

Social Media, Knowledge Sharing, and Innovation: Toward a Theory of Communication Visibility

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This paper offers a theory of communication visibility based on a field study of the implementation of a new enterprise social networking site in a large financial services organization. The emerging theory suggests that once invisible communication occurring between others in the organization becomes visible for third parties, those third parties could improve their metaknowledge (i.e., knowledge of *who knows what* and *who knows whom*). Communication visibility, in this case made possible by the enterprise social networking site, leads to enhanced awareness of who knows what and whom through two interrelated mechanisms: message transparency and network translucence. Seeing the contents of other's messages helps third-party observers make inferences about coworkers' knowledge. Tangentially, seeing the structure of coworkers' communication networks helps third-party observers make inferences about those with whom coworkers regularly communicate. The emerging theory further suggests that enhanced metaknowledge can lead to more innovative products and services and less knowledge duplication if employees learn to work in new ways. By learning vicariously rather than through experience, workers can more effectively recombine existing ideas into new ideas and avoid duplicating work. Moreover, they can begin to proactively aggregate information perceived daily rather than engaging in reactive search after confronting a problem. I discuss the important implications of this emerging theory of communication visibility for work in the knowledge economy.

Keywords: social networking; innovation; knowledge sharing; metaknowledge; computer-mediated communication and collaboration; knowledge management; ethnographic research

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Introduction

Most of the work conducted in today's knowledge-intensive organizations is largely invisible. Workers sit at computers typing reports, performing analyses, writing copy, and performing other tasks that are difficult for observers to discern. As scholars have noted, work in the postindustrial economy is increasingly disembodied such that there are few physical manifestations of activity for others to observe (Suchman 2007). Work is made even more invisible as organizations increasingly rationalize it into smaller task units, spreading them across workers in various groups and departments, perhaps in different geographic locations. Even if there were some physical manifestation of work, there would be few relevant coworkers around to see it done. Consequently, Nardi and Engeström (1999, p. 2) suggest that in a knowledge economy "work is, in a sense, always invisible to everyone but its own practitioners."

Work invisibility can have a number of negative consequences for organizations. Research has shown that when people cannot see what others do, or when, with whom, and how they do it, there is

less interpersonal trust among coworkers (Cramton et al. 2007). In addition, coordination suffers (Dey and de Guzman 2006), work duplication occurs (Lapré and Van Wassenhove 2001), and product and process innovation are less likely (Majchrzak et al. 2004). Because of these negative consequences, scholars have searched for technologies that might provide workers some visibility into the work of their colleagues. Technologies that make workflows (Kinnaird et al. 2012), activity status (Dourish and Bellotti 1992), and even worker location (Erickson 2010) visible to others provide a means to learn about the work of colleagues and, hopefully, to avoid some of the problems that occur when work is largely invisible to others.

The past few decades have seen an increase in the use of technology to make communication visible as a work activity. Workplace communication by telephone or face-to-face encounters is largely invisible to all but the parties involved or those who may be in proximity. The number of people who might overhear an interpersonal conversation (even spoken loudly) is small relative to the size of most teams, departments, and organizations. More contemporary

communication (e.g., email and instant messaging) is easily shared with others, and thus visible to a wider audience. Collaboration tools, decision support software, and worker databases have further increased communication visibility by loosening the requirement to select a target audience through email carbon copy features or the instant messaging forward feature. Instead, the sender can create a public communication platform that can be accessed by team members. Still even shared communication platforms limit visibility because membership in groupware and other collaboration tools are normally limited to specific team members. Shared databases and other repositories are often password protected and stored in a location unknown to most of the organization.

The introduction of social media tools, including social networking sites, blogs, wikis, and microblogs, into organizational contexts continues a long trend of making workplace communication visible. However, as Treem and Leonardi (2012) show in their detailed review, social media are making routine communications between coworkers even more visible to third parties than the many preceding communication technologies. For example, the exchanges between two people on an enterprise social networking site often appear on the wall or newsfeed of a third party not involved in the communication (Hampton et al. 2011). That people can articulate their social networks and tag documents and images produced by coworkers within social networking sites gives outsiders further visibility into the communication partners of their peers (Keitzmann et al. 2011). As some commentators suggest, social media are so quickening the pace by which technologies afford communication visibility that we are entering an era of “hypervisibility” where anyone can easily see with ease what any other person said and to whom (Keen 2012).

This paper will explore how the increasing visibility of communication might, as several researchers have suggested (Gibbs et al. 2013, Jarrahi and Sawyer 2013, Leonardi et al. 2013, Treem and Leonardi 2012), shape knowledge sharing in organizations, and the role that these implications for knowledge sharing might play in modern work. I conduct a qualitative study of the implementation of a new social networking site into a large financial services organization. This study takes advantage of a comparative analysis in which only one of two matched-sample groups in the same organization was given access to the social networking site for six months; the other group was not. Interviews with members of both groups before implementation of the social networking site and six months after its introduction provided a comparative basis for identifying the advantages the technology provided for staff work and the social dynamics that emerged as communication became more visible.

The findings demonstrate that the increased communication visibility associated with the social networking site enabled users to become more aware of what and whom their coworkers knew. This enhanced awareness allowed staff to avoid work duplication and to develop more innovative ideas for products and services. To realize these positive benefits, users had to enact fundamental changes in the way they worked. I conclude by discussing the implications of this emerging theory of communication visibility for research in information systems, management, and communication.

Theoretical Background

Learning About Knowledge Through Communication

Numerous studies conducted over the past two decades have shown that successful organizations create the conditions under which employees can effectively share knowledge with one another (Argote et al. 2000, Hansen 1999, Tortoriello et al. 2012). Most research on organizational knowledge sharing has focused on when, in the course of their work, researchers should look for new knowledge (Katila and Chen 2008, March 1991) and what conditions are likely to ease knowledge transfer (Reagans and McEvily 2003, Szulanski and Jensen 2006). Clearly, timing and knowledge transfer issues are important. However, the decision on when to acquire knowledge and how it can be applied to completion of tasks and problem solving would likely be impossible in the absence of accurate organizational metaknowledge. Organizational metaknowledge refers to knowledge about who knows what and who knows whom within the organization. Before workers can acquire instrumental knowledge, they must know where to get it and how to access other workers, files, or databases where that knowledge can be found.

Researchers who study transactive memory systems have, so far, been among the organizational theorists to explicitly consider the concept of metaknowledge. A transactive memory system is a collective system that individuals in close relationships use to encode, store, and retrieve knowledge (Hollingshead 1998a, Ren et al. 2006). A transactive memory system has two components. The first is a transactive memory, or as Ren and Argote (2011, p. 192) call it, “metaknowledge, which helps individuals to retrieve information from external sources.” The second component is a set of processes for updating and using that metaknowledge. Wegner (1995) suggested three such processes related to the development and application of metaknowledge: directory development (producing accurate metaknowledge);

information allocation (new knowledge communicated to the person whose expertise will facilitate its storage); and retrieval coordination (knowledge on any topic retrieved based on knowledge of who knows what in the system). A transactive memory system allows each group member to share accurate organizational metaknowledge. They can then route new knowledge to those who can best store it, and who can teach others in times of need (Brandon and Hollingshead 2004).

Despite the central role that accurate metaknowledge plays in effective transactive memory systems (without it, coordination among members of the system would be difficult [Austin 2003, Yuan et al. 2007]), most researchers have focused on information allocation processes (e.g., Jackson and Klobas 2008, Yuan et al. 2007) and retrieval coordination (e.g., Hollingshead 1998b, Jarvenpaa and Majchrzak 2008) at the expense of understanding how accurate metaknowledge is achieved (see Ren and Argote 2011). Instead, scholars have largely inferred the processes by which accurate metaknowledge is developed and shared among members of a group. For example, Liang et al. (1995) found that group members who underwent training together had more accurate metaknowledge that was common to the team than did group members who were trained individually. Other studies have shown that groups constructed of members who have had the occasion to see each other directly performing work tasks (Heald et al. 1998) and of members who had previously worked jointly on projects (Reagans et al. 2005) tend to have more accurate and more widely shared metaknowledge. The inferences drawn from these studies and others like them is that seeing each other learning to conduct tasks and having experience seeing others actually conducting tasks leads to more accurate and more widely shared metaknowledge.

