Working in Collaboration - What, Why, and How?

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ABSTRACT
Many situations call for collaboration, but there is still a lack of understanding about the process of collaboration, and the explicit support for facilitating it. We are interested in understanding instances, motivations, and methods of such collaboration, specifically in information seeking domain. Our goal is to use this understanding in developing better tools and services for the collaborators. The present article reports the beginning of our exploration in this direction. We interviewed a handful of people, including graduate students and faculty members, working in the field of information and library science. During these personal interviews, we asked them about various situations and scenarios of collaboration that they had been involved with or observed in the past. While describing these instances of collaboration, they were also asked to provide information regarding their motivations and methods for working on those collaborative projects. Here we provide these 'what' (instances), 'why' (motivations), and 'how' (methods) of collaboration, identifying common trends, and linking them with the CSCW literature. Implications of these findings and pointers to further exploration are also given.

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H.5.3 Information Interfaces and Presentation (e.g., HCI): Group and Organization Interfaces—*Computer-supported cooperative work*

INTRODUCTION

It is natural for us to work with others, as *man is a social animal.* There are several good reasons for this natural tendency. For one, sometimes a problem is just too complex for a single individual to tackle. Denning & Yaholkovsky (2008) regard such problems as "messy" or "wicked" and argue that collaboration is essential for resolving such messes. Twidale and Nichols (1996) pointed out that "The use of library resources is often stereotyped as a solitary activity, with hardly any mention in the substantial library science and information retrieval literature of the social aspects of information systems." They subsequently claimed (Twidale *et al.*, 1997) that a truly user-centered system must acknowledge and support collaborative interactions between users and showed that users often desire to collaborate on search tasks. Based on their extensive studies with patent office workers, Hansen & Jarvelin (2005) also concluded that the assumption that information retrieval performance is purely individual needs to be reconsidered.

However, collaboration is not always required or useful. Even when collaboration is desired or encouraged, it could induce additional costs that includes cognitive load and the cost to coordinate various events and participants (sometimes called *collaborative load*). Working in a group may not be beneficial if the participants have conflicts of interest, they do not trust one another, or they do not intend to collaborate (London, 1995). On the other hand, considering collaboration could be a natural choice in many situations, there is a lack of support for users in an information seeking domain to work in collaboration. In general, our understanding of how people work in collaboration on information intensive projects, and the tools that support such activities are inadequate (Shah, 2008).

We are interested in exploring scenarios, motivations, and methods for doing collaboration, more specifically in the context of information seeking. As Grudin (1994) pointed out, *"many expensive failures in developing and marketing software that is designed to support groups are not due to technical problems; they result from not understanding the unique demands this class of software imposes on developers and users."* Therefore, in our pursuit for building better tools to support CIS, we first attempted to understand existing practices for collaboration.

We commenced our exploration by interviewing several people with a good amount of experience in doing collaboration. From these individuals, we elicited information regarding not only their own personal experiences with collaborative projects, but also what they have observed from their colleagues, friends, and families. The present article is an attempt to lay out their responses, identify common patterns, and derive some lessons for further exploration in this direction.

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METHOD

With the overarching research agenda of understanding people's information seeking behavior in collaboration, and providing them with tools and support to do effective collaboration, for the work reported here our focus was on learning about instances, motivations, and methods of collaboration. Instead of looking at collaboration in general, such as Gray (1989) and London (1995), we decided to interview a set of people asking questions related to their collaboration in information seeking domain.[1]

We contacted several graduate students and faculty members, working in the field of information and/or library science (or a similar one), of a large university using convenient sampling method. We knew these subjects personally and knew that they had been involved in some collaborative work in the recent past. The interview lasted about 30 to 45 minutes. The subjects were not given any compensation.

We interviewed 11 subjects between age 25 and 58. Seven of these subjects were graduate students in Information & Library Science and the other four were faculty members. Among the faculty members, two were in Information & Library Science, one was in Human Services and Management, and one was in Media Effects and HCI field. All the subjects were fairly to very experienced searchers, doing Web searches every day. Almost all of them were involved in some collaborative projects on a day-to-day basis. While interviewing these subjects, we tried to elicit information about not only their past collaborations, but also other collaborative projects that they may have seen their colleagues, students, friends, or family members doing. Also, instead of asking about respondents' collaboration for information seeking tasks only, we formulated the questions looking at a larger context, focusing on the situations that got them into collaboration, how they worked together, and what they thought about the process in retrospect.

