Sensemaking in Collaborative Exploratory Search

Johanna Shelby and Robert Capra
School of Information and Library Science
University of North Carolina at Chapel Hill
jecronin@email.unc.edu, rcapra@unc.edu

ABSTRACT

This paper reports on a study investigating the information seeking and sensemaking processes undertaken by groups engaged in collaborative exploratory searches. We conducted semi-structured interviews with eight participants who each described two collaborative search experiences: one with friends or family who they knew well, and one with a project group for school or work. Our results highlight the importance of understanding the stages of a collaborative information seeking process, the need to support individual sensemaking efforts before sharing results, and current practices for summarizing and contextualizing results for collaborative sensemaking.

Keywords

Collaborative search, sensemaking, information seeking.

INTRODUCTION

Collaborative information seeking (CIS) describes the practice of searching for information in conjunction with other people. CIS can take a variety of forms, ranging from asynchronously emailing items of interest over time, to being co-located and conducting searches in person (Golovchinsky et al., 2009). In addition, CIS can take place in a variety of contexts from personal to professional. Collaborative searchers may have a low level of familiarity with each other or may know each other very well.

An area of recent interest in collaborative information seeking research is support for awareness and sensemaking (Paul & Morris, 2009; Paul and Reddy, 2010; Shah and Gonzalez-Ibanez, 2010). Sensemaking is defined in information-seeking models for individuals as a process of contextualizing and understanding search results, by identifying gaps in knowledge and information deficiencies (Dervin, 1992). Studies have shown that sensemaking is an important component of collaborative search, especially considering that the understanding and processing of

information must take place across multiple individuals (Paul and Morris, 2009; Paul and Reddy, 2010). In particular, handoffs and communication of information from one group member to another can be important, as group members may not have a full picture of a situation before having to take on the task themselves. In such situations, efforts may be duplicated, time may be lost, or problems may arise due to deficiencies or problems with information transfer (Paul and Reddy, 2010; Morris and Teevan, 2009, p. 3).

The goal of the study presented here is to gain a deeper understanding of the sensemaking process in collaborative exploratory search. Specifically, we analyzed the collaborative information seeking and sensemaking strategies employed by eight participants, in two different contexts. The insights from this study help inform the design of CIS systems by illuminating current behaviors, and by explicitly outlining key sensemaking challenges of groups working together on search tasks.

METHOD

Semi-structured interviews were conducted with eight graduate students who had previous experience with collaborative searching both in a work or school context and in a personal context. Participants were recruited via email through student listservs. Our eight participants came from four programs across our university. Seven of the eight participants were female.

Participation consisted of an in-person semi-structured interview that was audio recorded and lasted approximately 45 minutes. Each participant was asked to recount two search experiences, one in a *work/school* context and one in a self-motivated, *personal* context, leading to a data set of 16 collaborative search descriptions. After data collection, the audio recordings were transcribed and an open-coding process was used to annotate the data. Analysis included reviewing the interview notes and looking for patterns and trends in the coded data.

RESULTS

In this preliminary report, we focus on two themes that emerged from the data analysis. First, we found a common process that was used in many of the collaborative searches. Second, we note a boundary that many users observed between *individual* and *collaborative* searching and

sensemaking. These findings are described in more detail in the following sections.

Collaborative Search Process

A common pattern of collaborative search was noted in six of the eight work/school search descriptions and in two of the personal scenarios. Stages of this process are illustrated in Figure 1. If possible, collaborators would begin a search with an initial in-person meeting. This meeting would provide a framework and context for the search and might include the creation of an outline and explicitly divided tasks. Group members would conduct most of their actual searching individually, and would also synthesize, summarize and prepare the information they found individually before sharing. This finding is consistent with a prior study by our research group that identified the importance of supporting individual spaces to search and summarize before sharing in a collaborative search process (Capra et al., 2010). Following the individual searches, information sharing would occur either through online or in-person communication, followed by an in-person meeting that would also be used to synthesize other group members' results and progress. This meeting might also facilitate the group in developing a higher-level understanding of how each piece fit together and in identifying any remaining gaps in knowledge. Finally, the groups would reframe their search and iterate this process, or finalize their results into a final format. In groups that had a mixed hierarchical relationship (e.g., advisor-student), the process sometimes included an additional step of receiving feedback from the person in the position of higher power (who might have been less involved in performing the actual searches).

While Figure 1 was a common pattern, it was not observed across all groups. In one work/school example, a higher percentage of work was done independently, and most collaborators were only involved in the "Review" stage of the search process. A second school/work example relied on more tightly coupled collaboration with one peer collaborator, and less collaboration with an advisor, who was only involved in the process for the meeting and reviewing steps. In both of these cases, there was a hierarchical power dynamic involved, and the participants took on a larger portion of the search process and a greater level of synthesis and preparation of results before sharing. Similarly, in the personal collaborative search tasks, there

were more varied levels of collaboration and information sharing, perhaps due to a similar disparity in levels of involvement in the search process by different collaborators. For example, participants who discussed planning a wedding remarked on initiating searches independently, and subsequently reaching out to others for additional help and feedback on their search. An additional factor in personal searches was geographic distribution, which led to more sharing and sensemaking occurring online or by phone rather than through in-person meetings.

