‘Who Knows What’: Audience Targeting for Question Asking on Facebook

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Social networking sites are becoming increasingly popular venues for seeking information. To the extent that users can understand who knows what in their networks and target those friends appropriately, they can make effective use of the site as a knowledge base of information. This paper explores how targeting one’s Facebook network when asking questions influences the breadth and quality of answers they receive. An experiment (N = 64) was conducted in which participants posted questions to their Facebook networks in four broadcast level conditions: status update to their full networks, status update to a custom subset of their networks, posting on a friend’s Timeline, and sending a direct message. Results indicate that posting a question more broadly results in more information, which is moderated by perceptions of Facebook as a transactive memory system and as a source of social capital. However, informational and social value of responses is greatest when posting to a custom subset of their network. These results suggest that while targeting specific individuals may be the most effective means of gathering information in offline networks, the broadcast affordance of Facebook may be a more useful way to gather information on the site.

CCS Concepts: • **Human-centered computing** → Human computer interaction (HCI); Empirical studies in HCI

KEYWORDS

Status message question asking; Facebook question asking; broadcast level; transactive memory system; social capital

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1 INTRODUCTION

Social networking sites (SNSs) such as Facebook and Twitter have become popular places to seek information, serving as both social and informational resources for recommendations (e.g., restaurants, music, activities), requests (e.g., help requests), factual knowledge (e.g., travel information) and other information [33]. Individuals may find that their social networks provide better information in cases where their questions are highly contextual or in need of subjective feedback [33,40]. Querying one's social network also offers potential social benefits such as providing support, sparking conversation, and strengthening relationships [18,20].

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Using SNSs as information resources is a relatively common activity – as many as half of all Facebook users engage in Status Message Question Asking (SMQA) behavior in their personal networks [33], and up to one-third of all tweets on Twitter are questions [40]. Even with the existence of dedicated question and answer forums such as Yahoo! Answers and Quora, individuals' personal social networks provide a number of unique benefits. For instance, users generally place greater trust in responses from their social networks [33], and are more likely to turn to them when seeking particular networks of knowledge [36]. Given that some requests also incur costs on their networks, the social capital in SNSs make them potentially more valuable spaces for question-asking [14].

Yet, despite the many benefits of gathering information from one's social networks, only a small portion of social media users' overall information needs are sent to SNSs, with up to 80% still routed to search engines [36]. One reason that users do not more consistently turn to their vast networks of expertise for information is that they may vary in their awareness or their perceptions of SNSs as effective venues for seeking information.

In this paper, we argue that an SNS – Facebook in particular – can serve as a useful platform for question-asking, depending on how broadly or narrowly a user targets their network for information. We introduce and test the ideas of broadcast level and targeting to existing work on SMQA. We present findings from a naturalistic experiment that shows that the ability for an individual to obtain valuable information from their network effectively is partly dependent on 1) their knowledge of who knows what and 2) the resources that are available in their network.

2 QUESTION TARGETING AND BROADCAST LEVELS

In considering the use of SNSs for SMQA, these sites are best seen as a 'collection of features' [43]. On Facebook, one affordance is broadcast level, or how widely information is shared. This affords audience selection or customization regarding who sees a question posted on the site. For instance, the status update feature affords greater visibility, while the direct messaging feature may afford stronger connection with others. When asking a question, users can broadcast it to the whole network, or they can target more specific people through tagging, custom lists, or private messaging, which could lead to different informational outcomes. Prior research has found that individuals do target their information needs differently across social media and search engines depending on how broad or specific the question is and whether a more familiar or more public audience would seem more beneficial [36]. Yet, the outcomes are mixed in terms of informational value and satisfaction, indicating that one strategy is not universally better. Within Facebook specifically, posting to a whole network allows for a wide variety of new information, though it could fail to answer the question. Conversely, directing a question to just one person could garner a more personally tailored answer, but miss opportunities for more diverse information. We propose competing predictions that while posting more broadly will lead to more information overall, posting more narrowly will lead to greater information quality.

The most common way people ask questions on Facebook is by broadcasting them to their full network through a status update [45], which has its benefits. Research on news sharing found a story received more responses when it was posted more broadly [37]. While this finding is not about information seeking per se, it may follow that posting a question more broadly should lead to more responses. More broadly targeted posts should also lead to more diverse information, based on the larger audience who sees the post and the wider diversity of information they can contribute [45].

The average Facebook user has over 300 friends in their network [42]. Broader audiences offer more weak ties, and weaker ties are often the source of new information [8,17,18]. Recent research indicates that this is not necessarily because the information from weak ties is better, but simply that there are more weak ties in a network [16], which enhances the variety of

information from an audience that an individual posting a question was not necessarily considering. Therefore, simply in terms of amount of information, as a question is posted more broadly and seen by a wider variety of individuals, there are likely to be more responses, providing more information overall.

H1: Questions posted more broadly will result in a greater amount of information from an individual's network than questions posted more to a more targeted audience.

However, the sheer amount of information does not necessarily indicate its informational value, or the relevance, quality, and usefulness of the responses in answering the question at hand. Instead of posting a status update for the whole network to see, users can post information to subsets of their networks, referred to as micro-broadcasting [41,50]. While broadcasting a question may encourage more responses, the overall relevance of those responses may decrease. Likewise, information from one strong tie can be more useful than all the information gained from the weak ties in a network [16]. Evidence shows that responses from social networks to questions tend to be 'content-light,' serving more conversational than informational purposes [15]. Instead, when users target specific friends, the responses they receive are more content-rich, focusing on providing the requested information. Users tend to have a specific target audience in mind, even when posted broadly [31], but not targeting them explicitly may lead to responses from unexpected audience members that are not as focused. Therefore, we predict that questions posted to a more targeted audience will lead to responses more focused on the question at hand, and as a result provide better information.

H2: Questions posted to a more targeted audience will result in responses with greater informational value than questions posted more broadly.

2.1 Facebook as a Transactive Memory System

While the broadcast level a user chooses may affect the amount and quality of information received, these effects are likely moderated by a user's ability to understand their network as a potential resource for knowledge and expertise. Put another way, the ability for a user to effectively obtain valuable information from their network depends on their knowledge of who exists in their network, what they know, and what additional resources they make available – in other words, their understanding of Facebook as a transactive memory system.

