

# Collaborative Information Seeking in Electronic Environments

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## ABSTRACT

Collaboration in information seeking, while common in practice, is just being recognized as an important research area. Several studies have documented various collaboration strategies that people have adopted (and adapted), and some initial systems have been built. This field is in its infancy, however. We need to understand which real-world tasks are best suited for collaborative work. We need to extend models of information seeking to accommodate explicit and implicit collaboration. We need to invent a suite of algorithms to mediate search activities. We need to devise evaluation metrics that take into account multiple people's contributions to search.

## Author Keywords

Information seeking, collaboration, CSCW

## ACM Classification Keywords

H.3 INFORMATION STORAGE AND RETRIEVAL:  
H.3.5 Online Information Services: *Data sharing*

## INTRODUCTION

Information seeking has traditionally been conceived as a solitary activity: a user identifies an information need, uses some tools to discover useful information, and iteratively evolves the information need. A number of studies have found, however, that this activity often involves other people. Reddy *et al.* have described collaborative information seeking in medical environments [9][10]; Morris found that people using existing browsers and search engines engage in a variety of collaboration activities [6]; Evans and Chi [2] surveyed users to uncover episodes of collaboration among them.

Much of this collaborative activity uses tools not well-

designed to support collaboration. The exceptions (e.g., SearchTogether [7], Físchlár [12] running on the Diamond Touch table, Cerchiamo [8]) are few, and address only a few problems associated with collaborative search.

One of the reasons that the existing systems do not adequately support collaboration is that it we do not have good models that describe users' and systems' behavior during collaboration.

While in some cases collaborative search can be handled by conventional search engines, we need to understand how the collaborative nature of the task affects the requirements on search algorithms. For example, recommender systems such as that implemented by Amazon [5] use correlations between other people's past behavior and the current searcher's actions to generate potentially-useful search results; Cerchiamo [8] implements within-session feedback among searchers working together to help them coordinate their activity and reduce redundant results. We need to understand the design space of retrieval technology of which these are two samples.

Evaluation is another challenge. Different people contribute to search in different ways, and we need to invent ways of quantifying their contributions. This is necessary for both formative and summative evaluation. In addition to measuring tradeoffs among various interface and algorithmic elements that make up a system, we need to measure the impact – both advantages and costs of – adding collaborators on overall task performance. Traditional recall and precision metrics may not capture the contributions of individuals acting in particular roles.

## FIELD WORK CHALLENGES

We need to understand how people collaborate during search tasks. Collaboration can take many forms, can be long-lasting or transient, can involve similar or different roles, and can be coupled to other tasks (tasks that motivated the search) in a variety of ways. Challenges involve identifying opportunities for collaboration that are currently being done with existing tools, identifying important roles and relationships in collaboration (e.g., librarian and patron), and identifying opportunities for collaboration that can be mediated by technology.

## MODELING CHALLENGES

The extensive literature related to models of information exploration needs to be extended to account for the range of collaborative activity. While some steps in this direction have been taken [4][2][3], we need to develop a comprehensive model that accounts for the broad range of collaborative information seeking. We need to account for a range of phenomena including a taxonomy of tasks, a framework for defining user roles, the temporal and spatial nature of collaboration, the degree of mediation, etc. These models would not only help us compare existing work, but may also serve as predictive tools for exploring the design space of collaborative information seeking.

## SYSTEM BUILDING CHALLENGES

There are at least three broad classes of systems that support collaboration. These include recommendation systems such as that Amazon [5], UI-only collaborative search systems (e.g., [12][1][7]), and synchronous, deeply-mediated systems such as Cerchiamo [8]. We need to broaden our repertoire of such systems, to investigate different interfaces and different algorithms, and to make such systems available for laboratory studies and for real-world applications.

## EVALUATION CHALLENGES

Traditional information retrieval systems have been evaluated based on recall/precision measures, sometimes with averaging techniques such as MAP [11]. These metrics assume a single logical searcher (even if more than one person contributed to the final search results). We need to develop new metrics to assess the contributions of multiple team members to collaborative search processes. Naïve approaches such as averaging by the number of participants do not reflect the reality that marginal rates of finding documents often decrease with the addition more searchers. Furthermore, different team members may contribute in different ways, depending on their roles.

## CONCLUSION

Information seeking needs to be understood as a collaborative activity. We need to explore the variety of modes of collaboration, we need to construct models that represent this activity, we need to build systems that address the specific needs and opportunities in this space, and we need to construct evaluation metrics appropriate to collaborative search tasks. These characteristics distinguish this field on one hand from traditional information seeking, and from generic HCI and CSCW issues on the other. Research in this space needs to adopt the theories and methodologies of HCI, CSCW and IR to the constraints of interactive information seeking tasks, and supplement them with new theoretical and methodological constructs as appropriate.

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