

Towards a Model of Understanding Social Search

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ABSTRACT

Search engine researchers typically depict search as the solitary activity of an individual searcher. In contrast, results from our critical-incident survey of 150 users on Amazon’s Mechanical Turk service suggest that social interactions play an important role throughout the search process. Our main contribution is that we have integrated models from previous work in sensemaking and information seeking behavior to present a canonical social model of user activities before, during, and after search, suggesting where in the search process even implicitly shared information may be valuable to individual searchers.

Author Keywords

Social search, social navigation, information seeking, sensemaking, web browsing.

INTRODUCTION AND RELATED WORK

Surprisingly, researchers have thought about navigating and browsing for information as a single user activity, centered on eliciting users’ information needs and improving the relevance of search results. For example, Choo, Detlor & Turnbull [2] discussed categories of search behaviors and motivations in information seeking, but they overlooked the role of other individuals in search. On the other hand, library scientists [10] have observed for some time that friends and colleagues may be valuable information resources during search. Similarly, recent authors have begun to recognize the prevalence and benefits of *collaborative search* [5, 9].

However, in addition to explicit collaboration in joint search tasks [5], we believe that even implicit social experiences could improve the search process. Therefore, the general term “social search” may more suitably describe information seeking and sensemaking habits that make use of a range of possible social interactions: including searches that utilize social and expertise networks or that may be done in shared social workspaces. This notion certainly encompasses collaborative co-located search, as well as remote and asynchronous collaborative and collective search. Our focus in this paper is to explore a model of social search that may offer suggestions for supporting social interactions in the information seeking process.

SURVEY

We conducted a survey asking 150 users to describe their most recent search act using Amazon’s Mechanical Turk service. Our survey was designed to resemble critical-incident reporting, in which users self-report events that occurred relatively recently [4]. We prompted users to report information about the *context* (“What were you doing just before you searched?”) and *purpose* (“What prompted you to perform the search?”) of the selected incident, and how (or if) they interacted with other individuals prior to and following the primary search act. Selected survey questions are presented below:

1. What kind of information were you searching for?
2. Did you talk with anyone before you searched?
3. What steps did you take to find this information?
4. What did you do just after you searched?
5. If other people were nearby, were you interacting with them or were they influencing your search process?
6. After you found the information, did you share it with anyone?
7. If yes, how did you share the information?

Users provided background information on their profession, job roles (Table 1), and levels of job expertise as rated on a 5-point Likert scale (Table 2). Two-thirds of search acts occurred on the same day that our survey was filled out; 19.3% on the day before; and 17.3% more than 2 days ago.

Profession	%Users	Job Role	%Users
Education	9.3	Manager	19.3
Financial	8.7	Assistant	18.7
Healthcare	6.7	CEO/Director	8.0
Govt. Agency	6.0	Customer Support	7.3
Retail	6.0	Teacher	6.0

Table 1. The most frequently occurring professions and job roles reported by users in our sample.

Search Duration	%Users	Job Expertise	%Users
< 5 minutes	44.7	5	33.3
5–10 minutes	23.3	4	35.3
10–20 minutes	10.7	3	20.7
20–30 minutes	13.3	2	7.3
> 30 minutes	8.0	1	3.3

Table 2. Information reported about duration of the search act and level of job experience.

RESULTS

Our main contribution is that we have integrated our findings with models of sensemaking and information seeking from the literature, and we present a canonical model of social search (Figure 1 on the next page). We will discuss our model in three phases, highlighting where information exchange occurred through social interactions and providing both quantitative data and anecdotal case studies of actual user behavior.

Before Search

Context Framing

Information-seeking behavior is rooted in a “need” to find information [1, 10] or a motivation that drives the search process. This may be thought of as the *context framing* stage, where user motives and information needs are defined. Requests for information may come from an external source or may be self-initiated. From our sample, 47 of 150 users (31.3%) searched for information following a specific request from a boss, customer, or client; whereas 103/150 users (68.7%) were self-motivated to find information related to personal or work endeavors.

