

To Search or to Ask: The Routing of Information Needs Between Traditional Search Engines and Social Networks

ABSTRACT

In status message question asking (SMQA), members of social networking sites make use of status messages to express information needs to friends and contacts. We present findings from a laboratory study that examined 82 participants' SMQA behaviors in the broader context of online information seeking. When given the option of using a search engine and/or a social network, we found that participants leveraged SMQA for 20% of their information needs, most often posing a question to their network in addition to issuing a query. We uncover the motivations behind these routing choices and show how the specificity of the information need and the perceived audience of a given network play important roles. We then demonstrate how information needs and routing decisions are related to participants' satisfaction, information value and trust of responses and query results. Our findings suggest that search engines may be able to better address up to 20% of information needs by integrating SMQA capabilities into their systems.

Author Keywords

Social media question asking; information seeking; social networks; search

ACM Classification Keywords

H.5.m [Information Interfaces and Presentation]:
Miscellaneous

General Terms

Human Factors

INTRODUCTION

Search engines have historically served as the dominant tool for online information seeking. Although search engine use remains ubiquitous, the number and diversity of alternative strategies have been growing. One new information seeking approach receiving attention from both researchers and practitioners is *status message question asking* (SMQA) [1,4,10,11,12,19,20,23]. In SMQA, a user of a social networking site like Facebook or Twitter co-opts her status message field to pose questions to her friends and contacts [11].

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee.

CSCW '14, February 15–19, 2014, Baltimore, Maryland, USA.

While we are beginning to develop an understanding of SMQA behavior in isolation, little is known about how this behavior fits into people's broader online information seeking strategies. For instance, although we have some understanding of users' motivations when they do ask status message questions (e.g. [10,11,23]), the same cannot be said for when they purposely eschew their networks and instead route an information need to search engines. Similarly, while status message questions in Facebook and Twitter have been examined separately (e.g. [11,14]), the process by which question askers choose the appropriate network to express a given information need has not been investigated. In addition, the relationship of these routing decisions to the type of information need is also not well understood.

The relationship between SMQA and search engines has implications not only for our understanding of SMQA behavior but also for the design of systems that seek to integrate traditional search engines and social networks such as Bing's "Social Sidebar" [18], Google's "Search, plus Your World" [17], and research systems such as SearchBuddies [6] and MSR Answers [8]. A deeper knowledge of routing behavior has the potential to guide further development of such technologies.

In this paper we present findings from a laboratory study that examined participants' SMQA behaviors in the broader context of online information seeking. We focus on three major contributions that help elucidate SMQA in the context of online information seeking strategies. First, asking the question "*What goes where?*", we engage in the first examination of people's routing of information needs between search engines and social networks. Here we show that when given the option of expressing an information need to a search engine or a social network, people prefer search engines, although they utilize SMQA for a significant minority of information needs (20%). The overall preference for search engines still exists for types of information needs that have been shown to be most prevalent in status message questions (e.g., recommendations), but it is weaker. Our results also demonstrate that when status message questions are asked, it is more often as a complement to issuing a query to a search engine, rather than as a replacement. Our results suggest that search engines may be able to better address up to 20 percent of information needs by integrating SMQA capabilities into their systems.

Second, exploring the question “*Why (and why not)?*” with regard to routing decisions, we uncover new motivations for searching and asking. By comparing the rationale for using each strategy, we show that the specificity of the information need and the perceived audience in a given network play an important role in people’s choices. Our findings suggest that these factors not only guide decisions with regard to searching and asking, but also figure into selecting the correct social network to ask.

Finally, in addition to examining routing decisions, we also look at the outcomes of these decisions by asking the question “*What was successful?*”. We demonstrate that responses to information needs from no one strategy can be considered universally better than those from the other, with each strategy having complementary advantages and disadvantages. Thus, it is important to note that while SMQA may occur in relatively small numbers compared to querying search engines, there are clear benefits to the behavior.

RELATED WORK

Since Morris et al. [11] identified that as many as 50% of Facebook and Twitter users engage in SMQA behavior, SMQA has become the focus of an increasing number of studies. We extend this work by placing SMQA into a broader framework of online information seeking that includes both SMQA (on multiple networks) and traditional search.

In addition to establishing the popularity of SMQA, Morris et al. [11] also found that the most popular information needs sent to social networks are requests for recommendations and opinions, primarily due to greater trust in friends’ opinions, need for subjective information, and the belief that a search engine would not work well in such cases. Additional SMQA studies have built on this typology. In an exploration of 420 information-seeking status updates on Facebook, Gray et al. [4] identified similar question types as Morris et al., but in very different proportions. Rhetorical questions made up the highest percentage of questions, followed by requests/favors and opinion/polls. Studying SMQA on Twitter, Paul et al. [14] found that the types of information needs posed to that network were somewhat different from those assessed on Facebook by both Gray et al. and Morris et al., with rhetorical questions most prominent and requests for factual knowledge and polls also quite prevalent.

Researchers have also examined the answers to status message questions, primarily by scoring friends’ and contacts’ responses on various measures of quality (e.g. [3,4,11,14,19]). Morris et al. [11] rated responses to information needs routed to social networks on whether or not they were helpful and if a response came as quickly as expected. Paul et al. [14] coded responses to question tweets as related or unrelated. Gray et al. [4] developed a more sophisticated measure that examined both the satisfaction and usefulness of responses. Evans et al. [3]

compared response quality in traditional search to several social search approaches and found that depth of processing was greater for search results. In an assessment of the effects of tie strength on answer quality, Panovich et al. [13] developed a multi-faceted measure of answers including various informational and trust aspects of the information and the source. Building on this work, our experimental design enables us to assess the quality of an answer on various dimensions, depending on information need and routing decision.