Transactive memory is a form of interdependent cognition, in which a dyad or group can think about things in ways their individual members could not do alone. Wegner [47] posits that in addition to storing information in our memory (internally), we store information externally, such as in technological devices or about the knowledge of other group members. The transactive view of memory is focused on what information is available in the minds of group members, and how it is communicated among them [48]. It has two components: an organized store of knowledge contained in the memories of the group members, and knowledge-relevant transactive processes that occur among group members. A transactive memory system (TMS) is this collective set of information possessed by the group and the awareness of who knows what [48].

In organizational settings, a TMS functions as a sort of meta-knowledge about "who knows what" and "who knows whom" in term of where to get information at work [27]. SNSs have played an important role in knowledge acquisition in organizational settings, serving as a resource for understanding who has what knowledge. Enterprise social media have allowed colleagues to share knowledge with each other by providing affordances such as visibility, editability, persistence, and association [44]. Making information about with whom and where information lies more visible in a workplace SNS vastly improves workers' meta-knowledge about this information in the organization.

We argue that even networks formed on non-work SNSs such as Facebook can function as similar transactive memory systems. Like organizational SNSs [28,44], Facebook offers high visibility of other users' communications, persistence of that information even as those users go offline, editability of the information by the original user and the audience, and clear associations between individuals on the site. Research has linked social media use to TMS both in and outside of the workplace because it makes communication between dyads or group visible [26]. Social media can support transactive memory encoding through the way that individuals use the sites [2]. For instance, social media use at work is positively related to the development of TMS and to job performance [9]. Aspects of TMS are also linked to using social media to share travel information from both formal sources and from friends [11]. Likewise, question and answer (aka "Q&A") sites such as Stack Overflow are similar to TMS's in that they contain a database of user knowledge upon which others can rely for the information itself, or for insight into particular users that may have relevant expertise to solve their problems [46].

A TMS on social media is built through social interaction [22]. On Facebook, each user builds a network by adding other users as friends who are then visible in one's news feed. Individuals may talk with each other about pieces of information as they encode them, and topics are then linked to individuals through these interactions [47]. On Facebook this process is enacted through the use of crafting profiles of one's background, and discussion that builds around topics that occur in users' posts [2]. When individuals need information that they believe can be found within their social networks, they can turn to the site to either connect with those who have that information ("who knows what"), or to find out who can help ("who knows whom"). This can be seen in the behavior of asking the 'Facebook hive mind' to collectively provide answers to one's questions.

While Facebook can function as a TMS, the ability to draw on this memory system relies on a shared awareness of the site as such a system. Transactive memory is a collective process, but individuals vary in their ability to form and use a TMS [35]. The more Facebook users use the site to seek and share information, the stronger their perceptions of Facebook as a TMS may become [22,38]. On Facebook this means that as users interact socially, they also gain information through conversation about who is an expert about what. To the extent that a Facebook user has stronger transactive memory capabilities and greater expertise recognition, the more effectively they can target questions to their network to obtain useful information. Thus, successful question targeting will depend on stronger perceptions of their Facebook network as a TMS.

H3: Perceptions of one's Facebook network as a transactive memory system will moderate the effects of broadcast level on the informational value of responses received.

2.2 Social Capital in Seeking Information on Facebook

Understanding how to find information in one's social network is closely tied to the value that one places in that network for finding information. This value is known as social capital, or the actual or perceived resources individuals can gain by interacting with others in their social networks [5,34]. SNSs have been established as sources of social capital for their users [6,7,13,14,23].

Generally, bridging social capital—that focused on gaining new information across weaker ties—is positively related to perceptions of information usefulness [18,24]. Those who feel more connected to their Facebook networks and view them as a way to learn more about new people and new experiences rate the answers they receive in response to their questions as more useful [18]. However, the effects of tie strength—a key factor in social capital—on information quality are mixed. While there is evidence that responses from weaker ties are rated as more useful [18], other research shows users place more value on answers from strong ties [39]. That is,

bonding capital – that focused on maintaining existing relationships – may also be an important influence on information quality, particularly if the cost of the request is high [14]. This highlights the importance of a user's perceptions of what their network can provide.

Like with transactive memory, the quality of information that users receive from Facebook is likely to be higher when they have a strong sense of available social capital in their network. Therefore, positive or negative perceptions of bridging and bonding social capital should increase or decrease the effects of broadcast level on information quality.

H4: Perceptions of bridging and bonding social capital on Facebook will moderate the effects of broadcast level on the informational value of responses received.

2.2.1 Social Benefits of Question-Asking

Given that SNSs are inherently social spaces, individuals using these sites to seek information are likely to also obtain social or relationship-oriented benefits. If a user asks their network to recommend moving companies in the area, they can expect to receive recommendations and personal experiences that can help them make an informed decision. They are also likely to receive socially-oriented responses that ask when they are moving, if they need help, and if they can meet up before they leave. While these responses do not provide the information requested, they provide social interaction, support, and potentially even offline relationship-building. That is, the answers may provide social value, or be beneficial in terms of various types of relevant social support, beyond only answering the question at hand.

Seeking social interaction is one of the main user intents that drives question-asking on community question-asking sites [10]. On Facebook, even when answers to questions were not rated as useful, they were still considered relevant because they provided support [33]. On Twitter, nearly all question threads have conversational elements, and this social content serves the important function of supplying momentum in conversations, leading to more information-gathering [12]. These social benefits may be subject to the type of audience targeting strategy used. Questions posed to a more targeted audience are likely to receive responses that focus more directly on answering the question at hand. Conversely, responses from a broader audience will vary more widely in the information they offer, and there is evidence that these responses will be more social [15]. If a user asks for a recommendation about moving companies and receives conversational responses about their move, they may feel supported by and closer to individuals in their network.

H5: Questions posted more broadly will result in responses of greater social value than questions posted to a more targeted audience.

3 METHODS

To test our hypotheses, we conducted a within-subjects experiment with four audience targeting (broadcast level) conditions. Participants asked questions of their Facebook networks using four broadcast levels ranging from their full network to one person, based on previous research [37]: 1) a status update made visible to their entire network, 2) a status update made visible to only a custom (narrower) audience, 3) a post made directly on a friend's Timeline, and 4) a private message sent to a friend of their choice. Participation lasted over the course of four weeks, with each participant completing all four conditions at the rate of one condition per week.