The assumption that workers will develop accurate and shared metaknowledge naturally through direct observation of work and interaction becomes less tenable when one raises the level of analysis from the group to the organization. The departmentalized structure of most organizations reduces the chances that people from different units will work together, even though they may have complementary knowledge. Also, the geographic dispersion of workers in different departments and business units reduces opportunities to see what others do when they work, and with whom. More commonly, workers learn by talking with others or hearing second-hand reports about how tasks were conducted and with whom. In his initial theoretical formulation of the transactive memory perspective, Wegner (1987) acknowledged that, in real world settings (versus the laboratory) talking with others about their tasks and

communication partners might be a primary way through which accurate metaknowledge was developed: “The history of conversation about who has done what and heard what and been where and studied what and with whom and under what circumstance could be exceedingly rich, and so allows members to discern with much greater precision just who is expert in each of a variety of information domains” (p. 191). Recently, Palazzolo et al. (2006, p. 245) suggested that informal “water cooler communication” in which workers talked about their tasks and communication partners could facilitate development of a transactive memory.

There are a number of ways in which workers might learn what and whom others know. The distinction between experiential and vicarious learning often discussed in the literature on organizational learning demarcates two distinct strategies (Gioia and Manz 1985, Kim and Miner 2007). A person can learn experientially by communicating directly with a coworker, i.e., by asking questions and listening to answers. Workers can also acquire metaknowledge vicariously by watching others communicate. Through direct communication a worker can learn what and whom coworkers know even if that was not the explicit goal of the communication. Sometimes the focal actor is looking for specific, necessary instrumental knowledge from coworkers and, for this reason, asks them to recount tasks they have conducted or the people they know (March 1991). Yet workers can also learn through talking with coworkers though they may have no specific or immediate need for the knowledge they hope to obtain (Newell et al. 2009).

Like experiential learning from active communication, vicarious learning by watching the communication of others can occur when attention is focused or divided. Some third-party observation of communication occurring among others is focused in the sense that the focal actor is looking to find specific, needed instrumental knowledge from targets and, for this reason, watches to see what people are saying to others, to whom they are talking, and who they mention they have talked with before (Liebeskind 1996). Workers can also be exposed to communications between others even when they are not focused on trying to learn anything. In this way, they divide their attention among many communication events and file vicariously learned metaknowledge for future use (Weick 1995).

To the extent that the organizational environment makes it difficult for workers to develop accurate metaknowledge by observing what others do and with whom, it is unlikely that the environment will foster experiential learning through direct, active communication. Studies of co-located cross-functional teams and geographically distributed functional teams find that the departmental, temporal,

and linguistic boundaries between workers make it difficult for them to talk directly with each other (Cummings et al. 2009). Other studies show that active communication among coworkers who are not on teams, but who work in the same organization and do not sit near each other is relatively nonexistent (Allen 1977). Consequently, when considering the development of metaknowledge across the organization, as opposed to on small teams characterized by high degrees of task interdependence, experiential learning through direct communication with others, whether one's attention is focused or divided, may not be much more effective than direct observation of others' work. However, given recent advances in communication technologies within organizations, improvements in the accuracy of metaknowledge through vicarious learning, which can occur by simply watching or eavesdropping on others communication, may be not only feasible, but also effective (Ren and Argote 2011).

Enterprise Social Networking Technologies and Communication Visibility

Many organizations, large and small, are beginning to use enterprise social networking sites. According to Leonardi et al. (2013, p. 2), enterprise social networking technologies allow workers to: (1) communicate messages with specific coworkers or broadcast messages to everyone in the organization; (2) explicitly indicate or implicitly reveal particular coworkers as communication partners; (3) post, edit, and sort text and files linked to themselves or others; and (4) view the messages, connections, text, and files communicated, posted, edited, and sorted by others in the organization at any time. Significantly, enterprise social networking sites also provide a forum for public communication among employees (DiMicco et al. 2008). When two people share messages with one another, those messages appear on the communicators' personal profile pages, or "news feeds." On many social networking sites sold specifically for enterprise use, or enterprise applications that are built in-house, communications between coworkers can be seen by all of their respective contacts, and, if the appropriate settings are applied, by everyone in the organization.

The little empirical research on the use of enterprise social networking sites suggests that, unlike public social networking sites such as Myspace or Facebook where a user's online connections are strongly correlated with his or her offline social networks (see for example, Lampe et al. 2006), employees who use enterprise social networking sites tend to maintain connections with coworkers whom they do not know and with whom they do not regularly interact offline

(DiMicco et al. 2008). Given the access to others' communications they provide, enterprise social networking sites may enable vicarious learning through passive exposure to communications between others that extend observers' reach beyond their immediate work group members.

If enterprise social networking sites are indeed useful in helping workers to develop broader and more accurate metaknowledge through vicarious engagement in others' communications than they would otherwise develop through direct experiential involvement in communication with others, they are likely to do so only very slowly. It would be unlikely that a routine communication between two coworkers occurring on an enterprise social networking site would contain a concise description of someone's knowledge that would be useful at some other time by a casual observer. Instead, it is more probable that routine communications seen by third-party observers contain some bits of information that can only be turned into metaknowledge when they are assembled with other bits of information from different observed communications. Even if this were the case, the mechanisms through which communication on an enterprise social networking site would become visible to third-party observers are unclear. Also, the kinds of behavioral or work-based changes necessary to take advantage of this communication visibility, and the goals of that visibility, are unclear. To explore these issues, I turn to the study described below.

Methods

Research Setting and Design

The data for this study were collected at a large financial services firm headquartered in the Midwestern United States. American Financial (a pseudonym, as are all names in this article) is a major direct banking and payment services company. In late 2010, the company's Director of Internal Communication began working with the external software vendor, Jive, to customize an enterprise social networking site for internal communication among employees. The social networking site, called "A-Life" (short for "American Financial Life"), seemed nearly identical to publicly available social networking sites, such as Myspace and Facebook. It contained profile pages, news feeds, and algorithms for suggesting new contacts. The default settings for the site, which were unchanged, allowed anyone who used it to view anyone else's profile and to see communications between any other users on the site. The site also contained a shared document repository where items could be tagged and linked to a user's profile page or news feed. The system used employment data to create a list of a user's work group members and display that

list on his or her profile page. A-Life also allowed employees to post queries (much like a discussion board) and to blog about ideas.

In late 2011, the IT team responsible for A-Life's implementation selected 20 groups, at random, from across the company to participate in a pilot study to ensure the new technology was working properly before it was rolled out across the entire company. One of these groups was a management leadership program in the company's Marketing Division. The program consisted of employees from various departments within the Marketing Division. Employees were selected for the program after a competitive admissions process during their first year of employment and remained in the program throughout their tenure at the company. Membership in the program provided employees with regular access to company executives, extensive professional development classes, and regularly scheduled workshops and speaker events specifically designed for the program. In short, the program was a community of practice within the Marketing Division. At the time of this study, there were 44 program members. Their tenure with the company ranged from six months to 11 years and spanned entry-level positions through vice-president.

Because the Marketing group had been selected as a user community for the A-Life pilot study, but had not yet seen or begun to use the technology, a pre-/post-implementation research design could be used to assess what types of changes to work were associated with implementation and use of the social networking site by comparing how the individuals worked before as opposed to after their use of the system. Explaining whether and how A-Life increased communication visibility, and exploring changes in awareness and work practice over time required more than a simple pre/post research design. I needed to demonstrate that the dynamics resulting from A-Life use were not just attributable to the normal passage of time (Benbasat et al. 1987). To address this issue, we were permitted to examine the work of staff in a similar management leadership program group in the Operations Division over the same time period. The Marketing and Operations groups represented a matched sample in that the two leadership programs had nearly identical distributions of demographic profiles as to age, gender, ethnicity, tenure at the company, hierarchical level, and job performance ratings. There were 50 employees in the Operations group. None of them communicated with informants in the Marketing group. This reduced the possibility that changes occurring in one group might depend on or be affected by changes in the other. A-Life was implemented in Marketing in early January 2012.

Data Collection and Analysis

In December 2011, semi-structured interviews were conducted with 16 employees from Marketing and 18 from the Operations leadership program groups (hereafter, simply Marketing and Operations) to examine their normal patterns of communication and the various technologies they used to share knowledge. Each interview lasted between 40 and 70 minutes, with an average length of 50 minutes. The interviews followed the same semistandard protocol comprised of four major sections. In the first section, informants were asked general questions about their background and past work experience. Questions such as "What do you do in your job?" and "What does it take to be successful in your current role?" were designed to solicit opinions on the skills necessary to do their work. In the second section, we asked specific questions about information and data used at work. Questions such as, "What type of information or data do you think is most important for being a good (insert job title)?" and "Are some people at American Financial more knowledgeable in certain areas than others?" were meant to encourage informants to discuss their needs for information and data to complete their work. The third section asked them about the kinds of people they interacted with daily, how they interacted with them, and how they knew which coworkers to contact. Questions such as "How do you decide who you will talk with when you're working on a project?"; "What kinds of technologies do you use to interact with others?"; and "What kinds of technologies do you use to learn about the interactions occurring among your coworkers?" were intended to capture strategies for communication, interaction, and learning. The fourth section contained specific questions about various technologies used at home and at work, their general perceptions of social media technologies, and their perceptions of the role of technology in successfully executing their work.