The literature on answer quality in SMQA also contains the only other study that simultaneously considered search and SMQA [12]. In this study, 12 information needs were simultaneously issued as queries and status message questions, and the responses/answers were compared for speed and quality. Our work, on the other hand, is focused on how people route information needs across SMQA and search, as well as on the entire question/answer pipeline.

METHOD

We conducted a laboratory study to assess when people with information needs turn to a search engine versus when they ask their social networks. We examined what types of needs were directed to which services and why, and assessed how the participants felt about the answers and results they received in response. Participants considered both self-directed information needs and a set of prompted needs based on common status message question and query types identified in the literature. They then explained their service selections and returned at a later session to rate the responses/answers.

Participants

Participants ($N = 82$) were recruited from the geographic area surrounding a mid-sized Midwestern university. They were required to be regular users of the Internet and social media, and have at least a Facebook account. The sample ranged in age from 18 to 64 ($M = 24$, $SD = 10.10$) and was 64% female. The majority of the participants (84%) were students. Fifty-one percent were Caucasian/White, 28% Asian/Pacific Islander, 11% African American/Black, and 10% Multi-racial.

Participants were moderately skilled in their web use [5] ($M = 3.53$, $SD = .82$), and all but two participants stated they were familiar with all of the services used in the study (Google, Bing, Facebook, Twitter). All participants indicated that they seek information online daily with issuing queries to Google being the most popular strategy.

Procedure

We designed a web application (Figure 1) that allows users to type in a query or question and send it to two search engines (Google and Bing) and two social networks (Facebook and Twitter). Participants could select up to all four services for each information need. The first page of query results was displayed in the window below the question box. Participants were informed that questions

routed to Facebook and Twitter were recorded but not posted and that only one would be randomly selected for each service at the end of the study and posted to their Facebook Timeline or Twitter news feed. This was done to prevent concerns about spamming one's network with many questions in quick, unnatural succession [24] from interfering with their routing decisions. The web application logged all questions, search results (including post-query interactions), and answers to Facebook and Twitter questions.

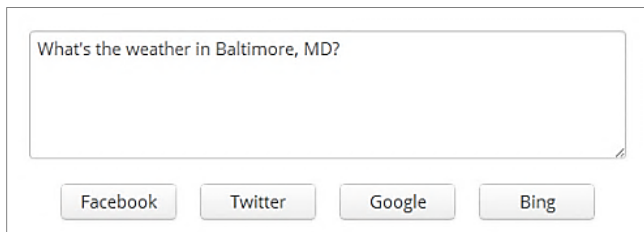


Figure 1. The primary interface to the web application used in the study.

Participants completed the study over two sessions within a one-week time period. In the first session, they used the web application to attempt to fulfill the prompted and unprompted information needs and completed questionnaires regarding their information seeking strategies. In the second session, they rated the search engine results and answers to the questions that were posted to their social networks.

Information Seeking Phase

The *information seeking phase* of the study began by giving participants five minutes to write down "anything you've been meaning to ask someone, information you have been seeking, anything you want to know more about, or want to understand better." Afterward, participants were instructed on how to use the web application and given 10 minutes to explore their own information needs. During this stage, they were allowed to enter as many questions/queries as they wanted using any of the available services.

Participants were then instructed to consider a number of prompted information needs (Table 1). Each participant saw 10 of the 30 prompted needs created for the study, one from each of the types discussed in the section that follows. They were required to use at least one service to investigate a prompted information need before they could move on to the next one. Participants had 20 minutes to complete this process. While the prompted approach is less natural than user-defined questions, it ensures coverage over a wide range of information need types.

At the conclusion of the information seeking phase, participants were shown each of their routing choices and were asked to complete the following open-ended items: "Why did you choose to use [service] to ask this question?" and "What [answers/results] were you expecting from [service]?"

Participants then completed a final questionnaire indicating how often they use each of the four services for seeking information on a six-point scale ranging from "Never" to "Several Times a Day." At the end of this session, participants were partially compensated and instructed not to delete or edit their status message questions (if they had asked them) or any responses before their follow-up session.

Response Assessment Phase

Participants returned for a second session between one and five days after the information seeking phase to rate the responses to their information needs. In this *response assessment phase* of the study, participants were shown each of their previous information needs along with the results/answers they received. For search queries, they were shown the same results they had received previously, with those they had clicked highlighted in gray. If the question was posted to Facebook or Twitter and received any answers, that question was displayed with accompanying responses. Participants were instructed to select which result/answer they thought was best, which loaded a questionnaire about that answer, and then they rated it on dimensions of satisfaction, informational value, and trust [13]. Upon finishing the answer-rating questionnaires, they were compensated for their second session.