Morris (2008) had attempted to explore similar questions using a survey. She surveyed 204 knowledge workers at a large technology company to investigate into a collaborative Web search practices that people employ. Her survey included questions to determine whether people need an/or want to collaborate while searching the web, and if they do, what strategies they employ to collaborate given that such an activity is not explicitly supported by current search interfaces.

Our study is different in two major ways from Morris's study. First, we conducted personal interviews, and not a survey. We were also very selective about who we interview; we contacted only those people who we know had been involved in several collaborative endeavors. Choosing this method limited the number of subjects we could study, but provided us with a richer set of data for analysis. Conducting interviews also enabled us to customize some of the questions to the interviewee, which resulted in more meaningful responses. Second, in contrast to Morris's study, our study targeted to looking at collaboration in information seeking domain in general, and not just for the Web search tasks. It is very unlikely that CIS is done as an independent process. We believe collaboratively seeking information is almost always done as a part of a larger project/problem, and it is important to study CIS in that context.

In the rest of the article, we will present a synthesis of what we learned from these interviews. This synthesis is divided in three logical parts: instances (what), motivations (why), and methods (how).

[1]This includes information searching and retrieval, sharing, and usage.

INSTANCES OF COLLABORATION (WHAT)

From the description of their past collaborations, we identified three major trends of doing collaboration for our respondents:

1. *Forced collaboration*
   Often people are forced to work together by their superior. A class project, where the instructor forms the groups, is such example. Our subjects also mentioned working in such *forced collaboration* in case of a merger (permanent or project-driven). For instance, one of our subjects, who worked on a welfare reform project, talked about how various agencies were brought together by a funding organization to work together on the project. These agencies may not have worked in a collaboration otherwise, but as a requirement for their joint funding circumstance, they had to work together.

2. *Peer-to-peer situational collaboration*
   This kind of collaboration was found most commonly among our subjects. The most typical example was co-authoring on research papers or proposals with colleagues. This was not surprising as our subjects work in fields that are highly collaborative, and most projects involve collaboration. Had we interviewed subjects from other fields, such as humanities, we may have found such kind of collaboration not very predominant. In addition to collaborating with peers on professional basis, several of the subjects also reported collaborating with their spouses for different reasons, with travel and shopping being the most common.

3. *Expert-novice asymmetric role collaboration*
   As reported earlier, all of our subjects were expert searchers. In addition to this, most of them are also subject experts. Therefore, they receive many requests for information on various topics that they are expert/familiar with. Faculty members obviously get constant requests from their students on their respective subjects, but even the graduate students are prone to such calls. As one of our subjects, who is a graduate student, said about her friends and colleagues requesting information from her, "They think I'm a walking library!"

   Such requests often start a collaboration. One of our subjects described his experience with responding to information requests regarding information architecture subject, on which he is considered an expert. He reported about some collaborations that he had started in the past due to back-and-forth interactions with even some strangers

based on those initial requests that he received for the information. "Sometimes these requests turn into interactions, and into a relationship, and then we both start benefitting.", he responded.

When asked about the group size for the collaboration, most reported working in a group of two to five people. Very rarely, the subjects worked on a project that involved eight to ten or more people.

The duration of a collaborative project varied a lot for each subject. The shortest duration of a collaborative project was reported about two weeks, and the longest about a couple of years. One subject talked about doing a collaboration over a cup of coffee, and another subject recalled preparing a grant proposal in collaboration in a single day. Discounting these outliers, a few weeks to a few months seem to be most usual duration for collaborative projects for our subjects.

When asked for the optimal group size and project duration, everyone said that it depended on the situation. As one respondent said, "No matter how many people you put to it, pregnancy is a nine month affair!"

MOTIVATIONS FOR COLLABORATION (WHY)

One of the most interesting questions while studying collaboration is why people collaborate. While collaboration is necessary in many situations, and beneficial in several cases, it has its costs and disadvantages. Our interviewees talked about this issue from their personal experiences and observations.

Similar to the instances of collaboration, the motivations can be categorized as follows.

1. *Requirement or setup*
   As reported by the respondents while talking about the instances of their past collaborations, often working together is a requirement of a project. As a respondent said, "Sometimes you don't even think of doing a project any other way. You just have a group." Merger of two organizations is such an example. While working on collaboration under such "motivation", the respondents often found frustrations and loss of productivity. However, most subjects pointed out that such frustration is primarily due to personal preferences. "Some people like to be told what to do", as a faculty member testified referring to some of her students.

