Use of Social Network Sites for Question and Answer Behavior

by

Katrina Panovich

Submitted to the Department of Electrical Engineering and Computer Science in partial fulfillment of the requirements for the degree of

Master of Science

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

February 2011

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Abstract

In this thesis, we look at the behavior of posting questions as status updates on popular social network sites like Twitter and Facebook. This question asking behavior is similar to the use of search engines, question and answer sites, and information exchange offline, and can provide useful information for information seeking patterns elsewhere.

We performed a large-scale survey asking about this behavior and used the techniques of affinity diagramming to code types and topics of questions, and grounded theory to code motivations for asking and answering questions. We conducted a field study in which participants posted status updates that asked a question that we varied across several dimensions, including several variations on phrasing. We also conducted a lab study where participants with information needs both posted questions on their Facebook profiles and searched online - we report on their preferences. Lastly, we looked at what kinds of friends - acquaintances or close friends - were answering questions, and who among them was the most useful, helpful, and trustworthy. From our collected data, we report on implications for design of both social systems and search engines.

Thesis Supervisor: David R. Karger

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1. Introduction

We all have information needs — How’s the weather? Who’s the actor in this movie? Where can I find the best burgers in Boston? — and we’ve found ways to satisfy these needs. Some are well-suited by a trip to the library, some by a phone call to a knowledgeable friend, and many are now best handled by using the internet. The internet has become a fully integrated utility in many people’s lives, and the place to find an answer to any question. Besides the obvious option of using a search engine, one might post to a Q&A (question and answer) site, where others help find answers. Browsing websites can help to find information — searching is the most common approach [14], but there are options far beyond those listed here. Some people use the internet to contact specific friends, using IM or email. One option that’s gaining traction is using a social network site, such as Facebook, MySpace, LinkedIn, or Twitter. In this case, people ask all of their friends or followers at once — they have no need to direct questions at specific people, or even to specific lists of people. These sites have gained popularity and with that popularity has come the option of asking for help through an SNS (social network site).

The significant difference between each of these sites is that some involve searching — looking through existing information to find the answer needed, similar to researching in a library. Others are asking methods — where one asks for help or pointers to existing information. When searching, the person is in control of the process entirely. She doesn’t have to rely on outside factors, but she also lacks assistance if there are difficulties and must put forth enough effort to find her answer. Asking a question of a Q&A site requires formulating a question, and then waiting. The person with the need is no longer completely in control — she must trust others and wait for the information to come to her, but she also uses less effort.

Asking questions online through Q&A tools has been studied, but prior to the work presented here, the practice of asking questions in such a general-purpose forum as one’s own social network had never been addressed. We specifically look at the practice of setting a status update (a short burst of text associated with a specific user at a specific point in time) as a question, like “Does anyone know if Momogoose is open during normal hours today?” or “What’s everyone’s favorite Christmas album?”. This is of note because of the practice’s broadcast mechanisms, in contrast to email, SMS, IM or other more directed communication methods. Asking a question on SNS would be similar in audience to emailing one’s entire contact list or SMSing one’s entire phone book. These methods could be seen as rude or spammy. However, asking on SNS is more socially appropriate and is not seen as an intrusion. Setting an “away message” on an instant
messaging network is similarly less rude, and might reach a large audience, but lacks the more asynchronous response patterns of social networks (IM is generally used in a synchronous fashion; responses would be given were it assumed the poster was present, instead of “away”). In this thesis, we investigate the behavior of asking questions in one’s social network status update. This use of social networking sites is contrary to the purely social motivations assumed by most, and seems to form a unique intersection between these social interactions and informational ones.

Part of the interest in social network questions in status updates is because the practice runs contrary to what status updates were originally intended for — statuses. Facebook originally had status messages that took the form of “Katrina is” and a list of dropdown options, like “at the library.” Slowly the list of options expanded into just “Katrina is” and freeform text, and then finally just text. The advent of Twitter, on the other hand, was hailed as the advent of “microblogging” — short blurbs of text that were ostensibly meant to be somewhat archival. In fact, Twitter didn’t originally allow for @-replies (replies that are made to other users through one’s own status updates, called such because they begin with @username), users grabbed that convention and others and made them work. Question asking is a similar repurposing: short statuses become questions, parts of a larger conversation, not just with fellow users, but with information online and offline.

Using social networks for question answering long predates this interest — in this work, we are particularly interested by previous work in the sociology community by Mark Granovetter. Granovetter’s landmark 1973 work, “The Strength of Weak Ties” [16] defined tie strength as the strength of a friendship — close friends are strong ties, and acquaintances are weak ties. He observed [17] that a community of men in Newton, MA found new work opportunities largely through word-of-mouth communication with weak ties — the very useful information about new jobs came from acquaintances who traveled in different circles and so had access to different information. One portion of this work looks to address whether or not this same pattern holds true online. Do our offline friends travel in the same online circles as us? Do they frequent the same places and sources of information online? In the broadcast question-asking mechanism concerning us here, one’s entire network of friends has the ability to answer questions, and so both who answers questions (strong ties? weak ties?) and how they answer them (does one group provide more useful information, as in Granovetter’s work?) are interesting.

To begin to investigate question-asking via SNS status updates, we conducted several studies in which we asked people about this behavior, studied properties of questions through a field study, compared searching with this asking behavior, and looked at how the strength of a friendship affects responses. In our survey study, we contacted social network users and asked them about their use of social networks for information
seeking, specifically, if they had asked or answered status message questions. Many of our participants volunteered questions they had asked or answered, and we categorized those into several different types and topics of questions — most popularly, recommendations and opinions, and technology and entertainment questions. We also investigated the motivation behind posting questions (most frequently trust) and answering others’ questions (altruism).

Following this survey, we performed a lab study to determine what aspects of a question (and the person posting that question) affected the quantity and quality of responses. Participants posted variants on the same question as their status messages. We found that scoping questions to “anyone” and keeping questions short increased the quantity and quality of responses, as did having a higher number of friends.

In order to better compare this asking process to searching on a search engine, we performed a study in the lab in which participants asked a question of personal interest to them to their social network, then searched for the answer online, and then compared the results when they had found the information they wanted. Searching online was preferred by the participants in general, but many of them appreciated the dual approach, which allowed for friends to share opinions, alternatives, and support that would not be found online. Strong friends were found to be the most likely to respond to questions.

In the last study, we compared the previous finding, that strong friends seemed more likely to respond to questions, with Granovetter’s work on tie strength and the strength of weak ties. To investigate this, we conducted a field study in which participants reported on the value of responses they got to questions they had posted, and compared these values to algorithmically-derived tie strengths, where we found that stronger ties provided more helpful and useful responses, contrary to the Granovetter work.

That some users turn to their status updates for question asking seems to signal need unmet by search engines and Q&A sites. In this thesis, we address how people are asking questions online, how they try to get information, what these unmet needs might be and implications for the design of systems that might address these issues. The search for information is as old as humanity itself, and repurposing status updates into questions is what seems to be the latest step in that quest.
2. Related Work

With information needs as old as they are, many attempts have been made to quantify, explain, and solve the problem of how to get information. This research is beholden to several different areas of research: online question and answer tools, searching online, asking online, social search (of which this thesis is a part), social networking systems, and tie strength, a sociological principle spawned from interest in information exchange.

2.1 Online Q&A Tools

Venues such as electronic bulletin boards, newsgroups, and question-answering sites enable users to post questions targeted either at a particular community or to the world at large. We refer to sites where users post questions to be answered by people not known personally as Q&A sites. Question asking and answering behavior on Q&A sites has been well studied (e.g., Harper et al. [20]; Hsieh and Counts [23]; Liu et al. [33]; Zhang et al. [56]). For example, Harper et al. [20] identified two categories of questions posted to Q&A sites: conversational questions, which are intended to spark discussion, and informational questions, which solicit specific facts. They found informational questions have higher archival value. Interestingly, questions in status updates can be used simultaneously for both conversation and information, due to the inherently social component of the sites.

The Internet offers many opportunities for people to ask and answer questions online. There are, for example, third-party applications that Facebook users can install designed specifically for Q&A purposes (e.g., “My Questions” [slide.com]). We focus on the use of status messages for question asking, which does not require the installation of additional applications and thus has a lower barrier to entry, as well as for its unique role in repurposing social network tools.

Expertise-finding systems help users identify people with a particular type of knowledge, which can be beneficial for question-asking. Collabio [5] is a tagging-based Facebook game designed to augment a network with metadata that can be used for expertise finding.

Compared to our data on typical questions on social networks, response times on Q&A sites tend to be long. For example, Zhang et al. [56] reported that when expert Java users posted questions to the Java Developer Forum, the average time to receive a response was nearly 9 hours. Hsieh and Counts [23] reported that
the average time to receive an answer to a question posted to Microsoft's Live QnA site was 2 hours and 52 minutes. Hsieh and Counts also reported that 20% of questions posted to Live QnA never received an answer at all. In the section three, we provide self-report data on the speed of responses to questions posted on social networks, rather than Q&A sites.

Some researchers have explored the factors affecting answer quality on Q&A sites. Raban and Harper [44] point out that a mixture of both intrinsic factors (e.g., perceived ownership of information, gratitude) and extrinsic factors (e.g., reputation systems, monetary payments) motivate Q&A site users to answer questions. These questions come from complete strangers or near-strangers using the same system, as opposed to friends or followers online. Ackerman and Palen [2] and Beenan et al. [3] confirmed that intrinsic motivations, such as visibility of expertise and the feeling of making a unique contribution, influence participation in such systems. Results regarding extrinsic motivators have been more mixed; Hsieh and Counts [23] found market-based incentives did not increase answer speed or high-quality answers, but did decrease the number of low-quality responses, but Harper et al. [20] found fee-based sites produced higher quality answers than free sites.

In this work, we provide data on users’ satisfaction with answers from social networks, rather than Q&A sites — there are no extrinsic motivators besides social ones. Harper et al [19] also looked at questions on Q&A sites to determine the difference between informational and conversational questions — objective and subjective questions — and included "non-questions". These "non-questions" are of particular interest as many status message questions are not in typical question form. We incorporate their precedent and include information seeking sentences like these (often prefaced with "I wonder...") in the same group as general questions. These sentences are information seeking, and can be reframed in the form of a question, so can be considered questions.

There are several factors that differentiate the experience of asking a question on a Q&A site versus on a social networking site. First, questions on Q&A sites can be posted anonymously (or under a pseudonym), whereas on a social networking site, the asker's true identity is known to the readers of the question. Second, the audience of potential answerers is much smaller on a social networking site than on a Q&A site, since it consists of only the direct contacts of the asker rather than an entire community or the internet at large. Social networking sites typically impose a limit of only a few hundred characters on status message length, whereas many Q&A sites allow much longer, more detailed questions to be posted. Perhaps the most significant difference is that Q&A sites are specifically for question asking, as opposed to being part of a greater purpose, like a social network. In light of these differences, it is valuable to study question asking behavior on social networks, since they provide quite a different audience and experience than Q&A sites.
Question-and-answer systems (Q&A systems) are of commercial interest as well. One commercial system of note is Aardvark [vark.com], a site which routes questions through an instant messaging bot to an appropriate user in one's extended network. Upon registering users tag themselves with areas of expertise and provide information about their network. Questions are then routed to members of the asker's network (friends, friends-of-friends, and strangers) based on expertise. Aardvark suggests that users ask longer questions rather than shorter if users do not receive answers quickly. Rather than focusing on finding a particular expert within one's network to direct a question to, we study situations in which users post questions to their entire network. We also focus on questions that are short, rather than extended. Aardvark [22] aims to direct questions to friends-of-friends for responses, and in fact, this appears to be a good way to increase the quality of the response. When asked for feedback about the answer the user received, 76% of the answers from within the user's extended network were rated 'good', and only 68% of answers from outside the user's network were rated 'good.' We hypothesize that extended network effects here mirror the effects of weak ties or acquaintances providing novel information.

Other commercial sites for question answering include ChaCha [chacha.com], where users' questions, sent by SMS, are redirected to one of a number of designated answerers, who provide an answer, and Yahoo! Answers [answers.yahoo.com], which lets anyone (with an account) post questions and answers of any nature — humorous, subjective, informational, personal, etc.