Prompt Development

The prompted types used in the information seeking phase are presented in Table 1 and were based on typologies from the social media question-asking and information retrieval literatures. The objective was to capture a wide range of query and question types and examine how they were routed between search engines and social networking sites. The bulk of the prompted types were based on the schema from Morris et al. [11] that includes eight types of questions: Recommendation, Opinion, Factual Knowledge, Rhetorical, Invitation, Favor, Social Connection, and Offer. However, due to our broader scope, it was also necessary to consider types of information needs not seen typically in SMQA but common in traditional search. In doing so, we identified two additional need types not captured by Morris et al.'s schema: navigational information needs [7,16], which are typically expressed by queries such as "cscw 2014" and "gmail", and exploratory information needs [9,22], which are defined by their open-ended and multifaceted nature. Three prompts were written for each of the ten types. Wording was constructed so as not to bias participants toward any particular service. For example, the word "find" was used consistently across all prompts rather than the word "ask" or "search," and the use of the word "network" was avoided.

Recommendation
Find a good place to get food right after this study. Find a good birthday present that you could buy online now for a specific relative. Imagine a trip you'd like to take in the future and find out what others recommend as the best sights to see.
Opinion
Think of a certain place you are interested in seeing and find out whether it's worth traveling there. Think of the next tech product you'd like to buy and find out what people think of it. Think of a TV show that you plan to watch during your next free hour and find out what others think of the show.
Factual Knowledge
Find out what might be causing symptoms you have been having recently. Find out what traffic will be like for your commute to your next destination after this study. Find out what the weather is like outside right now.
Rhetorical
Contemplate something that's always confused you. See what others think. Think of something that's frustrating you right now. See what others think. Think of a strong opinion you have about a current issue. See what others think.
Invitation
Plan an activity you would like to do this weekend and find out who is interested in joining you. Find out if someone in the area is interested in meeting up for your next meal. Think of something you would like to do after this study and find out if anyone else would be interested too.
Favor
Think of a project you'd like to do or a task you need to finish for which you don't have the right tool or gadget. Find someone local who has this particular item you can borrow. Think of a task at home you could use help with today, and find someone who would be willing and available to help. Think of an errand that needs to get done today. Find someone else who can take care of it right now.
Social Connection
Find someone who can help you learn more about a new hobby you'd like to take up. Find someone who would be a good person to know for finding a job in [local city] for you or someone else. Find someone to teach you a new skill while you're online right now.
Offer
Think of a skill or particular area of knowledge you have. Find someone who could benefit from this skill/knowledge. Think of an item you have at home that you no longer use. Find someone else who could use it. Think of something you can offer to do in your next free hour that would be useful within your group of friends or local community.
Navigational
Find the website for the main gym at your university or alma mater. Find Nike's website. Find [local library] website.
Undirected / Exploratory
Find a current event you are interested in keeping up with (one you aren't already keeping up with). Find an idea for a new hobby (a hobby you haven't considered before). Find a new activity to do this week.

Table 1. Prompts by prompt type

Data Preparation

Participants initially submitted a total of 1,728 information needs. Exact duplicates within each service were removed, and information needs that indicated fixed typos or rephrasing strategies within the same service were collapsed into a single information need (e.g., “Breaking Bad next season date” and “Breaking Bad season date 2013”). For prompted information needs, those that did not address the prompt were marked and excluded from further analyses. This left a total of 1,397 valid information needs, of which 584 (42%) were the participants’ own needs (user-defined) and 813 (58%) were prompted.

All unprompted information needs were coded in accordance with the aforementioned typology. There were no unprompted needs expressed for two of the types and an additional type was added – polls – to capture needs that did not fit into our initial schema. This coding process was performed by two independent coders. Initial inter-rater agreement was low ($Kappa = .67, p < .001$) due to conflicts in the categorization of navigational needs. The navigational type definition was clarified, questions were recoded, and acceptable inter-rater agreement was reached ($Kappa = .81, p < .001$).

WHAT GOES WHERE?: ROUTING DECISIONS

As noted above, little is known about how people route their information needs between status message questions and search engines. Our first series of analyses addresses this “what goes where?” question.

A clear theme emerges from our participants’ routing decisions: when given the option of issuing a query to a search engine or posing a question to their social networks, information seekers prefer search engines but utilize SMQA for a non-trivial minority of their needs. Overall, 80% of unprompted information needs and 76% of prompted information needs were routed exclusively to search engines (Table 2).

Focusing on the more naturalistic distribution of information needs from the unprompted dataset, we found that when status message questions were asked, they were more often accompanied by a query to a search engine than not. While 7% of all unprompted information needs were expressed solely through status message question asking, 13% were expressed in combination with a search query (Table 2).

As discussed above, recent work has established that status message questions reflect a unique distribution of information needs, with requests for recommendations,

Type	Search	SMQA	Both
Unprompted Needs	80% (344)	7% (27)	13% (54)
Prompted Needs	76% (522)	20% (134)	4% (30)

Table 2: The final routing choices for prompted and unprompted information needs.

opinions, and factual knowledge being the most common. Our unprompted and prompted results show that even for these types of information needs, search engines remain dominant, although to a somewhat lesser degree. Figure 2 depicts participants' routing decisions by type of information need. Fifty-six percent of opinion unprompted needs went only to search engines, with the analogous numbers for recommendations and factual knowledge being 77% and 81%, respectively. The results for prompted information needs were similar, with a trend towards a higher percentage of search engine queries. Moreover, as with the results for the entire dataset, status message questions were accompanied by queries a majority of the time. For instance, only 3% of unprompted recommendation information needs were routed solely to social networks, with the remaining 20% going to both.