2. *Division of labor*
   This motivation is one of the simplest appeals of many collaborations. For instance, one of the respondent (a faculty member) talked about letting her students choose if they wanted to do an individual or group project, and most of the times the students chose to work in groups. This allowed them to distribute the work and get more done in the limited time and resources they had.

   The distribution of work may not always be tangible, such as dividing up the searches to do or documents to read. As one respondent mentioned, some times you want to use your collaborators to cross-validate the work you have done. As another respondent pointed out, some times we also need to share the *load of thinking*. One respondent identified the value in having multiple people searching for information for literature review. "Lit review is hard and ACM Digital Library is bad.", he stated.

3. *Diversity of skills*
   This is the kind of motivation that makes it possible to have *the whole greater than sum of all*. Almost all of our respondents admitted being involved in several collaborations because of this reason; either an individual did not possess the necessary skills to complete a task, or the participants realized the importance of involving people from different skill sets. For example, one of the respondent, a graduate student specializing in bibliographic research, discussed how she frequently collaborates with two other colleagues, one with statistics background, and another with good writing expertise, the skills that she lacked.

   A faculty member, very affirmatively, supported the idea of collaborating with people from different fields. "Two heads are better than one, especially if it's mine!", he joked. The same respondent presented three conditions that he looks for while establishing such collaborations with someone: (1) he should like the person, (2) they should have fun working together, and (3) the process of collaboration should be stimulating and interesting. Another faculty member presented her point on the motivation for collaboration by saying that she expects to influence and be influenced. "..otherwise, what's the point!", she exclaimed.

   Faculty members often involve their students in projects for educational purpose. One of the student respondent confirmed this and added that such a collaboration with advisors help them learn new skills, and keep them on focus. "She always knows the big picture", the respondent said referring to her advisor.

METHODS FOR COLLABORATION (HOW)

Our respondents identified several methods and tools that they have used or seen others using for collaboration. The most common among them were email, face-to-face meetings, IM, and phone or conference calls. In general, the choice of the method or tool for our respondents depended on their situation (co-located or remote), and objective (brainstorming or working on independent parts).

About half the respondents reported using Google Docs, but most of them were not satisfied with the results. One respondent complained about difficulty in knowing 'who did what' on Google Docs, and the lack of support for using embedded spreadsheets.

A couple of respondents expressed their frustration with Blackboard[2] discussion board (one mentioned that it takes too many clicks), and reported success in using Sakai[3] instead.

