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Chirag Shah

# Social Information Seeking

Leveraging the Wisdom of the Crowd



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*For my wife Lori for her unconditional love  
and unwavering support that make projects  
like this book possible.*

# Foreword

Now, it is probably impossible for college students to imagine what people had to do in order to get a question answered before the Web. Imagine, for a moment, that it is 1990, when none of the current university students are yet born, and well before the age of search engines, and of course Wikipedia. You have no easy access to a library, and the reference books nearby are not enough. You might have a simple question like “what movies are good to watch tonight?” The only option you might have is to call up a friend who might know the answer. In fact, this option is so important, it is baked into the game *Who Wants to be a Millionaire?* as one of the three lifeline options to take when you’re stumped for an answer. This natural instinct to call someone is what is baked into how we search for information and make sense of it.

Interestingly, even with the Web search engines at our fingertips, we still find the opinions of others, even strangers, to be quite valuable for decision-making. For example, in our many purchasing decisions, we seek the reviews and recommendations of others. We like to understand the average experiences of others for a given movie—how they felt about the acting, the storyline, and the production value of the film. In buying a lawn mower recently, I wanted to understand not just whether the product is well-built, but also whether it tends to break down over time, what kind of maintenance costs are associated with it, and whether the manufacturer stands behind their warranty when something goes wrong.

With the above in mind, let me first lay out the general research challenges in social information seeking from the perspective of a system builder.

First, gathering all of these opinions from people is challenging in multiple ways. For example, how do we incentivize users to contribute opinions and review and then to curate it? How do we build systems for processing, indexing, and extracting useful bits of information from the gathered data?

Second, we need to process a huge amount of social signals so that helpful bits are surfaced. For example, when we turn to social sources for information, we expect it to be free of unhelpful bias. However, every personalized source of information is somewhat subjective, by definition. Indeed, even what “facts” to include or not to include might bias the perception of information reliability. Ironically, it is precisely this subjective nature of opinions that causes us to seek out different points of

views from others, including both friends and strangers. Therefore, in processing this curated data set, social search and recommendation systems must take care to understand each piece of information and how it might be valuable to users.

Third, we have to build ranking or recommender systems that help users decide what to read from the myriad of social information sources that are available. Searchers' skills in deciding whom and what to pay attention to and how to process facts and opinions from these social sources are critical to many decision-making and sense-making tasks. For example, when you call someone on the phone for information, one of the first steps is deciding whom to call. This is precisely the expertise modeling or question-routing problem in social question-and-answering (QA) systems.

Fourth, there are plenty of human factor issues in social information seeking. For example, in a social QA system, potential answerers might be "finicky": they don't want us to spam them; they don't like being interrupted; and they don't like it when we ask them overly simple questions. In other words, we have to deal with real human context and the associated social interaction.

Finally, we also have to socially engineer the growth of this system, so that early users get good enough experiences that they rave about the service and recommend it to other users. We want to build trust, and we want a network effect, such that, as each user joins the system, the whole system becomes even more useful to users that are already there.

In short, in thinking about how we are going to build better information seeking systems, we see how it is natural to think about the entire sense-making experience that includes social sources of information. The present manuscript is devoted to exactly this topic—broadening the scholarship around information seeking and sense-making to the social realm. There are multiple ways Dr. Shah has approached this question.

First, the book seeks to understand how we should curate social sources, situating the research here within past relevant works. For example, as discussed in a journal article, a collaborator and I used crowdsourcing survey techniques to understand social information seeking behavior [2] and what social sources are relied upon by users.

Second, the manuscript explores various ways in which socialness can be indirect and direct, with the most direct social information seeking activities as being entirely collaborative. Again, drawing from my own research before, we have found that social interactions were present and pervasive throughout the information seeking episode—before, during, and after the core search task [2]. Therefore, understanding the various social dimensions here is critical.

Third, the book catalogs and analyzes various tools and systems that have been built to support social information seeking and the methods researchers have employed to evaluate these systems to understand the degree to which the systems are successful and what user activities they support. For example, in evaluating a pioneering QA system called AnswerGarden, Mark Ackerman observed that users were often more satisfied when an answer came back quickly, even if the answer

was somewhat less than perfect [1]. Given the amount of past work in this area, a comprehensive guide to evaluation approaches is sorely needed.