Requirement Refinement

After the information need and motives are established, users *refine their search requirements*. Previously described as a *generation loop* [8], this phase involves gathering requirements and formulating relevant schemas such that an effective search may result. In our data, this cycle is marked by social interactions 42.0% of the time (63/150 users) as a means to “influence the information need” [9], gather useful keywords or URLs, or develop the necessary guidelines for a given task.

During Search

Although search can be a cyclical process, the search stage in our model represents the active instantiation of representations or “encodons,” as part of a “data coverage” loop [8]. In other words, this is the stage where users engage in traditional information seeking [10] and foraging activities [6, 7]. We detail each of the three types of search acts below (*transactional*, *navigational*, and *informational* [1]), drawing special attention to the social interactions.

Transactional Search

With a *transactional* search, users locate a source where they can subsequently perform a transaction or other “web-mediated activity” [1]. In our sample, this typically involved navigating to a website through a series of routine steps and requesting specific information such as weather at a destination, movie listings, or data from a customer’s account. As an example, an ambulance chief found the distance from a patient’s home to the hospital through MapQuest.com by entering the start and end locations, and then retrieving the mileage information.

Navigational Search

During a *navigational* search, users perform a series of actions to identify content from a particular, often familiar, location. The content is often known in advance, or will be easily recognized once it is (re)discovered. For example, a nurse used the NIH website to look up information on a medical drug: first by logging into Google, looking up the NIH’s web address, and then searching for the drug on the NIH website. The nurse reports: “I knew exactly where [the information] would be—just couldn’t recall what the answer was.”

Transactional and *navigational* searches occasionally involved pre-search interactions with others (19.0% and 47.6%, respectively), but information exchange did not occur during the search itself. Consequently, it is unlikely that socially-augmented search would improve or facilitate *transactional* or *navigational* information retrieval.

Informational Search

On the other hand, social search may greatly improve tasks involving *informational* search—an exploratory process, combining foraging and sensemaking [6, 7], of searching for information that may or may not be familiar to the user.

Foraging. The basic “information assimilation” process [3] illustrates this early foraging phase where users search for information within a specific patch, followed by skimming, reading, and extracting information from source files. Throughout this process, users may update and shift their search representations [8] as they discover new items, at times by seeking feedback from others. A public librarian worked with her boss to find the Cheetah Girls 2 soundtrack: “We had to deduce a number of [keyword] combinations. We tried a number of ways to write Cheetah Girls, including hyphens and spelling out the number two.”

Sensemaking. After an initial pass at foraging, users may identify preliminary “evidence files” [7] from which they can further modify their search schema and query. For example, an English Professor engaged in a classic sensemaking process when he used MSN.com to look up information about Robert Frost. He copied and pasted query results into a Word document, which he revisited later to sort and summarize for an upcoming lecture.

Social interactions may also augment the sensemaking process. One programmer from Intuit engaged with a colleague while searching for an application programming interface (API). They began with a brainstorming session, followed by an online search, and finally “another round of discussion” on whether the API (the “evidence file”) would be sufficient for their purposes.

Over half of the search experiences reported by our sample were *informational* in nature (89/150 users, 59.3%). Even though our survey did not ask users to report