3.1 Participants

Participants (N = 64) were recruited from a mid-sized Midwestern university and the surrounding area. To be eligible they had to be at least 18 years old, have a Facebook account,

and post on Facebook at least monthly. Payment of up to $20 in Amazon gift cards and entry into a drawing for an iPad were given to those who completed the study. The sample is 61% female and 69% students. Participants range in age from 18 to 46 (M = 22.89, SD = 5.39). Forty-five percent of participants are White, 28% Asian, 9% Black, 2% Hispanic, 2% other, and 14% multi-ethnic. The median number of friends participants have on Facebook is 664, ranging from 30 to 1,735 (M = 660.78, SD = 357.28).

3.2 Procedure

The study was completed online using a custom website built to provide study instructions, randomly assign conditions, track participation, collect question and answer content, record Facebook data, and integrate Qualtrics questionnaires into one continuous workflow. Facebook feeds involve social interaction and can elicit interactions and content with potential social and ethical implications. To address this, we built in several safeguards to our study protocol. We ensured participants produced natural questions that they wanted answers to and would be comfortable asking of their social networks. If at any time they were uncomfortable with their question and the intended audience, they were able to revise it before sending or choose not to send it at all. We also ensured that the participants had the opportunity to review their responses, and could remove any part or entire thread of comments if they wished to do so. While these safeguards were in place, none of the participants chose to withhold their posts or remove content from the final analysis. The study procedure was also reviewed and approved by the university's Institutional Review Board (IRB). Consenting participants logged into the system using their Facebook accounts and authorized access to their account information via Facebook's Application Programming Interface (API). Then, they completed a questionnaire about their Facebook use and SMQA habits.

Next, they were told that they could use the interface to ask any question they had been wanting an answer to. We asked participants to come up with their own question in order to focus them on information needs relevant to them, and ones on which that they would engage with their networks naturally. In our prior work [36] we tested both researcher-selected and user-selected questions and found that the pre-selected questions contained inquiry types that users did not make on their own, limiting engagement from their networks. Once they came up with the question, they typed it into a status update box to post to Facebook. Before the question was posted, they were randomly assigned to one of the four broadcast level conditions, and given additional instructions on how to post their question to the audience assigned for that condition (i.e., how to post to their full network, a custom audience, tag friends to target them, or send it directly to a friend). After the question was posted, participants continued to a questionnaire about what they expected to receive in response to the post.

Two days after posting the question, participants received a reminder email to log back into the interface and complete questionnaires about any responses they received. This procedure was repeated each week for each of the remaining conditions, until each participant had completed all four conditions, which were counter-balanced to eliminate order effects. After the completion of all four conditions, participants were compensated and instructed on how to remove API access to their Facebook account.

3.3 Data

3.3.1 Data Collected from Facebook Accounts. By logging into our interface and agreeing to connect their Facebook accounts, participants granted permission to collect the following information about their Facebook accounts: Age, gender, location, and number of friends. Once they posted a question, the following information about the post was collected in our database (with permission): post content, post location, time of post, post privacy settings, content attached to post, and which (if any) friends were tagged. Finally, the number of comments was

recorded for each post to measure the amount of information received. If friends liked or commented on the question, the following information was collected about each response: who liked the post, comment owner, comment content, comment likes, and comment tags. Names of friends who made comments were shown to participants in follow-up questionnaires, but these comments were de-identified prior to analysis.

3.3.2 Questionnaire Measures. Measures of Facebook use, transactive memory, and social capital measures, as well demographic information, were collected in a questionnaire before starting the experiment. Comment ratings were collected after responses to questions had been received.

3.3.2.1 Facebook use for Information-Seeking. Participants were asked how often (1 = Never – 6 = A few times per day) they engaged in eight information-seeking activities on Facebook (based on [33]): Get recommendations, gather opinions about an item, seek answers to a specific question, learn more about a topic, invite friends to an event, ask for a favor, get a referral to a new connection, or offer something to others. These items formed a reliable scale of Facebook information-seeking, $\alpha = .88$ ($M = 2.62$, $SD = .97$).

3.3.2.2 Facebook as a Transactive Memory System. Lewis's [30] Transactive Memory System scale was adapted to address Facebook networks specifically. The original scale contains 15 five-point Likert-type items (1 = Strongly disagree – 5 = Strongly agree) across three sub-dimensions: Specialization, Credibility, and Coordination. Because the Coordination sub-scale referred specifically to teamwork (e.g., 'Our team worked together in a well-coordinated fashion'), it was not used in the context of Facebook. This is supported by qualitative research which finds that social media features are used to determine specialization and credibility within their networks more than coordination [2]. Therefore, only the Specialization and Credibility sub-scales were used. Four items were adapted from the Specialization dimension (e.g., 'Each person in my Facebook network has knowledge about specific topics), and four items were adapted from the Credibility dimension (e.g., 'I trust that my Facebook network's knowledge is credible'). This resulted in a total of eight items. Overall reliability for this scale was high, $\alpha = .83$ ($M = 4.60$, $SD = .84$).

3.3.2.3 Social Capital. Facebook social capital was measured using Williams's [21] scale developed for Facebook. This scale was originally adapted from online scales of bridging and bonding social capital [49], which have been widely used in online studies of social capital [1,4,23]. The bridging social capital sub-scale includes items such as 'Interacting with people in my Facebook network makes me want to try new things,' and 'Through my Facebook network, I come in contact with new people all the time.' This scale showed good reliability: $\alpha = .83$ ($M = 4.89$, $SD = .82$). The bonding social capital sub-scale includes items such as 'When I feel lonely, there are several people in my Facebook network I can talk to,' and 'The people I interact with in my Facebook network would put their reputation on the line for me.' This scale was reliable: $\alpha = .81$ ($M = 4.97$, $SD = .91$).