We also found that the two types of information needs drawn from the information retrieval literature and not yet considered in the context of SMQA – navigational needs and exploratory needs – were routed almost exclusively to search engines. The navigational result is to be expected as search engines are known to excel at navigational queries

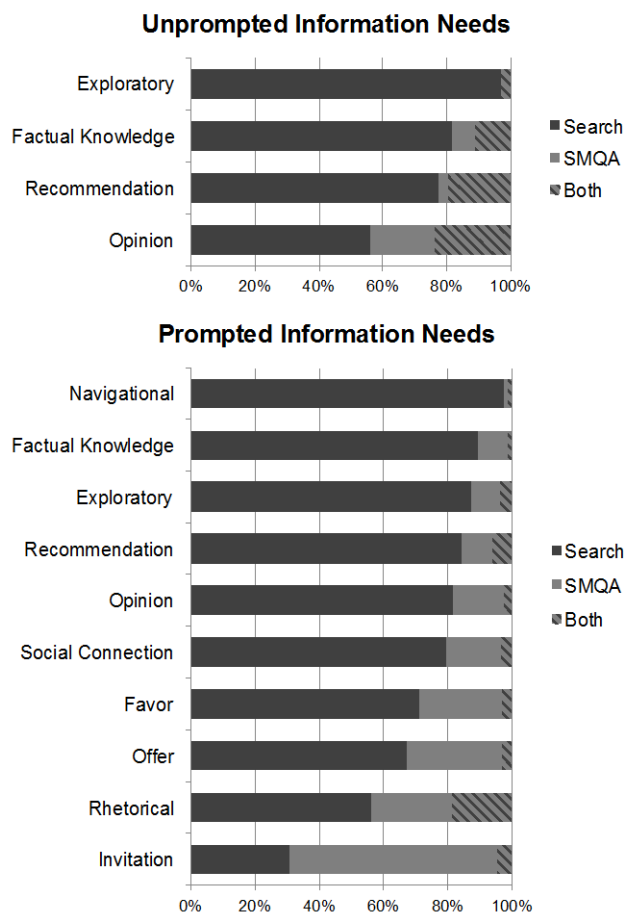


Figure 2: The routing decisions of participants by type of information needs. Only types with 10 or more expressed information needs are shown.

[22]. The same is not true of exploratory queries, however, which are widely recognized as a weakness of modern search technology [21,22]. Moreover, the rich conversational environment in which SMQA takes place would seem well-suited to exploratory information needs, which are open-ended, multifaceted, and typically fulfilled iteratively [22]. We address participants' motivations for routing exploratory needs away from their social networks and the implications of this finding for development of new exploratory search technologies later in the paper.

WHY (AND WHY NOT?): MOTIVATIONS

For each information need, participants were asked to explain why they chose the service they did and what they were expecting. These open-ended responses were gathered for 1,195 of the expressed information needs and were analyzed for themes that compare and contrast the use of the two available service types: search and social.

Why SMQA?

Participants turned to social networks for their information needs for reasons that were largely consistent with previous findings [11]. We found that participants routed information needs to Facebook because they trusted their friends' opinions, were asking subjective questions, were seeking a specific audience, or hoped for better personalization and contextualization. That said, some previously documented reasons for routing needs to social networks were not observed in this study. Notably, participants did not mention turning to Facebook because of a belief that a search engine would not work for the information need, although this was a common motivation in earlier work [11]. Connecting socially is another motivator missing in the present study. Participants may have routed some information needs to Facebook for this reason, but it was not explicitly expressed. Answer speed (social networks being *faster*), failed previous search, and social networks as an easier option were also not mentioned by participants. Conversely, these three motivations sometimes drove participants to search.

Different Uses of Facebook and Twitter

Past research has focused either on social networks as an undifferentiated category or on a single network at a time, but the ability to choose between networks or use more than one in this study allowed for a comparison of differential routing behavior among networks. Gathering opinions from friends was a commonly cited motivation for asking a question on Twitter, as it had been for Facebook. However, Twitter users also took advantage of the site's broader network in different ways than they did of their more personal Facebook networks. For instance, one participant asked others what she feels is a very personal thing, yet did not want this information sent to her Facebook network:

"I think the people in the twitter could be a little bit smart and there isn't too many real-world friend in the twitter, and interest in bible is a very personal thing, I don't want my friend know it."

Similarly, another participant wanted to gather a subset of friends for an event, but did not want to include all of his other friends in the area:

“I know some people in [town] on Twitter and I would be curious to see if they’d be interested (a friend who is also on twitter and in [town] had brought up the idea of going). I didn’t post this to facebook because I have a different set of [local] friends there and I didn’t want them to see this post.”

Twitter was also used for questions deemed too sensitive for Facebook, but for which a search engine would not be fruitful, such as political discussions:

“It is a platform that I generally use (and I know is commonly used) to follow political and social issues, as well as to interact with the opinions of my friends. I tend [not] to post political content on Facebook at all.”

Twitter users were also aware of the potential for broader audiences beyond friends. One participant was frustrated about a local situation and was seeking others in the area who might have similar opinions:

“[Information about new campus construction] is something that a search engine probably won’t be able to answer because it’s a more under-the-wraps issue. I’m also looking more for people who feel the same way about me and to instigate a discussion.”

Twitter’s public network was described by one participant as having a benefit over other venues for gathering opinions:

“Not only to get my question answered, I like that the fact someone replied to my answer pops up both on my page and the other person’s page. The conversation becomes public therefore can engage other people in.”

With search engines at one end of the information-seeking spectrum and Facebook at the other, Twitter serves as a unique middle ground where participants can get subjective information not accessible from search engines, but with fewer social costs and a broader audience than routing information needs to Facebook.