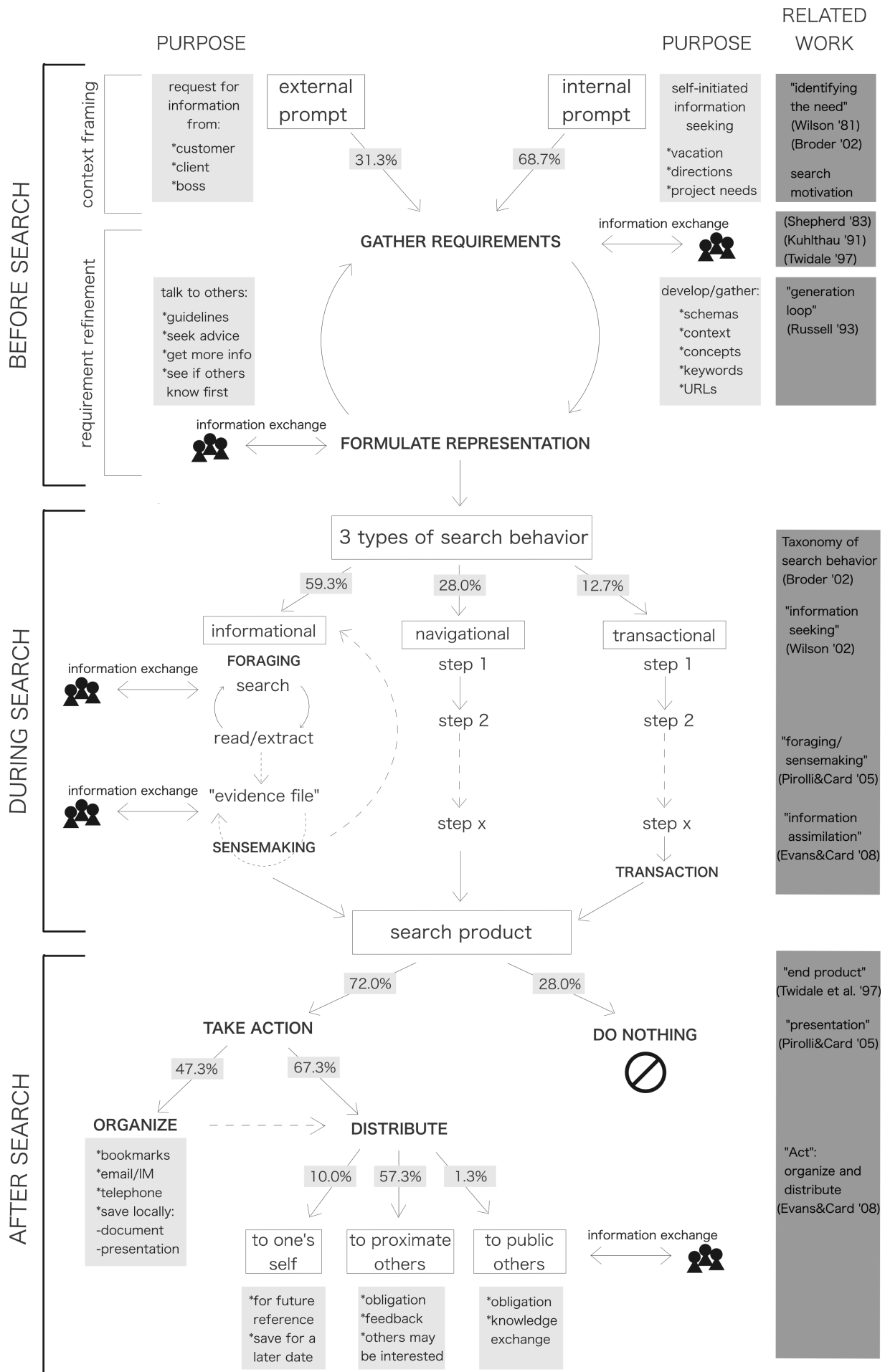


Figure 1. Canonical social model of user activities before, during, and after a search act, including citations from related work in information seeking and sensemaking behavior.

social incidents or explicitly collaborative search acts, searchers did engage with others both before and during the *informational* search. In fact, 35 out of these 89 individuals (39.3%) had social experiences prior to searching—and not simply out of obligation. Some used these social opportunities for brainstorming, to assess others' opinions, or to improve their own search schemas (“to know what kind of material would be useful”). Consequently, there appears to be both a need for and an interest in input from others throughout the *informational* search process.