3.3.2.4 Comment Ratings. Participants were asked to rate each comment on their questions across 14 items collected from previous studies in the question-asking literature [19,33,36], using seven-point Likert-type scale items (1 = Strongly disagree – 7 = Strongly agree). A factor analysis was conducted on the 14 items. Examination of the scree plot revealed two factors, which were rotated using Varimax: informational value (7 items, $\alpha = .90$, $M = 4.93$, $SD = 1.39$) and social value (5 items, $\alpha = .81$, $M = 5.11$, $SD = 1.09$). Seven items loaded onto the information value scale: satisfied, useful, answers the question, relevant, provides new information, supportive, and learned more about the commenter. Five items loaded onto the social value scale: interesting, trust in the commenter, feel closer to the commenter, entertaining, and lifted mood. Items about the comment being upsetting and the comment verifying known information did not load onto either factor and were dropped. See Table 1 for factor loadings and Table 2 for a correlation matrix of all measures.

Table 1. Response ratings means and standard deviations.

Item	M	SD	Informational value	Social value
I am satisfied with this response	5.33	1.65	**.74**	.39
This response is useful	5.00	1.84	**.89**	.14
This response answers my question	5.00	1.91	**.88**	.05
This response is relevant to my question	5.50	1.64	**.74**	.17
This response provides information I didn't know before	4.38	2.01	**.67**	.08
This response is supportive	5.33	1.50	**.68**	.38
I learned something new about the person who provided this response	4.00	1.80	**.47**	.12
This response is interesting	5.00	1.48	.31	**.64**
I trust the person who provided this response	5.83	1.13	.33	**.49**
This response makes me feel closer to the person who posted it	4.82	1.58	.31	**.61**
This response is entertaining	4.78	1.61	-.05	**.70**
This response puts me in a good mood	5.15	1.45	.20	**.79**
This response verifies information I already knew	3.99	1.83	.01	**.18**
This response upsets me	2.08	1.46	-.20	**-.21**

Table 2. Correlation matrix of measures.

	1	2	3	4	5
1. Facebook information-seeking					
2. Transactive memory	.27***				
3. Bridging social capital	.53***	.32***			
4. Bonding social capital	.26***	.23***	.58***		
5. Informational value	-.13*	.08	-.05	.01	
6. Social value	-.15*	.20**	-.03	-.02	.47***

Note: * $p < .05$, ** $p < .01$, *** $p < .001$.

4 RESULTS

4.1 Questions Asked and Responses Received

Participants posted a total of 175 questions to Facebook. Due to some attrition over the four-week period, 50% of participants completed all four conditions, while the remainder complete just one to three of the conditions. Still, these questions were evenly distributed among the experimental conditions ($X^2 = 10.40$, $p = .32$), with 41-47 questions in each of the four broadcast level conditions. Questions were categorized according to coding schemes used in [33,36]. In line with previous work, most questions were seeking recommendations (36%), gathering opinions (19%), and seeking factual information (18%). See Table 3 for a sample of questions asked in each category.

Sixty percent ($n = 104$) of these questions received responses in the form of comments or replies, ranging from one to 30 responses, with a median of one response ($M = 10.02$, $SD = 8.68$). This resulted in a total of 563 responses, which differed significantly by condition, $F(3, 633) = 38.40$, $p < .001$, with a question asked as a private message receiving the most responses ($n = 215$, $M = 13.90$), and a question posted on a friend's Timeline receiving the least ($n = 77$, M = 3.68).

Ratings were completed for 225 (40%) of the responses received. Responses were rated positively overall, with participants indicating that they were generally satisfied with the responses ($M = 5.33$), found the responses relevant to the question ($M = 5.50$), and that they

trusted those friends who posted them (M = 5.83). See Table 1 for descriptive statistics. Overall, responses were rated as providing slightly more social value (M = 5.18) than informational value (M = 4.87).

Table 3. Question types and examples.

Question Type	Percent	Example Question	Condition
Recommendation	36%	Anyone have any good recommendations on how to study for MCAT this summer??	Status: All
Opinion	19%	Is it actually worth spending money on Facebook games?	Status: Custom
Factual knowledge	18%	When is Mardi Gras?	Status: All
Rhetorical	12%	Why is it not spring yet?	Direct message
Poll	7%	What are you most looking forward to in spring quarter?	Direct message
Favor	3%	You don't happen to have a wealth of colored sharpies? Looking to decorate CDs.	Friend's Timeline
Invitation	3%	Let me know if you guys would want to go to a circus performance at actors gymnasium on a Saturday in the next couple weeks....just asking around. Love ya!	Friend's Timeline
Social connection	1%	Any chance someone has a sweet connection to someone who owns an exotic car or swanky…transportation to/from a wedding?	Status: Custom

4.2 Question Targeting Outcomes

Hypotheses were tested using two modeling approaches. First, a generalized linear model for a Poisson distribution was used to model the number of comments (since the data exhibited a non-normal distribution that is typical of count data), and model fit and selection were determined based on Akaike Information Criterion (AIC). Second, mixed effects models were used to model a comment's perceived social value and informational value (since the variables follow a normal distribution and to account for the fact that multiple comments could be rated by a given participant and therefore require adjusted standard errors). In all models the dependent variables were regressed on broadcast level, perceptions of Facebook as a transactive memory system, bridging social capital, bonding social capital, and two-way interactions of these variables with broadcast level. Number of friends, Facebook information-seeking, and question type were included as control variables, and, for the mixed effects models, participant was set as a random effect variable due to the repeated measures nature of the comment data. Hypothesis 1 predicted that asking a question more broadly would lead to receiving more information (see Table 4).

The effect of broadcast level on number of comments received was significant: X^2 (3, N = 175) = 104.5, p < .001 (see Figure 1). Posting a question as a status update to one's whole network (i.e., 'Status: All') was 1.7 times more likely to yield a comment than posting to a custom subset of the network (X^2 = 18.18, p < .0001), and more than three times as likely to yield a comment as posting on a friend's Timeline (X^2 = 44.67, p < .0001). Sending a direct message was also more effective than posting to a custom subset or on a friend's Timeline (~2.1 and 3.8 times respectively; all p's < .0001). This provides substantial support for H1, as posting to one's whole network resulted in more comments than most other conditions, except for the direct message, which generally elicited a large number of responses, due to the conversational nature of this type of interaction. The model also shows a significant effect of question type on number of responses, X^2 = 32.68, p < .0001 (Figure 1).