<table>
<thead>
<tr>
<th>System</th>
<th>Mechanism</th>
<th>Types of Questions</th>
<th>Pool of Answerers</th>
<th>Targeting of Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aardvark</td>
<td>Instant Message</td>
<td>Primarily Informational, some Opinion</td>
<td>Extended Social Network (friends of friends)</td>
<td>Questions are tagged, answerers volunteer expertise</td>
</tr>
<tr>
<td>ChaCha</td>
<td>SMS</td>
<td>Informational</td>
<td>Guides, compensated by ChaCha</td>
<td>Don't appear to be targeted</td>
</tr>
<tr>
<td>Yahoo! Answers</td>
<td>Web-based</td>
<td>Informational and Opinion based</td>
<td>Volunteers on the site</td>
<td>Categorized by question asker</td>
</tr>
</tbody>
</table>

2.2 Searching

We use the term search to refer to solitary information seeking behaviors, where the person with the
information need does not actively engage with other people. This is as opposed to Q&A sites, where there is an expectation that a person will answer, and *asking*, discussed later. Query log analysis gives insight into what people search for using search engines, including the types [8] and topics [46] of the queries people issue. Log analysis has also shown how search engines are used, revealing typical session behavior [27], the prevalence of re-finding [53], and the trails people follow after clicking on search results [7].

However, Web search engines are typically used merely as starting-off points to orienteer to an information target [48]. In addition to keyword search, search behavior includes a related ecology of online information-seeking activities, such as browsing to specific URLs, making sense of found content, iteratively revising a query, and disseminating results. Marchionini [34] detailed the importance of browsing in information seeking, and O’Day and Jeffries [41] characterized the information seeking process by outlining common “triggers” and “stop” conditions that guide people’s search behaviors as their information needs change. Pirolli and Card [42] characterize information seeking as a foraging process, where searchers follow the “scent” of their information targets in order to find them. Web searches may be accomplished with a single query, or they may span multiple work sessions. For example, exploratory search tasks [55] can potentially last days, months, or even longer.

Although *search* is used to refer to an individual searching alone, this does not mean that the searcher operates in complete isolation. Many search engines use the behavioral information of other people to help improve the individual’s search experience. Personalization schemes, like Groupization [50], often use data from groups of people to produce the best result ranking. For example, HeyStaks [45] is a browser plug-in that enables users to mark search results as relevant. These results are then boosted in the rankings of socially connected users who do searches on similar topics.

Individuals may also conduct solitary searches over existing databases of content previously provided by other users, such as searching over the collection of public Twitter posts, or searching through an archive of past questions and answers on a Q&A site, such as in the Answer Garden system [1]. Search engines might also be devised using the output of social tagging systems like delicious (delicious.com) or Dogear [35].

Despite all of the research and effort given to search, it’s still far from a solved problem: we believe the prevalence of non-search tools signifies that there are needs unmet by search. Questions asked on social networks are one way that people try to do this; discovering why and for what helps us to understand why search might fail these users otherwise.
2.3 Social Search

Broadcasting a question to one’s social network, as in status message questioning, is one way to find information online; other common methods include using a search engine or emailing a question to a particular person. The term social search refers broadly to the process of finding information online with the assistance of social resources, such as by asking friends, reference librarians, or unknown persons online for assistance. Some researchers have built special tools to integrate social information with search engine use, such as HeyStaks [45], mentioned above.

A collaborative search [38] is a social search where several users share an information need and work together to fulfill that need, in some cases using tools like SearchTogether [37]. Although people who ask questions via social network status messages do so to enlist the help of others, they are not engaged in collaborative search as the information need belongs solely to the question asker; they are, however, engaged in the broader phenomenon of social search. Collaborative search necessitates back-and-forth discussion that make the search a collaboration, whereas SNS questions do not require this exchange.

Social search behavior appears to be common. In a 2008 survey, Wells and Rainie [54] found people used a mixture of internet search and social resources (e.g., phone calls and face-to-face meetings) to answer many types of questions. Torrey et al. [52] found that craft-artists kept their social networks informed of current projects in the hopes of receiving “gifts of information,” including pointers to relevant online resources that might benefit their projects. This practice is somewhat similar to setting up alerts on a search engine for relevant information. Some researchers have proposed formal models to describe the interplay of online information seeking with the use of social resources. For example, Pirolli [43] developed a model of social information foraging, and Evans and Chi [11] described the various stages in the search process when users engaged with other people.

To compare social search with more traditional search, Evans et al. [12] conducted a study in which eight participants completed two search tasks. For one task, participants used only non-social, online resources (e.g., search engines), while in the other they used only social resources (e.g., calls or emails to friends, and social network or Q&A sites). Evans et al. found that in the social condition targeting questions to specific friends versus asking a social network had similar outcomes in terms of task performance; questions posed to the social network received more answers, but those targeted to individuals received in-depth answers. We build on these findings to show additional factors that affect perceived answer speed and utility on social networks via a survey of 624 people.
When people turn to more traditional search methods, such as search engines, the process can be social as well. Evans et al. [11] surveyed participants on their social practices surrounding search. They found that users discussed searches with others beforehand, and shared results with a subset of their social network afterward. Particularly interestingly, users with informational queries engaged in social interactions during the search, often to help refine the search. Wells et al. [54] also found that people incorporated other sources into their internet searches, including social sources, especially those social sources offline, like phone calls. Some searchers also receive search assistance from professionals, like reference librarians [47].

2.4 Social Network Sites

While the bulk of our work looks at question asking, the fact that it happens on social networks is non-trivial. Social network sites enable users to specify other users that they are connected to. Examples of popular social networking services include Facebook, Twitter, and MySpace. A December 2008 survey by the Pew Internet Project [31] found 35% of adult internet users in the U.S. have a profile on a social network, as do 65% of U.S. teens.

The popularity of these social network sites (SNSs) is a big part of the reason this research is interesting: there are many users and their use is only increasing. Addressing unmet information needs in such a well-used medium means that more people are able to participate, as opposed to installing a tool or signing up for another service. This low barrier to entry is similar to simply searching on a search engine.

Researchers have explored many aspects of how social networking services are used. Lampe et al. looked at how university students' perceptions and use of Facebook changed over time [30]. In particular, Lampe et al. found that the number of participants who used Facebook "to get useful information" increased from 2006 to 2008, pointing toward potential social information seeking behaviors, though it’s unknown if this “useful information” consisted primarily of social awareness information or if it also included content gleaned from practices such as question asking. Joinson [26] identified seven primary uses of Facebook via a survey of 241 users. Question-asking was not specifically asked about, but the behavior may be part of the identified use of status updating. DiMicco et al. [9] reported on the use of Beehive, a corporate social networking tool. They found employees used the tool for “caring,” “climbing,” and “campaigning,” but did not mention whether Beehive was used to ask or answer business-related questions.

Other researchers have looked at Twitter—both motivations for its use as well as the conversations that
arise. Java et al [25] looked at the usage of Twitter and some basic demographics, and Honeycutt et al [21] looked at interactions on Twitter. Honeycutt and Herring studied 36,000 public messages shared via Twitter, doing an in-depth analysis of 200 tweets containing the “@” symbol. Their sample indicated that 1.5% of @reply tweets (tweets specifically addressed to another user) were information seeking, and that nearly a third of @replies were responded to publicly within an hour. This data reinforces the existence of this status message Q&A phenomenon that we seek to understand better. Kwak et al [29] looked specifically at information diffusion across Twitter. They found that Twitter functioned both as a social network and as a news medium – users shared social content but also overwhelmingly engaged with “Trending Topics” on Twitter, of which a substantial percentage were about news. The way we interpret this finding is that news-related tweets are likely either opinions about said events, or additional information about that content (or both). Knowing that Twitter is used for informational content like this further paves the way for our look at information exchange through Q&A on the site.

Others have looked more specifically at expertise finding on social networks. Bernstein et al [5] generated a body of informational tags for users from their friends using a social game, and then were able to leverage that information for a system suggesting who might be able to answer a question. While we do not choose to direct questions at a specific user, as they have, it is here that we see interesting use of expert-finding within Facebook. The strongest parallel between their work and ours is that it shares the intent of exploring the information within one’s social network — that one’s friends have knowledge that can be used.

2.5 Tie Strength

In our introduction, we discussed Granovetter's landmark work looking at tie strength. His seminal paper “The Strength of Weak Ties” [16,18] discussed the value of weak ties (acquaintances). The primary idea behind tie strength is that, amongst our network of friends (online or offline), we have friends with whom we are close (strong tie) and friends who are less close, acquaintances or weak ties. Granovetter identified this after observing friendships in an offline social network, and pointed toward the idea that one's weak ties might be an effective information source because they traveled in separate social circles, and so could better transmit new information, elaborating on this premise in Getting a Job [17]. In this work, he observed that a group of men looking for work in Newton, MA found their jobs through word-of-mouth from weak ties.

Recent work by Gilbert and Karahalios [15] looked at Granovetter's [18] denotation of strong and weak ties within real-life offline social networks and found a series of features that can effectively predict tie strength between friends in an online social network. Granovetter highlighted the role of tie strength in information
exchange between people, and as such, models of tie strength online can help us to understand the exchange of information through questions and answers online. We build upon their algorithm in our work looking at what kinds of friends provide useful, helpful, and trustworthy information in answers to questions online.
3. Survey on Behavior

Given that there are people asking questions in their status messages online, we first wanted to identify the basics of this behavior. To do this, we performed a large-scale survey where we asked about the kinds of questions people posted and why. This work appeared previously at CHI 2010 [40].

Popular social networking sites Facebook and Twitter allow users to write brief status messages or status updates, short messages meant for sharing thoughts of all sorts. These updates are shared with their friend networks and are used for a broad range of topics — Facebook and Twitter prompt users to share “what’s on your mind” and “what are you doing” respectively. A December 2008 survey by the Pew Internet Project [32] found that 11% of U.S. adults used online status-updating services. We observed that some subset of messages were questions and conducted a survey to explore the ways in which people used their statuses to ask questions of their social networks.

3.1 Survey Content

We performed our study online and surveyed employees of Microsoft, a large software company. We collected basic demographic and background information, including whether participants used Facebook or Twitter. We also asked a series of questions related to question-asking and -answering behaviors, such as whether respondents had ever used their status message to ask a question of their social network. If they had, we asked how often they had done so, what types of questions they had asked, and about the responses they received. Participants were also encouraged to included questions that they had previously asked as their statuses. We also asked the corresponding questions about answers they had given or would give to a friend’s status — if they had answered, what types of questions and topics they would deal with, what their motivation was in choosing to answer or not answer a question — and asked them to provide a question that they had answered, and the answer they gave. All of the answers are self-report, unless indicated otherwise. This implies that participants’ explanations and ratings are not necessarily accurate — responses may be exaggerated or biased — and readers should keep that in mind when interpreting results.

3.2 Participants

We had 624 participants (25.5% female) complete our survey. Respondents were all Microsoft employees
as noted above, 72.8% were full-time employees and 27.2% were students working as summer interns. We recruited participants by emailing lists where members self-identified as interested in social networking, and the interns email list with approximately 20% response rate overall. Interns were directly targeted in an attempt to achieve a wider range of ages and usage patterns — many social networks are heavily used by university students (a 2008 survey found that over 85% of college students had at least one social network profile [10]). However, our older age skew should not be considered an issue as the average age of SNS users has increased (for example, the number of adults with social network profiles quadrupled between 2005 and 2008 [31], and users over 35 are the fastest-growing Facebook demographic [13]). 28% of our survey respondents were aged 18-25, 40.1% aged 26 – 35, 25.5% aged 36 – 45, and only 6.1% aged 46 and over. While the age distribution of our participants mirrors the distribution of social network users on a broader scale, note that our population is unusual in terms of gender breakdown. As employees of a software company, our population is likelier to be more tech-savvy than usual as well.