[2] http://www.blackboard.com/
[3] http://sakaiproject.org/

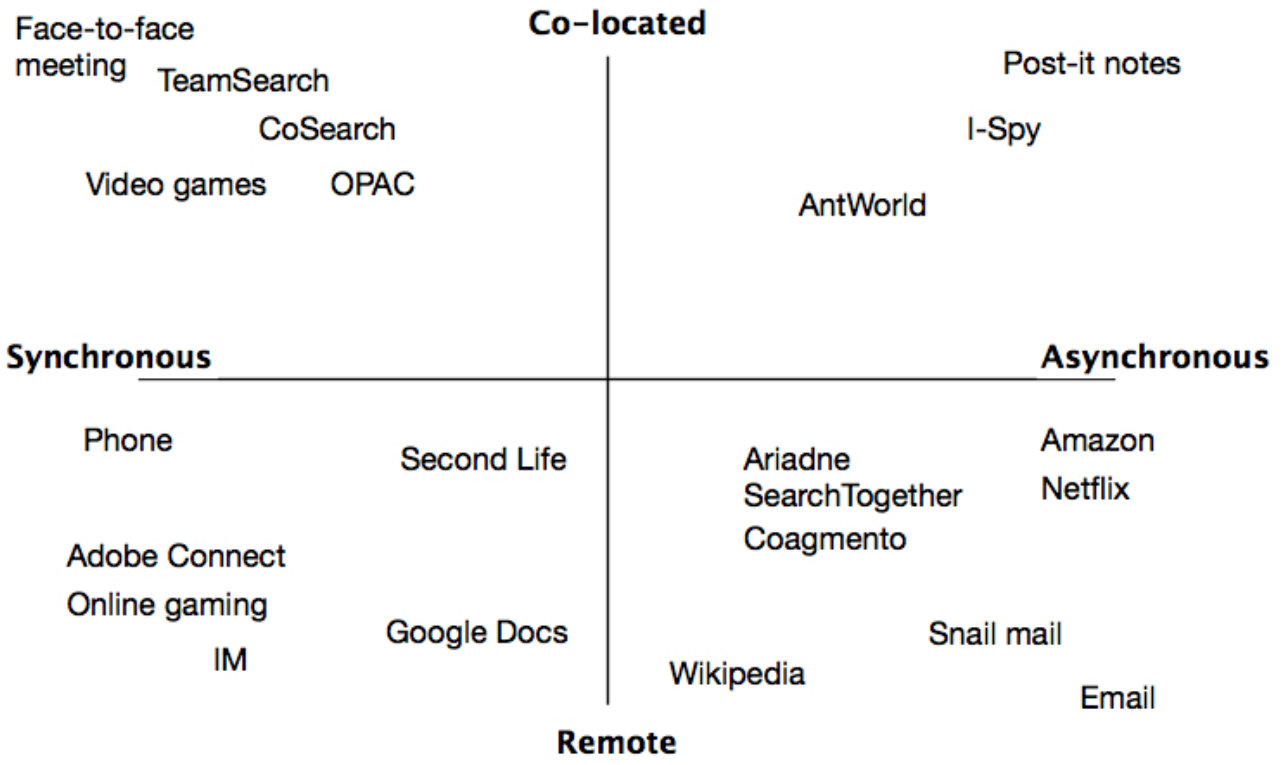

Figure 1. Collaborative systems/methods organized according to time and space aspects.

Most respondents also reported successfully using whiteboards for collaboration, which of course, required them to be co-located and working synchronously. Using 'track changes' feature of Word, on the other hand, got mixed opinions. Most respondents reported using it because there was no other or better alternative. This dissatisfaction sometimes drove them to simply make annotations on a printed document and pass it around in the group.

IMPLICATIONS AND FURTHER EXPLORATION

Following are some of the lessons and guidelines for future explorations that we derived from the presented study.

Implications for collaboration

- The so-called *entry points* for collaboration have changed significantly in the new millennium. The respondents who were active collaborators in pre-Web and pre-Google era talked about collaborations that used to begin only through explicit interactions and intentions among the participants. In the recent years, though, due to wider accessibility of tools, such as emails, Web search services, IM, Skype, wiki, and blogs, people are able to have very low-cost interactions and loosely defined collaborations. The advent of Web 2.0 services have certainly sped this up.

- While the old philosophy of "birds of a feather, flock together" or the idea of homophily (Lazarsfeld & Merton, 1954) still prevails, collaborations that connect people of diverse background and/or span multiple domains are increasingly becoming common.

- Email and face-to-face meetings are some of the most popular methods of collaboration. These methods represent two extremes of classical model of collaborative methods (Rodden, 1991; Twidale & Nichols, 1996), where email fits on remote and asynchronous end, and meetings fit on co-located and synchronous end. However, due to changing structure of work environments and habits (people working on multiple projects with different set of collaborators, across multiple sessions, and with multiple devices), the need to fill in the gap between these extremes is more than ever. Figure 1 depicts various tools and methods on the classical model of describing the nature of collaboration. As we can see, several systems and methods exist to fulfill most situations. However, transition from one situation to another may not be seamless, and that is where further work is needed. For instance, while talking about what they would like to see in a better system for collaboration, almost all of our respondents desired to have a smooth flow between their different devices or environment with which they work. A typical example was being able to carry on a collaborative project on mobile devices and with or without the Internet connection.

- While most of our respondents wished for better tools for collaboration, they agreed they would have a hard time departing from familiar tools, such as email and IM, even though these tools were not explicitly designed to support collaboration. While tools such as del.icio.us exist, people still send Web site links to each other over email. System designers and developers have a grave implication due to this fact; they need to provide seamless integration

of tools that support collaboration within a user's existing working environment rather than making him choose between his tried-and-tested method and a new tool. This finding reflects the views of Grudin (1994), where he suggested extending an existing single-user system that a user is already familiar with groupware features to minimize the cognitive load and maximize the adoption rate. As one of our respondent admitted, "We focus on results, and not how to do it."

These points are highly valuable in designing a system that can support CIS. Based on the study presented here and the lessons learned, we can derive the following guidelines for designing a successful CIS system, as well as understanding its limitations.

Implications for CIS

- As we saw, often people may be forced to do collaboration. A CIS system, in such case, can support that collaboration, but the success of such an endeavor depends on the ability of the participants in establishing the trust required to carry out the collaboration. If the participants really did not want to work together, the system would have no control over that. London (1995) and Gray (1989) have also presented such a realization in their works.

  A CIS system should provide support for not only a well-established and intentional collaboration, but also for impromptu or forced collaboration with the caveat that if the participants really do not intend to collaborate or if they do not trust one another (or loose the trust in the process), the system cannot help them beyond making certain recommendations regarding the possible benefits of that collaboration.