Six months after Marketing began using A-Life, a second round of interviews was conducted with the same 16 employees from Marketing and 18 from Operations. The same interview protocol used in section one was used again for all employees; however, this round of interviews included questions on specific similarities and differences in communication and knowledge sharing since the last interview. Marketing participants were also asked specifically how they used A-Life over the previous six months. In total, 68 interviews were conducted across the two rounds with both groups. With the consent of the informants, all of the interviews were audio-recorded and later transcribed verbatim. In total, 473 pages of single-spaced interview transcripts were produced to serve as the raw data for analysis in this study.

The logic underlying this research design is the ability to isolate the effects of communication visibility enabled by social media use in Marketing through a two-way comparison (e.g., Miles and Huberman 1994). The diachronic comparison (i.e., comparison over time) facilitated understanding of changes to work occurred in Marketing after the implementation of the social networking site. The synchronic comparison (comparison with another group at the same time) between Marketing and Operations both before the implementation of the technology and after six months of use facilitated an understanding of what changes in Marketing resulted from enterprise social networking site use as opposed to simply broader organizational changes or changes due to natural increases in learning amongst coworkers due to six additional months spent working together. In other words, comparing the experience of staff in Marketing and Operations at two points in time facilitated focus on the nature of changes in Marketing, the only group to use the enterprise social networking site. Data analysis proceeded through three sequential phases (see Table 1).

The first phase of data analysis was designed to uncover the mechanisms by which use of the social networking technology made communication among coworkers visible. I began the analysis with the process of theoretical coding. Glaser (1978) suggests that theoretical coding is a useful strategy for the analyst who wishes to study a concept by examining the data. Accordingly, I began by examining the Marketing interview transcripts only from the interviews conducted six months after A-Life was implemented. I identified each instance in which informants talked about vicarious exposure to coworkers' communications. I applied codes to each instance that indicated what type of communication was made visible, how it was made visible, what the informant learned from the visible communication, and how that new knowledge was used in their work. In total, 49 distinct codes were produced in these various categories. The next step of analysis was axial coding. This involved reassembling the coded data in new ways by grouping codes that were conceptually similar (Strauss and Corbin 1998). Axial coding resulted in the reclassification into two main codes indicating what informants became aware of due to increased communication visibility (knowing what other people knew and knowing who other people knew), two main codes indicating how use of the technology prompted this awareness (making it easy to see the content of messages exchanged and making it easy to see who people sent messages to or indicated as a frequent contact), and four main codes indicating changes to their work that arose from this new awareness (expanded

their personal networks, avoided duplicating previously completed work, finished projects faster, and combined ideas from various sources).

The second data analysis phase was designed to confirm that the codes about what workers learned from using the new technology and the outcomes that resulted from its use were specific to Marketing at Time 2. Following the analytical induction process (Glaser 1965), I examined all of the other transcripts (Marketing before implementation of A-Life and Operations at both time periods) to ascertain whether the activities that Marketing participants performed after using A-Life were similar to or different from the activities before A-Life and whether the same was true for Operations informants at either time. Specifically, I used my understanding of what Marketing participants learned through vicarious exposure to visible communication on the enterprise social networking technology, and what they did with this knowledge, to uncover whether this kind of vicarious learning and knowledge use was discussed in any of the other interview transcripts. To verify that Operations was an acceptable comparative set to Marketing, I compared the codes generated for the two groups from the interviews done before A-Life was implemented. The codes were indeed quite similar both in placement and frequency. This provided evidence that Operations represented a reliable comparative set and that I could compare changes that occurred naturally over time in Operations to changes that occurred over time in Marketing. I could then safely argue that those changes in Marketing were different than would be expected given the results in Operations.

To verify that the four changes to the way people in Marketing worked (expanded their personal networks, avoided duplicating previously completed work, finished projects faster, and combined ideas from various sources) were confined, specifically, to the period of use following the implementation of the social networking technology, I followed the same process outlined earlier by comparing these codes to codes generated in the other interview transcripts. I used a conservative estimate to determine whether changes uncovered through this coding process were specific to the Marketing group. Specifically, I sought to determine whether discussions of these four outcomes were present in less than 5% of the interviews conducted in Marketing before implementation of the social networking tool, or in Operations at either point in time. Two of the three outcomes (i.e., expanded their personal networks and finished projects faster) were mentioned in 12% of interviews in Operations at Time 2. (They were excluded as findings, leaving only two main outcomes linked to the use of the new technology in Marketing.)

Table 1 Phases of Data Analysis

Phase	Goal	Data	Coding procedures		Comparison procedures		Finding
			Theoretical	Axial	Analytic induction	5% threshold analysis	
1	To uncover mechanisms by which social networking technology makes communication among coworkers visible	—16 interviews with Marketing employees after six months of tech use	—49 codes describing what type of communication was made visible, how that communication was made visible, what the focal individual learned from the visible communication, and how they used that new knowledge in their work	—2 codes indicating what informants became aware of due to increased communication visibility —2 codes indicating how use of the technology prompted this awareness —4 codes indicating changes to work that resulted from new awareness	N.A.	N.A.	—Knowing what coworkers knew and knowing who coworkers knew) —Making it easy to see the content of messages exchanged and making it easy to see who coworkers sent messages to
2	To confirm that findings from Phase 1 (what workers learned from using the new technology as well as the outcomes that arose from its use) were limited to those who used new technology	—32 interviews with Marketing employees (16 before and 16 after implementation) —36 interviews with Operations employees (18 before and 18 after implementation)	N.A.	N.A.	—Compared placement and frequency of codes given to Marketing and Operations from interviews before tech implementation	—Examined 4 codes indicating changes to work that arose from new awareness from Marketing in Time 2 and compared to appearance in all other transcripts	—Avoided duplicating previously completed work and combined ideas from various sources
3	To learn what kinds of behaviors were needed to change work in ways found in Phase 1 and verified in Phase 2	—16 interviews with Marketing employees after six months of tech use	—18 codes indicating new ways of working following implementation of new tech	—2 codes indicating behavioral changes necessary to achieve benefits found in Phases 1 and 2	N.A.	N.A.	—Learning without context and storing knowledge for possible later use

The final phase of the analysis was designed to determine what kinds of behaviors were needed to change work in ways uncovered in the previous phase. To execute this phase, I isolated all instances in which Marketing informants talked about new ways of working following the implementation of A-Life. I then repeated the steps summarized above—engaging in theoretical and axial coding to narrow and connect phenomena in the data and then comparing those codes to the other interview transcripts in an attempt to isolate these emerging findings to the work of those who used A-Life and, consequently, improved their awareness by being exposed to visible communications occurring amongst coworkers. Through this process, I identified two behavioral changes needed to

support new ways of working (i.e., learning without context and storing knowledge for future use).

I used Atlas.ti software to keep track of all theoretical, axial, and selective codes in each round of coding described above. To verify the accuracy of these codes, two research assistants repeated the coding procedure used by the author, using the detailed codebook (i.e., descriptions of each code) created in the Atlas.ti software. To ensure consistency, the author initially reviewed the codes applied by the two assistants after they had coded five randomly assigned transcripts. This helped the researchers to reach a consensus on the proper interpretation and application of each code. The researchers then recoded the five initial transcripts and all subsequent transcripts. At the

end of this process, a Cohen's Kappa was calculated to determine the extent of agreement between the three coders (i.e., the author and the two researchers). The final Cohen's Kappa, 0.87, was very acceptable (Fleiss 1971).

Next I present data primarily from the 16 Marketing interviews conducted after implementation of the enterprise social networking technology. As described above, the additional 52 interviews that were analyzed allowed me to say with certain confidence that the practices and changes that occurred within Marketing were indeed related to the way individuals in this group used the new enterprise social networking site because they represented changes to the informants' own work before the implementation of the technology, as well as changes from the normal dynamics of work in Operations occurring during the same six month window.