Many participants had tried or used one or more of the the most popular SNSs, including Facebook, Twitter, MySpace, Friendster, LinkedIn, and Orkut. Facebook and Twitter, however were the two most popular services, with 98.1% of participants having a Facebook account and 71% having a Twitter account. Future reported data from the survey reflects usage of only these two sites as the most prominent. While the mean size of a Facebook network is 120 friends [13], our users reported a median network size of 209 friends, above the average. Conversely, our Twitter-using participants had a median follower count of 25, considerably lower than Twitter’s site-wide average of 85 followers [24] (though it should be noted that the Twitter mean follower count of 85 is likely skewed high by the extremely high number of followers that corporate and celebrity accounts have). It should be noted that both means are potentially skewed because of site mechanics, though more accurate data is unavailable from the services.

Table 1 shows the SNS activity levels of the participants — specifically, the reported frequency with which they update their status messages.

<table>
<thead>
<tr>
<th>Service</th>
<th>Never</th>
<th>Rarely</th>
<th>A few times a month</th>
<th>Weekly</th>
<th>A few times a week</th>
<th>Daily</th>
<th>A few times a day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facebook</td>
<td>8.2%</td>
<td>18.0%</td>
<td>14.2%</td>
<td>12.3%</td>
<td>29.0%</td>
<td>7.7%</td>
<td>10.6%</td>
</tr>
<tr>
<td>Twitter</td>
<td>17.6%</td>
<td>19.9%</td>
<td>12.2%</td>
<td>5.2%</td>
<td>16.9%</td>
<td>7.0%</td>
<td>21.2%</td>
</tr>
</tbody>
</table>

Table 1. Percent of respondents who reported updating their status messages at a given frequency (of 612 Facebook users and 443 Twitter users).

3.3 Analysis
For Likert scale questions, opinions were on a 5 point scale, where 5 = strongly agree and 1 = strongly disagree. These Likert scale questions were statistically analyzed using non-parametric tests, since participants may not have interpreted points on the scale as equidistant. Participant-provided example questions were analyzed by affinity diagramming [6] to iteratively develop a classification scheme for question type and question topic. Motivations for asking and answering questions were analyzed and categorized in two phases: first, a close reading of responses to develop a categorization scheme, and second, re-reading to assign categories. We evaluated categorizations of question types and topics for different demographic properties of the asker using non-parametric tests (Kruskal-Wallis and Mann-Whitney).

3.3.1 The Questions People Ask

First we discuss the responses from the survey covering what questions people ask of their social networks; in the following sections we will discuss what answers people receive from their networks.

Our first question targeted Lampe et al’s survey question about getting “useful information” from Facebook [30] and asked how much participants agreed with the statement “I use sites like Facebook and Twitter to get useful information.” (Emphasis added post-survey.) Participants indicated agreement (median = 4 out of 5), and just over half of the participants (50.6%) said they had used their status messages to ask a question. Among questions participants had asked and answered that they volunteered in the survey, we garnered 249 examples. Examples (edited for spelling) ranged from silly (“Why are men so stupid?”) to complex (“Point and shoot camera just died — need to replace it today for vacation tomorrow. Tell me what to buy/not buy. Think under $200.”). To better understand the process of asking a question through a status update, we examined the example questions for phrasing, types and topics, demographic impacts, and motivation for asking.

3.3.1.1 Question Phrasing

Questions were short. Although Twitter allows status updates to be up to 140 characters long, and Facebook up to 423, the example questions we collected had a mean length of only 75.1 characters (13.8 words). Most questions (71.9%) were a single sentence (mean 1.4 sentences), and any additional sentences were used to help provide context and explain motivation for posting. For example, one participant asked, “I’m creating tweetcloud t-shirts for an event. Does anyone have a company I can send the clouds to and have t-shirts made (not copy print iron-ons)?” We found the inclusion of a motivating sentence interesting — it takes up
space that may be valuable — and explored its effects in the next section.

The vast majority (81.5%) were explicit questions with a question mark (i.e. “Should I replace my Blackberry with an iPhone, or just upgrade my Blackberry?”), though the remainder were statements and ended with a period. These often took the form of “I wonder” or “I need” statements, like “I need a recommendation on a good all purpose pair of sandals, preferably one I can get through Zappos.”

Some (20.9%) of the questions used the phrase “anyone” (or “someone,” “somebody,” or “anybody”) to direct their question to their entire social network (“Anyone know of a good Windows 6 mobile phone that won’t break the bank?”), though the vast majority didn’t direct their questions at all (“How can I type Akan symbols online?”). Some askers scoped their question even more specifically, directing it to a specific group of friends. Some were expertise-based: “Developer? Take the survey http://[url].” Others were location-based, like “Hey Seattle tweeps: Feel like karaoke on the Eastside tonight?”, or asking about local traffic information.

### 3.3.1.2 Question Types

We also looked at the types of questions people asked of their social networks. By type we seek to differentiate these from topics. Table 2 shows the categories and prevalence of the different question types observed. The table also illustrates each type using an example from the data.

<table>
<thead>
<tr>
<th>Question Type</th>
<th>Percent</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommendation</td>
<td>29%</td>
<td>Building a new playlist any ideas for good running songs?</td>
</tr>
<tr>
<td>Opinion</td>
<td>22%</td>
<td>I am wondering if I should buy the Kitchen-Aid ice cream maker?</td>
</tr>
<tr>
<td>Factual knowledge</td>
<td>17%</td>
<td>Anyone know a way to put Excel charts into LaTeX?</td>
</tr>
<tr>
<td>Rhetorical</td>
<td>14%</td>
<td>Is there anything in life you’re afraid you won’t achieve?</td>
</tr>
<tr>
<td>Invitation</td>
<td>9%</td>
<td>Who wants to go to Navya Lounge this evening?</td>
</tr>
<tr>
<td>Favor</td>
<td>4%</td>
<td>Needing a babysitter in a big way tonight... anyone?</td>
</tr>
<tr>
<td>Social connection</td>
<td>3%</td>
<td>I am hiring in my team. Do you know anyone who would be interested?</td>
</tr>
<tr>
<td>Offer</td>
<td>1%</td>
<td>4 jeans?</td>
</tr>
</tbody>
</table>

Table 2. Breakdown of question types for the 249 example questions survey respondents had asked their networks.

<table>
<thead>
<tr>
<th>Question Topic</th>
<th>Percent</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>29%</td>
<td>Anyone know if WuW works on Windows ??</td>
</tr>
<tr>
<td>Entertainment</td>
<td>17%</td>
<td>Was seeing Up in the theater worth the money?</td>
</tr>
<tr>
<td>Home &amp; Family</td>
<td>12%</td>
<td>So what’s the going rate for the tooth fairy?</td>
</tr>
<tr>
<td>Professional</td>
<td>11%</td>
<td>Which university is better for Masters? Cornell or Georgia Tech?</td>
</tr>
<tr>
<td>Places</td>
<td>8%</td>
<td>Planning a trip to Whistler in the off-season. Recommendation on sites to see?</td>
</tr>
<tr>
<td>Restaurants</td>
<td>6%</td>
<td>Hanging in Ballard tonight. Dinner roy?</td>
</tr>
<tr>
<td>Current events</td>
<td>5%</td>
<td>What is your opinion on the recent proposition that was passed in California?</td>
</tr>
<tr>
<td>Shopping</td>
<td>5%</td>
<td>What’s a good Mother’s Day gift?</td>
</tr>
<tr>
<td>Philosophy</td>
<td>2%</td>
<td>live?</td>
</tr>
</tbody>
</table>

Table 3. Breakdown of question topics for the 249 example questions survey respondents had asked their networks. An additional 4% fell into the “Miscellaneous” category.
The two most common question types, recommendation and opinion questions, both ask for subjective information; an opinion question asks for a rating of a specific item, while a recommendation question is an open-ended request for suggestions. That these were the most common types points to the utility of social network questions for subjective information. Factual knowledge questions, on the other hand, have objective answers; in many cases these are the questions that might be directed to search engines. Rhetorical questions correspond to the “conversational” category noted in Harper et al’s study of Q&A sites [19]; these are primarily aimed at prompting discussion and social grooming. We choose to include them here because, while a portion of these rhetorical questions maybe truly rhetorical and not looking for responses, an additional portion are geared toward starting discussion, or seeming rhetorical while still seeking information (i.e. rhetorical questions about weather could be both rhetorical, complaining or social, and looking for information). Invitations ask others to join in an event, favors request services from others, offers ask whether others are interested in receiving an object or service, and social connection questions ask to be introduced to people having specific characteristics. While these last three categories may be considered questions about one’s social network, rather than questions directed toward one’s social network, we choose to include them because there are online components for each, from friend finding sites to online dating sites for finding people to engage in specific activities, to Craigslist.com for favors and offers. Further refinement of these categories is outside the scope of this work.

3.3.1.3 Question Topics

In addition to looking at the question types, we also looked at question topics — what the question was about. Table 3 summarizes the different topics we found and how often they occurred in our corpus, along with an example from our data.

Technology questions were the most popular, possibly because of our Microsoft-based participant pool, and include those on computer hardware, software, programming, social media, mobile phones, cameras, and cars. We hypothesize that the population of all SNS users will mirror this popularity, though to a lesser extent. Entertainment questions were also popular, and include questions about movies, TV, the arts, books, sports, and music. Home & Family questions include those on children, pets, health, cooking, gardening, and real estate. Professional questions are about jobs, education, and events such as professional conferences. Places
includes questions about travel and about local transportation. Restaurants include questions about dining out at restaurants, cafes, and bars. Current events refers to questions about the news as well as questions about ongoing phenomena (e.g., "Anyone else notice that bit.ly seems to be acting up today, slow to load, stats seem wildly off?"). The shopping category includes non-technology-related shopping questions, such as those about fashion, gifts, or services. The ethics & philosophy category includes musings on philosophical or moral issues.

This is a different distribution from that of search engines — the 2004 study of America Online's query logs [4] found that the most popular query topics were shopping (13%), entertainment (13%), pornography (10%), computing (9%), health (5%), travel (5%), games (5%), and home (5%). Pornography and health were not popular in our study, and in fact, participants indicated that they would avoid asking such questions of their friends, as they were deemed too personal. Similarly personal topics were religion, politics, dating, and financial issues.

3.3.1.4 Who Asked Which Questions

We looked at characteristics of the person asking each question (for the questions shared that were asked by the participant, not answered by them), specifically the asker's demographics and social network use, and related these to the types and topics of questions they asked. These results are in Table 4.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age</th>
<th>Network used</th>
<th>Frequency of use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>18-25</td>
</tr>
<tr>
<td>Count</td>
<td>157</td>
<td>77</td>
<td>51</td>
</tr>
<tr>
<td>Opinion</td>
<td>23.6%</td>
<td>22.1%</td>
<td>21.6%</td>
</tr>
<tr>
<td></td>
<td>17.8%</td>
<td>19.5%</td>
<td>19.6%</td>
</tr>
<tr>
<td></td>
<td>10.8%</td>
<td>10.4%</td>
<td>23.5%</td>
</tr>
<tr>
<td></td>
<td>35.0%</td>
<td>22.2%</td>
<td>33.3%</td>
</tr>
<tr>
<td></td>
<td>17.8%</td>
<td>19.5%</td>
<td>19.6%</td>
</tr>
<tr>
<td></td>
<td>8.3%</td>
<td>19.5%</td>
<td>7.8%</td>
</tr>
<tr>
<td></td>
<td>10.8%</td>
<td>9.1%</td>
<td>7.8%</td>
</tr>
<tr>
<td></td>
<td>8.9%</td>
<td>5.2%</td>
<td>15.7%</td>
</tr>
<tr>
<td></td>
<td>5.7%</td>
<td>7.8%</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>6.4%</td>
<td>2.6%</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>3.2%</td>
<td>7.8%</td>
<td>5.9%</td>
</tr>
</tbody>
</table>

Table 4. Breakdown of question topics and types by demographics. We exclude the favor, social connections, and offer question types and the ethics question topic from this chart, since those categories represented only a small fraction of questions. Shading indicates that prevalence of a topic/type differed significantly for the given demographic category (p < .05).