Table 4. Poisson regression model for number of comments (n = 174).

	Estimate	SE	p-value	[95% CI]	
Intercept	0.8203	0.3912	0.0390*	0.0420	1.5764
Number of friends	-0.0004	0.0001	0.0031**	-0.0007	-0.0001
Question type					
Factual knowledge	0.2709	0.1262	0.0276*	0.0294	0.5293
Favor	-1.2328	0.5125	0.0022**	-2.4601	-0.3793
Invitation	-0.0655	0.2298	0.7741	-0.5415	0.3662
Opinion	-0.1751	0.1405	0.2183	-0.4485	0.1070
Poll	0.4852	0.1596	0.0025**	0.1721	0.8018
Recommendation	0.3467	0.1167	0.0017**	0.1267	0.5898
Rhetorical	-0.0641	0.1604	0.6894	-0.3817	0.2518
Facebook information-seeking	-0.1203	0.0581	0.0370*	-0.2351	-0.0072
Broadcast level					
Status: All	0.3513	0.0754	<.0001***	0.2031	0.4990
Status: Custom	-0.1828	0.0894	0.0371*	-0.3617	-0.0107
Friend's timeline	-0.7623	0.1165	<.0001***	-1.0015	-0.5434
Transactive memory	0.0909	0.0747	0.2253	-0.0563	0.2368
Bridging social capital	-0.0008	0.0928	0.9934	-0.1805	0.1836
Bonding social capital	0.0373	0.0686	0.5864	-0.0968	0.1721
*Broadcast level * Transactive memory*					
Status: All * Trans.memory	0.0864	0.1054	0.4119	-0.1198	0.2936
Status: Custom * Trans. memory	0.2970	0.1108	0.0069**	0.0812	0.5159
Friend's timeline * Trans. memory	-0.5735	0.1716	0.0006***	-0.9154	-0.2423
*Broadcast level * Bridging social capital*					
Status: All * Bridging soc. cap.	0.1494	0.1278	0.2417	-0.1005	0.4010
Status: Custom * Bridging soc. cap.	-0.4639	0.1345	0.0005***	-0.7297	-0.2021
Friend's timeline * Bridging soc. cap.	0.4007	0.2000	0.0395*	0.0188	0.8049
*Broadcast level * Bonding social capital*					
Status: All * Bonding soc. cap.	-0.2727	0.1086	0.0115*	-0.4867	-0.0609
Status: Custom * Bonding soc. cap.	0.5931	0.1160	<.0001***	0.3665	0.8215
Friend's timeline * Bonding soc. cap.	-0.3690	0.1481	0.0130*	-0.6593	-0.0781

Notes: Pseudo-R^2 for the model is 0.16. Reported estimates are Poisson regression coefficients and represent the difference in the log of the expected count for a one-unit change in the predictor, holding constant the other predictor variables; Categorical variable estimates represent offsets from the overall categorical mean. *p < .05; ** p < .01; *** p < .001

Hypothesis 2 states that posting to a more targeted audience will result in responses of greater informational value. The model results for comment informational value (see Table 5) revealed a significant effect for broadcast condition, $F(3, 189.3) = 2.68$, $p = .048$. Examination of this effect with a post-hoc Tukey HSD test reveals that broadcasting a question to a custom subset of the network led to responses with significantly greater information value (M = 5.01, SE

= .341) than asking a question via direct message (M = 4.18, SE = .306; p = .0283), with broadcasting to the full network (M = 4.78, SE = .346) and posting to a friend's Timeline (M = 4.75, SE = .403) indistinguishable from either of these conditions. This does not directly support H2, but indicates that there is an optimum level of targeting, as asking a custom network led to the most informational responses, but targeting too narrowly through a private direct message provided the least.

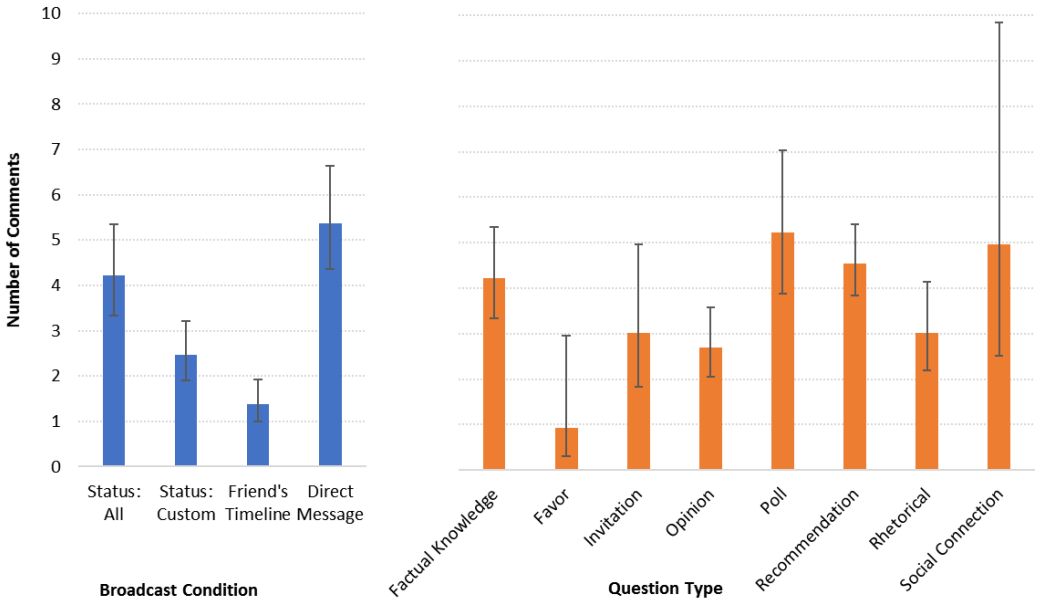

Figure 1. Predicted number of comments by broadcast condition (left; mean +/- 95% ci) and by question type (right; mean +/- 95% ci).