Finally, as parting words, let us not forget that users want one thing—getting their questions answered right now. Search engines have played that role for many years now. It can be argued that the greatest impact computers have had on the human endeavor is the Web search engine, whose development and refinement seems to be the epitome of computer science. That was before the Web truly became social. In the brave new social Web, search should and will be different, and reading this book will give you a sense of the direction where social search and information seeking is headed.

Los Altos Hill, CA, USA  
March, 2017

Ed H. Chi  
Sr. Staff Research Scientist  
Google Research & Machine Intelligence

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# Preface

We grew up learning in school that humans are social animals. More importantly, we have seen how we need social support (family, friends, colleagues) to accomplish many important tasks, including obtaining and using relevant information for various decision-making objectives. And yet, our favorite search engines are developed with individuals—rather than partners and groups—in mind. This could be because search engines are meant to be just a start of an information seeking activity, and not the end. Or it could be because we don't know how to create an effective search engine that incorporates the social and/or collaborative dimensions of our behavior.

Either way, studying the social aspect of information seeking is long overdue. Scholars have argued for decades that while Web search engines have been very effective in doing what they do, these systems have ignored the very fundamental aspect of human behavior—being social. While search engines have struggled to incorporate social/collaborative aspects to their search systems, people have been finding and utilizing methods and services to facilitate looking for, sharing, and making sense of information. They are increasingly seeking information through social channels such as social media services, social networking sites, and community-driven content providers. Examples of such behaviors include:

- Updating one's Facebook status to ask friends for advice
- Posting a question on a community-based question-answering service such as Yahoo! Answers
- Using Twitter to gather opinions through a poll

Social information seeking (SIS) is a field of research that involves studying situations, motivations, and methods involved in people's seeking and sharing of information in participatory online social sites, such as Yahoo! Answers, WikiAnswers, and Twitter, as well as building systems for supporting such activities.

Some may ask how SIS is different from collaborative information seeking (CIS), considering social and collaborative ties definitely have a lot in common. While this is true, they also have some important differences. A *real* collaboration is studied and understood with connections among the participants who work toward a common goal with explicitly expressed intentions in a mutually beneficial way.

Such connections have some level of inherent trust and a sense of shared ownership. To create a social tie, however, participants need neither a shared common goal nor a great deal of shared trust and knowledge to interact. In this way, SIS allows information seekers to expand their reach for seeking and sharing information.

My own journey has taken me through explorations of both SIS and CIS, almost at the same time. Until I started my PhD at the University of North Carolina (UNC) Chapel Hill, things were more straightforward for me with my work and interest in information retrieval (IR). But then I started looking at interactive IR and information seeking, specifically the situations where people seek information *with* and *through* other people. The former (*with*) defines CIS, whereas the latter (*through*) relates to SIS. For over a decade now, I have been exploring and writing for both CIS and SIS. I published the first full-length book on CIS with Springer in 2012, and so it is only fitting that I also publish the first full-length book on SIS with them. And that's what I present here. This volume is a culmination of more than a decade's work, dozens of studies and experiments, numerous conference and journal papers, a couple of PhD dissertations, and countless midnight candles burnt. The final product unfolds in the following manner.

First, we'll define and understand SIS in context. SIS sits at the intersection of the well-established and well-studied fields of information seeking/retrieval, social media, and social networking. It follows that here we will first look into issues of information seeking and social media/networking. Such research frames the first part of this book. This will give us the necessary foundation to then discuss how those aspects could intertwine in different ways to create methods, tools, and opportunities for supporting and leveraging SIS. Part II starts with the social dimension; primarily, we will examine SIS through question-answering activity. Part III brings the collaborative dimension of information seeking into the mix. After reviewing social information seeking and collaborative information seeking separately, it is interesting to note how often they overlap and connect. Therefore, we will provide a new context in which social and collaborative dimensions are considered together. We acknowledge that, to truly make a model of social and collaborative information seeking function, much more work needs to be done.