3.3.1.5 Demographics
Gender did not play a significant part in types of questions asked, though it did in topics — men asked a higher proportion of technology-oriented questions ($\chi^2 = -20, p = .044$), and women asked more home & family questions ($\chi^2 = -2.5, p = .013$). More specific information, like which gender asked more questions, is unknown from this study due to the study mechanics; these questions were submitted voluntarily by participants (one each) and form the basis of this part of the study. This could result in frequent question askers being underrepresented.

Age related to the types, though not topics, of questions people asked. Younger participants were more likely to ask invitation questions than the older age groups ($\chi^2(3, N=230)=13.4, p=.004$). In contrast, younger participants were less likely to seek recommendations than their older counterparts ($\chi^2(3, N=230)=9.7, p=.021$).

### 3.3.1.6 Social Network Use

We also investigated whether the specific service (Facebook or Twitter) used influenced question properties. Users asked a much higher proportion of technology questions on Twitter ($\chi^2 = -5.9, p < .001$). On Facebook, users were more likely to ask questions about home & family ($\chi^2 = -3.2, p = .001$) and about entertainment ($\chi^2 = -2.8, p = .006$). It is unclear if this was a sampling bias - for instance, perhaps the more technologically savvy amongst our population were primarily Twitter users — or if these are affordances of the different networks.

We also looked at frequency of posting and how that correlated with question asking behaviors. Participants self-reported how often they updated their status; we separated participants into those who updated once per week or more, and those who updated their status less often than once per week. The latter group, infrequent users, were more likely to ask questions related to rare events or special occurrences, such as travel ($\chi^2 = -1.8, p = .059$), and health ($\chi^2 = -3.8, p < .001$), than were their more frequently posting counterparts. The greater incidence of health questions may be due to infrequent users having different understandings of the norms and etiquette on such systems.

### 3.3.1.7 Motivation for Asking

For participants who reported asking a question in their status, a follow-up question asked what their motivations had been for asking their social network rather than (or in addition to) using a search engine. Table 5 shows common themes in the reasons people gave, and responses exemplifying each.
The most common theme was trust — participants trusted the responses from their friends more than results from a search engine. Participants also felt that subjective questions, such as opinion or recommendation questions, were better served by their friends. We were surprised to learn that many participants thought search would not work for their question, even if they hadn't tried. For example, 3.7% of responses suggested that search engines would not be able to find up-to-date information on current events. A small number of participants turned to their social network after search engines had failed them.

Participants also liked to ask their friends because they were a specific audience that shared relevant knowledge,
even context about the participant, and participants also enjoyed being able to connect socially while still asking a question. For some participants, their network seemed to bring them better answer speed or quality than searching on a search engine, though not all participants agreed that it would be faster. In some cases, questions were asked of their network because they were non-urgent and so any additional latency was acceptable. This contrast in perceived speed of answers and lack of speed of answers is partially a result of self-reported answers. We investigate the speed of answers more fully in section five.

The low cost of posting a status update also meant that participants posted questions because they were easy, fun, and harmless.

While some of these motivations could apply to Q&A sites, the more traditional way to ask questions online, the biggest difference seems to be trust. Participants reported that they trust people in their network to help them answer questions (median = 4) significantly more so than they trust people on the internet that they do not know to answer questions (median = 3) (τ = -8.82, p < .001).

3.3.2 The Questions that Got Answered

Participants shared with us their subjective experience with the speed and utility of the replies they received to their question. They also shared when they did and did not choose to answer others’ questions. Many participants reported having answered questions. Three-quarters (73.4%) had seen a question posted as a status message by a friend; of those, nearly all (93.4%) said they had answered such a question on at least one occasion. We first discuss the speed and usefulness of answers to questions, and then motivations for answering questions.

3.3.2.1 Answer Speed and Utility

All but 6.5% of questions shared via the survey received an answer. (Participants might have biased questions that they shared toward those that received responses.) Overall, the 93.5% who received a response reported that their questions were answered promptly; 24.3% received a response in 30 minutes or less, 42.8% in one hour or less, and 90.1% within one day. Some of the reported time results may be over- or under-exaggerated due to self report; we address timing more in sections four and five. We do not have data on how frequently participants checked their SNS, only updated; frequency of visits may have resulted in distorted time perception, though many SNSs, like Facebook, provide notifications for comments to updates. Participants seemed to expect faster response times than reality: a third (31%) expected a response within
15 minutes or less, but only 15.7% received one that quickly; 62.5% expected a response within one hour, but only 39.8% got one. Expectations and reality approached each other at the one day mark, with 88.9% of participants expecting a response within a day or less and 83.9% receiving one. Despite the discrepancy between expected and reported answer speed, getting a response within one day seemed acceptable to most people, with 89.3% reporting they were satisfied with the response time they experienced.

Participants seemed happy with the quality and usefulness of their responses. 69.3% of participants who received responses reported they found the responses helpful, while 30.7% reported receiving unhelpful responses.

We considered the effects of phrasing and question type and topic, covered earlier, on the usefulness of responses. We found that shorter questions got more useful responses ($r = -0.13$), though the length of the question had no effect on speed. It may be that multi-sentence questions appear more similar to a “regular” status update and less like an actual question. The use of punctuation (phrasing as a question or as “I wonder” etc) and scoping terms (asking “anyone”) did not have a significant effect on reported response speed or usefulness.

Question type also influenced response utility, with rhetorical questions receiving a far smaller share of all helpful responses (5.6%) than of non-helpful ones (30.1%) ($\chi^2 = -5.0, p < .001$); the nature of rhetorical questions means that a low percentage of helpful responses is not a surprise, though the fact that participants rated some of the responses they received as helpful points to the potential for information seeking behavior in this type of question. Response times seemed to have some correlation with different types of questions ($\chi^2(7, N=234)=14.8, p=.039$); the question types receiving the fastest responses were requests for factual knowledge, recommendations, and opinions, with 19.6%, 40.0%, and 22.7% of responses received within one hour or less, respectively, as compared to the average one hour response rate of 12.5%. Question topic did not influence response time or utility.

We also looked at demographic traits of the asker to see if they were correlated with answer speed and usefulness. Gender and age did not have any significant effect. We also looked at the frequency of updates and the service used: there was no reported difference between Facebook and Twitter, but those who updated their status frequently received faster responses ($\chi^2 = -2.1, p = .033$). Approximately 87% of frequent updaters reported receiving responses in one day or less, while only 64.5% of infrequent updaters received responses within one day.
Table 6. Reported motivations for answering questions seen in network members’ status messages (out of 408 responses).
Some responses fell into multiple categories.

<table>
<thead>
<tr>
<th>Motivation</th>
<th>Percent</th>
<th>Example Survey Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altruism</td>
<td>37.0%</td>
<td>- Just trying to be helpful.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Being friendly.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Social goodness.</td>
</tr>
<tr>
<td>Expertise</td>
<td>31.9%</td>
<td>- If I’m an expert in the area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- [all depends on] my knowledge of the subject that the question refers to.</td>
</tr>
<tr>
<td>Properties of question</td>
<td>15.4%</td>
<td>- Interest in the topic.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- [all depends on] it is ... time sensitive.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Is it directed at me?</td>
</tr>
<tr>
<td>Nature of relationship</td>
<td>13.7%</td>
<td>- If I know and like the person.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- If I know the person well</td>
</tr>
<tr>
<td>Connect socially</td>
<td>13.5%</td>
<td>- Connect with others.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Keeps my network alive.</td>
</tr>
<tr>
<td>Free time</td>
<td>12.3%</td>
<td>- Boredom/procrastination.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- It’s fun to answer.</td>
</tr>
<tr>
<td>Social capital</td>
<td>10.5%</td>
<td>- Favor marketplace.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- It creates social currency.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- I will get help when I need it myself.</td>
</tr>
<tr>
<td>Obligation</td>
<td>5.4%</td>
<td>- A tit-for-tat.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- It’s part of being in a community of trusted people.</td>
</tr>
<tr>
<td>Humor</td>
<td>3.7%</td>
<td>- Thinking I might have a witty response.</td>
</tr>
<tr>
<td>Ego</td>
<td>3.4%</td>
<td>- Wish to seem knowledgeable.</td>
</tr>
</tbody>
</table>

3.3.2.2 Motivation for Answering (and Not Answering)

For participants who reported answering a friend’s question, we asked a follow-up question about their motivation, to which we received 408 responses. Table 6 shows our categorization of motivations, how often we saw that motivation, and an example response.

The most common motivation was altruism, followed by expertise, where participants felt that they had knowledge that would benefit the asker. Properties of the question, like how interesting, urgent, and to whom the question was directed, also played a part. Some participants felt more inclined to answer the questions of close friends, while others used question answering to rekindle old friendships, maintain current ones, and create new ones. We discuss the strength of friendships’ effects on question answering more fully in section six.

Some people answered because they had free time, and the question was quick to answer, or answering entertained them. Others hoped that the social capital they gained would result in answers for their own
questions later — others answered because they felt obligated since one of their friends had answered a question in the past.

Many (224) participants reported why they hadn’t or wouldn’t answer a friend’s status question. Not surprisingly, the bulk simply didn’t know the answer (42.0%), and didn’t want to guess incorrectly in the public space of a social network. One respondent commented, “I don’t feel like I know enough and [am] afraid to be wrong in public,” and another noted, “[I] don’t want to be on record as an expert in anything I’m not.”

Many topics of questions were deemed too private and went unanswered (24.1%), though some participants indicated that they might respond privately to such inquiries rather than responding within the social networking tool (“Not in a public setting. I might send an individual response in email.”). (Note that some participants were asked about questions in a hypothetical situation, hence suggesting that this participant ‘might’ send an email.)

The most common topics considered too private were religion (“I don’t like talking religion with those outside my circle”), politics (“questions which might be sensitive (like political opinions”), sex and dating (“I’m not comfortable publicly answering sexual questions in a public forum.”), personal details about friends or family (“[questions requiring] details on my children that I may not want in a public forum”), money (“requests for cash”), and health (“if you want a health opinion, visit your doctor”).

Some participants preferred personal requests for communication rather than those directed broadly at the whole network (“I would rather be asked directly,” and, “My lack of response is motivated by the impersonal nature of the questions.”).

3.4 Discussion

In this section, we’ve presented detailed data from a survey of 624 Facebook and Twitter users on the topic of asking and answering questions in status updates on SNSs. We’ve gained insight into motivations for these behaviors but it should be noted that this population may not be representative and all the data is self-report. Future work in more objective sampling would be beneficial to the community. In this section we will reflect on the tradeoffs between this behavior and more traditional tools, like search engines and Q&A sites, and discuss implications for design based on our findings.
3.4.1 Tradeoffs of Social Networks, Search Engines, and Q&A

Search engines and Q&A sites are arguably the best well known, though not the only, sites designed to help people satisfy their information needs. Our survey found that social network-based status updates should perhaps be added to this list, even though their original intent was to foster social connectedness and awareness rather than information-seeking.

Our data suggests that there are some significant differences between information seeking using traditional online sources (search engines and Q&A sites) and information seeking through status update questions on a social network:

*Type of Information Need:* Social networks seem to be very well suited for subjective information needs, especially for opinion and recommendation questions. Social networks are not, however, a good choice for questions on private topics, such as health, dating, religion, and finance. The lack of anonymity on sites like Twitter and Facebook is balanced by (optionally) total anonymity on many Q&A sites, which may be more attractive for subjective questions on highly personal topics. Search engines are, of course, well suited to provide objective answers on topics both personal and impersonal, as well as factual: though many participants used their SNS questions to address subjective information, some asked factual questions, perhaps signaling a need not met by search engine use alone.

*Trust:* Social networks provide names and faces to those answering questions. In many cases they are part of real-life networks that provide accountability and lend a level of trust to answers that the greater internet simply cannot provide. Q&A sites and sites ranked by search engines can provide some reviews and recommendations, but still lack the trustworthiness of friends.

*Response Time:* Search engines measure response times in fractions of seconds, though these are responses to queries, not necessarily questions, and may need rewording or additional effort to find specific answers. Responses on social networks were often received within less than an hour of posting (40% in our sample), and nearly all questions received responses within one day. Response times and rates reported by our survey participants were comparable to or faster than those reported for Q&A sites (e.g., [23,54]). When information needs are not urgent, or when searching is difficult or fails, participants will wait a few minutes or hours for an answer. Simple modifications to questions, like requesting subjective answers in a short question, can increase the speed of responses.

