Approach to Research

In Human Computer Interaction (HCI) circles, one often encounters intellectual debate between the "builders" and the "watchers"—people who make technology, and people who study technology use—about which approach should be valued more. In a way, it is a false dichotomy, because both are necessary; however, in practice, disciplinary boundaries are still strong. I am unique because my research speaks to both worlds. I have found that some of the most challenging system design problems stem from trying to understand and predict how people will use a particular system, and how aspects of the design might affect cognition and behavior.

When a computing system is created, assumptions about people and how they will use it are encoded in the design, and thereby made invisible. For example, consider a problem my colleagues and I encountered when designing what were then (10 years ago) next-generation photo-sharing applications for cell phones, at Motorola Labs. We hypothesized that sharing photos within the context of a conversation was an important capability for people who collaborate. Unfortunately, the hardware and software architecture of the platform we were using made this real-time sharing unnecessarily difficult. There was no easy way to send voice and packet data (files) simultaneously during an active call, meaning users had to hang up before sharing a photo—a considerably less than ideal solution that might have been significantly improved had the platform been designed differently. This example illustrates the importance of "builders" and "watchers" working together: computing systems can encode values and beliefs about people and behavior, all the way down to the architecture.

In my work, I challenge design assumptions, so that I can understand why certain solutions work and others don't. I consider the designs themselves to be hypotheses about human behavior. This perspective allows me to ask design-related questions and answer them from a scientific, theory-driven perspective. I can then use these findings to develop more appropriate assumptions, and help create better systems. I have two high-level goals for any research project I undertake: (1) to produce contextualized results that contribute to solving a particular applied problem, and (2) to obtain generalizable scientific knowledge that can be applied to other similar situations. I bring an interdisciplinary perspective and a broad methodological approach to finding answers and producing guidelines that will help solve real-world problems. My long-term goal is to supervise my own research lab made up of both "builders" and "watchers"; I believe that in this kind of collaboration, the whole is truly greater than the sum of its parts.

Research Focus

In my research, I focus on understanding social processes that affect information sharing online—people sharing files, blog posts, photos, tags, status updates, tweets, etc., without a specific intended recipient. In face-to-face communication, speakers automatically shape their utterances for their listeners in an effort to ensure that they converge on shared meaning and understand one another; this is referred to as *audience design* [4]. In an information sharing system, information producers, who contribute information, must similarly *package*, or encapsulate and structure information for consumers who access and use it. Packaging is the work producers do that enables consumers to find, understand and use the information [3].

However, information producers often have difficulty packaging for others' reuse [1]. Effective packaging requires that information producers consider their own ideas and assumptions regarding their contributions to a given system, as well as what they know about the knowledge, information needs and context of whomever might want to view the information. What producers and consumers know about each other, if anything, usually comes from sources outside the system; but, if users were given the right information and feedback at the right time, *through* the system, they might be able to learn what they need to know about each other to package more effectively.

I am suggesting that information sharing systems should be designed to incorporate support for people to do what they do best: communicate. To better understand and improve the process of packaging information for reuse by others, we must re-conceptualize it as a form of asynchronous communication between information producer and consumer, mediated by the system. Information sharing systems are often viewed as storage media, rather than social media; by shifting this focus I am able to draw upon what is already known about how people reach common understanding and shared meaning in other kinds of circumstances. For example, the "social" perspective highlights language use as important, because words are chosen to serve as a *handle or identifier* for the information. Language comprises the infrastructure by which information in a given system is found, accessed, and interpreted; this means deciding what to name a file and what folder to put it in are packaging decisions [5]. Likewise, in many social media systems users' contributions consist primarily of text—the words in a status update or "tweet" are often the only information users have about each other upon which to base their packaging choices.

Recent Projects

My recent work has investigated whether social processes might affect the emergence of shared meaning in two different types of information sharing systems. I have contributed surprising results about tagging in social bookmarking, and suggested a perspective from which to think about organizing and finding files in group information repositories.

Tag Choices in Social Bookmarking: Social bookmarking systems like delicious.com provide a means for users to associate personally salient keywords or labels (called *tags*) with their online bookmarks. The history of each user's bookmark and tag choices is public by default, thereby providing visibility into words others have used to tag similar items. A common assumption in the literature is that because users can see each other's tags, they would begin to imitate each other, and a socially constructed information organization scheme for web content would emerge [2]. However, in a semi-structured interview study of delicious.com users, my coauthor and I found that personal information management motivations were more prevalent [7]. Tags are used to navigate and find information in social bookmarking systems; it is important to understand influences on how users choose tags because these influences affect how well the system as a whole supports information finding.

To test whether a social process, like imitation, could be influencing tag choices we analyzed a large sample of bookmark and tag history data downloaded from delicious.com. In one study, we used logistic regression to estimate the influence of several predictors on users' tag choices. In a follow-up investigation, we developed a computer model to simulate several tag choice strategies one at a time, and compared aggregate patterns in model results against the same measures in the real-world data from delicious.com. Results from both analyses indicate that tag selection in delicious.com is governed by individual, idiosyncratic processes, not by a social process in the form of direct imitation. Our results contradict the prevailing wisdom, and suggest that simply making tags public in a design does not mean they will be used in a social way. This work underscores the need for further research to understand how tagging systems, and information management systems in general, might be designed to encourage more socially-oriented behavior [6].