Why Not SMQA?

While motivations for routing information needs to SMQA largely confirmed previous work [11], the structure of our experiment allowed us to examine for the first time motivations for routing information needs *away* from SMQA. We found that the three most common of these motivations were (1) information needs being either too specific or not specific enough for SMQA, (2) concerns about the limited information available in one’s social networks, and (3) hesitation about disrupting one’s network.

Needs Were Too Specific, Or Not Specific Enough

Search engines were utilized most often when individuals had a very specific information need or when they had one

that was quite abstract. The first indication of this u-shaped relationship between the specificity of an information need and search engine use came with our observation that navigational (very specific) and exploratory (very unspecific) needs are both almost always sent to search engines. However, participants also provided support for this relationship when discussing the motivations behind their routing decisions.

At one end of the specificity spectrum, participants used Google or Bing as a proxy to a specific site they knew would have the exact answer, e.g., by typing “weather” to get to weather.com or by starting their query with “wiki” to find a relevant article about a topic. Likewise, Bing and Google were most often chosen when users felt they were asking a “simple” or “straightforward” question to which they could quickly and easily find an answer. In the words of one participant, “[The search engine] has a straightforward answer and would give me the fastest results.”

On the other hand, when faced with very unspecific information needs, participants turned to a search engine because “it seemed like a good place to start” or because they were unsure what to ask their network. One participant explained, “I felt that Google would help me direct my search through the results I’d get from this initial search, especially since I wasn’t sure exactly what I was hoping to find.” Similarly, another participant stated that “Since I wasn’t sure exactly how to phrase the question, perhaps Google’s results would help me do that.”

Limited Information in Networks

A common motivation for eschewing SMQA for search was a belief by participants that the people in their networks would not have sufficient information to answer their question. For instance, in seeking opinions on a new smartphone, a participant wrote “*don’t know anyone who has it yet, but I know it is being released soon and I imagined tech reviewers may already have their hands on it.*”

Interestingly, although we (and others, e.g. [11]) found that people often route needs to SMQA because they believe their friends have a greater knowledge of the relevant context, we also saw the opposite occur. That is, some participants avoided using SMQA because they thought their friends and contacts knew very little about the relevant context. For instance, referring to a search for a new restaurant, one participant wrote, “*I did not want to use Facebook to ask this because people on Facebook do not know my specific taste in food. Instead I would like to use a search engine to check out menus and possibly see pictures.*”

Even for types of needs like invitations, there were a moderate number of cases in which participants searched for Meetup groups for a specific activity because they did not have the right group of friends for that activity. One

participant wanted to start doing martial arts in her community, but her network was limited: *“I don’t know of anyone in my networks that does this and lives in this area, so Google would be best for a primary search.”*

In many cases, participants believed that searching for opinions and recommendations gave them a much wider variety of information than their friends could, even when their friends were likely to have specialized knowledge. For exploration of the local city, one participant routed his information need to search rather than his network *“because a lot of more people worldwide may have already done this before.”* Likewise, another participant decided that while her audience had the expertise she needs, she wanted a broader audience: *“As much as I know some friends have traveled extensively, I was more curious to see what cultural Francophiles had to say about the overrated tourist spots.”*

Disruptive to Network

Participants actively avoided SMQA for subjective information when they were afraid of disrupting their networks. This was particularly true for controversial topics for which opinions were desired, but for which the social cost of posting to Facebook or Twitter was too high. One participant specifically sought a discussion about gun control from the comments in response to an opinion piece, stating, *“I know that using Facebook to discuss strong political issues can be a very tricky thing that can invite heated unpleasant arguments.”* Similarly, another participant wrote, *“I would NOT use Facebook for this question because I already know my friends’ opinions, and even if I didn’t I’d be wary of asking political questions on Facebook.”*

A different form of disruption avoidance occurred when participants wanted to keep their activities out of the networks so as not to cause tension between contacts, such as when getting information related to an exclusive event: *“I’m going to a party there on Saturday. Thought I could get dinner before hand. didn’t want to announce the party to everyone on facebook or twitter because I know people who are not invited.”*

Avoiding SMQA Completely

Twenty-two (27%) participants did not send any questions to Facebook or Twitter, despite all participants having social media accounts. While most did not mention vigorously avoiding their networks, a few participants indicated that they did not want anything posted to their Facebook Timeline. More specific motivations matched those described previously for routing information needs away from social networks. The majority of these 22 participants indicated that that they were most comfortable using search engines for information or felt that a search was adequate or most relevant. As one participant who sent all her information needs to search indicated: *“I thought it would be unnecessary to wait for a response from Facebook friends when I could easily search it.”*

Merging SMQA and Search

Eighty-four information needs were sent to both SMQA and search engines. Two broad motivations emerged for this behavior: contextualizing friends’ opinions with search and using social to interpret search results. With regard to the former, one participant asked his network for their “passionate responses” and then sent the question to search engines, doing so because *“a search engine would be better than asking my friends through Facebook where everyone ...has biased opinions.”* Similarly, one participant first asked her network because *“i want to know what all my smart friends are using to study [for the GRE],”* but then issued a query to Google because *“I thought google would give me less biased answers than my friends.”*

In contrast, sometimes friends’ knowledge was expected to help clarify factual information found via search engines. For instance, one participant wanted to learn about a topic both on Wikipedia and then on Facebook because *“My friends might be able to summarize the answer to this question in a way that would be easier for me to understand.”*

WHAT WAS SUCCESSFUL?: RESPONSE OUTCOMES

1,142 (82%) of the 1,397 information needs received responses, with 10% of information needs routed to social networks receiving at least one and up six responses. All search queries automatically received 10 responses. Ratings were received for 1,036 (91%) of these responses. The best response to each information need was selected and then rated on 7-point scales capturing the informational value of the response (which include facets of contributing to knowledge, providing new information, and verifying information already known), satisfaction, and trust (in the answer, the source, and the service).

