular interest because the role of collaboration for educational outcomes is much studied, and effective collaboration related to improved educational outcomes. Indeed, there is a sizeable literature in the field of ‘computer supported collaborative learning’ (CSCL) the core interest of which is how to use collaborative technologies to support learning. Thus the consideration of context in CIS is of particular interest to educational situations (see Knight and Littleton, this volume), although the particular context of CIS is less directly studied. Indeed, given that collaborative incidents may be ad-hoc (such as ‘over the shoulder’ collaboration) identifying CIS even in formal educational contexts is a complicated matter. Of course, many educational contexts are similar to those discussed above – with a distribution of expertise (for example students and teachers or expert librarians), division of labour in teamwork (for example in shared class assignments), or – as mentioned above – ad-hoc collaboration through asking a classmate for assistance. However, even where similarities exist in CIS factors involved (such as distribution of expertise), the outcome measures in educational contexts have particular salience. In this context, the important factor is learning – thus the analysis of CIS ‘performance’ through exploration of retrieved information may be a poor indicator. Instead,
educators are likely to have stronger interest in what has been learnt – thus, retrieving fewer documents, but having more productive learning talk and collaborative sense-making around them may be more important an outcome measure.

The medium of collaboration

What is of particular interest in these cases is the means to evaluative the quality of those interactions. For example, one study of children’s poor search ability concluded that, “…the conditions for students working collaboratively deserve attention. Our results confirm the importance of collaborative inquiry activities being more than just ‘working together’”. They suggest that such successful situations, “showed students who helped each other, who knew what everyone else was doing and who all shared the same goals. This resulted in a high motivation and an accumulation of knowledge.” (Kuiper, Volman, & Terwel, 2009, p. 679). In this case, understanding the outcome is not only a matter of understanding the level of recall, but of understanding the interactions between participants and their collaborative ‘grounding’. Such claims around classroom interaction are common in educational research, and are likely to be important in understanding CIS and the significance of sense-making and collaborative talk.

Some studies have explored such issues in educational CIS. For example, Lazonder (2005) suggested that students are, “largely unable to select appropriate search strategies (planning), check their progress (monitoring) and assess the relevance of search outcomes (evaluating).” (Lazonder, 2005, p. 466). He thus suggests that collaboration may aid in overcoming the “inert knowledge problem” (Lazonder, 2005, p. 466) in that verbalisation to collaborators may contribute to the self-regulatory processes, prompting users into better negotiating the search process. The implication here is that, by encouraging the creation of common ground or knowledge, we facilitate better information seeking processes. However, this was a small scale study, based on older students in which, although talk or ‘verbalisation’ was deemed important for self-regulation, it was not analysed as a data form or sense-making activity.

In much of the research even in educational contexts, language – as a specific component of educational importance, and context – has not been studied. In many cases, outcome variables have also not been measured – for example, using the classic pre-test, post-test model to assess how much learning has taken place through a particular activity. Understanding the context of collaboration in educational contexts – particularly classroom contexts – is important to understanding how to evaluate its success. Given the importance of sense-making in CIS, and the essential role of sense-making in learning contexts, such an analysis may also be important in other CIS contexts – where participants seek to make sense of information together, and learn from each other.

CIS in Patent

The context of collaboration

CIS can also, as has been demonstrated (e.g. Hansen and Järvelin, 2005, Hansen 2011), occur in professional work task situations involving a high level of information-intensive (search) tasks. The patent domain involves a large amount of information searching activities during the process of finalizing the patent work task, information seeking is thus a primary activity in this domain. Today, it is essential for professional workers to stay informed of their work environments in order to effectively manage knowledge and stay competitive, effective and innovative. The flow of information (e.g. gathering, assimilation, and creation of information) involves increasingly complex task processes.

There are a number of different types of patent searches such as State-of Art, Prior Art, Patentability, Validity, Invalidity, Novelty (Hansen, Järvelin and Järvelin, 2013), One of the
most common is the prior art search. This task is related to the handling of a patent application in a patent office. The goal is to determine whether the innovation claimed in a patent is original, or already known to the public. The important factor in this context is making sense of patent information as well as formulating search queries that return no results. This then means that there is an innovation that can be patented. The patent domain context also involves synchronous and asynchronous collaboration with colleagues remotely and co-located, since the information is sought both on internal databases as well as on external databases. Furthermore, the collaboration in seeking information is related to different level of goals (Hansen & Järvelin, 2005), such as the individual levels of goals, group/team level of goals and organisational goals. Generally, the task performance process at PRV (the Swedish Patent and Registration Office) is formally well structured and involves a certain set of stages. In general, the patent engineers handle three different types of applications: one is an application written by a professional patent bureau, another is written by an internal patent department within a company, and finally some applications are written by private persons. The handling of the patent applications, which is done mainly through classification, searching, retrieving, inspecting and judging relevant information within the patent domain, will ensure that the application through which a patent is sought is treated in a fair way. There are clear manifestations of collaboration involved in the information seeking and retrieval process (IS&R). That collaboration and collaborative task activities in IS&R is frequent suggests that collaborative activities are an important characteristic of IS&R tasks in professional task-based IR in general and in the patent domain specifically.