*Effort:* SNS status queries are easily written in natural language, as opposed to finding optimal queries for search engines, and the purposefully low barrier to entry of status updates means that asking one's social network is very easy. Questions are kept short by character limits, whereas the longer messages offered by Q&A sites suggest they are appropriate for more intricate questions. There's also less effort needed to
evaluate answers from friends when compared to hundreds of thousands of search results returned, which was particularly appealing to our respondents.

**Personalization:** While there are search personalization algorithms (e.g., [44]), these cannot yet achieve the same degree of personalization as a close friend. Q&A sites similarly require any context to be added in the question, increasing effort and still not matching the knowledge friends might have about a person. Respondents appreciated that members of their network knew a great deal about their backgrounds and preferences, and were thus able to provide answers tailored based on this context.

**Secondary Benefits:** Asking questions through status updates on a social network provided not just information, but also entertainment and social benefits. Search engines are, by nature, impersonal (note that this is a strength when it comes to personal questions), and Q&A sites lack the deep exchange of social capital that happens in sites specifically designed for social networking.

### 3.5 Implications for Design of Search Engines

While some of the benefits of using a social network for asking questions cannot be translated into design of search engines and Q&A sites, others can. For certain question types, notably recommendations or opinions, on impersonal topics such as dining, travel, shopping, and entertainment, it may be beneficial for search engines to return not only traditional results, but also results from a question asked of the user’s social network, if the user is engaged in a long search session. A search engine could search profiles and status updates for keywords to suggest knowledgeable friends, similar to Bernstein et al.’s Collabio system [5], or even simply imply that one’s network may have useful information in it.

Search engines could also post well-formed status updates for users, and integrate any responses received through the social network into the search results as they arrive. This would be particularly appropriate for answers that were received quickly, in the minutes one is searching for a topic, or for long search sessions on one topic. Further study would be needed to validate these approaches.

Some of the utility of asking one’s network factual questions came from the fact that responses were hand-selected by friends. This process, of letting friends select results, mirrors the “Instant Answer” features on many search engines (i.e., typing a query such as “Atlanta weather” into many search engines returns a local weather forecast, rather than a set of hyperlinked results). Our findings suggest that it may benefit search engines to expand the range of question types for which instant answers are offered.

Previous work in personalized search algorithms and our data suggests that there is a great need for more
context in search engine use — personalized search could integrate social information in an attempt to mirror the context latent in one's social graph.

The entertainment provided by social networks may be difficult to translate to a design change for search engines, though previous work on collaboration during searches (e.g., [37]) may indicate a way to incorporate those social features into a search engine environment, turning a mundane experience into one that provides both intellectual and social benefits.
4. Field Study in Question Properties

In this section we discuss a study addressing what gets a SNS status question answered. In the previous section, we discovered that participants had phrased questions in specific ways (addressing “anyone”) and found that things like age affected the questions people asked and answered. One of the great values of search engines is that they are almost guaranteed to return a result for a given question; we wondered if there were different properties of questions that would be more likely to return results. To find out, we chose a number of variants and had participants post one of the variants as their status message, and then looked at the results. Content in this section is currently under submission at ICWSM [51].

4.1 Study Design

We performed a field study where we asked 282 people to post a variant of the question, “Should I watch E.T.?” as their Facebook status message. We chose to have people ask for opinions about the popular science fiction film E.T. (Universal Studios, 1982) for several reasons. Our prior work (see previous section) found opinion questions to be a popular type of question asked of social networks, and entertainment to be a popular question topic. This film was chosen for its popularity globally and across age groups and its innocuous nature, so the question would seem natural when posed by participants from a variety of backgrounds. However, although the question we studied is of a common type and topic, it is unknown how results will generalize to other types and topics.

For the study, participants were sent a calendar appointment with the specific question they were to ask and the instructions for the study: post it verbatim as their Facebook status at the time specified by the appointment. We used only Facebook for several reasons: we did not want to confound the study by using multiple services, Facebook is the most popular social networking tool [Arrington 2009], and comments are more structured than other sites like Twitter. Participants were asked to not reveal that the update was not genuine, to not comment on their status or on any of the responses, and to not update their status for at least 24 hours after posting the question.

Three days after posting the question, we asked participants to send a screenshot from Facebook containing the text of the replies they received (e.g., Figure 1), and to complete a short series of questions about their
social network and demographics.

Taking it easy, I wonder if anyone thinks I should watch E.T. 

- Definitely. Definitely E.T. It's not the 'Entertainment Tonight' one. 
- Defined as long it's not the 'special edition' where Spielberg digitally replaced all the guns with walkie talkies. 
- Agree: Balls to the special edition. 
- Taking it easy. Taking it easy. Taking it easy. 
- Taking it easy. I just like saying that. 

Write a comment...

Figure 1. Participants captured screenshots from Facebook to record the responses received.

4.2 Study Conditions

Questions varied across five dimensions: whether or not the question was an actual question (as opposed to "I wonder...")), if any context was added, to whom the question was directed, the time of day the question was posed, and the properties of the asker, as detailed in Table 1.

<table>
<thead>
<tr>
<th>Punctuation</th>
<th>Context</th>
<th>Scoping</th>
<th>Example</th>
<th>Number posted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question</td>
<td>None</td>
<td>None</td>
<td>Should I watch E.T.?</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Anyone</td>
<td>None</td>
<td>Does anyone think I should watch E.T.?</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Movie buff</td>
<td>None</td>
<td>Do my movie buff friends think I should watch E.T.?</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Provided</td>
<td>None</td>
<td>Taking it easy. Should I watch E.T.?</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Anyone</td>
<td>Taking it easy</td>
<td>Does anyone think I should watch E.T.?</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Movie buff</td>
<td>Taking it easy.</td>
<td>Do my movie buff friends think I should watch E.T.?</td>
<td>20</td>
</tr>
<tr>
<td>Statement</td>
<td>None</td>
<td>None</td>
<td>I wonder if I should watch E.T.</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Anyone</td>
<td>None</td>
<td>I wonder if anyone thinks I should watch E.T.</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Movie buff</td>
<td>None</td>
<td>I wonder if my movie buff friends think I should watch E.T.</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>Provided</td>
<td>None</td>
<td>Taking it easy. I wonder if I should watch E.T.</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Anyone</td>
<td>Taking it easy</td>
<td>I wonder if anyone thinks I should watch E.T.</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Movie buff</td>
<td>Taking it easy.</td>
<td>I wonder if my movie buff friends think I should watch E.T.</td>
<td>22</td>
</tr>
</tbody>
</table>

Table 1. The different question phrasings studied, and the number of participants who posted each.

4.2.1 Phrasing

Three of our dimensions were phrasing-related: question/punctuation, context, and scoping. These were
chosen based on work detailed in the previous section — these three ways were ways in which we observed questions varying. Questions were phrased either as a question with a question mark, or as a statement (ending with a period). We hypothesized that statuses that were clearly questions would be more likely to be answered. Half of the questions were given the added context of “Taking it easy” to provide additional information to the asker’s friends. Our previous work indicated that longer statuses were less successful, and we hypothesized that that would play out here as well — we also hypothesized that the contextual sentence, while providing information to the answerer, could also disguise it as a normal status instead of a question, similarly to the punctuation. Questions were scoped in three different ways — not at all, as in the base question, scoped to ‘anyone’, a common variant in previous work, and to ‘my movie buff friends’. We hypothesized that the more specific questions were scoped (movie buffs being the most specific) the more successful they would be, by reminding users of the unique contributions they could bring to bear on the question [Karau & Williams 1993, Beenan et al. [3]]. While some participants might have more friends that fall into the ‘movie buff’ category, the participants who asked that variant were equally spread amongst the population and so this variance should not be a detriment to our study.

Each variant of phrasing was posted by between 18 and 27 participants (some neglected to complete the study, though this did not have any correlation with their assigned question; all analysis is based on completed participation of 282 participants). We attempted to balance gender across conditions, and each overarching difference had a total of 89 to 153 participants. For example, each question can be phrased as a question or as a statement regardless of how it is scoped; 143 participants posted the question phrased as a question, and 139 participants posted the question phrased as a statement. Table 1 has a summary of the total number of participants in each condition.

4.2.2 Time of Day

We also explored two different times of day for question posting. Participants were separated into morning (7-10 am) or afternoon (4-7pm) conditions (we did not include nighttime as many participants were posting from their offices at work). All but three participants were in the continental US and so the time periods were non-overlapping. Homophily and self-reported estimation implied that most participants’ networks were in the same time zone as the participant. 50.0% estimated that most or all of their network lived in the same time zone as they did, and each condition was affected equally. 138 participants posted the question in the morning, and 143 posted it in the afternoon.

4.2.3 Properties of the Asker
We also considered the various demographic properties of participants in this study. All participants were Microsoft employees with Facebook accounts, recruited via an email to lists related to social networking or college-aged interns, but participants varied in gender, age, and social network use. Ninety seven (34.4%) of the participants were female. The median age was 34. This is similar to our prior work, and some participants were recruited because they had participated in the previous study. We considered network size (median 215, again slightly higher than the site average), length of time on Facebook (84.4% had had accounts for over a year), update frequency, and whether or not the participant had asked a question before. Some of the participants had overlapping networks, and a few responses indicated that they had seen a similar question, but these participants were equally distributed in the study and so are unlikely to impact results.

4.3 Response

4.3.1 Metrics

We first compare quantity, quality, and speed of responses as a function of each different condition of the experiment.

4.3.1.1 Quantity

This measure relates to the number of responses received. We considered how many responses were received per condition (percent with response), and, given any responses, how many responses were received (number of responses).

4.3.1.2 Quality

Our measures of response quality were hand coded by the experimenters — did the question receive a direct answer (e.g., “YESSS! One of my favorite movies of ALL time,” or, “Soooo boring. I vote no.”), and did the question receive useful information, like facts about the movie (“Would you miss Drew Barrymore’s first time in a movie??”), opinions (“ET Rocks!”), and suggestions of alternative films (“I’d suggest Weird Science instead!”). For this yes or no question, answers that contained “yes” or “no” were considered direct answers; the fact, opinion, and suggestion answers, like those above, were considered useful, though not direct answers. Coding was done using a grounded theory approach (Glaswer & Strauss, 1977): we performed a two-phase process that involved a first pass through all of the responses to develop a coding scheme of answer types, followed by a second pass to label each response. The percent of questions that received direct answers are referred to as “percent answered”, and the percent that received responses containing useful information are “percent useful”. Response length is another potential indicator of quality. Longer responses
can contain more information, and previous research [19] shows response length is an indicator of response quality on Q&A sites. Another metric of quality is therefore “response length,” given a response occurring. We include this metric to reinforce our hand-coded quality assessment.

4.3.1.3 Speed
Given that a response was received, we calculated the average time to receive a first response.

4.3.2 Statistical Tests
Significance between variants for a particular dimension is calculated using two-tailed, independent samples t-tests. ANOVA tests were performed first for dimensions having more than two variants, and significance for these cases is reported only when both the ANOVA and the follow-up t-tests were significant.

4.4 Results
We will first overview the behavior we observed, and then discuss the effect of different study conditions on responses received.

4.4.1 Overview
There were 282 questions posted, and a total of 744 responses. We summarize these in Table 2.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Quality</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>Percent with response</td>
<td>Number of responses</td>
</tr>
<tr>
<td>Overall</td>
<td>282</td>
<td>82.3%</td>
</tr>
</tbody>
</table>

Table 2. The average quantity, quality, and speed of the responses our 282 participants’ questions received.

4.4.1.1 Response Quantity
82.3% of questions posted received responses. For those with responses, an average 3.207 responses (median 3, max 11) were received. Figure 2 shows the distribution.
4.4.1.2 Response Quality

Responses were, on average, 55.7 characters long. 46.5% of answers directly answered the question (as coded by the experimenters). 69.0% provided useful information (including an answer; 22.5% were useful without answering the question). A number of questions received some useful answers and some purely social responses. On average, 72.0% of the questions had at least one useful response. In some cases, answers asked for clarification ("The movie or the entertainment show [Entertainment Tonight]? I will reserve my judgment until you answer.")