Sensemaking – Individual and Collaborative

A second research question guiding this study was: How do people prepare information they find to share with others, and how do they make sense of information shared back with them by collaborators? Sensemaking, in this context, refers to understanding, processing, and synthesizing the results of a search. Two common sensemaking behaviors were observed in our data: in-person synthesis and the summarization and contextualization of shared information.

In-person synthesis. In 14 of the 16 collaborative searches, participants described engaging in face-to-face sensemaking after conducting individual searches. Several participants stressed that these face-to-face discussions were crucial to their ability to process information as a group. One participant noted that after dividing up a personal search task, the two collaborators sat down in person and, "*identified sort of a series of gaps, things that neither of us had looked at yet, and then…we basically assigned those tasks to one another,*" – to continue working independently. The same participant described a similar process for another task, coming together to review search results and make a final decision in person:

> *I'll look at a couple dozen reviews of hotels and then I'll come back and say, these are my top three, and we'll sit down at the computer and look at them together. We'll look at reviews, we'll look at the actual websites, we'll compare prices, and then we'll make a decision together.*

Face-to-face synthesis was found to be particularly prevalent in academic settings, where in general there is a high level of searching intensity and often there are great amounts of information to process. However, these behaviors occurred in personal searches as well; three participants remarked that convening in person allowed them to more easily make decisions and to fill in gaps in their independent searching. Demonstrating the importance
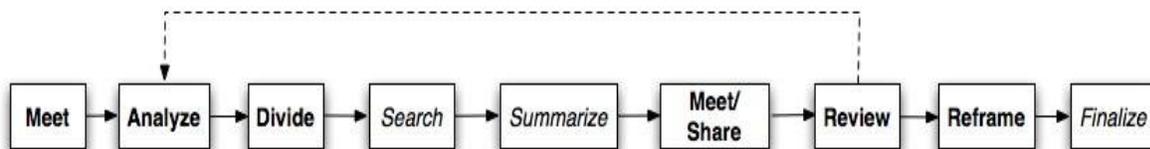
Note: In general, steps shown in *italics* were undertaken individually, and those in **bold** happened collaboratively.

Figure 1. Common pattern of collaborative information seeking

of in-person communication in both scenarios, one participant remarked:

I think that, for me, in both of these situations, the most effective way to synthesize everything that everyone's found, has been in-person conversation – that may result in a document, but it's really personal interaction.

Contextualization of Shared Information. Participants described that both they and their collaborators made significant effort to provide context for the information they shared with collaborators through online channels. Examples included summarizing results, note-taking, copying relevant information directly into an email or shared online document and sharing URL links through email. Sharing links via email included a variety of behaviors to help with sensemaking that went beyond simple summarization of results. Our participants described providing insights about their information sources, notes about their impressions of the information being passed along, and other meta-level information such as recommendations. These behaviors were similar to the "understandings" and "interpretations" that Paul and Reddy (2010, pp. 327-328) noted that medical care providers included in handoffs of patient information at shift changes.

DISCUSSION

A key aim of this study was to gain a better understanding of how groups made sense of information as compared to individual sensemaking models, and what types of behaviors were undertaken to facilitate group sensemaking. Several common practices were observed that supported sensemaking in the collaboration process. Once search, preparation, and synthesis had taken place individually, results were shared with others, often through face-to-face conversation. Face-to-face communication was important in both academic/work and personal settings. Participants specifically referenced both in-person synthesis and in-person gap identification as important steps in the collaborative information seeking process. As such, the basic process identified by Dervin (1992) was confirmed; however, in our data, the act of gap identification and sensemaking appears to take place predominantly through collaboration, and group members' inputs and actions play a crucial role.

On the whole, most participants reported being happy or satisfied with their search results, and felt that their collaboration was relatively successful. This finding is interesting in comparison to the findings of Paul and Morris (2009), who report that users in a laboratory setting had difficulty with sensemaking, particularly during handoffs. However, their study had an imposed division of labor and handoff: one participant was tasked with asynchronously resuming a search that had started earlier by two participants collaborating synchronously. In the natural settings of the searches discussed by participants in our study, all groups found ways around this information sharing problem by providing context when sharing items remotely, and using in-person communication to prevent confusion whenever possible. Systems for collaborative information seeking could benefit from providing support for summarization and sensemaking channels within the collaborative system so that these notes can be associated directly with the source information.

As with all studies, there are limitations to our data. The current study was small, containing eight participants, and was limited in its sample. However, findings emerged that have implications for the design of systems to support collaborative search. Our results suggest the importance of understanding the stages of a collaborative information seeking process, supporting individual sensemaking efforts before sharing results, and providing mechanisms to contextualize and interpret results.

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