**The medium of collaboration**

Hansen and Järvelin (2000 and 2005; Hansen 2005) have studied CIS activities that involve activities in a patent domain, for example finding 155 occurrences of CIS activities distributed over 12 patent handling tasks observed. That research highlights some key characteristics of CIS activities that may describe the communicative part of collaboration:

- **Task cooperation.** Sometimes there is a need to share a patent application task due to various reasons. This could be done through two different processes: sequentially or in parallel.
  - Sharing division of patent application tasks. Colleagues verbally discuss and decide how to divide the incoming patent applications among each other in the subject group or if it is necessary to assign the patent application to another group within the organisation.
  - Sharing search strategies. Search process/strategy was verbally shared and used in a collaborative way if target documents are closely related. In this classification we also find sharing search terms and classification codes.
  - Sharing, or asking for, external and internal domain expertise. Patent engineers use both internal as well as external expertise to help with problem solving. Colleagues might internally be asked for domain specific knowledge as well as for information retrieval specificities, while external advice might concern clarification, law etc.
  - **End product creation.** In the final phase of a task, humans may collaborate to finalize the end product of the problem-solving task. In the case of the patent domain this is often a report covering the outcome of the search and its applicability to the stated claims in the patent application.
  - Communicating and sharing of personal and subjective opinions in verbal form that for example reflects an immediate relationship between the document and its “neighbourhood”.
  - Sharing internal experience. Ask colleague regarding earlier experience with similar type of applications. This category involves also issues such as procedural, legal and strategic issues.
Collaborative activities show a pattern that comprises of asking colleagues both internally and externally regarding experiences, and search strategies. The communication part is essential in this CIS activity. In summary, we have identified a large set of human-related collaborative characteristics involved in the IS&R process. Notably, these collaborative activities do not only belong to the information seeking stage but also to the information retrieval stage using communicative means.

Understanding the Context of Collaborative Information Seeking

Evans and Chi’s (2010, p. 661) proposed model of social search, discussed above, indicates various ways, and stages at which, collaboration can occur in the search process. Their model includes three main stages: before search; during search; and after search. We suggest that there are two extensions to this model of social information seeking, a pre- and post-information-seeking extension, to specify context.

The pre-model extension would lead into the internal prompt phase of Evan and Chi’s (2010) in the ‘before search’ stage. Information-seeking can address specific known questions, problems and/or needs in the pre-model extension. Specific established desired outcomes and modes of communication for dissemination of information are identified in this stage.

As well, a post-model extension provides further context to the ‘after search’ phase in Evan and Chi’s (2010) model, which specifies a post-search process involving proximate others phase and/or public display. This stage is tied to the pre-information-seeking stage described above in which desired outcomes provide context for the search process, which are then evaluated and perhaps re-formed in a feedback loop in this post-search stage.

These two extensions would complement the model of social information in terms of context specificity. The four disciplinary lenses discussed in this chapter each provide a specific context each with differing types of information need and desired outcomes. Each discipline has specific modes of communication that work best in their context. For example, in nursing the oral mode of communication with colleagues usually works best when information-seeking during a shift on a unit or in patents – colleagues verbally discuss patent applications according to subject group. In terms of the after search phase either the discipline specific answer is satisfied, or re-formulated to enter the seeking process again. For example, a scientist researcher may find answers to research questions and now can communicate finding through publications or conferences or need to continue studies and literature reviews, perhaps contacting an expert in the field, or review literature with the assistance of a librarian to scope and search for information to answer specific questions.

The two extensions, pre and post model, provide particularities of the disciplinary lens which can allow for context specific use of desired outcomes and successfully known communication strategies to disseminate information to others. Context is variable to each discipline however there are some commonalities across disciplines. Evan and Chi’s general model supports this notion of commonalities, by understanding the discipline-specific outcomes and process variance, we provide a deeper understanding of the information seeking context, not only as ‘setting’ but as task oriented and involving both a setting, and set of standards for processes and outcome-evaluation.