We used a mixed-effects regression model to analyze the informational value, satisfaction and trust scores. The independent variables include participants’ web skill, age, gender, question type (categorical), and search (vs. SMQA). Because observations were not independent, participant was modeled as a random effect. Full results of these models can be found in Appendix 1.

Information Value

Questions routed to search engines were rated significantly higher for contributing to knowledge ($M = 4.85$) than those routed to social networks ($M = 3.73$), $F(1, 950.1) = 9.49$, $p < .01$. Responses were also rated higher for providing new information for questions sent to search engines ($M = 4.78$) than for questions sent to social media ($M = 2.94$), $F(1, 952.9) = 24.51$, $p < .001$

Question types had a significant effect on contributing to knowledge, $F(10, 950.1) = 6.54$, $p < .001$, and on providing new information, $F(10, 953.4) = 5.52$, $p < .001$. For both outcomes, responses are rated highest for Factual Knowledge and Exploratory information needs; types for which new knowledge would be most valuable. In contrast,

responses were rated significantly higher in verifying existing information to Navigational needs, which are targeted and easily fulfilled, than to Factual Knowledge needs and to the more social needs of Social Connections, Invitations, Favors, and Offers ($F(10, 944.2) = 5.76, p < .001$).

Satisfaction

While participants felt that information from search engines contributed more new knowledge than social networks, they were more satisfied with responses to questions posted to social networks.

The effect of routing on satisfaction shows a trending effect, with responses to information needs routed to social media rated as more satisfactory ($M = 5.86$) than those responses to those routed to search engines ($M = 5.2$), $F(1, 968.4) = 3.06, p = .08$. Across question type, users were more satisfied with responses when they sent their questions to Facebook or Twitter than to search engines. This indicates that satisfaction has a social component; users may rate responses as satisfactory even if they don't answer the question as well because of other factors that enhance their judgment of that response, e.g., humor.

Question type also had a significant effect on satisfaction with responses, $F(10, 968.8) = 11.28, p < .001$. Navigational, Recommendation, and Factual Knowledge information needs lead to the most satisfying results, while Offers, Favors, and Invitations garner the least satisfactory result, as might be expected by their necessarily reciprocal nature, which is harder to attain.

Trust

Trust in a given service for information varied significantly by routing decision, such that participants trusted search engines ($M = 5.78$) more than social networks ($M = 3.78$) as a source of information, $F(1, 939.8) = 86.51, p < .001$.

However, when rating the specific *source* of the information (a friend in the case of social networks or a specific website from a search engine), participants placed greater trust in responses from social sources ($M = 6.19$) than search sources ($M = 5.27$), $F(1, 952.2) = 11.39, p < .001$.

This presents an interesting contradiction whereby individuals generally perceive search engines as more trustworthy sources of information, but end up trusting the information provided by their friends more than what they ultimately find in those search engines.

Question type also had a significant effect on trust in source, $F(1, 953.2) = 11.11, p < .001$, and trust in answer, $F(10, 953) = 12.10, p < .001$. For both, responses to Navigational needs are rated highest, whereas Favors, Offers, Rhetorical questions and Polls.

DISCUSSION

The results above both contribute to our understanding of SMQA behavior and inform design decisions for the

growing number of technologies that seek to bridge traditional search and social networks. This section discusses both of these topics and also covers our work's limitations.

SMQA Behavior

Our findings related to the "What goes where?" question highlight both the potential of SMQA and its limitations. With regard to SMQA's potential, the fact that participants entirely ignored search engines in favor of SMQA for 7% of unprompted information needs means that SMQA can serve as a search engine alternative in special cases. Moreover, SMQA's utility as a complement to web search was highlighted by the 13% of information needs that went to both search and SMQA. On the other hand, we also saw that search engines were used exclusively for a large majority of information needs. This is true even though status message question asking and searching were made equally prominent in our study's website interface, suggesting that our numbers represent something of an upper-bound for SMQA (as it currently exists). Overall, our findings intimate that SMQA has an important role to play as both an alternative and complement to web search, but that this role is somewhat constrained.

These trade-offs are contextualized in the "why (and why not)?" motivations showing not only when to route to, but also when to route away from or merge with SMQA. While motivations for turning to SMQA were consistent with previous work (e.g. [11]), our findings shed light on information seeking strategies for actively avoiding SMQA when it is deemed limited or disruptive. We introduce the U-shaped curve of specificity, indicating that SMQA is deemed appropriate within a spectrum bound by needs too exploratory to be successful in SMQA and too specific to be necessary in SMQA. Evidence for a desire to merge SMQA and search is seen in comparisons between the two in multiple ways: simply comparing for a wider variety of information, using search to verify friends' opinions, or turning to friends to clarify search results.