Findings

The results of the analyses are presented in three sections. First, I discuss how specific advantages created by use of the enterprise social networking site enabled third-party observers to become aware of "who knows what" and "who knows whom" in the organization. I then show how this newly held knowledge about what and whom others knew (i.e., metaknowledge) facilitated two changes to the way marketing informants worked. First, they avoided task duplication through more effective reuse of knowledge. This increased the speed at which they worked and allowed them to move on to tasks that added more value to the organization. Second, they recombined ideas culled from various coworkers into new ideas that helped them solve problems faster and more thoroughly. Finally, I show how the ability to develop sufficiently accurate metaknowledge from visible communication that could lead to recombinant innovation and avoidance of task duplication required at least two significant behavioral changes: Shifting from problemistic search to proactive aggregation of content and doing something else. I present evidence for these claims below.

Communication Visibility and the Development of Metaknowledge

Like workers in many large organizations, employees at American Financial typically had a good idea of what their coworkers (team members, other staff, or those they saw daily) were doing. Yet their understanding of other coworkers' activities in different departments (or geographic locations) was not extensive. As one Marketing informant observed, "This is a big company. I don't really know what other people do outside of my team. I definitely don't know what they do all across Marketing. My guess is that some

people do really cool things that would be really useful for my projects, but I just don't know what that is or who those people are."

The primary reason that most workers knew little about what their coworkers were doing is limited communication. Marketing employees consistently indicated that they learned about coworkers' daily activities from exposure to their communications. Because the actual conduct of one's work was invisible to others, people typically learned what he or she did by either asking them directly about it or by seeing or hearing communications they had with others that revealed the nature of their tasks. For example, when asked during the first round of interviews with whom she typically interacted in the workplace, one informant answered:

I typically interact with people I know something about—know what they do. That mostly means I communicate with people on my immediate team... I don't ever really see those people actually doing work. I mean I see them sitting at their computers, but I don't know what they're doing. They could be writing a report, checking email, or just reading the news. I don't know. But I normally get a sense of what they do because they tell me about it when we talk, or I get copied on an email they send to someone else and I read what they say or I overhear them talking about some aspect of their project with someone who comes to their desk. So you just sort of get a sense of what people do because you're getting to see what they're saying or hearing them talk about it. If you don't have that, it's hard to know what they do.

As indicated, much of her awareness about her coworkers' tasks was generated through exposure to their communications. However, as she implied, she, like most other employees at American Financial, only had visibility into the communications of those on her team or those sitting around her, and visibility into even those communications was often only serendipitous.

Comparing the Marketing communication environment before and after implementation of the enterprise social networking site, as well as to the dynamics of the Operations communication environment over time, showed that workers used the new technology to enhance their awareness of who among their coworkers had what kind of knowledge, as well as to learn which coworkers knew each other. Increased awareness of who knows what and who knows whom improved the accuracy of their metaknowledge. Two advantages fostered by the new technology helped improve the accuracy of metaknowledge: the transparency of coworkers' messages and the translucence of others' networks.

Message Transparency and Awareness of “Who Knows What.” As demonstrated above, a typical problem stemming from the invisibility of work and communication at American Financial was that employees did not know what their coworkers across the organization knew. Employees recognized that under normal conditions communication between coworkers was largely invisible to everyone but the sender and the receiver. As one informant commented, “I send emails all day. What I say in them could maybe be useful to someone else, but I don’t know that so I don’t know who to copy on it. Someone could probably learn a lot if they browsed around inside my inbox for a day just like I could if I could see inside other peoples’ emails.” Emails were not the only culprit. Even messages exchanged in face-to-face encounters were often indiscernible by third-party observers. As another informant commented: “Sometimes I see people talking a couple desks away. I can’t hear what they’re saying but they look really into the conversation and it looks important. It probably is, but how can I know unless I go over there and eavesdrop.”

Use of the enterprise social networking site for routine Marketing communication made coworkers messages more transparent than they might have been using different technologies. Message transparency means that people can literally see what others are saying to one another. On A-Life, a message sent between coworkers appears on both the sender and the receiver’s “wall.” If another person who was neither the sender nor the receiver had accepted one of those two communicators into their social network on the site, that message would appear on his or her news feed, essentially making that individual a third-party observer to the communication among the others.

As an increasing number of employees began communicating routine messages on the enterprise social networking site, those who were neither the original sender nor the recipient began to learn who knows what by looking at the messages. One informant succinctly discussed this type of awareness:

I saw some messages exchanged between two guys in another department saying about how they determined the appropriate rate for a consultant. I didn’t know how to do that and I thought it would be good to know so I kind of made a mental note that these guys knew that so I could go ask them in the future. That would really be helpful knowledge to have for some upcoming projects . . . I’m glad they sent that message through A-Life ‘cause that meant I got to see it. If they did it through email I wouldn’t have ever known that message was sent and I couldn’t have seen it so I wouldn’t have learned that these guys know about rate determination.

Most of the messages communicated across the organization were opaque to would-be third-party observers for two reasons. First, individuals simply did not know that other people were communicating with each other when those messages were sent via email, IM, or some other electronic form of written communication. If they did not know that a message was being communicated, would-be third-party observers could not try to position themselves in a place where they could view it. Second, even if a third-party could see that communication was occurring amongst others (for example, seeing two people talking across the hall or seeing someone pick up the phone to call someone else) the contents of those messages were often inaccessible. Messages exchanged through the enterprise social networking site were not subject to these two limitations, as perceived by third-party observers. Not only were the messages sent transparent such that a third-party observer could see into them, but they remained transparent over time:

A great thing about seeing people send stuff back and forth on A-Life is that it’s like a conversational thread. So you can get to the conversation and scroll down to see what they said before easily because they respond specifically to that thread and all the communication’s there in one place . . . Like if someone posted their emails to a website. Well, the email chain might contain some of the information, but if one of the people didn’t reply to original message and started a new message instead then you’d miss half of the original message. That happens all the time. On A-Life you don’t have that problem.

Consequently, messages that were communicated through A-Life could be viewed by third parties in ways that provided an aggregate understanding of the conversation, which helped them to become aware of who had what knowledge, even if the conversation was no longer active.

Message transparency gave individuals access to the contents of communication occurring among others. Of course, reading content did not translate into an immediate awareness of “who knows what.” Instead, third-party observers had to rely on message content to make inferences about what kinds of knowledge others in the organization had. Sometimes the inferences made by third-party observers were incorrect. But informants overwhelmingly trusted their own inferences (based on actual work-related interactions among people) over someone’s proclamation about his or her own area of expertise:

A lot of people like to look or act like they know something they don’t. They tell you, “I know how to do that.” But you ask them later more about it and it turns out they don’t. I find it’s better if you actually read something they wrote—like a note or a report—and you can compare that to what someone else wrote and

then really assess what they know. It's like going on evidence rather than hearsay.

It's like a mix of things you do to figure out who's got the knowledge you need. You might get some advice, but you want to do some homework and do some comparison to see who is really an expert because there's usually more than one person you could ask. So if you see what people say to each other that's a pretty good indicator you can use to decide.

What did informants do with the awareness of "who knows what" that was generated through exposure to messages communicated by other people on the enterprise social networking site? The data suggest that they decided to whom they should go for advice or whom they should approach to ask for transfer of the needed knowledge. The top half of Table 2 provides five representative examples, pulled from the interview transcripts, indicating how individuals used their newly acquired awareness of "who knows what," which was gleaned from their use of the enterprise social networking site. In each case, informants indicated that they noticed the communications occurring between others and attended to them because, "what they were saying seemed related to something I was doing or something I knew I had to do." Thus, potential future applicability of the knowledge that person had directed the observer's attention to further read his or her transparent messages. As the final column in the table indicates, observers did not normally need the knowledge that they became aware that someone else had immediately. Instead, they projected a need for it sometime in the future. Out of all 33 instances identified (of which only five are summarized in Table 2) the shortest time frame in which an observer projected needing the knowledge they became aware that someone had was two weeks.