After Search

Following the active search phase, an “end product” is often obtained [9], which may be “acted” on through *organization* and/or *distribution* [3].

Organization

Nearly half of our users (71/150 or 47.3%) organized their end products in some fashion. Pirolli and Card referred to this process as *schematizing*, where raw evidence is organized and “represented in some schematic way” [7]. For example, one real estate agent printed and reviewed the results of a search before “giving them to an attorney for legal inspection.” The president of a design company bookmarked online articles about web mashups to read later in the week. Evans and Card remarked how users may serve as filters for information through their actions in bookmarking, tagging, or annotating items, which subsequently “improve[s] access to the item in the future or...integrate[s] it with previous knowledge and context” [3].

Distribution

In fact, most of these organizational acts served as a means for distributing the end product to others, as a “presentation or publication of a case” [7]. At other times, information was shared directly face-to-face or verbally over the phone. Regardless of the distribution mechanism, over half of respondents (88/150, 58.7%) shared their end products with others (e.g., a floral designer relayed information about local spring blooming flowers to a bride-to-be). Some even “shared” the content with themselves by printing out documents or bookmarking websites for re-accessing at a future date (11 users, 7.3%).

These activities suggest that social interactions are important even after the primary search act, especially for self-initiated searches. 49 of the 104 self-motivated searchers (47.5%) distributed search content for verification, feedback, or because they thought others would find it interesting.

CONCLUSION

As we outlined through the model, social inputs may help users throughout the search process. Before searching, social interactions may help establish the requirements for the actual search task. During search, especially for self-motivated *informational* searches, users

may talk to others for advice, feedback, and brainstorming to improve their search schema and query keyword selections. After search, users may still wish to engage with others to collect additional feedback or to share knowledge gained during the search.

Altogether this suggests that a notion of “social search” may facilitate the process of information seeking. One technique for supporting social search may be through instant messaging access to your personal connections alongside the search box. Or it might exploit a website's existing community to reveal domain-specific experts who would be willing to advise searchers. Alternatively, sites could display related and successful keyword combinations or search trails from previous users, or automatically-generated tag clouds of semantically related concepts that may provide high-level feedback on the general search topic. We hope that our discussion in this paper will encourage researchers to explore both explicitly collaborative social interactions as well as implicitly shared information to augment web-based search.

REFERENCES

1. A. Broder. A taxonomy of web search. In *ACM SIGIR Forum*, pages 3–10, 2002.
2. C. W. Choo, B. Detlor, and D. Turnbull. Information seeking on the web: An integrated model of browsing and searching. In *Proc. ASIS'99, ACM Press*, pages 3–16, 1999.
3. B. M. Evans and S. K. Card. Augmented information assimilation: Social and algorithmic web aids for the information long tail. In *Proc. CHI'08, ACM Press*, pages 989–998, 2008.
4. J. Flanagan. The critical incident technique. *Psychological Bulletin*, 51:327–358, 1954.
5. M. Morris. A survey of collaborative web search practices. In *Proc. CHI'08, ACM Press*, pages 1657–1660, 2008.
6. P. Pirolli and S. K. Card. Information foraging. *Psychological Review*, 106:643–675, 1999.
7. P. Pirolli and S. K. Card. The sensemaking process and leverage points for analyst technology as identified through cognitive task analysis. In *Proc. Int'l Conference on Intelligence Analysis'05*, pages 2–4, 2005.
8. D. M. Russell, M. J. Stefik, P. Pirolli, and S. K. Card. The cost structure of sensemaking. In *Proc. CHI'93, ACM Press*, pages 269–276, 1993.
9. M. B. Twidale, D. M. Nichols, and C. D. Paice. Browsing is a collaborative process. *Information Processing and Management*, 33(6):761–783, 1997.
10. T. Wilson. On user studies and information needs. *Journal of Documentation*, 37(1):3–15, 1981.