Labeling, Organizing, and Finding Files in Group Information Repositories: Group information repository systems are often assumed to be tools for storage and sharing of files and their metadata, not tools for communication. The "storage" approach focuses on providing users with detailed information about the objects in the system—where they are, who is looking at them, how they've been used in the past, etc. However, group information repositories tend to grow and become disorganized over time, such that users have difficulty finding what they need. A different approach is to think of these systems as social tools that could be governed by similar processes to face-to-face communication. The purpose of this research was to better understand user behavior

when labeling and organizing files in group information repositories, and to determine whether social factors might shape users' choices when labeling and organizing information. These choices determine how information in the repository is structured, and affect whether subsequent users can find the files they need.

Through interviews with group information repository users and analysis of system log data, I found that users tend to restrict their activities in a repository to files they "own," are reluctant to delete files that could potentially be useful to others, dislike the clutter that results, and can become demotivated if no one views files they uploaded. I also conducted an online experiment in which participants labeled and organized short text files into a file-and-folder hierarchy, and later completed search tasks in the hierarchies created by others. Participants came from two intellectual communities, and were instructed to organize the files for one of three different audiences: themselves, someone from the same intellectual community, and someone from the other community. I found that when participants organized files for an audience they imagined was like them, everyone searched more efficiently, regardless of whether they shared community membership with the hierarchys creator. Further, analyses of the hierarchies showed that users performed better when file and folder labels were more similar to the text of the documents they represented. These results show that audience design, a communication process, affects group information management tasks. The findings from both studies suggest that sharing files via a group information repository is more complicated than simply making the files available on a server. Processes that affect spoken communication also impact word choices when the "interaction" is mediated by a repository. With this new knowledge, it is possible to begin design work on a new class of systems that go beyond mere storage, and better support the social aspects of user behavior in group information repositories.

Future Directions

In my post-doctoral fellowship, I have recently begun several avenues of inquiry that will help me to better understand the negotiation of shared meaning between producers and consumers in information sharing systems.

First, I aim to learn more about how the information presented to producers and consumers about each other by an information sharing system affects the inferences they make. Users' perceptions of each other are important, because they provide the starting point for the negotiation of shared meaning in these contexts. However, this aspect of information sharing has received little attention. What information do consumers need about producers to make sense of their contributions more effectively? Also, when producers contribute information, how does what they know about their intended audience affect how the information is packaged? Through a series of lab experiments in which I manipulate user-based information provided to producers and consumers, I will identify information that will help them form better mental models of each other, and explore ideas for incorporating this information into system designs.

Second, I am looking for evidence of packaging (audience design) in real-world social media systems that support information sharing. In my prior experiment, simply providing different instructions to participants was enough to induce them to package differently; this is evidence that information producers need very little information to tailor their information sharing contributions for consumers. However, based on my delicious.com work, it seems that packaging may take place to varying degrees in different systems. An idea that I am currently developing is a comparison of delicious.com and twitter.com as systems supporting both packaging and social information discovery. This comparison is intriguing because while users can share links and commentary in both systems, delicious.com was created primarily for storage and navigation of information while twitter.com is more conversational. Identifying instances of packaging in situ and testing hypotheses

about different influences on packaging choices will provide a foundation for understanding what design approaches are most effective.

Finally, it is not clear how aware producers and consumers are of each other when they use information sharing systems. In email or instant messaging, the participants in the conversation are known to each other. However, the communication "participants" are less well-defined when contributing Facebook.com status updates or tweets, tagging, or posting photos. Who do producers and consumers feel like they are "talking to", if anyone? How does the system design affect what people notice about each other, what they choose to share, and how the information is packaged? Understanding these perceptions, and what triggers them, will help me make design choices that appropriately support awareness between producers and consumers.

References

[1] Berlin, L. M., Jeffries, R., O'Day, V. L., Paepcke, A., and Wharton, C. (1993). Where did you put it? issues in the design and use of a group memory. In *SIGCHI conference on Human factors in computing systems*, pages 23–30.

[2] Golder, S. and Huberman, B. A. (2006). Usage patterns of collaborative tagging systems. *Journal of Information Science*, 32(2):198–208.

[3] Markus, M. L. (2001). Toward a theory of knowledge reuse: Types of knowledge reuse situations and factors in reuse success. *Journal of Management Information Systems*, 18(1):57 – 93.

[4] Niederhoffer, K. G. and Pennebaker, J. W. (2002). Linguistic style matching in social interaction. *Journal of Language and Social Psychology*, 21(4):337–360.

[5] **Rader, Emilee** (2009). Yours, mine and (not) ours: Social influences on group information repositories. In *CHI '09*, pages 2095–2098.

[6] **Rader, Emilee** and Wash, R. (2008). Influences on tag choices in del.icio.us. In *CSCW '08*, pages 239–248.

[7] Wash, R. and **Rader, Emilee** (2007). Public bookmarks and private benefits: An analysis of incentives in social computing. In *ASIST 2007*.