Finally, our "what's successful" question receives a nuanced answer in which search and SMQA act differentially on various facets of success. In line with our findings about the large percentage of information needs which are sent to search engines, we discover that information seekers perceive search to provide more valuable information than SMQA. However, SMQA plays a niche role in providing more satisfying answers, indicating that success goes beyond informational content, and information seeking potentially fulfills a more holistic, partly social need. That information-seekers place greater trust in search engines as a whole for information, but greater trust in their friends than web results found in search corroborates this interplay of informational and social needs, in which both search and SMQA can play complementary roles.

Implications for Design

At a high level, our results add to the growing body of work advocating for technologies that merge the searching and asking experience. Our results suggest that search engines may be able to better address up to 20 percent of information needs by integrating SMQA capabilities into their systems. Social networks, on the other hand, could increase the information value of asking a status message question by incorporating search engine technology into the conversations around status message questions.

Our work also presents the possibility of developing technologies that automatically route information needs to the appropriate service. We saw above that distinct patterns exist in people's routing choices and the motivations behind those choices. Using these patterns, a model could be developed that would allow, for instance, a search engine to know when to suggest posing a status message question in addition to – or instead of – continuing with a search. Indeed, working towards this model is a direction of future work.

Another important implication for design arises from our finding that exploratory information needs nearly always are routed to search engines, at least in part due to a tendency to avoid posing open-ended questions to one's social network. Exploratory information needs are a well-known weakness of current search engines and are, accordingly, an active area of research. Our research suggests that despite the conversations around status message questions having many properties conducive to the open-ended, multifaceted, and iterative process that is exploratory search [22], there may be limited opportunity for the development of exploratory search systems in this domain.

Limitations

Although this paper is the first to examine the routing of information needs across SMQA and search engines, we did not consider the effect of other social search strategies such as IM, e-mail, SMS, and face-to-face discussion, whose relationship with traditional search has been a subject of several studies (e.g. [2,15]). Understanding routing in this more diverse ecology of services is a subject of future work.

Our research is also limited by sampling biases. Although the distribution of web skills among our participants was not abnormal, our sample had an overrepresentation of women and students. Additionally, our sample was drawn from a specific geographic area, which suggests other biases may exist.

Another issue not addressed here the potential "saturation effect" present in SMQA. In order to understand routing behavior at the information need-by-information need level, we necessarily restricted the number of status message questions that would actually be posted to participants' networks. Our future work involves taking a longitudinal

perspective in order to shed light on the relationship between the number of status message questions posted in a given timeframe and the likelihood of asking another question.

Finally, there is a possibility that our results related to prompted information needs are biased towards search engines due to participants being reluctant to post "artificial" information needs to their friends and contacts. While very few participants indicated that this was a concern in their questionnaires, this effect may still exist. Throughout the paper, we have been careful to use only the unprompted information needs or present the results separately when this issue could have affected our conclusions.

CONCLUSION

In this paper, we presented the results of an 82-participant laboratory study on status message question asking (SMQA), a form of information seeking in which social network users pose questions to their friends and contacts. We placed SMQA behavior in the context of more traditional information seeking through search engines by identifying what types of information needs to go SMQA instead of, or in addition to, search engines. We also investigated why users are motivated to route information needs to or away from social networks and which routing decisions are most successful in terms of information value, levels of trust, and satisfaction. This work presents evidence that users combine routing strategies, providing support for new technologies that aim to merge search and social information-seeking approaches.

ACKNOWLEDGEMENTS

*** removed ***

REFERENCES

1. Ackerman, M., Adamic, L., Ellison, N., et al. Social media question asking workshop. *CSCW '13 EA: 2013 ACM Conference on Computer Supported Cooperative Work (Extended Abstracts)*, ACM (2013), 297–298.
2. Evans, B.M., Kairam, S., and Pirolli, P. Do your friends make you smarter?: An analysis of social strategies in online information seeking. *Information Processing & Management* 46, 6 (2010), 679–692.
3. Gray, R., Ellison, N.B., Vitak, J., and Lampe, C. Who wants to know?: question-asking and answering practices among facebook users. *CSCW '13: 2013 ACM Conference on Computer Supported Cooperative Work*, (2013), 1213–1224.
4. Hargittai, E. and Hsieh, Y.P. Succinct survey measures of web-use skills. *Social Science Computer Review* 30, 1 (2012), 95–107.
5. Hecht, B., Teevan, J., Morris, M.R., and Liebling, D. SearchBuddies: Bringing Search Engines into the Conversation. *CHI '12: 30th International Conference on Human Factors in Computing Systems*, (2012).
6. Jansen, B.J., Booth, D.L., and Spink, A. Determining the informational, navigational, and transactional intent