Network Translucence and Awareness of "Who Knows Whom." Whereas reading the content of the messages other people communicated on the enterprise social networking technology enabled employees to become aware of who knows what, the fact that they could see with whom others communicated and who those others signaled were their work-related colleagues led to an awareness of who knows whom. The social networks of others, as perceived by third-party observers, revealed actual and potential communication partners. However, what third-party observers often could not discern was the nature of the communication or the scope of the relationship. For example, a third-party observer might see that two coworkers exchanged three messages. Yet they could not know whether those were the only messages they exchanged through any medium (indicating a weak tie) or whether they also exchanged many more messages in person or through some other

technology such as email (indicating a strong tie). Similarly, if someone indicated that another American Financial employee was his or her coworker (in the way one would accept a "friend" in a popular social networking site like Facebook), the third-party observer could not know what topics these people communicated about (e.g., exchanging work-related advice or coordinating a meeting time for lunch). Thus, I suggest that the social networks of others made visible through the enterprise social networking site are only translucent, i.e., clear enough to show that a relationship exists, but not clear enough to show the scope and/or nature of that relationship. Network translucence enabled by use of the enterprise social networking site was often revealing for Marketing employees. Consider the following common responses given by informants to the question, "What was the most surprising thing you learned from using A-Life?"

I guess I didn't realize how many people there are in Marketing that I don't know, who know people I actually do know.

I thought for sure no one I work with really talked to people on the debit side of the business. But it turns out I actually know some people who talk to those folks because I see they're friends on A-Life.

I had no clue that Molly and Javier knew each other. But I see them send messages to each other from time to time.

As informants typically indicated, it was difficult to know whom other people knew in such a large company. The default assumption enacted by many individuals was that the people they knew typically knew people they knew. In other words, a logic of homophily drove most people's conceptualizations of the underlying social dynamics at American Financial. But by the translucent networks they perceived on the enterprise social networking technology belied this belief. Instead, informants began to learn that their communication partner's communication partners were actually quite diverse.

There were several ways that individuals became aware of whom their coworkers knew. The most common way was by seeing the list of names of "connections" that was linked to someone's profile page. Just like the "friends" list on Facebook, employees at American Financial could formally request someone at the company to be a connection and accept connection requests from others. This list of cultivated connections was displayed in association with a person's personal profile. This list of "connections" provided an easy way for individuals to become aware of who knew whom:

Sometimes I just kind of look at someone's list of connections really quick just to see what people they know. That's always interesting because you get a

Table 2 Examples of Metaknowledge Learned as a Result of Increased Communication Visibility

Type	Knowledge needed	How metaknowledge was learned on enterprise social networking site	How metaknowledge was/will be used	Time frame for projected use
Who knows what	How to make spending projections for customer acquisitions	Reading message one employee sent to other to ask for help	Ask the message's recipient to teach employee to make projections	24 weeks
	How to determine date for promotional mailings	Reviewed a template document sent along with a message from one employee to another	Ask the template's creator about feasibility of altering date	12 weeks
	How to perform search engine optimization	Saw at least four messages among different people where sender asked recipient for the name of an expert who could help on just this task. One expert was consistently mentioned	Approach employee who is consistently mentioned and ask to be taught task	2 weeks
	How to track tasks in a project management environment	Noticed template sent by another employee in a message	Ask poster of template for tutorial in project tracking	12 weeks
	How to forecast revenue for new market segment	Saw the title of a document that coworker sent, which indicated that the document contained a report in which forecast was made	Ask poster of document for a lesson on how to conduct forecast	9 weeks
Who knows whom	Who has a contact with someone at the Datacenter who can extract promotional histories	Reviewing a message response from employee commenting on a meeting he was about to attend	Ask sender for introduction to employee at Datacenter	6 weeks
	Who to ask about the best person from whom to learn how to write rewards language compliant with NAD rulings	Noticing that a close colleague had a conversation with someone in legal	Ask the colleague to ask his or her friend in legal who is the appropriate person to contact	3 weeks
	Who knows someone to contact in the Finance department to expedite review of impacts of new promotional program	Noticed that someone had asked a colleague a question on his wall about who is the best person to contact in the Finance department. Employee figured the person asked the question because the person of whom it was asked knew the answer	Ask the answerer of the question who is the best person to contact in the Finance department and advice for the best way to approach this person	5 weeks
	Who to ask for a contact who has run a social media contest	Saw a message sent by a coworker who talked about a focus group she had done at work to give ideas for a social media promotion	Ask coworker for name of focus group leader and for introduction to him or her	3 weeks
	Needed help writing a script to automate data entry. Heard of someone who knew how to do this in IT, but heard that person was busy.	Saw a picture included in a message from a colleague in which the colleague was talking at a company party with the person from IT. Asked the colleague for an introduction to the person from IT	Ask colleague to persuade person in IT to help employee with her request. Personal favor needed because it is outside of IT's job description	4 weeks

sense of who they talk with and a lot of times they're people you wouldn't expect.

Although perusing the list of one's displayed connections was certainly the easiest way to get a sense of their work-related contacts, it was also the most unsatisfactory because it provided the leanest information. After reviewing this list, the observer still would not know the content that typically flowed along the tie between the two individuals nor would they know how frequently those two individuals communicated.

Consequently, a more robust way of learning "who knows whom" was to pay attention to the messages people exchanged with one another. Informants took as evidence of a real and substantial relationship the

observation of coworkers sending messages to each other:

On A-Life you can see what people are sending messages to other people. So you see that message and its like, "OK, they know each other, great." And you can kind of just remember that piece of information. And sometimes you see that they send a lot of messages to each other so you say, "Well, I guess they really know each other pretty well." So that's all helpful information to have.

The advantage of building an awareness of "who knows whom" by attending to actual messages exchanged was that the nature and intensity of the tie were easier to discern than building such an awareness simply by reviewing one's list of contacts. To acquire this more granular information, informants

would regularly check their own news feeds on the enterprise social networking site to see if conversations among their connections appeared there. They would also regularly peruse the walls of people they knew with the explicit goal of learning who their communication partners were.

What did informants do with the awareness of “who knows whom” that was generated through exposure to translucent networks on the enterprise social networking site? The data suggest that they decided which of their coworkers could help them to gain an introduction to others at the organization or endorse them for others from whom they wanted to ask a favor:

Sometimes you want to talk to someone, but you don't know them. So you think, “who do I know that might know them?” and then you go ask that person if they can make a connection for you, like call them or something. Or, you might know that you want to ask someone you don't really know well for something, like to give you a bunch of data. So to make that easier you ask someone you know to put in a good word for you to that person, like “Jim's not a bad guy it would be great you'd help him out” and that can sort of grease the skids.

Another way in which informants indicated that they used their knowledge of “who knows whom” gained through use of the enterprise social networking site, was to try to discern “who knows who knows whom.” For example, if a person knew that he or she wanted to talk to a specific person in accounting, but didn't know that person directly, they might see on A-Life that one of her coworkers knows someone in accounting and would ask that person to ask the person in accounting if she knows the person in question. The bottom half of Table 2 provides five representative examples, pulled from the interview transcripts, indicating how individuals used their newly acquired awareness of “who knows whom.” As the examples illustrate, individuals often had either specific (by name) or general (by position) people they wanted to talk with across the organization and used the enterprise social networking site to help them figure out who amongst those that they did know could help them achieve the goals summarized above. As was the case with knowledge of “who knows what,” informants indicated that they did not normally activate their new knowledge of “who knows whom” immediately after acquiring it. Out of all 41 instances identified (of which only five are summarized in Table 2) the shortest time frame in which an observer projected needing the knowledge they became aware that someone had was three weeks.

New Ways of Working Arising from Improved Metaknowledge

The increased awareness of who knows what and who knows whom enabled by seeing coworkers' communications in the enterprise social networking site had at least two important consequences for the Marketing staff. First, enhanced metaknowledge helped workers to avoid doing jobs that had already been done and to avoid taking the time to learn something that a coworker had already learned and could share. In short, improved metaknowledge helped workers avoid duplicating previous work. Second, enhanced metaknowledge helped workers to combine disparate ideas from across the organization into potential new ideas for specific projects. This recombinant innovation became feasible when workers improved their awareness of both who knows what and who knows whom in the organization.

Duplication Avoidance. As in many large organizations, work duplication was a common problem at American Financial. Table 3 provides examples of work duplication that occurred in Marketing prior to implementation of the enterprise social networking site. As the table indicates, when staff were assigned to work on a particular task they often began to learn the knowledge necessary to complete the task without learning whether someone else in the organization had either already completed the same task and could simply share their results, or whether someone else in the organization already had the knowledge necessary to do the task and could help the person in question do it without that person having to engage in a lengthy learning process. Typically, the fact that knowledge and work were duplicated was discovered serendipitously after the duplication had occurred and American Financial had incurred the associated costs.

