

# Classifications of Collaborative Search

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## ABSTRACT

We present a set of three collaborative styles that were reported by participants in an interview study we conducted in the summer of 2009 to investigate exploratory and collaborative search behaviors. We give examples of each style from our data and comment on how the styles relate to existing classification schemes and models. We highlight the nature of tight versus loose coupling and how styles may vary based on task, expertise, and the relationship of the collaborators.

## Author Keywords

Information seeking, collaborative search

## ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

## INTRODUCTION

The study of social and collaborative search is evolving. Researchers are still defining dimensions, classification schemes, and proposing and testing models of collaborative information needs and behaviors. Twidale et al. [8] outline a framework for: classifying collaborative search activities along spatial and temporal dimensions (following CSCW research), distinguishing interactions with regard to product versus process, and considering whether relationship of the collaborators is mutually beneficial or instructional in nature. Hansen and Järvelin [5], also drawing from CSCW literature, outline dimensions for cooperative activities: 1) asynchronous / synchronous, 2) human communication or computer-mediated, 3) tight or loose coupling, 4) awareness, and 5) information sharing aspects. Hansen and Järvelin [5] also give examples of collaborative information retrieval tasks including: task cooperation, task division, sharing search strategies, sharing domain expertise, end product creation, sharing opinions, and sharing internal experience.

Golovchinsky et al. [4] suggest a taxonomy of collaboration that includes four dimensions: intent, depth, concurrency, and location. They also outline roles and relationships of the collaborators based on being peers, domain expertise, search expertise, and prospector/miner activities. In Morris' [6] survey, she reported on methods of collaboration on search process (co-location, use of instant messenger, and dividing a search task into parts), and on methods for collaborating on search products. Morris and Teevan [7] studied properties of groups that engaged in collaborative search activities, examining two dimensions: group membership (implicit or explicit) and group longevity (short term task-based, or longer term trait-based groups). Evans and Chi [3] suggest that "social search" describes information seeking that includes that includes the use of social and expertise networks, shared social workspaces, and collaborative co-located search. Wilson and schraefel [9] adapted and combined and Bates' model of tactics [1] and Belkin's model of users [2] and applied them to evaluate collaborative information seeking systems.

The goal of this position paper is not to reconcile existing classifications or propose a new model of collaborative search. Rather, we present a set of three collaborative styles that were reported by participants in an interview study of collaborative search behaviors and comment on how these styles relate to and extend the existing models and classification schemes summarized above. We also discuss factors that may affect variation and use of these styles based on our data.

## INTERVIEW STUDY

During the summer of 2009, we interviewed 30 people in three cohorts about their current practices conducting, managing, and sharing information from on-going, exploratory searches. Interviews were conducted with: 1) *academic researchers* working on on-going research projects, 2) *corporate workers* who conducted exploratory searches for business purposes, and 3) *medical information seekers* who had conducted on-going searches for medical information for themselves or a family member. We coded data from the interviews using a combination of open and closed coding and analyzed the data using qualitative analysis techniques.

## COLLABORATIVE STYLES

### *Directed Collaborative Search*

A common type of collaborative search in the academic and corporate groups was directed in nature, with one person leading the work and other team member(s) conducting the searches. For example, a PhD student described directing the search activities of an undergraduate researcher, a corporate intern described being given specific search tasks by her supervisor, and a senior faculty member talked about giving students a journal article or two so they could use the references as starting points for a search on a topic. These types of collaborative searches were often task-based and the collaborators were not typically peers, but had distinct roles.

One graduate student we interviewed described a very controlled, directed collaborative search for a research project:

*I was your typical research assistant. I started out with pre-determined search terms. My advisor was definitely the brains, I was the machine. I just entered the search terms and I would go onto these pre-specified search engines that he had identified. He started out with a very, very specific plan, with the search terms laid out, the search engines specified, so we would have the methods right there. I documented the number of hits and would download all of the citations into EndNote.*

This is a good example of a collaboration in which there is likely to be both a mutually beneficial search goal and an instructional nature to the collaboration.

### *Tightly Coordinated Collaborative Search*

In a tightly coordinated search, the collaborators divide the search task and each work on individual parts. These searches may or may not be synchronous, but collaborators are likely to synchronize their efforts at various stages of the process. Directed searches as described in the previous section could be considered to be type of tightly coordinated search in which one collaborator specifies the search process and the other conducts the searches. However, we find that distinguishing between tightly coordinated and directed search is useful.

A corporate participant in our study described a tightly coordinated collaborative search that he conducted with one of his colleagues that included innovative use of several information management tools. They had a limited amount of time to do a literature review for a client (i.e. task-based collaboration) and primarily worked as peers, although one was the project lead. They used individual Zotero (<http://www.zotero.org/>) instances to collect resources found from their individual searches and to take notes during the search process. Each day they synchronized and discussed their Zotero libraries. Then,

after syncing the libraries, one team member would do more searching while the other would start reading the articles found from the previous day (a type of prospector/miner relationship). They created a blog entry for each article, including tags, and to indicate what articles were currently being read by what person. After they had found a number of articles, less face-to-face communication was needed while they were reading.

### *Loose / Informal Collaboration*

Our participants also reported examples of loosely coupled and informal collaboration on searches. This type of collaboration commonly occurred among the medical information seeking group. For example, family members and/or friends of the person might do searches and share information on an ad-hoc basis.

These styles of collaboration involve an aspect of intent. Golovchinsky et al. [4] outline two levels of intent: explicit and implicit. Collaborative filtering systems typically involve implicit collaboration whereas explicit collaboration “occurs when two or more people set out to find information based on a declared understanding of the information need” [4, p.48]. Our interviews suggest a possible third level, or a continuum of intent, that includes people who are not as strongly invested in the search process or outcomes, but who may opportunistically contribute information they find. This dimension includes aspects of Twidale et al.’s “serendipitous altruism” and “instructional” types of collaboration [8].

One participant described how shared information can be lost when using opportunistic, informal collaboration methods:

*We don't have a good way of creating and sharing a list of resources... So... that kind of collaboration can be very informal... via IM or email... But there's no place that I can go and easily reference those links... there's no one place to go and find that information once it's been shared.*

We believe that informal and loose collaborative search are an area that could especially benefit from better tools.

## COLLABORATIVE VARIATION

Information seeking is often one component of a broader set of activities by collaborators that may include sensemaking, synthesis, and generation of work products. The style of coordination may vary based on the specific activities involved, and the expertise and relationship of the collaborators. For example, a university professor in our study described a multi-disciplinary project in which the collaborators did searches within their own areas of expertise and then shared the results with other team members (Golovchinsky et al. [4] refer to this as a variation on a peer role, “domain A expert / domain B expert”). There were fairly well-defined, coordinated, and natural divisions of high-level work among the team

members, but within their own areas, each team member conducted searches based on their own expertise. In another example illustrating the influence of expertise, an corporate intern in our study described increased collaboration with her supervisor regarding searches for which she was having trouble finding information.

Collaborative search style may also vary based on the relationships of the collaborators. For example, a PhD student in our study was leading a research project. He was being loosely supervised by a post-doc, was a member of his advisor's research group, and supervised an undergraduate student working on the project. Collaborative search activities with the undergraduate were tightly coupled, but there was loosely coupled, incidental sharing of search results among members of the research group.

### CONCLUSION

In this paper, we briefly outlined three collaboration styles that were reported by participants in an interview study of exploratory and collaborative search behaviors: directed, tightly coordinated, and loose/informal collaboration. We related aspects of these styles to existing classification schemes for collaboration and described how factors such as task, domain expertise, and collaborator relationships may influence collaborative style.

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