Hypothesis 3 states that a better understanding of one's Facebook network as a transactive memory system should moderate the effect of broadcast level on comment informational value. The interaction of transactive memory perceptions and broadcast level on comment informational value was not significant, $F(3, 183.8) = .41$, $p = .74$. This does not provide support for H3. However, there was a significant interaction between broadcast level and transactive memory perceptions ($X^2 = 13.20$, $p = .004$) on number of comments (Figure 2), indicating that transactive memory instead moderates the relationship between broadcast level and the amount of information one gets. Further examination of the interaction reveals that a greater understanding of one's Facebook network as a transactive memory network was associated with more comments in the custom status update and the direct message conditions, whereas it had only a slight positive effect when posting to one's whole network, and had a negative relationship to comments when posting to a friend's Timeline.

Hypothesis 4 stated that social capital would moderate the effects of transactive memory perceptions on information value. There was no significant interaction effect of either bridging or bonding social capital on comment informational value. This provides no support for H4. However, there were significant interaction effects on the number of comments between broadcast level and bridging social capital, $X^2 = 13.79$, $p = .003$ (Figure 3) and broadcast level and bonding social capital, $X^2 = 29.34$, $p < .0001$ (Figure 4). Greater bridging social capital was associated with a higher number of responses in conditions other than the custom status

update, indicating that when already targeting a custom audience, having greater bridging social capital does not add much benefit in getting responses. Greater bonding capital was associated with a higher number of responses in the custom status update and private message conditions than in the whole network status update. This shows that contrary to bridging capital, bonding capital serves to increase the number of responses from audiences that are specifically selected for question-asking.

Table 5. Mixed effects model for comment informational value.

	Informational value			Social value		
	(DF num, DF denom)	*F*-ratio	*p*-value	(DF num, DF denom)	*F*-ratio	*p*-value
Fixed effects						
Number of friends	(1, 29.16)	2.684	0.1121	(1, 33.54)	4.958	0.0328*
Question type	(7, 91.58)	1.508	0.1744	(7, 114.3)	3.035	0.0058**
Facebook information-seeking	(1, 27.22)	0.7468	0.3950	(1, 33.97)	3.1852	0.0832†
Broadcast level	(3, 189.3)	2.679	0.0483*	(3, 195.9)	3.1759	0.0252*
Transactive memory	(1, 37.15)	1.236	0.2734	(1, 41.36)	3.1559	0.0830†
Bridging social capital	(1, 42.49)	0.0108	0.9178	(1, 44.61)	0.8603	0.3586
Bonding social capital	(1, 41.59)	0.3084	0.5816	(1, 43.19)	0.1672	0.6846
Broadcast level * Transactive memory	(3, 183.89)	0.4138	0.7433	(3, 194.5)	1.9641	0.1207
Broadcast level * Bridging social capital	(3, 165.8)	0.3990	0.7539	(3, 184.2)	0.5150	0.6725
Broadcast level * Bonding social capital	(3,175.5)	0.5208	0.6685	(3, 192.1)	0.2120	0.8880
Random effects	Variance (SE)			Variance (SE)		
Participant	.355 (.1878)†			.340 (.1277)**		
Level-1 residual ($\hat{\sigma}^2$)	1.515 (.1656)			.651 (.0717)		
Adjusted-R^2	0.36				0.517	

Notes: Entries for reported *p*-values for the random components were obtained by testing the null hypothesis that the particular variance component is zero. Tests were performed using the likelihood-ratio test between the model and baseline model. † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Hypothesis 5 stated that posting more broadly would also result in more social benefits. The model results for comment social value (see Table 5) revealed an effect of broadcast level, $F(3, 195.9) = 3.18$, $p = .025$. Examination of the broadcast condition with a post-hoc Tukey HSD test reveals that posting a status update to a custom network leads to comments of greater social value ($M = 4.96$, $SE = .248$) than posting to the whole network ($M = 4.43$, $SE = .250$; $p = .016$), with asking a question via direct message ($M = 4.58$, $SE = .221$) or posting to a friend's Timeline ($M = 4.73$, $SE = .286$) indistinguishable from the other conditions. This does not support H5, as a custom status update is less broad than a post to one's whole network. This again indicates that there is an optimal level of targeting questions, even for obtaining socially-oriented responses.

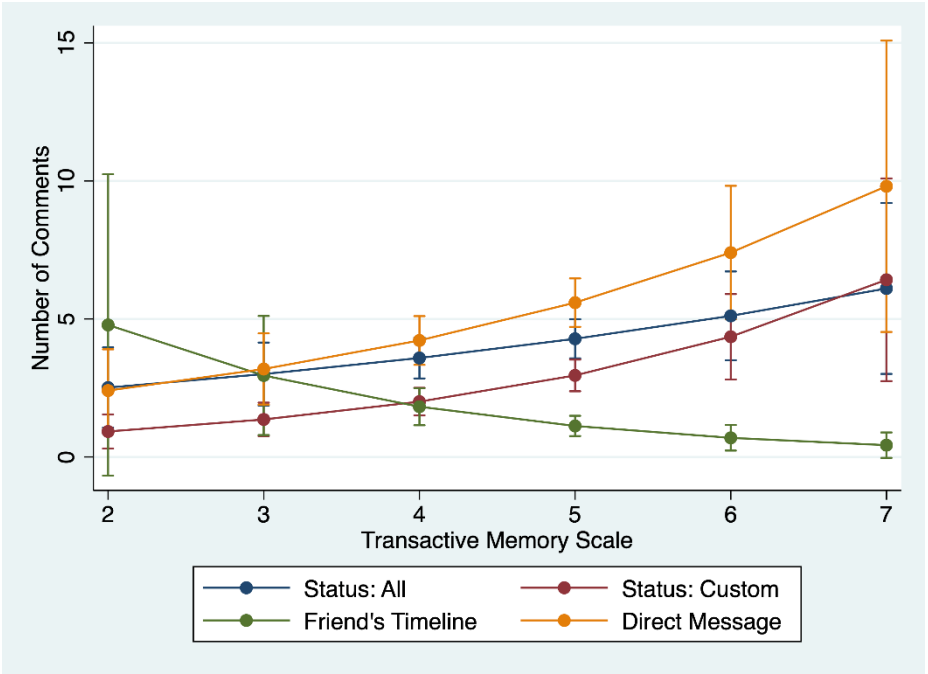

Figure 2. Plot of broadcast level by transactive memory system perceptions interaction on number of comments received with 95% CI.