Disciplinary Contrasts and Commonalities in CIS

All four example disciplines described above provide various contexts in which CIS occurs. Researchers and practitioners should consider the between, and within context variations in CIS. In the following sections we first highlight some key aspects of CIS which demonstrate common within-discipline variation across the examples we provided above. In the subsequent section we highlight that although there are some common variations within disciplines, understanding the particular instantiations of contextual factors in CIS is also key.
Commonalities across disciplines

As described above communication is a key mediator of CIS. For sensemaking the role of communication is indispensable and sensemaking itself is an important factor in CIS. Furthermore, sensemaking is a collaborative process of creating shared awareness and shared understanding out of different perspectives. In all four working contexts communication is essential for successful CIS. Despite the importance of these factors across domains, the role of communication and communication for sense-making is relatively understudied. Another, very important aspect of communication in relation to CIS and communication for sensemaking is sharing of information (Talja and Hansen, 2006). This may in part be because, while the process of sensemaking is domain general, many factors involved – including domain content, and roles – will be domain specific.

In a similar vein, another commonality between domains is the heterogeneity of people in all four example areas in regards to participant’s personality and traits. People are not a homogenous crowd, but individuals with individual strengths and shortcomings. Even in a team with just scientists, just students or just healthcare employees, people differ in their behavior and personality; and all of these groups interact with other professionals from other domains. Furthermore, individuals and groups of individuals may have different goals and aims when solving a task in collaboration. Between these areas, professionals do not only differ in their personality but also in the way they work and their expertise. In general it also makes a difference if people are used to working in teams or not; the personality of people, their experience and expertise, their interests and the way of everyday work and life have influences on how people build teams, behave in teams and in the end also on how successful a CIS episode can be. This might again have influences which distinguish different collaborative teams. These differences are interesting because they are likely to have influences on team building and the way team-members work and search collaboratively.

The four examples provide different disciplines in which CIS occurs. On the one hand, as we discuss in the following section on contrasts, these examples illustrate differences between occurrences of CIS in different domains. On the other hand, these examples highlight that across the domains, there is within-domain variation in the situations which call for CIS; there is not just one situation in which CIS occurs but many different ones. Furthermore, while in some cases the occurrence of CIS may be rather obvious, in other cases the shared information seeking will be more subtle. Similarly, in some cases CIS will be an explicitly planned occurrence – patient record handover; sharing of literature reviews; group class assignments and solving patent application tasks – but in others, CIS may be more ad-hoc (Hansen, 2013); less structured; and unplanned.

The model described above – Evans and Chi’s model, augmented by pre/post model elements describing the CIS context – provides a useful and shared means to understand this range of CIS occurrences. Within this shared model, to understand the nature of CIS across the domains, it is important to consider the context of a CIS episode, including: (1) its function and the desired outcome of the CIS episode; (2) the participants and their roles; (3) the ways those participants sensemake, (4) the participants and their roles, and (5) communicate towards the desire outcome. In the next section we highlight some particular ways in which, there are contrasts between the example domains.

Contrasts across disciplines

Besides the commonalities connected with CIS in Healthcare, Education, Scientific Teams and Patent domain there exist differences too, for instance in regards to the outcomes of CIS processes. The aspects we discuss – related to participant expertise and division of labor, work task, communication and sharing medium, and the role of communication itself – come together to produce important differences in context, and desired outcomes.
Contrasts in Outcome

The main goal in an educational context is learning and knowledge transfer. That means that the planned outcome of a collaborative search is to provide efficient ways of learning and imparting knowledge; but in some contexts, the processes learned will be considered more important than the number of pieces of information obtained. In many such CIS occurrences all participants have the same level of expertise and required to work together to a mutual understanding of some problem. Furthermore, while in some contexts a difference in expertise results in deference to the expert, in educational settings teachers often try to scaffold students to new learning without directly giving them answers.

In contrast, while the healthcare domain is interested in the use of evidence informed practices and knowledge transfer too, the primary goal is to achieve positive health outcomes for individuals and communities. Collaboration, for instance, occurs to avoid potentially life-threatening medical errors or to assist a family member in locating the proper equipment to support a patient’s independence. Professionals working in the Healthcare domain are mainly asking team members for help, when confronted with an unknown problem. However, the patient or family may be a resource. The knowledge and experience of different people searching together to satisfy their shared information need is essential for providing positive health input.

Scientific Teams have varying interests regarding the outcomes of collaboration. As in education and healthcare, knowledge transfer is one but mainly, as described above, scientists collaborate because of a lack of expertise. The intent in this case is of course to carry out research projects which are often multidisciplinary. That again raises the chance for funding; on the one hand while writing applications for research projects and on the other hand for future research projects or applications which require different expertise; the target outcome is not necessarily to transfer knowledge between partners, but to divide labor appropriately.

In the patent domain, the main goal for the applicant is to get a fair assessment of the patentability of the invention based on the knowledge registered in the world. For patent engineer the overall goal is to provide protection for investments that individual and companies have made into new technological innovations and to stimulate the competitiveness and development. The handling of the patent applications, which is done mainly through classification, searching, retrieving, inspecting and judging relevant information within the patent domain, will ensure that the applied invention is treated in a fair way. The flow of information (e.g. gathering, assimilation, and creation of information) involves increasingly complex means.