We finally come back to more concrete terms in Part IV of this book to consolidate what we know about how people have been studying SIS and related areas, what tools they have developed, and how they evaluate various methods and systems. It is important to complete this synthesis before launching into what might become the next big thing, so we conclude the book by laying out some important pointers for both theoretical and practical SIS work.

In the end, one should treat this book as a good starting point for exploring the next phase of information seeking/retrieval, specifically the one that will seamlessly incorporate social and collaborative dimensions.

There is a lot to be done for this next revolution in the fields of information retrieval, information seeking, and social media/networking. Let's get started.

# Acknowledgments

A book like this does not happen with the efforts of a single person. And if this book shows anything, it is that we are social animals who use each other as support for difficult tasks. So I have taken help from many people over the years to make this book possible. I would like to thank all of the following people and organizations for their contributions to my research relating to this book. Without them, this work would not exist.

- My friends and colleagues Sanghee Oh (currently at Chungnam National University, South Korea) and Jung Sun Oh (currently at the University of Pittsburgh), who introduced me to the area of social/community-based question-answering as fellow PhD students at the University of North Carolina Chapel Hill. I wrote my first paper on this topic with them, which now seems like ages ago!
- My colleagues Dr. Marie Radford at Rutgers University and Dr. Lynn Connaway at OCLC for working with me on online/digital Q&A services, especially looking for hybrid solutions that connect virtual reference services run by libraries and peer-based, community-based/social Q&A services.
- My longtime collaborators Rob Capra at the University of North Carolina Chapel Hill and Preben Hansen at Stockholm University for helping me shape many of my ideas of collaborative information seeking over the years through co-organizing various workshops and other events with me. Some of their contributions are also reflected in the writing of Chap. 7.
- Several of my PhD students over the years for contributing to my understanding of various topics reported in this book as well as for working on different studies and experiments that produced new knowledge in the fields of collaborative information seeking, social information seeking, and interactive information retrieval. Specifically, I would like to recognize the contributions of Roberto Gonzalez-Ibanez, Erik Choi, Vanessa Kitzie, Long Le, and Manasa Rath. Parts of their papers and dissertations are sprinkled all over this book.
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- Brainly.com for providing not just funds for doing some of the work reported here, but also giving us access to their data and services to be able to run our experiments.
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# Acronyms

ACM	Association for Computing Machinery
ACRL	Association of College and Research Libraries
ASIST	Association for Information Science and Technology
ASK	Anomalous States of Knowledge
ASP	Answer Satisfaction Prediction
CIB	Collaborative Information Behavior
CIR	Collaborative Information Retrieval
CIS	Collaborative Information Seeking
CLIR	Cross-Language Information Retrieval
CMC	Computer-Mediated Communication
CQA	Community Question-Answering
CSCW	Computer-Supported Cooperative Work
CTAR	Collaborative Technology Assisted Review
DAU	Daily Active User
EKR	Electronic Knowledge Repository
FRMB	Facebook Relationship Maintenance Behaviors
GUH	Group Unified History
HCI	Human-Computer Interaction
HIB	Human Information Behavior
IM	Instant Messaging
IPL	Internet Public Library
IR	Information Retrieval
ISC	Information Seek Cycle
ISCM	Information Seeking and Communication Model
ISCS	Internet Social Capital Scale
ISP	Information Search Process
LIS	Library and Information Science
LSM	Linguistic Style Matching
MAU	Monthly Active User
MISE	Multiple Information Seeking Episodes
MT	Machine Translation

NIST	National Institute of Standards and Technology
OC	Online Community
P2P	Peer-to-Peer
PDMS	Peer-to-Peer Data Management System
Q&A	Question-Answering
QR	Question-Routing
SCIS	Social and Collaborative Information Seeking
SDL	Structured Definition Language
SIGIR	Special Interest Group on Information Retrieval
SIS	Social Information Seeking
SLSS	Social Live Streaming Service
SNS	Social Networking Site
SQA	Social Question-Answering
TREC	Text REtrieval Conference
UGT	Uses and Gratification Theory
VR	Virtual Reference

Social Information Seeking

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