The improved metaknowledge enabled by use of the enterprise social networking site helped Marketing staff avoid these kinds of duplication. Having an awareness of who knows what gave informants a window into the kinds of tasks or jobs coworkers were likely to conduct. This insight made it easy for them to ask others about particular tasks they were working on to ensure that knowledge or work would not be duplicated. As one informant summarized:

My manager asked me to put together a report summarizing some of our competitor's positioning and branding strategies for a particular product. I was like, “Ok, I'll do that.” I had a lot of other things going on and this was going to take two or three days to do and delay me getting to those other things. I told her [the manager] that and she said it was ok. But as I started to do it I remember that I saw that Jenny in the Consumer Insights department had sent a message on A-Life to someone about some work she was doing with this

Table 3 Examples of Knowledge Duplication Problems in Marketing Division

Task	Knowledge duplication problem	Reason problem occurred	How existing knowledge was discovered	Consequence arising from duplication
Assigned to create report on consumer default behavior	After creating report, employee discovered that someone had already created an identical report six months earlier	Manager assigned task, but forgot he had assigned the same task to a person six months before. Employee did not know that someone else had created it	During small talk at company holiday party employees discussed past projects	Employee delayed other work tasks for four days while creating report. Missed deadline assigned by another manager
Assigned to create banner ad for holiday credit card offer	Researched types of graphics that capture attention. Hired outside consultant to create art. Discovered later that graphic could not be used for legal reasons	Employee was unaware of a position in the company, occupied by another employee, dedicated to creating banner ads	During review of banner ad by legal department, lawyer asked why employee had not utilized the dedicated banner ad position	Employee lost two weeks of productivity and spent \$15,000 on a consultant who created a banner ad that could not be used
Assigned to place a smart button in email so that when mobile phone user clicked the link, it would redirect them to their App store	Looked up logic to insert link for appropriate device (iPhone vs. Android). Applied various solutions found through Google search. Discovered later person in IT who knew solution.	Employee thought it was such a rare instance that he didn't think to go around and ask for someone who knew (employee didn't think anyone had that expertise)	Finally connected with a teammate of employee's "go to" person in IT (after three weeks of emails to various people), who had a better solution to the problem	Wasted time and made himself look incompetent (when his solutions found on Google failed)
Assigned to create a dashboard to summarize the progress/success metrics of various team projects	Similar dashboards existed, but needed to make changes that reflected new metrics being tracked. Did not have skills to create dashboard, but tried to by working two weeks nonstop. Later, found a colleague who knew how to make the update.	Employee did not think that anyone else in her group had the skills to make the update and she didn't know anyone in another group who might have them	While training a colleague who was moving over from another department the trainee mentioned that he possessed the skills to improve the dashboard and auto-populate the necessary data	Employee lost two weeks of work time trying to update the dashboard. In addition, three other projects were stalled because workers lacked data that they could have seen if the dashboard had worked.
Needed to change copy (wording) on a letter going to card members about rewards	Information about rewards changed because of NAD rulings. Did not learn that wording had changed until after the letters were mailed.	Employee's department did not normally work with legal so, consequently, they were not on legal's regular update emails	While waiting for a staff meeting to begin, employee talked with coworker about the rewards program the coworker initiated and the coworker mentioned changes from legal	Company had to retract the first letter and send out a second letter with revised awards. Also, purchase credits had to be given to customers who made purchases under false assumptions about rewards. Overall, more than \$60,000 was spent to fix the problem.

particular competitor. So I called her up and told her what my manager wanted me to do and before I could finish she told me that she had already done that as a by-product of something she was working on and she would send me the file. It was exactly what I needed so I didn't have to do the work. It was great... If I hadn't seen her talk about that on A-Life I wouldn't have ever known to ask her and it would have wasted those couple of days and pushed back the other work.

Awareness of "who knows whom" was also a crucial ingredient for duplication avoidance in many cases because even if, through awareness of "who knows what," someone learned that someone else had completed a particular task or had certain necessary knowledge, it was not always straightforward that the person who had done the task or had the knowledge would share. Sometimes, knowing

someone who knew that person and could provide entrée to him or her was needed:

So it turned out that this guy in Business Development had put together this fair market value tool for paying consultants, which would say what their rate should be. I needed to hire a consultant for my project and I needed to figure out the rate when I found out this guy had this tool. So I emailed him to ask if he could tell me what information he used to make the tool, I wasn't even asking for the tool itself, but he never emailed me back. Maybe he didn't want to give it up or something. But I happened to see one day when I was on A-Life that he was friends with this other guy I know really well. Well, I mean they were listed as "connections" and my friend didn't have a lot of connections. So I asked my friend if he knew the guy and would ask him about the tool for me. He said, "sure" and he copied

the guy and me on an email together. The next day the guy sends me his tool. That was great, saved me a bunch of time.

Avoiding the duplication of knowledge and work was a tremendous benefit for employees, their managers, and the organization as a whole. As one manager noted, “We hire smart people and we want them to share what they know. We’re a better company when that happens.” Use of the enterprise social networking site helped individuals in Marketing to avoid duplication by helping them to become aware of who might have done something similar already or had similar knowledge and who could help them get to those people and their products. As one informant noted, “It’s amazing how much more efficient you can actually be when you have a good lay of the land in the company. I never realized [before using A-Life] how much I was missing.”

Recombinant Innovation. Innovation in commercial products and internal processes was highly valued at American Financial. Employees were formally recognized by management for developing new ways of working more efficiently or for generating good ideas that translated into new product offerings. But developing innovative processes and products was difficult. An increase in the accuracy of one’s meta-knowledge, which was enabled by use of the enterprise social networking site, allowed informants to more effectively engage in what innovation scholars refer to as “recombinant innovation” (Hargadon 2002). Recombinant innovation refers to innovations that arise when knowledge that already exists in the organizations is re-used in new combinations that result in novel and useful changes in products, processes, or services (Majchrzak et al. 2004). Innovating through recombination of knowledge requires individuals to be aware of what knowledge exists in the organization that can be combined with other knowledge. By enabling better awareness of who knows what and whom, use of the enterprise social networking site allowed some employees in Marketing to meet this requirement.

For example, Marta, who worked in the Card-member Marketing department, had spent several months conducting research on why consumers were likely to choose one credit card brand over another. Her research uncovered that, within the demographic for which she was interested, consumers made decisions largely based on the availability of rewards programs and, more specifically, rewards that could be redeemed for cash or credit on a card statement. Marta tried, unsuccessfully, for several weeks to figure out a strategic plan based on her findings. One day, however, Marta had a breakthrough:

I was racking my brain about it when I suddenly remembered that I’d seen a communication exchanged between these two guys on A-Life in which one of them, Joe Franklin who’s in the Pricing and Analytics department, mentioned something—I forget the context—about interest rate variation depending on spending habits. That caught my eye so I read the history of conversation he had and it turns out that there was some flexibility in rate assignment based on spending class. When I remembered I had seen this it occurred to me that we might offer a cash-back bonus or something similar for specific consumers in that spending class if we kept below our rate assignment threshold. So I sent him an email to see if I could learn more about it. It made sense so I developed the program around it and it has been pretty successful so far. I am proud of the innovativeness as well.

As this example illustrates, Marta combined her knowledge about consumer preferences with Joe Franklin’s knowledge about interest rate variation to produce a novel and useful new marketing program. Marta produced this innovation by recombining knowledge in new ways. Importantly, her ability to do so was enabled by her awareness of what Joe knew, which she had because of the visibility into his communication provided by the enterprise social networking site.

Informants from Marketing discussed numerous other cases similar to Marta’s, most of which were much smaller in scope and significance, in which they combined knowledge that already existed within American Financial in new ways because use of the enterprise social networking site allowed them to see what knowledge other people had, as well as to see who they would need to talk with to access that knowledge. As one informant suggested:

One thing A-Life gives you is a better vantage point. You can simply see more of what other people are doing by getting involved in their communications. So you start to realize what they know. Also, even though you might not understand it completely, you can think to yourself, “Hey, I didn’t even realize someone had this knowledge” and then you can start to think how that knowledge might complement some knowledge either you already have or some other knowledge that you saw someone else had. That is pretty cool and helps you to be more innovative in your job by leveraging off of what others know.

The metaknowledge enabled by use of the enterprise social networking site did not appear to make anyone inherently more creative. But, it did appear to give people a vision advantage such that they could see what knowledge existed within the organization to be had and to acquire it from those who held it such that they could combine it with other pieces of knowledge to innovate in their work.