Contrasts in Motivation

Accordingly the motivations for, and the intent to, collaborate differ depending on the discipline. While the motivation in education is to train and instruct students, in healthcare it is to help people to regain or maintain their health and in science it is mainly to develop research and research programs or grants. The outcomes, and therefore the intention to collaborate, are connected with the context in which CIS occurs.

CIS processes in healthcare may occur due to time pressure and an imbalance of expertise, or due to longer term health management planning. The needed Information might save lives and the combination of different people with different knowledge and expertise raises the chance to get information quick and with all required details. In Education the context for CIS is often a classroom situation in which students in collaborative groups compile knowledge or teachers apply collaborative methods to transfer knowledge. CIS in this context is often not just about compiling pieces of information, but rather about developing a shared understanding of some problem, and developing skills – including sense-making and communication – to build this shared understanding.
CIS-scenarios in Science mainly happen during everyday work, while writing applications for research funds or working on research projects. At some point it might happen that one’s expertise is not sufficient. That is mainly the case because research projects, as described above, are usually multidisciplinary and one person probably would not have the knowledge required to cover all disciplines. Again when a project is carried out, CIS happens in places where knowledge or information from different areas of expertise is required.

CIS in patent domain occurs in most of the information-related activities during professional work tasks. Each person represents a specific domain expert as well as having a certain degree of search expertise. However, patent applications may involve several different topic areas, which then call for different experts in order to solve the task. Furthermore, each patent application task may take several days or weeks to finish and therefore the task process need to be documented for later use. This documentation can be shared by other patent engineers, working with a similar task at the same time, or at a later time.

Contrasts and Commonalities – Summary

As indicated above, there are various commonalities and contrasts in CIS behavior related to the domain in which it occurs. One interesting consideration is that CIS actually does take place across disciplines, even if all four examples exhibit differences in regards to the working context. The goals, methods, and the intention to collaborate vary in healthcare, education, science and patents. Also the motivation for working and searching together is heterogeneous and depends on the working scenario. While in healthcare caring for people’s health is ranked first, in education it is learning whereas in science research and knowledge production is most relevant and in patents technological development and economic aspects need to be secured for individuals and companies in world-wide competitions.

Besides the contrasts commonalities also remain between the described domains. Although methods, tools, motivations and outcomes vary, a shared model of CIS – involving the defining of information needs, the searching and sharing of that information, and evaluation of found information – can be identified. Communication is one example of a specific and key shared element in CIS. In the description of the working scenarios we could show that communication is essential for CIS. To be able to make sense out of information which was collected during team searches, being able to communicate is essential.

This chapter has highlighted the relevance of context to understanding CIS through the use of four examples. Context of course differs between healthcare, education, science and patent but it is an important issue in search scenarios in general. It frames the information needed on the one hand and the nature of collaboration on the other –framing the evaluative standards for CIS. All four disciplines provide different contexts in which collaborative search takes place; understanding those contexts offers potential for a deeper understanding of CIS.

The question remains whether it is possible to develop tools to support CIS across disciplines, and indeed within them. A further question would be whether or not the use of such tools could be compared across disciplines – after all, email is a widely used tool of collaboration and its existence helps to shape the context of collaborative encounters, but there are many other factors at play which would dictate ‘success’ in its use. Finally, there is a question of how to appropriately analyze communication in CIS, such that analysis accounts for information exchange, task-management, and deeper sense-making to provide more insight into ‘success’ beyond communicative effort or facts transferred.

6. Conclusions

This chapter discussed CIS through four disciplinary lenses and shows that there are many commonalities. The chapter has highlighted the situated nature of CIS, noting that understanding the context of disciplines in which CIS occurs, and specific occurrences of CIS within those disciplines, is key to developing understanding of the nature of CIS. We have highlighted that across disciplines an augmented version of Evans and Chi’s (2010) model of
social search – adding a pre and post-model extension – could provide a shared framework for researching contextual features of CIS, and in particular for understanding how communication differs across disciplines and CIS occurrences. It is important that future research evaluates or measures CIS among the different disciplines, and in particular develops a deeper – more contextualised – understanding of the major characteristics of a ‘successful’ collaboration within each discipline.

Comparing CIS in different areas as provided here shows further that there exists a lack of research. CIS is investigated in a variety of different work places and everyday activities with no studies comparing CIS in different domains. Investigating and identifying contrasts and commonalities between CIS-scenarios could generate interesting results which could allow a deeper understanding for collaborative search and potential to develop cross-domain support for users CIS activities.

References