- of Web queries. *Information Processing & Management* 44, 3 (2008), 1251–1266.
7. Kules, B. and Capra, R. Creating Exploratory Tasks for a Faceted Search Interface. *HCIR '08: 2nd Workshop on Human-Computer Interaction and Information Retrieval*, (2008).
 8. Lampe, C., Vitak, J., Gray, R., and Ellison, N.B. Perceptions of Facebook's Value as an Information Source. *CHI '12: 30th International Conference on Human Factors in Computing Systems*, (2012).
 9. Morris, M.R., Teevan, J., and Panovich, K. What do people ask their social networks, and why?: a survey study of status message Q&A behavior. *CHI '10: 28th International Conference on Human Factors in Computing Systems*, ACM (2010), 1739–1748.
 10. Morris, M.R., Teevan, J., and Panovich, K. A Comparison of Information Seeking Using Search Engines and Social Networks. *ICSWM '10: 4th International AAAI Conference on Weblogs and Social Media*, (2010).
 11. Panovich, K., Miller, R., and Karger, D. Tie strength in question & answer on social network sites. *CSCW '12*, ACM Press (2012), 1057.
 12. Paul, S., Hong, L., and Chi, E. Is Twitter a Good Place for Asking Questions? A Characterization Study. *ICWSM '11: 5th International AAAI Conference on Weblogs and Social Media*, (2011).
 13. Rose, D.E. and Levinson, D. Understanding user goals in web search. *WWW '04: 13th International Conference on World Wide Web*, ACM (2004), 13–19.
 14. Singhal, A. Search, plus Your World. *Google Inside Search Blog*, 2012. <http://googleblog.blogspot.com/2012/01/search-plus-your-world.html>.
 15. Taylor, B. Bringing Your Friends to Bing: Search Now More Social. *The Facebook Blog*, 2010. <http://blog.facebook.com/blog.php?post=437112312130>.
 16. Teevan, J., Ringel Morris, M., and Panovich, K. Factors Affecting Response Quantity, Quality, and Speed for Questions Asked via Social Network Status Messages. *ICWSM '11: 5th International AAAI Conference on Weblogs and Social Media*, (2011).
 17. White, R., Muresan, G., and Marchionini, G. Evaluating Exploratory Search Systems. *SIGIR '06 Workshop on Evaluating Exploratory Search*, (2006).
 18. White, R., Roth, R., and Marchionini, G. *Exploratory search: beyond the query-response paradigm*. Morgan & Claypool,, [San Rafael, Calif.] :, 2009.
 19. Yiang, J., Morris, M.R., Teevan, J., Adamic, L.A., and Ackerman, M.S. Culture Matters: A Survey Study of Social Q&A Behavior. *ICWSM '11: 5th International AAAI Conference on Weblogs and Social Media*, (2011).

APPENDIX 1.

	Satisfaction	Contribute Knowledge	Provide Information	Verify Information	Trust Answer	Trust Service	Trust Source
	<i>Estimate</i> (SE)	<i>Estimate</i> (SE)	<i>Estimate</i> (SE)	<i>Estimate</i> (SE)	<i>Estimate</i> (SE)	<i>Estimate</i> (SE)	<i>Estimate</i> (SE)
Age	.0070 (.0076)	.0160 (.0108)	.0091 (.0106)	.0181 (.0124)	.0069 (.0076)	.0135 (.0082)	.0069 (.0075)
Female	-.0042 (.0898)	-.0329 (.1284)	-.0430 (.1259)	.0312 (.1478)	-.0285 (.0908)	.0711 (.0975)	.01780 (.0892)
Web Skill	-.0504 (.1030)	-.1679 (.1463)	-.0870 (.1434)	.1626 (.1680)	.1027 (.1035)	.0262 (.1108)	.1400 (.1016)
Search (vs. social)	-.3304 # (.1890)	.5621 ** (.1825)	.9200 *** (.1858)	-.1538 (.1708)	-.1942 (.1398)	1.003 *** (.1078)	-.4612 *** (.1367)
Question Types (vs. avg. others)							
Exploratory	.3124 # (.1632)	.6073 *** (.1576)	.5743 *** (.1604)	.2216 (.1474)	.3567 ** (.1205)	.0596 (.0932)	.2756 * (.1178)
Factual Knowledge	.6593 *** (.1343)	.5445 *** (.1301)	.5986 *** (.1324)	.2153 # (.1222)	.5190 *** (.0997)	-.0421 (.0772)	.4649 *** (.0976)
Favor	-.5127 * (.2242)	-.7857 *** (.2180)	-.3214 (.2204)	-.5337 ** (.2025)	-.1713 (.1659)	-.2549 * (.1288)	-.2106 (.1621)
Invitation	-.9318 ** (.3187)	-.2608 (.3083)	-.1614 (.3140)	-.3670 (.2889)	-.0584 (.2362)	-.3520 # (.1859)	.0191 (.2309)
Navigational	1.458 *** (.1911)	-.0748 (.1840)	-.3927 * (.1874)	.8572 *** (.1722)	1.343 *** (.1411)	.1689 (.1087)	1.249 *** (.1379)
Offer	-.5022 * (.2361)	-.4804 * (.2273)	.0860 (.2316)	-.6517 ** (.2126)	-.2292 (.1743)	-.1001 (.1342)	-.2663 (.1703)
Opinion	.3480 # (.1914)	.4224 * (.1846)	.5216 ** (.1880)	.3324 # (.1727)	.0474 (.1415)	-.0956 (.1090)	.0834 (.1383)
Poll	-1.269 (.8526)	-1.083 (.8230)	-1.697 * (.8381)	-.9006 (.7712)	-2.094 *** (.6313)	.5256 (.4865)	-2.042 ** (.6170)
Recommendation	.7248 *** (.1575)	.5846 *** (.1521)	.4858 ** (.1551)	.2410 # (.1427)	.4790 *** (.1166)	-.0011 (.0901)	.4899 *** (.1141)
Rhetorical	-.4343 # (.2467)	.2724 (.2364)	-.2233 (.2407)	.6045 ** (.2214)	-.3309 # (.1853)	-.0354 (.1397)	-.2664 (.1770)
Adj-R ²	.192 n = 1,006	.302 n = 1,008	.294 n = 1,008	.384 n = 1,009	.302 n = 1,007	.430 n = 1,007	.302 n = 1,008

Notes: Significance levels are the following: # $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$. For ease of exposition only fixed effects are reported in this table.