In some cases, the question prompted a conversation between commenters, and 10.7% of follow-up responses (second and subsequent comments) referred to a previous response. Examination of responses indicates that many subsequent responders are influenced by earlier responders even when that influence is not overt; similar jokes and similar wording patterns are repeated in responses (e.g., everyone phrases their response as, “You should,” instead of “Yes,” or everyone expresses opinions about Drew Barrymore’s role without directly referring to the previous responder’s comments).

Of the non useful responses (responses that were not direct answers or pertinent information), 8.5% were jokes, and 24.6% were social comments inspired by the topic of the question. There were also responses that were not related to the question at all (e.g., “Missing you at MGX!!”).

4.4.1.3 Response Speed

The mean time to a first response (if one was received) was 1 hour and 27 minutes after the question was posted, and the last response arrived on average 3 hours and 34 minutes after. The time to response is heavy-tailed and appears to follow a power-law distribution. The median time to first response was 22 minutes —
this is consistent with what is reported in the previous section. Half of all responses occurred in the first hour and 25 minutes after the question was posted. Participants who received their first response quickly were got more responses in total. Figure 3 shows the number of responses received compared with the time to the first response.

Facebook’s user interface and News Feed algorithm influenced these numbers in a way that we cannot control for: newer and more popular updates are placed higher and more accessible on the home page, and so as time elapses, status updates are less likely to be viewed.

4.4.2 How Who Asked Affected Responses

We considered traits of the asker, such as demographics and social network stats, to see if those influenced answers. The biggest predictors of response quality, quantity, and speed were social, especially the number and types of friends a person has.

In this analysis we look at how correlated different features were with measures of response success. The correlation coefficients for a representative quantity (number of responses), quality (percent answered), and speed (time to first reply) measure are shown in Table 3. When features seemed promising, or particular correlations, we grouped similar participants and compared the average quantity, quality, and speed of response for the group. These results are in Table 4.
<table>
<thead>
<tr>
<th>Asker</th>
<th>Gender</th>
<th>Quantity</th>
<th>Quality</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counts</td>
<td>Count</td>
<td>Percent with response</td>
<td>Number of responses</td>
<td>Percent answered</td>
</tr>
<tr>
<td>Male</td>
<td>185</td>
<td>80.0%</td>
<td>3.115</td>
<td>56.8%</td>
</tr>
<tr>
<td>Female</td>
<td>97</td>
<td>86.6%</td>
<td>3.369</td>
<td>62.9%</td>
</tr>
<tr>
<td>Age ≤ 35</td>
<td>150</td>
<td>83.3%</td>
<td>3.384</td>
<td>62.7%</td>
</tr>
<tr>
<td>Age &gt; 35</td>
<td>132</td>
<td>81.1%</td>
<td>3.000</td>
<td>54.5%</td>
</tr>
<tr>
<td>Number of friends ≤ 200</td>
<td>133</td>
<td>75.2%*</td>
<td>2.600*</td>
<td>50.4%*</td>
</tr>
<tr>
<td>Number of friends &gt; 200</td>
<td>148</td>
<td>88.6%*</td>
<td>3.667*</td>
<td>66.4%*</td>
</tr>
<tr>
<td>Time on network ≤ 1 year</td>
<td>44</td>
<td>79.5%</td>
<td>2.914</td>
<td>43.2%</td>
</tr>
<tr>
<td>Time on network &gt; 1 year</td>
<td>238</td>
<td>82.8%</td>
<td>3.259</td>
<td>61.8%</td>
</tr>
<tr>
<td>Update frequency ≤ weekly</td>
<td>191</td>
<td>83.4%</td>
<td>3.351</td>
<td>69.1%</td>
</tr>
<tr>
<td>Update frequency &gt; weekly</td>
<td>113</td>
<td>80.5%</td>
<td>2.736*</td>
<td>55.8%</td>
</tr>
<tr>
<td>Friends Few</td>
<td>185</td>
<td>80.1%</td>
<td>3.135</td>
<td>55.7%</td>
</tr>
<tr>
<td>Friends Lots</td>
<td>95</td>
<td>86.6%</td>
<td>3.333</td>
<td>84.9%</td>
</tr>
<tr>
<td>Family Few</td>
<td>59</td>
<td>83.1%</td>
<td>1.449</td>
<td>57.6%</td>
</tr>
<tr>
<td>Family Lots</td>
<td>222</td>
<td>82.0%</td>
<td>3.137</td>
<td>59.0%</td>
</tr>
<tr>
<td>Classmates Few</td>
<td>211</td>
<td>80.6%</td>
<td>3.041</td>
<td>56.4%</td>
</tr>
<tr>
<td>Classmates Lots</td>
<td>69</td>
<td>87.0%</td>
<td>3.667</td>
<td>65.2%</td>
</tr>
<tr>
<td>Work Few</td>
<td>236</td>
<td>83.5%</td>
<td>3.250</td>
<td>61.6%</td>
</tr>
<tr>
<td>Work Lots</td>
<td>45</td>
<td>75.6%</td>
<td>2.882</td>
<td>48.6%</td>
</tr>
<tr>
<td>Closeness of shot Close-up</td>
<td>85</td>
<td>88.2%</td>
<td>3.080</td>
<td>60.0%</td>
</tr>
<tr>
<td>Closeness of shot Long shot</td>
<td>95</td>
<td>75.8%</td>
<td>2.722</td>
<td>54.7%</td>
</tr>
<tr>
<td>Another person No</td>
<td>218</td>
<td>81.7%</td>
<td>2.926*</td>
<td>56.4%</td>
</tr>
<tr>
<td>Another person Yes</td>
<td>48</td>
<td>87.5%</td>
<td>4.310*</td>
<td>70.8%</td>
</tr>
</tbody>
</table>

Table 3. The quantity, quality, and speed of response according to features of the asker. Significant differences (p < .05) are bolded and (p < .01) are indicated with a *. Counts do not always sum to 282 because not all participants reported in all cases.

<table>
<thead>
<tr>
<th>Asker</th>
<th>Quantity</th>
<th>Quality</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics</td>
<td>Gender</td>
<td>0.055</td>
<td>0.059</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td>-0.114</td>
<td>-0.085</td>
</tr>
<tr>
<td>Social network use</td>
<td>Num. friends</td>
<td>0.224</td>
<td>0.122</td>
</tr>
<tr>
<td></td>
<td>Time on net.</td>
<td>0.056</td>
<td>0.137</td>
</tr>
<tr>
<td></td>
<td>Update freq.</td>
<td>-0.109</td>
<td>-0.033</td>
</tr>
<tr>
<td></td>
<td>Asked before</td>
<td>0.171</td>
<td>0.055</td>
</tr>
<tr>
<td>Social network makeup</td>
<td>Friends</td>
<td>0.041</td>
<td>0.049</td>
</tr>
<tr>
<td></td>
<td>Family</td>
<td>-0.001</td>
<td>0.038</td>
</tr>
<tr>
<td></td>
<td>Classmates</td>
<td>0.181</td>
<td>0.149</td>
</tr>
<tr>
<td></td>
<td>Work</td>
<td>0.038</td>
<td>0.035</td>
</tr>
<tr>
<td>Avatar</td>
<td>Closeness</td>
<td>-0.068</td>
<td>0.010</td>
</tr>
<tr>
<td></td>
<td>Another person</td>
<td>0.248</td>
<td>0.113</td>
</tr>
</tbody>
</table>

Table 4. Correlation coefficients for features of the asker with measures for response quantity, quality, and speed.
4.4.2.1 Demographics

Gender was correlated with response quality, quantity, and speed. Women got slightly more responses and slightly better responses, though at a slower speed. The average time to first response was 20 minutes slower for women than men. The only statistically significant difference we observed between the two groups was that women received a higher proportion of useful answers from their networks (79.4% v. 68.1%, p < .05). The difference in genders might signal different patterns in use of social networks for different genders — the principle of homophily, that people associate with similar people, suggests that women have more female networks, and men have more male networks, and that the same would extend to age groups and so on. To respect the privacy of friends of our participants, however, we did not collect demographic data on the participants who answered questions and so we cannot draw any conclusions about such phenomena.

Age was correlated with quantity, quality, and speed as well — the younger the participant, the more responses, higher quality, and faster responses were received, perhaps because of length of time on the social network and number of friends — Facebook was originally only for students. However, when separated into two age groups (over and under 36), none of these differences were statistically significant.

4.4.2.2 Social Network Use

The most active and consistent (many friends, long duration using Facebook, and frequent status updates) users were more successful in their answers along all metrics (quantity, quality, and time). The strongest correlation of the three was number of friends — participants with greater than 200 friends were much more likely to get responses than those with less (88.7% with many v. 75.0% with few friends). These participants also received more responses (3.67 v. 2.59) that were longer (211.6 chars v. 138.4) and got them in shorter time as well (52 minutes v. 2 hours and 16 minutes). All differences are significant (p<.01).

Quality was also significantly affected. Participants with more friends were more likely to get an answer (66.4% v. 50.4%, p < .01) or to receive useful information (79.9% v. 63.2%, p < .01). They also got more social responses — 46.7% of their responses included some social commentary, compared with only 35.7% of responses to people with fewer friends (p < .05). We hypothesize that this is because active users maintain their real-world friendships using online tools like Facebook. Social exchanges are necessary for this maintenance and that can extend to question asking as statuses very naturally.

4.4.3 How the Time of Day Affected Responses

Table 5 shows how time of day influenced responses. Our participants received significantly more responses in the afternoon, though morning responses were longer (61.2 characters long v. 49.8 characters long, p < .05),
and there was a trend towards having a somewhat higher proportion of their questions answered then. We hypothesize that, in our population and their networks, more users visit Facebook toward the end of the day, but the site may be more active in general at the time, leading to attention being shared across more content and less time given to providing a careful answer to a friend’s question.

<table>
<thead>
<tr>
<th>Time of day</th>
<th>Count</th>
<th>Quantity</th>
<th>Quality</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Percent with response</td>
<td>Number of responses</td>
<td>Percent answered</td>
</tr>
<tr>
<td>Morning</td>
<td>138</td>
<td>84.1%</td>
<td>2,802*</td>
<td>52.2%</td>
</tr>
<tr>
<td>Afternoon</td>
<td>143</td>
<td>80.4%</td>
<td>3,609*</td>
<td>65.0%</td>
</tr>
</tbody>
</table>

Table 5. The quantity, quality, and speed of response based on the time of day the question was asked. Significant differences (p < .05) are bolded and (p < .01) are indicated with a *. Time of day data is missing for one participant.