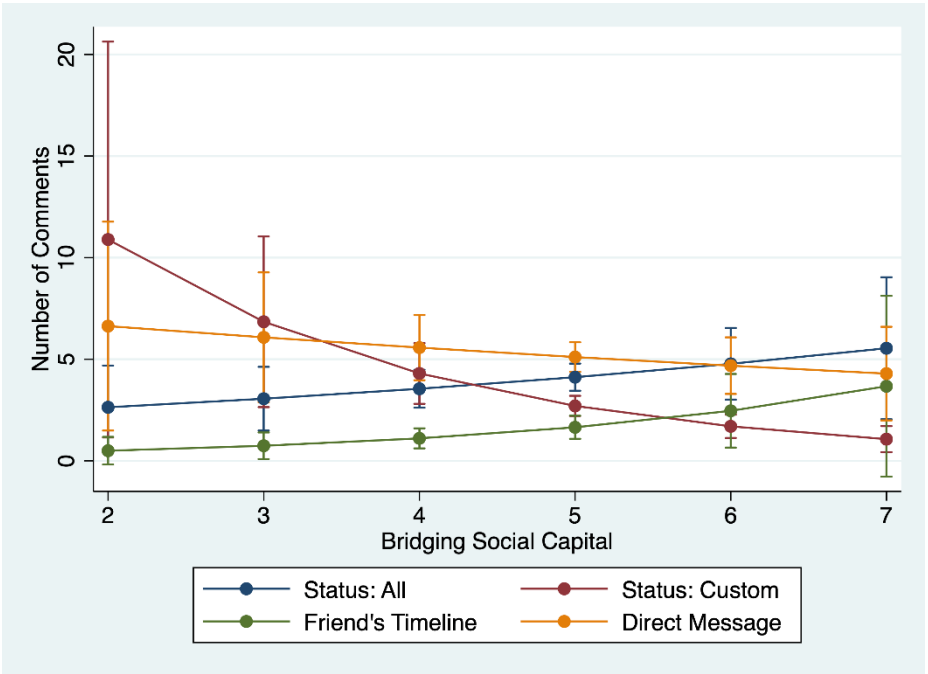

Figure 3. Plot of broadcast level by bridging social capital interaction on number of comments received with 95% CI.

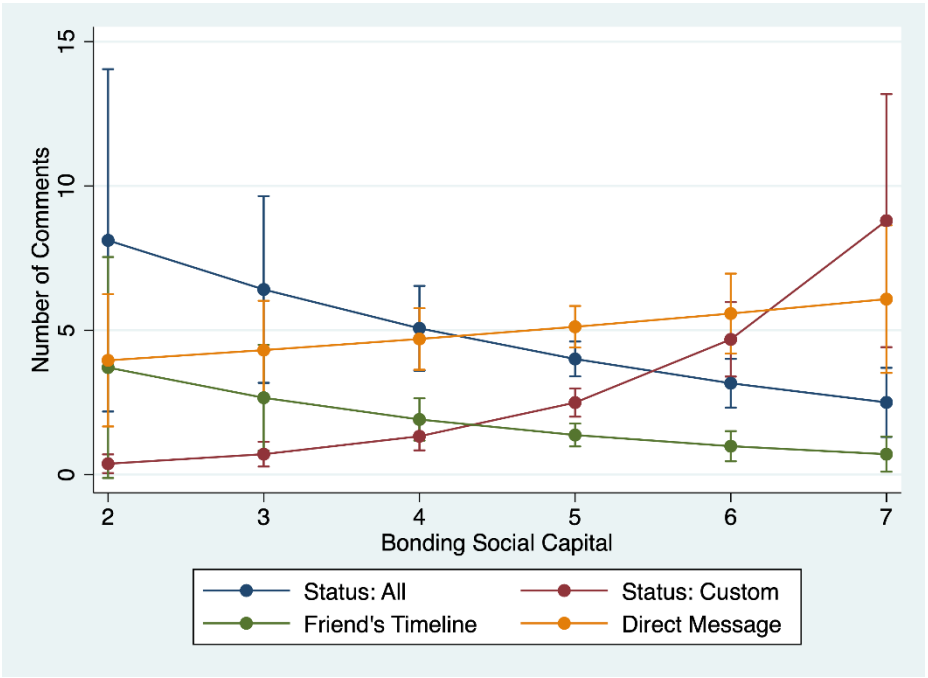

Figure 4. Plot of broadcast level by bonding social capital interaction on number of comments received with 95% CI.

4.3 Analysis of Question Type

Given that question type had an effect on the responses received, their informational value may also be impacted differentially by a sense of transactive memory (e.g., for factual knowledge) or social capital (e.g., social connection). Therefore, we also performed additional post-hoc analyses to explore whether question type interacted with transactive memory, bridging social capital, and bonding social capital on our measures of informational and social value. However, we found no evidence of an interaction between question type and any of these other variables in the model.

5 DISCUSSION

In this paper we see that an SNS—in this case Facebook—can be a useful platform for asking questions and receiving responses because of its broadcast level affordances. However, the benefits depend on how the user specifies and targets a potential audience for their query. Overall, our results provide support for the prediction that targeting a specific audience when asking questions on Facebook can lead to more useful information. Posting to a custom audience resulted in responses of the greatest informational value and social value, while posting more broadly led to more responses. For some broadcast levels, questions received more responses for individuals who better understood their network as a transactive memory system. Similarly, bridging and bonding social capital were associated with a higher number of responses for certain broadcast levels.

Broadcast level plays a key role in gathering useful answers from one's network. For the greatest amount of information, results show that individuals should broadcast to their whole network, where they are likely to reach the largest audience. Yet, our results indicate that for those responses to be useful, selecting a custom audience is key, which corroborates previous

research [15]. There appears to be an optimal targeting level, in which the user selects a custom subset of their network. A private message is too narrow because it relies on only one expert. Similarly, a post on a friend's Timeline narrows the network of expertise to that friend and their mutual friends. The custom status update allows individuals to limit the audience to exclude the potentially less relevant parts of their network, but still broadcast and discuss within a sub-network. This results in a greater wealth of information than a narrower broadcast level, and information which is also more likely to be relevant than from a whole network.