Behavioral Changes Enabling New Ways of Working

Although the data suggest that duplication avoidance and recombinant innovations were two new ways of working that arose because enterprise social networking site use enabled staff to develop more accurate metaknowledge, not everyone could engage in these new behaviors. In fact, the analysis showed that of the 16 Marketing enterprise social networking site users interviewed at the end of this study, only eight (i.e., exactly half) reported that use of A-Life allowed them to avoid knowledge duplication or to recombine knowledge in ways that produced product or process innovation. Interestingly, seven of these eight users did both. To learn how these eight users worked in these new ways, I compared their responses to the responses of the other eight informants who did not achieve these two benefits, as well as to the Operations informants who also did not report working in these new ways. This subsequent analysis revealed that informants worked in new ways. Avoiding duplication and recombining knowledge for innovation were two important behavioral changes that allowed them to take advantage of the enhanced awareness of who knows what and who knows whom afforded by the new technology: They shifted from engaging experiential learning to vicarious learning and moved from conducting reactive search practices to proactively aggregating knowledge.

From Experiential Learning to Vicarious Learning. The first behavioral change to adopt the new ways described above was to shift the way the worker learned from others. Instead of learning through personal experience, he or she learned vicariously by observing the communication between a coworker and someone else. Marketing and Operations informants suggested that experiential learning was typically the way they developed an understanding of what and whom coworkers knew, and that this happened primarily through communication:

You get to know about other people by talking with them directly and asking questions and hearing their answers. That's how you get to know what projects they've worked on and get a sense about the kinds of things they have expertise about.

Communicating with other people is one of the most important things you can do to be successful in your job. You've got to make sure you're learning all the time about what other people can do and you can only learn that by being good at engaging them in conversation.

When you're talking to someone else you can really get a good grip on the kinds of things they know about. It's just the way they respond to you—like how fast or what they're body language is like—is how you can get a sense about it. You know, when

you're immersed in conversation and you just kind of absorb it.

Learning through direct communication with others was also common because interpersonal exchange forced individual attention. In other words, in addition to the benefit of asking clarifying questions to sustain a conversation (whether synchronous or asynchronous) workers had to focus on the communication partner's words to respond. This forced attention helped them store the learning about what and whom that person knew in memory. Repeating it in conversation helped to solidify it as actual knowledge.

Yet workers effectively avoided duplication of knowledge, and combined knowledge in ways that produced innovative outputs. Not only did they learn through their own experience communicating with others, but also by observing other communications in which they were not themselves involved. Although this behavioral change seems somewhat subtle, informants stated that it actually presented substantial cognitive challenges:

The major thing I've been finding as I've been trying to figure out the best way to use A-Life is I get a lot more out of it by being a lurker than I do from talking to people, personally. I mean the people that I would send a message to on A-Life are probably the same people I would talk to offline or on email. But when I'm on A-Life I can see what a bunch of other people that I wouldn't normally talk to are saying to one another and all that conversation has useful tidbits in it. But I've got to make it a process to read those communications or at least look at them quickly and I have to reflect on them a bit more than I would if I talked to either of those people directly because I've got to try to pick up the context of the comments. It's like, in school, if you ask the teacher something directly you know how the answer fits into the bigger picture because you asked about it. But if you overhear the teacher talking to another student you can still learn a lot, but you've got to figure out how to contextualize it. That's hard, but it can be real valuable.

Learning vicariously through observation of communications between others represented an important behavioral change for those who used the enterprise social networking site. Conceptualizing user commentary to infer knowledge was particularly important; the sustained attention necessary to cull information from coworkers' communications required effort and control. Significantly, informants did not abandon experiential learning entirely. They continued to learn through direct conversation with others in their work groups and from those who sat near them. Thus, vicarious learning took place most often through use of the enterprise social networking site. Informants had to balance these two modes of learning and move quickly and adeptly between them. This entailed another unique set of cognitive competencies.

From Reactive Search to Proactive Aggregation.

The second behavioral change that workers made to avoid work duplication and achieve recombinant innovation was in their approach to the timing and process of finding knowledge. As Marketing and Operations informants indicated, they typically acquired new knowledge in the process of trying to solve a newly encountered problem.

I guess what normally happens is I run into some issue in my work that I can't figure out. So I go out asking people if they have some solution. Hopefully I find someone. I've gotten better about searching for what I need over time.

If I have some problem that I can't solve I look for some kind of knowledge or information that will help me solve it. That is probably the instance where I learn the most. You know, you learn when you don't understand something; it's just the time when that normally happens.

The times when I really find out what people know are when I'm stuck in my own work. I get into some kind of jam and there is some problem so I search for a solution. I ask around and around to people till I come up with something that will help. Then, it's like, "Oh yeah, now I just learned something new."

Put in more formal terms, the typical way in which people dealt with problems encountered in their work was to reactively search for knowledge that would help to solve them. The process could be characterized as reactive because people did not think about acquiring new knowledge, or the metaknowledge that would help them get that knowledge, until the problem arose. Moreover, the process could be characterized as search because they were actively looking in a focused and directed way for some specific type of knowledge.

Note that those who learned the new ways of working described above did not reactively search for knowledge when they encountered a problem. Instead, they proactively aggregated the metaknowledge they acquired daily through the communication visibility made possible by the enterprise social networking technology. In other words, they stumbled into knowledge of who knows what or who knows whom at random intervals. Although they had no use for that metaknowledge at that moment, they held it in passive memory (along with other pieces of metaknowledge) for future use. Informants noted that this behavioral change was profound.

The biggest change I have seen from using A-Life is that when I encounter a problem I automatically know who can help me solve it. It is unusual. Earlier, when I encountered a problem, I would think, "Damn! Where am I going to get help for this?" Now, I know immediately who to contact even though I may have never met that person.

Although this shift in behavior from waiting until knowledge was needed to learn who might have it or who might know the person who had it, to developing metaknowledge in advance, in anticipation of some future need state, was somewhat drastic, it could pay large dividends. To accumulate those dividends required that informants be more proactive in the purposeful development of metaknowledge:

I find myself doing something new now when I'm on A-Life. I see all these things that people are saying and I get a sense for what they know. It's a lot of noise, but it's useful noise. So when I see something and realize that John knows about consumer promotion rates I sort of take a breath and tell myself that I should remember that and I file it away. That's a pretty big change—to see something and try to absorb it so you can use it later when you don't even know if you'll ever need to use it.

Although use of the enterprise social networking site made it easier to learn who knows what and who knows whom, remembering that knowledge appeared to take some willful determination.

Discussion

This paper offers a grounded theory of communication visibility. The emerging theory suggests that once invisible communication between others in the organization becomes visible for third parties, those third parties may improve their metaknowledge (i.e., knowledge of who knows what and who knows whom in the organization). Communication visibility leads to enhanced awareness of who knows what and whom through two interrelated mechanisms: message transparency and network translucence. Seeing coworkers' messages helps third-party observers make inferences about others' knowledge. Seeing the structure of coworkers' communication networks helps third-party observers make inferences about who coworkers talk with somewhat regularly. The emerging theory further suggests that enhanced metaknowledge can lead to more innovative products and services and less knowledge duplication if staff learn to work in new ways. Specifically, users can recombine existing ideas into new ideas more effectively and avoid duplicating work if they switch from learning through experience to learning vicariously and if they can begin to proactively aggregate information they are perceiving daily rather than engage in reactive search after they have run up against a problem they cannot solve.

Enterprise social media plays a central role in this theory because it makes heretofore invisible communication between coworkers visible to others in the organization. Specifically, the enterprise social networking site used among employees in this paper

enabled them to see into their coworkers' messages (message transparency) and view coworkers' communication networks (network translucence). By enabling message transparency and network translucence, a social media tool such as an enterprise social networking site fosters conditions for the dynamics summarized above. However, the mechanisms that drive these dynamics are themselves message transparency and network translucence. Enterprise social networking sites are not the only information technologies that can make messages transparent and networks translucent. The notion of visibility is tied to the amount of effort necessary to locate information in workers' communications. If workers perceive that information is difficult to access, or if they do not know what information is accessible, they are unlikely to seek that information (Brown and Duguid 2000). In short, information may be available for examination, but unless workers know where it is, it will remain invisible. Clearly, effort can help make communications visible. Still, busy workers are unlikely to make that effort if access to those communications is too difficult. Thus, any technology that helps to make coworkers' communications more easily accessible will make that information visible across the organization. As these findings show, an enterprise social networking site accomplished this in ways that other technologies available to informants could not, thus providing them access to new and potentially valuable knowledge.