The question phrasing also affected our metrics. Table 6 summarizes this. Questions phrased explicitly as a question received better responses and a higher number of responses (88.1% v 76.3%, p < .01). We hypothesize that “I wonder” statements did not adequately signal an information need to friends of the participant. Some respondents found the phrasing awkward, mentioning the use of “wonder.” (“Why are you wondering about that now, almost 30 years later?”) Including context (“Taking it easy”) seems to have a similar effect to phrasing questions as a statement, in losing some typical question indicators. The differences in success metrics were all significant (p < .01, except of speed, which was p < .05). The questions with context received less direct answers as well: only 42.6% of questions with context received an answer, while 75.4% of the questions without it did. It is possible that some of the discrepancy comes from our choice of contextual sentence. Even though we intended for it to be neutral, some respondents found it unusual: there were references to the Eagles song, to demands that the person stop taking it easy (“what are you doing taking it easy? Get over here and work!”). None of the ten responders who commented on the presence of the phrase “Taking it easy” answered the actual opinion question. Part of this issue might have been the contrived idea of ‘taking it easy’ early in the morning for those participants as almost all of the participants who got a comment on the contextual sentence were in the morning condition, when it was expected the asker should be working rather than relaxing. Though this added context might not generalize at all, it’s possible that any added context provides a separate target for respondents to discuss, distracting from the question at hand. Although the responses received were equally likely to include useful information (68.4% of the questions with context included useful information, and 69.2% without context did), the particular useful information varied; when the question was posed with context people were more likely to get an alternative movie suggestion (13.4% v. 5.4%, p < .01), and questions without context were more likely to get a yes or no answer (49.3% v. 40.9%, p < .05). Context did, however, reduce requests for clarification. Only 33% of questions with context received responses requesting clarifications, as compared to 49.6% of questions.
4.4.4 Scoping

Interestingly, scoping made a very significant difference in responses received. The questions that were scoped received better responses. For example, asking “my movie buff friends” yielded significantly (p < .01) more replies, more useful information, and longer replies than questions that weren’t scoped (i.e. Should I watch E.T.?). Scoping questions to ‘anyone’ was not significantly less successful than to ‘movie buff friends’, and was more successful than no scoping. It’s possible that too explicit of scoping could be a detriment to friends who feel they are out of the scope of the question. However, in our study, we saw several responses who answered even though the didn’t feel that they qualified: “I don’t think I qualify to answer…but I would say you should.” One respondent even went as far as to ask someone else who did have the appropriate expertise. “Ron says ‘Yes, it’s a classic. It might seem dated, but it has lots of topical references and you get to see Drew Barrymore in her non-nude phase.’ (I don’t qualify to comment.)” Since ‘anyone’ was nearly as successful as more specific scoping, perhaps it is a safe choice.
5. Lab Study on Comparison to Search Engine Use

Many of the comparisons we made in our first survey were based on search engine use: to further examine this point, we conducted a lab study to compare social and non-social search for complex, self-motivated information seeking tasks. Our design for this study was to have participants ‘race’ their social network: for a given problem, participants would post a question to their social network, and then try to search (using a search engine) for the answer. When they had found the answer, they compared the results from their search to any results they received from their friends on Facebook. From this, we can begin to understand more fully where searching and question asking intersect, and where they can be combined to create systems that better help users with unmet information needs. This work appeared previously at ICWSM [39].

5.1 Study Design

For this study, we purposefully controlled things less than the previous field study. Twelve people (four female) participated. All were U.S.-based Microsoft employees, ranging in age from 23 to 42 years old (mean = 31.9). Five participants self-rated themselves as expert searchers, and seven as average. All participants were required to have at least 50 friends on Facebook, to ensure that their social network was sufficiently large to potentially provide answers to their questions. Network size ranged from 50 to 743 (mean = 260.3). All participants had been members of Facebook for at least a month, and nine were members for over a year. Two said they updated their status “rarely,” eight “a few times a week,” and two “daily.”
Participants were asked to come to the study with a clear information need in mind already — something that they had been meaning to research on their own. By using an open-ended, self-motivated task, we ensured participants would be engaged and would be able to judge the quality of responses they received. Search topics are shown in Table 1. After a pre-study questionnaire, participants posted a question, phrased by themselves, as their status and began searching, using their normal search patterns.

Participants completed the study when they felt satisfied with the information they had found. During the course of their searching behavior, we logged the queries they used and the URLs they visited with a browser plug-in. After they finished searching, they visited their Facebook account and took a screenshot of the content and timestamps of responses, and completed a questionnaire about any responses they received. We requested an updated list of comments from participants at a later date to capture any answers that came after the completion of the lab portion of the study.

5.2 Results

We present an overview of users’ searching and asking behaviors, and compare the results of the two approaches. All ratings used 5 point Likert scales, where 1 indicates a negative responses and 5 is a positive one. Wilcoxon tests were used to compare scores.

5.2.1 Searching

Participants completed their searches in 30.3 minutes on average. They issued 6.5 queries and visited 35.4
pages from 12.3 distinct, non-search sites (again, on average).

5.2.2 Asking
Immediately after they had finished searching, participants received an average of 1.4 responses, and a maximum of 5. Five of the twelve received no responses at all. As with previous work, the number of responses was strongly positively correlated with network size ($r = 0.78$), and was also correlated with time of day, with more responses likely in the afternoon ($r = .30$). Followup data, from three days after the study, included an additional average 4.1 responses, for a total average of 5.5 responses. The total number of responses received ranged from 0 (two participants) to 20. Of the ten people who did receive responses, the minimum time to first response was 5 minutes, the median was 17 minutes, and the mean was 188 minutes. Time to first response was negatively correlated with number of friends (more friends = shorter time to first response, $r = -0.36$). Time of day did not correlate with time to first response ($r = .004$).

5.3 Searching Versus Asking
In this section we compare the answers participants found in both searching online and through their status message question and discuss the advantages of each method.

5.3.1 Comparison
When asked before the study, all of the participants indicated that they would normally have used a search engine to answer their question or information need. Almost half (41.7%, five participants) said they would have also used their social network — these participants were not involved in our previous two studies and were recruited randomly from Microsoft, further validating previous claims about use of social networks for information needs. Participants rated the anticipated usefulness of a search engine highly (median = 4.5 of 5), and rated the social network lower (median = 3.0). The difference is marginally significant ($z = -1.83, p = .067$).

Following the session, all but one (91.7%) reported being happier with the information they found from searching compared to their social network, with a median score of search satisfaction of 4.0 of 5, while the usefulness of the social network had median 2.0, This indicated that people felt the search engine was more useful ($z = -2.51, p = .01$).

The search engine met expectations as the difference in usefulness and satisfaction was not statistically significant (4.5 before, 4.0 after). The social network, however, underperformed the participants’ initial expectations of success (median 3.0 before and 2.0 after, $z = -2.49, p = .01$) in the given time frame. Note
that average study time was just over half an hour — this is shorter than many of the time ranges indicated in our previous studies. In fact, that participants expected to see answers so quickly reaffirms the expected lengths of time we saw in the survey (section three).

5.3.2 Benefits of Searching
Participants indicated they would normally turn to search engines first, expected to find what they were looking for via search engines, and were happy with what they found. In this section, we discuss some benefits of searching.

When engaging in the typical search engine behavior pattern, participants appreciated the control over the process they had, as opposed to the relatively little control over their social network (ie who would see and respond to the update). Timing was entirely a function of the participants’ actions and, indeed, one third (four) of the participants reported a preference for web search because of faster answers, though one participant acknowledged that, “Facebook might yield more responses given more time.” Four of the participants also preferred their ability to redefine their search task during the middle of the study — refining as they went along. Though not all searches follow this pattern, for ones that do, using a search engine is a clear choice. It could be considered rude to update one’s status frequently if information needs changed rapidly. For example, one user preferred search since, “I could jump from topic to topic and research new things as I stumbled upon them. It wouldn’t make sense to keep updating the question in Facebook.” Two of the participants also found the search engine to be less biased than a social network. For example, one said, “It feels to me like sources from the internet are more likely to be ‘authoritative’ on the subject matter instead of the obviously biased opinions of friends.” However, bias to some may manifest itself as personalization to others.

5.3.3 Benefits of Asking
Although searching was generally preferred to asking, participants also expressed some benefits to using their social networks during the study. Eight of the participants (66.7%) reported having asked questions to their social network before. They reported motivations like trust in their network, utility of opinions for answers, and the context their network could provide, the the fun of posting questions (each of these were reported by at least half of the eight participants who had asked a question before).

There is a contradiction between the perceived authority of the search engines and trustworthiness of one’s social network. We hypothesize that participants do not expect their friends to lie to them, but also don’t expect that any answers they share will necessarily be the best ones, where the search engine’s top results
presumably would be.

The only participant who preferred the results she found on Facebook to those found with a search engine liked the fact that her social network knew information about her, and thus was able to provide more customized answers. She explained that what she found, “was completely relevant because the people know me and my daughter and what we would like — a search engine isn’t going to know that.”

The utility of social networks seems to be in opinion or recommendation based questions, or even in providing opinions and recommendations in typically factual settings, validating claims made in previous sections. One participant noted he might prefer using his social network in such cases, stating, “If I were searching for something more opinions based (restaurants, etc.) then perhaps Facebook would be a more viable alternative.”

Regardless of utility, participants indicated that their answers were very trustworthy (median 5 of 5). Participants reported knowing those that answered very well (median 4 for how well they knew the answerer), and the better they knew an answerer, the more they trusted it ($r = 0.23$). This contradicts with our hypothesis that friends who were less close would provide the most useful answer: one possible explanation is that participants interpreted their friendships as closer because their friends had answered their questions. To eliminate this potential bias, work in the next section algorithmically determines tie strength.

Asking questions also provided social benefits. One participant noted, “[The replies] let me know what some of my friends' plans are, and helped me catch up with them.” Even non-useful answers were still somewhat relevant to the participants. These often included social comments related to the topic, such as a reply of “I have full confidence in you” to a question about career advice. These questions do provide value, though it is social, not informational.

Responses that included information pertinent to the question often had information that was not found in the participant’s web search. Eight of the ten participants who got answers on Facebook reported that at least one answer (and as many as 7, average=2.25) provided information that they did not encounter during their search. Only 1.7 answers were, on average, redundant with information found via the search engine.

This unique information, not found via a search engine, provided a different kind of value from typical search results: opinions, for instance, further underscoring the utility of social networks for recommendations and opinions. For example, in response to the question about the Disney vacation, one person responded, “2nd
vote for Mr. Toad's Wild Ride... Pirates of the Caribbean may be too scary.” Some answers on Facebook suggested alternatives that would not have come up in typical search patterns. For example, one person suggested “Start your own consulting business,” in response to the question about career advancement. The participant reflected on this response, noting, “It allowed me to think that not only training was an option but also detach myself from corporate work and start my own business.” Some of this information may not have existed on the web in a searchable location at all. For example, the participant who asked about vegetarian cooking was offered access to a resource not available online: “I've got HEAPS of really great vegetarian recipes!! Just yell when you need them!” And the participant planning a trip to New Zealand was invited to visit with a friend (“No, no. Spend the winter bouldering with me in Hueco, Bishop, and Rocktown.”); such an invitation unquestionably could not be found via Web search.

5.3.4 Benefits of Searching and Asking Together
The benefits of searching and asking seem to complement each other. Asking could provide confirmation and filtering of search engine results, for instance. Before the study, two participants noted they would normally start their information seeking with a search engine and then ask their social network follow-up questions, saying, for example, “I usually start with a search engine. In case of ambiguity I ask my friends on social network/twitter.” Once the study had completed, one participant noted that he would want to use Facebook at that point in his search to get feedback on what he had discovered from the search engine, “I was able to find more options [with the search engine] that I can validate with my social network.” After the later checkpoint, once more response had been gathered, another participant reported that the additional responses, “made me feel comfortable about my choices and my search results.”

5.4 Design Implications
As in the previous paragraph, the combination of searching and asking seems to be a useful area for inquiry, as qualitative results seem positive. A streamlined approach could incorporate both to form an optimal information seeking pattern.

A search engine could incorporate these findings by directing opinion, recommendation, or other suitable questions to a user's social network. Involved search tasks may be split up nicely by doing initial information finding on a search engine, and then narrowing results and filtering using the search engine. A failed search could similarly be directed to a social network, instead of forcing users to give up or visit a different site. Previous research suggests asking people to describe what they know about their target provides valuable information for the search engine [28], so the question as posed to a social network could be used to further
improve the search results returned.

Results could also be customized with context from the social network, as mentioned in previous sections. Identifying long search session with multiple queries on a single topic (e.g., [36]) could be followed by pushing a question to one's social network and pulling responses back in to the search engine while the user is still searching. Our data suggests this is a very ripe area for exploration, as 58% of participants received responses before completing their search sessions.

Similarly, SNSs could identify the pattern of question asking and attempt to direct users with appropriate needs to search engines, or by pulling information inline. Current work by Brent Hecht and colleagues at Microsoft suggests users could “friend” a search engine that would recognize questions that might be answered by a Web search, federate the question to a search engine, and include Web results as a response.
6. Field Study in Friendship Strength

In our previous work (section five) we saw that many participants’ questions were answered by friends they rated as close. Sociology's tie strength principle suggests that the most useful answers would not come from close friends, but from acquaintances instead. In section three we also saw that many participants were inclined to respond to friends who were close ... and to friends who weren’t, in an effort to improve the friendship, suggesting that friends of all strengths would respond to questions. Since Granovetter articulated that weak ties were the ones providing useful information in his offline work [16,17,18], we hypothesized that, despite close friends being more inclined to answer, weak ties would be more likely to provide valuable information. To test the hypothesis that this would extend to online communications as well, we conducted a study in which we calculated participants’ tie strengths with each of their friends algorithmically, and participants rated the usefulness, helpfulness, and trustworthiness of responses to questions they had asked as their status updates.