The effect of broadcast level on the number of responses was moderated by both transactive memory perceptions and social capital. In other words, the extent to which a user understood who knows what and the degree to which they viewed their network as a possible source of social capital, further influenced the effectiveness of a chosen targeting approach. Transactive memory had the strongest effect as a moderator in the custom status update, indicating that a greater awareness of Facebook as a transactive memory system may lead to more successful custom audience targeting. In this case, custom targeting lead to the greatest number of responses for those who had a stronger sense of their network as a TMS. That is, those who understood their networks well were able to target the best people to get the most information from. This makes intuitive sense as understanding who in your network might hold relevant information or know where to find that information, leading to more effective outcomes. Conversely, bridging social capital was more useful in the other broadcast conditions, offsetting the less effective strategy of broadcasting to less specifically targeted audience.

However, neither perceptions of Facebook as a transactive memory system nor social capital had main effects on any response outcomes. This contradicts previous research on social capital in SNS, which has found positive links between social capital and informational usefulness in information-seeking [14,24,25]. A potential reason for the lack of effects of transactive memory and social capital on response quality is due to the variety of question types. While information-focused questions such as those seeking factual knowledge or recommendations may benefit from a greater knowledge of where to find experts in one's network, socially-oriented questions such as invitations or favors may benefit from a wealth of social capital.

5.1 Theoretical implications

This research is the first step in understanding Facebook as a potential transactive memory system, based on features similar to SNSs used in organizational settings [28,44]. While understanding one's Facebook network this way does not directly lead to higher quality information, it does lead to receiving more responses when targeting one's network in certain ways. This study contributes to the existing knowledge that individuals do use social media sites as transactive memory support [2,9] with empirical evidence for the effects of using these sites when seeking information in particular ways.

The key to using a transactive memory system is remembering not a particular piece of information, but remembering where that information is located. In this experiment, it may be the case that participants did not know where the information they sought is located, rendering the targeting of specific individuals less effective. Moreland [29,32] notes that in very large networks, information exchange may not naturally occur, and it becomes necessary to state explicitly what each person knows. With an average network size of over 600 in this study, this is certainly the case on Facebook. For this reason, and because Facebook presents such a visible network, targeting specific individuals may actually be a detrimental strategy. Whereas existing transactional memory theory holds that a system is most effective when everyone in the network is aware of each other's expertise, the results presented here extend that theory to SNSs and show that in this setting, broader targeting can lead to better information.

It should be noted that Facebook cannot be conceived of as a true transactive memory system as it focuses on personal networks rather than bounded networks of people as might be found in a workplace. Facebook is not one closed network, but rather the interconnection of

many ego-networks. Therefore, the members of any user's network may not conceive of themselves mutually as part of that network and do not necessarily interact with others in that person ego-network, but rather interact with their own networks of which they are the center. This presents an additional factor to consider in extending transactive memory theory, which traditionally has dealt with complete networks, to personal online networks in which it may be harder to target individuals and more effective to broadcast information needs widely.

5.2 Practical Implications

Participants rated the responses they received from Facebook quite favorably, even though their understanding of the site as a transactive memory system did not help them obtain higher quality responses. This indicates that while people may not perceive the site as a source of information and are not yet using Facebook for information-seeking very regularly, doing so could be beneficial. With over one billion daily active users on Facebook, the site contains a wealth of information that users are only beginning to realize. Most Facebook users are checking in daily and engaging on a regular basis with friends' posts through comments and likes, and these posts could help them exchange useful information while socializing.

A key feature of Facebook is the affordance to broadcast requests for information broadly to the network in one post. This allows users to know very little about who to ask for information and still benefit from the knowledge present in the network. While targeting specific individuals may be the most effective strategy in other transactive memory networks, the size and visible nature of Facebook may make this unnecessary on the site. Instead it may be useful for SNSs to guide users who would be most knowledgeable to the posts requesting that information. Some efforts have been made to bring friends' knowledge closer to users, through Facebook's smart lists and graph search, and by researchers developing systems such as SearchBuddies [20]. SNSs can further guide users to learn from their friends through specific list recommendations or by directing them to information that friends have previously shared.

5.3 Limitations and Future Research

As with all experimental research, the behavior captured in this study is not necessarily representative. While some research has found that asking questions on Facebook is a common activity [33], most participants in the current study stated that they use Facebook to seek information only a few times a year. Participants did post valid questions in this study, but prompting them to think of a question may not get at the type of information needs they would otherwise send to their networks. Furthermore, participants were asked to think of a question to ask before they were instructed on how broadly to post the question. They were given the opportunity to edit the question before posting or sending it, but most questions were left unchanged or changed only slightly for wording, but not content. It is possible that participants would be able to better target network friends with real information needs for which they could choose the broadcast level they feel would best suit that question. It is also possible that they would not have asked the questions they did to the broadcast levels they were assigned. Finally, it is possible that participants' networks could overlap and some participants could have been exposed to and potentially interacted with posts from others, though the data do not indicate any such awareness of other study participants.

Additionally, this study only captured questions asked in an isolated instance in time. Question-asking and response behaviors may differ if users continue to ask questions of their networks over a longer period of time. Finally, the design of this experiment, in which participants were asked to post over the course of a month, and to evaluate all responses to each question, resulted in some data attrition, further limiting the potential amount of information for analysis. Beyond the limitations of the experimental design, the results are also potentially

influenced by the Facebook algorithm, which partly determines what users see in their Facebook news feeds, based on their behaviors [3]. This can make it difficult to completely control the audience for participants' posts in a research context. For instance, a post made for a user's network may not be shown to their whole network. However, the broadcasting and targeting strategies tested in this study would also be subject to the site's algorithmic influence in a real world context.

Future research should further examine the idea of Facebook as a transactive memory system, to understand how people naturally use their networks for information, and how they judge where to broadcast information needs. First, such research should also address the diverse content of questions, which was not fully explored in this study. Second, such research should also broaden the investigation of the site as a TMS to include the traditional coordination sub-factor that was not measured in this study. A better understanding of how users conceive of the expertise in their networks, and how they attempt to use that, will benefit future investigations of how to optimize the use of SNSs for this purpose.

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