  In short, a good CIS system should be able to cater to the needs of (1) intentional and planned collaboration, (2) impromptu or forced collaboration, and (3) independent and individual work in a collaboration. We believe this lets the act of collaboration up to the participants (if they have intention or not), while having the support of the system whenever and however required.

- We found from our interviews that people often use tools for doing CIS projects that were not designed for supporting collaboration. Morris (2008) also reported from a survey of knowledge workers that it is very common to send search results to a collaborator via email. As the author noted, people find their way around the traditional tools to make collaboration happen. Similarly, a CIS system that is designed to facilitate people's information seeking in collaborative projects should be able to support individual work as they would normally do with single-user systems. In fact, Surowiecki (2004) stressed that such an ability to be able to work independently is one of the requirements of a successful collaboration.

- Almost all of our interviewees reported collaborating to bring diverse skills to the table. Given this, it is important for a CIS system to highlight skills and actions of the participants in a collaborative project that can be useful to others in the team. For instance, a graphic designer may want to see her interface organized in a different way than a marketing analyst. If they are working on the same project with a CIS system, we need to provide them with an ability to configure the interface the way that suits their needs.

  In an information seeking situation, this can mean saving and sharing history of browsing, searching, and annotating. The system can take various documents found by different individuals and bring together in a single pile of results. If there is a conflict, the system can notify the participants, so that they can discuss it and resolve the conflict.

  A CIS system can even go a step further and use this information to make appropriate recommendations to the group members.

- While our respondents reported using traditional tools such as email much more than many specific tools for collaborations, they were open to the idea of accepting new systems, given such systems easily integrate in their existing practices. Fidel et al. (2000b) also recommended that instead of imposing a rigid structure of a collaborative system to the users, one needs to configure their system around the way the users work. As Grudin (1994) suggested, one needs to develop a system that seamlessly integrates in the user's tried-and-tested methods. For a CIS system, this means providing interfaces for communication and sharing that are not only familiar, but also can be incorporated into existing tools on a user's working environment. If the users are familiar and happy with their email system, the new CIS system could try to provide the support for that emailing software right from its interface.

  Another implication of this finding is that a CIS system should be easy to learn. It is expected that such a system will have its complexity, but to allow a new user to adapt such a complex system, the system should be designed such that a novice user does not get overwhelmed in the beginning with all its features that he may not find useful.

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REFERENCES

Denning, P. J. and Yaholkovsky, P. (2008). Getting to "We". *Communications of the ACM*, 51(4):19–24.

Fidel, R., Bruce, H., Pejtersen, A. M., Dumais, S. T., Grudin, J., and Poltrock, S. (2000). Collaborative Information Retrieval (CIR). *The New Review of Information Behaviour Research*, pages 235–247.

Gray, B. (1989). *Collaborating: Finding Common Ground for Multiparty Problems*. Jossey-Bass.

Grudin, J. (1994). Groupware and social dynamics: eight challenges for developers. *Communications of the ACM*, 37(1):92–105.

Hansen, P. and Jarvelin, K. (2005). Collaborative information retrieval in an information-intensive domain. *Information Processing and Management*, 41:1101–1119.

Lazarsfeld, P. F. and Merton, R. K. (1954). Friendship as a social process: A substantive and methodological analysis. In Berger, M., Abel, T., and Page, C. H., editors, *Freedom and Control in Modern Society*, pages 18–66. Van Nostrand, New York, NY.

London, S. (1995). Collaboration and community.

Morris, M. R. (2008). A survey of collaborative web search practices. In *Proceedings of SIGCHI Conference on Human Factors in Computing Systems*, pages 1657–1660, Florence, Italy.

Rodden, T. (1991). A Survey of CSCW Systems. *Interacting with Computers*, 3(3):319–353.

Shah, C. (2008). Toward Collaborative Information Seeking (CIS). In *Proceedings of JCDL 2008 Workshop on Collaborative Exploratory Search*, Pittsburgh, PA.

Surowiecki, J. (2004). *Wisdom of Crowds : Why the Many Are Smarter Than the Few and How Collective Wisdom Shapes Business, Economies, Societies and Nations*. Doubleday Publishing.

Twidale, M. B. and Nichols, D. M. (1996). Collaborative browsing and visualisation of the search process. In *Proceedings of Aslib*, volume 48, pages 177–182.

Twidale, M. B. T., Nichols, D. M. N., and Paice, C. D. (1997). Browsing is a collaborative process. *Information Processing and Management*, 33(6):761–783.