6.1 Study Design

We conducted a study with 5 participants. Participants were self selected as Facebook users who posted status updates primarily in English.

Participants were asked to evaluate the usefulness, helpfulness, and trustworthiness of answers to questions they had asked on Facebook. Using data from Facebook and an approximation of Gilbert and Karrahalios's 2009 social media tie strength algorithm [15], we calculated a tie strength for each of the friends who answered the participant’s questions.

Before the commencement of the study, participants were asked to download their data from Facebook.com. Facebook recently provided this opportunity, allowing us to bypass many of the typical API restrictions to gather complete or near-complete data about communication on the site. From the downloaded data, we gathered only communication information exchanged through wall posts and messages — specifically, we collected the text used and the dates of earliest and most recent exchanges, per the Gilbert and Karrahalios algorithm. Though the algorithm could potentially be expanded to include text from the inline Facebook Chat application, collecting this data was outside the scope of our study. Participants were allowed the opportunity to delete any sensitive information from their profiles by hand; though we did not specifically ask
if participants had done so, our data suggests that X users did so.

Users also completed a survey. At least 50 of their previous status updates on the site were collected using the Facebook API, as some participants declined to send the contents of their entire wall. The API allows access to the 50 previous status updates or all of the status updates form the past 30 days, whichever was greater. We displayed any of the updates that received comments. Participants indicated whether or not any of the status updates were questions. For those that were questions, they answered three Likert scale-style questions (using a five point scale) for each comment: How useful was the response?, How helpful was the response?, and How trustworthy was the response?. Usefulness was meant to target how novel the response was, i.e. had that piece of information been seen before. Helpfulness was meant to ask if the response was an attempt to help answer the question. If the participant had not asked a question that displayed within the API limited call, we requested that they ask a question of their choosing. As with the previous searching vs. asking study, we left things free-form and undefined. After at least five hours had elapsed, we requested that they fill out the survey again. We used five hours as our time frame because of data in previous sections suggesting that average times to final answers were approximately 3.5 hours — we rounded up to five hours to allow for outliers.

Of 5 participants, 3 had already asked a question that received comments, and 26 total comments had been received. The remaining two participants were asked to ask a question for the study.

While the survey was completed, our application also gathered information to determine the mutual friends between the participant and each of their friends. The mean tie strength of mutual friends is an important component in determining overall tie strength between two friends.

To generate tie strength for each friend, we relied heavily on the work of Gilbert and Karrahalios. We chose not to require participants to harvest data for us beyond what the API and downloaded data could capture, and so based our tie strength metric on text exchanged and the network effect of the mean tie strength of mutual friends. We mined participants' wall posts and messages to generate a list of words exchanged by each participant and her friends. We analyzed the list using the Linguistic Inquiry Word Count, the same tool used in the Gilbert and Karrahalios paper. Linguistic Inquiry Word Count, or LIWC, is a tool that takes text, in our case a bag of words that were exchanged between a participant and her friends, and compares it to a series of lists of words indicating things like intimacy, anger, work-related words, or swears. The output from LIWC, the dates of the earliest and most recent conversations friends had, and the mutual friends of the participant and each friend were all used to generate tie strength, using the algorithm from the previous work. We then
ranked friends based on their tie strength.

We hypothesized that the stronger a tie was, the more trustworthy the response would be. However, based on Granovetter [16], we hypothesized that the more useful and helpful responses would come from weaker ties. To evaluate this, we performed a linear regression for each of the three variables. The linear regression gives us a line of fit and tells us how much of a given variable can be predicted by another, in this case, tie strength.

6.2 Results

From the 5 participants that completed the study, we have data about 6 questions and a total of 38 replies given by 22 friends to the questions. We first present an overview of the data, followed by our analysis.

The minimum number of answers a question received in the study was 1 (we only included questions that received at least one comment in the study). The maximum number was 21, the median was two responses. Questions were not answered as quickly as in our previous work: the median time for a first answer was over 15 hours, and the median time for all of the answers for a question to be in was 27 hours. The minimum time to a first answer was one minute, and the minimum to a final answer was two hours and 43 minutes. The maximum time to a first answer was over 40 hours, the maximum time to a final answer was almost 48 hours. This discrepancy suggests that the sample was not large enough as outliers made a significant impact on the median statistics.

The mean tie strength of a commenter was 0.408 (median 3.288, minimum 0.005, maximum 0.994). The distribution of tie strengths is presented as histogram, binned into increments of 0.1 in Figure 1.
Tie Strengths

0-0.1 0.1-0.2 0.2-0.3 0.3-0.4 0.4-0.5 0.5-0.6 0.6-0.7 0.7-0.8 0.8-0.9 0.9-1.0

Figure 1. Distribution of tie strengths of commenters.

The average helpfulness rating was 3.1 and the median was 3; the mean usefulness rating was 3.2 and the median was also 3; both the mean and median trustworthiness rating was 4.0. The distribution of the ratings is in Figure 2.

Figure 2. Distribution of ratings of comments.
Our method for evaluating the correlation between each of our variables and tie strength is to use linear regression, which fits a line to the graph and determines how predictive tie strength is of each response metric. In Figure 3 we have shown the distribution of ratings given tie strengths; in Figures 4-6 we show each metric alone with the line of regression, if there is a statistically significant correlation.

Helpfulness is correlated positively with tie strength ($R^2 = 0.140, \beta = 0.1081, p < 0.05$). $R^2$ indicates that 14% of helpfulness is predicted by tie strength; the low $p$ value indicates that it is statistically significant data. $\beta$ indicates that, as ties become stronger, helpfulness increases, though not by very much. Usefulness is also correlated with tie strength ($R^2 = 0.157, \beta = 0.1083, p < 0.05$). Trustworthiness does not have a statistically significant correlation to tie strength.

Figure 3. Ratings for each tie strength.

Helpful
Useful
Trustworthy
Figure 4. Helpfulness (y axis) correlated with tie strength (x axis).

Figure 5. Usefulness (y axis) correlated with tie strength (x axis).
Figure 6. Trustworthiness (y axis) correlated with tie strength (x axis). There is no line of regression because there was not a statistically significant correlation between the two variables.

Each metric, helpfulness, usefulness, and trustworthiness, is correlated with each other metric. These results are all significant with \( p < 0.01 \) (very statistically significant). Table 1 shows the \( R^2 \) results and the \( \beta \) for each. \( \beta \) measures the slope of the regression line.

<table>
<thead>
<tr>
<th>Relation</th>
<th>( R^2 )</th>
<th>( \beta )</th>
<th>( p ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helpful / Useful</td>
<td>0.7964</td>
<td>0.8469</td>
<td>( p &lt; 0.01 )</td>
</tr>
<tr>
<td>Useful / Trustworthy</td>
<td>0.6172</td>
<td>0.8103</td>
<td>( p &lt; 0.01 )</td>
</tr>
<tr>
<td>Trustworthy / Helpful</td>
<td>0.6282</td>
<td>0.7758</td>
<td>( p &lt; 0.01 )</td>
</tr>
</tbody>
</table>

Table 1.

6.3 Discussion
Our initial discrepancies in the time needed to receive answers points to a different user population than in our previous work; these participants' questions were answered slower than previous participants. This may be a signal of potentially less frequent Facebook users than previous participants and may mean results do not generalize beyond this population. It is also possible that the Gilbert and Karrahalios tie strength algorithm does not generalize to our participants. Generalizing this algorithm, and our data, is a ripe area for future work.

Based on Granovetter's work on tie strength [16], we hypothesized that participants' weak ties (acquaintances) would be the friends providing useful and helpful information, while strong ties (close friends) would be the most trustworthy. Our data, however, contradicts this hypothesis. Instead of a negative correlation, we instead saw a positive correlation between helpfulness and usefulness and tie strength. This correlation indicates that closer friends were indeed able to provide more helpful and useful information to friends. Trustworthiness, on the other hand, had no statistically significant correlation to tie strength.

There are several factors that we feel contribute to the difference in Granovetter's offline work and our online work. We may have chosen participants who were not representative of the overall population and our sampling mechanism may be flawed (in determining the utility of information it would perhaps be beneficial to ask if the content of the answer was previously known by the participant). The high correlation (see Table 1) between each metric (helpfulness, usefulness, trustworthy) indicates that these may not have been the best measures to choose, as participants may have confounded them.

The idea of 'traveling in different circles' and gaining different knowledge may be a moot point online: while sharing items of interest is a popular activity on SNSs, people rarely, if ever, share all of the information they see with their friends. This may mean that each of a person's friends are different enough from her to offer useful and helpful information that she may not have known. As tie strength increases, friends are able to better personalize the information they have for her because of more frequent or close contact. We hypothesize that close friends are more likely to have access to disjoint information sources than they did before widespread use of the internet.

The model of Aardvark, where friends-of-friends provided the best answers [22] is different from ours. Aardvark compared results from weak ties and strangers; our results suggest that perhaps they should include strong ties as part of their model, since strong ties provided useful information to our participants. Future systems should consider this value of close friends, though it should be noted that the increase in helpfulness and usefulness was not large.
The lack of correlation between tie strength and trustworthiness may signal increased trust of one’s network due to the social contact enabled by sites like Facebook, though we do not have data on the different friending practices of our participants (some people friend people on Facebook indiscriminately, others are highly selective). Friends are made more aware of each other’s activities and so implicitly trust them more. Our comparisons for trust may also be changing: compared to strangers online, a friend on a site like Facebook may be much more trustworthy, regardless of what answer she gives. The reader should also note that trust was self-reported: participants may have been reluctant to say that they did not place a lot of trust in some friends, or reported high levels of trust for answers they were familiar with or found agreeable. Table 1 shows that trustworthy was highly correlated with both usefulness and helpfulness and participants may not have been able to rate the trustworthiness of an answer without considering its helpfulness or usefulness.
7. Conclusion

Our work in this space has spanned a survey, a lab study, and two field studies. We performed it with the goal of gaining insight into the status message question behavior observed on Facebook and Twitter.

In our 624 person survey, we asked a series of questions about these behaviors and found that many active social network users had posted or answered status messages in questions before, and that their motivation for doing so included social reasons but also informational ones. Users asked questions about technology and entertainment the most, and used their questions primarily to ask recommendation or opinion questions, though many asked factual questions as well. Participants expressed an information seeking behavior that paralleled, and complemented or even replaced traditional search engine use.

We compared these explicitly in our lab study on searching vs. asking. In this study, over half (58%) of participants got responses to their questions while still engaged in a search session on the same topic. Participants preferred the two behaviors together, as the search engine allowed for more agency and reframing of the question as new information came in, but noted that results from asking their friends on Facebook led to un-indexable answers, like personal recipes, decision support, and invitations, as well as helped them filter the results they got from searching.

Our field study in the behavior of asking saw that the bulk of participants (82.3%) received answers to their questions, and that the factors that contributed most to answers were the number of friends a participant had (with over 200 friends leading to more responses in shorter time), whether or not they asked their question obviously (questions that ended in a question mark were more successful), keeping questions short (adding context did not seem to increase responses), and directing questions clearly (to “anyone” or to even more specific groups). This work pointed toward implications for designing systems to ask on a user’s behalf, as the wording of a question could result in better time, better responses, and more of them. The lab study also pointed toward potential interventions search engines or social networks could make to increase the intersection of informational and social behaviors.

The final part of the work looked at one part of how information moved within the network — compared to methods of communication in offline networks where interesting information traveled through weak ties (acquaintances) rather than strong ties (close friends), online question asking and answering did not seemed
to follow the same pattern. Useful and helpful information was more likely to be provided by close friends, not by acquaintances, and tie strength was not a predictor of trustworthiness. As social and informational boundaries continue to be pushed and blurred, knowing from whom and how to elicit information from socially, in addition to from informational sources like search engines, will continue to be more and more relevant.
8. Works Cited


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