This emerging theory of communication visibility has several important implications for the nature of work in the knowledge economy. As clearly shown by the data presented, communication visibility and expanded metaknowledge can streamline work across an organization, while also fostering improvements in innovativeness. By learning who knows what and who knows whom employees at American Financial saved themselves and the company time and money by avoiding duplication of knowledge and work. Those who were best equipped to solve problems could do so. This, of course, is the goal of work specialization and encouraging intraorganizational collaboration (Ren and Argote 2011). In addition, by recombining existing knowledge with new ideas, employees bring new levels of innovation to organization products and services. Burt (2004, p. 351) suggests that those who are adept at innovating through recombination of knowledge have a "vision advantage" that others in the organization do not. He also suggests that this vision advantage comes from bridging across structural holes in an organization's communication network. Yet the findings of this study suggest that technologies such as enterprise social networking sites make communication among coworkers universally visible, thus giving the vision

advantage to all employees, regardless of network position.

The findings also showed that although communication between coworkers was visible to all users of the enterprise social networking site, not all users changed their behavior to avoid duplication and to innovate through recombination. Communication visibility thus appears to be a necessary but insufficient condition for work to change in these ways. Those users who successfully changed their work developed specific new behaviors of vicarious learning and proactive knowledge aggregation. Most organization research on learning processes heralds experiential learning or (i.e., learning by doing) (Von Hippel and Tyre 1995) rather than vicarious learning (i.e., learning by watching) to acquire knowledge. The findings presented here suggest that in the modern workplace vicarious learning may have as many if not more advantages than experiential learning in the development of metaknowledge. Still communications must be visible if vicarious learning (i.e., observing coworkers' communications) is to succeed. Also, organizational scholars typically herald problemistic search (Cyert and March 1963) as the vehicle for workers to effectively acquire new knowledge, i.e., when they encounter a problem, they search for a solution. Yet our findings suggest that proactively aggregating knowledge by observing coworkers' visible communications may be more effective than the reactive problemistic search. To successfully make this switch, workers would hone and retain their metaknowledge daily so that it could be recalled when needed. Developing metaknowledge in this way would require individuals to attend to bits of information that may seem trivial or useless in the moment and later recall those bits and assemble them with other bits to arrive at an accurate understanding of where knowledge is located and who can provide access to it. Thus, these two behavioral changes represent new ways of working that employees would likely have to adopt to take advantage of the communication visibility provided by new technologies such as enterprise social media.

Although the outcomes of communication visibility in this particular study were quite positive, introduction of social networking technologies to the organization could be problematic. For example, when once invisible behavioral information becomes visible, workers may become fearful of surveillance by management and coworkers (Ciborra 1997, Zuboff 1988). Moreover, visible communications may foster self-preservation behaviors by which workers do not communicate the true nature of their work, but rather what they believe others think they do and know. (Leonardi and Treem 2012). Thus, the openness fostered by communication visibility could backfire to

create unproductive organizational behaviors including intentional ambiguity (Gibbs et al. 2013). Clearly, these responses run counter to the tenets of effective knowledge sharing. Over time, if communications through the enterprise social networking technology stagnate, the result could be smaller increases in the accuracy of metaknowledge. In addition, motivation to use the enterprise social networking site may be undermined by the visibility of too many communications between too many workers. Vicarious learning may then be stifled when workers' attention is divided across too many messages. Workers may begin to focus instead on those messages that directly relate to their immediate task, and in so doing artificially limit the advantages of the organization-wide reach for which the enterprise social networking site was designed.

In addition to the broad implications for organization theory discussed above, the findings presented in this paper contribute to the more specific research on transactive memory. Transactive memory theorists argue that accurate metaknowledge is necessary for a successful transactive memory system. Yet (to my knowledge) there has been no in-depth exploration of how such accuracy is achieved or improved (Peltokorpi 2008, Ren and Argote 2011). Our findings demonstrate how enterprise social networking sites can foster the development and improvement of accurate organizational metaknowledge by enabling awareness of ambient communication. Significantly, the findings show that user inferences about who knows what and who knows whom, gleaned by attention to coworker's visible communications, are reliable and produce accurate cognitive knowledge and social structures.

Transactive memory researchers have shown that organizational technologies such as databases and directories are useful for helping teams allocate and retrieve knowledge from others (Choi et al. 2010). These findings demonstrate that technologies, such as enterprise social networking sites, which make communication visible and thus enable ambient awareness, can also help workers maintain accurate directories of who knows what and who knows whom. The findings also show that use of such technologies can increase the similarity between coworkers' cognitive knowledge and organizational social structures. The production of shared cognition is possible through the use of enterprise social networking sites because workers draw from the same set of cues (transparent communications and translucent networks) to form perceptions of "who knows what" and "who knows whom." Consequently, using enterprise social networking technologies can lead to metaknowledge that is not only more accurate, but also more similar across coworkers. Transactive memory theorists argue that

this improved metaknowledge provides the basis for jointly coordinated action and more economic distribution of effort (Austin 2003).

To help employees share their knowledge when carrying out tasks, many organizations implement technologies such as intranets, enterprise resource planning systems, shared data repositories, group support systems, groupware and customer relationship management systems, etc. Indeed, years of research on decision making and information sharing in experimental and organizational teams shows that workers often fail to integrate their knowledge with coworkers because they do not know what others know (Argote et al. 2000). Despite the fact that an increasing number of firms are implementing knowledge management technologies, few organizations report dramatic improvements in the exploitation of cumulative expertise (Kankanhalli et al. 2005). Scholars have suggested that many organizations using knowledge management systems do not reap their benefits because workers simply do not enter into the system information that accurately reflects their knowledge (Wasko and Faraj 2005). There are multiple hypotheses as to why this might be so: Perhaps workers are not proficient in using the new technology (Yuan et al. 2005); perhaps electronic documentation has not yet proliferated as a team norm (Walsham 2002); perhaps workers do not think the information they have is important for their coworkers (Cress et al. 2006).

The largest impediment to the success of knowledge management technologies for organization-wide knowledge sharing is that documenting the knowledge required to complete one's work is not a natural or routine part of most tasks. For example, a worker who writes marketing plans is typically evaluated on the success of those plans. Documenting how the material for the plan was assembled is not a step in the plan itself. Thus, it may be difficult for a worker to show how they used information technology to enhance their knowledge and improve knowledge management efforts. This is not a normal part of the worker's task (Bowker et al. 1995). It may even diminish the worker's ability to successfully complete future assignments.

Goffman (1959) referred to this problem of action versus representation of action in what he called the paradox of representation. He suggested that those who are most skilled at particular tasks spend so much time on those tasks that they do not have time to let others know how they completed them. He further argued that because most work is done in private (i.e., away from coworkers), workers must "dramatize" their task to make it visible: "While in the presence of others, the individual typically infuses his activity with signs which dramatically highlight and portray confirmatory factors that might otherwise remain

unapparent or obscure” (1959, p. 33). This insight suggests those who take the time to work well may not have the time to explain to others *how* they work well. In other words, Goffman suggested: “The problem of dramatizing one’s work involves...making invisible [actions] visible. The work that must be done by those who fill certain statuses is often so poorly designed as an expression of desired meaning, that if the incumbent would dramatize the character of his role, he must divert an appreciable amount of his energy to do so” (p. 32). As a consequence of this paradox, many workers do not take steps to make their behaviors public. Thus, the knowledge accumulated in the process of generating their work is unavailable to others in the organization (Gardner 1992).

A major implication of our findings is that rather than encouraging (or forcing) workers to document their knowledge for others, a more fruitful strategy may be to have them switch their channels of communication to technologies that help make their communication visible to others. Developing accurate metaknowledge through exposure to ambient communications requires little work on the part of sources. Tangentially, use of an enterprise social networking site requires minimal effort on the part of knowledge sources. Sources need only encourage workers to shift their communication activity from private channels (e.g., phone, email, instant messaging, etc.) to an enterprise social networking site where communications are public and visible to others in the organization. Because they are simply communicating as they normally do, there is a larger body of information available to their coworkers. From this coworkers can develop their own metaknowledge.

In conclusion, communication visibility may have many important consequences for the way work is conducted in the next several decades. Today, enterprise social media tools enable communication visibility at unprecedented levels. As technology designers and developers continue to improve these tools, develop streamlining applications, and devise algorithms that make them more efficient, we are likely to see even more communication visibility in the future. This paper has developed a tentative theory of communication visibility from a qualitative field study on enterprise social networking site use in one large organization. A good deal of work is needed to refine this theory, introduce scope, and test its predictions in varied organizational contexts. Moving the theory forward in this way will foster a greater understanding of how the increasingly public and visible nature of our communication is shifting the ways in which people work.

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