Microblogging's Potential Impact on Team Collaboration Awareness

A field study of microblogging within and between project teams

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Abstract—**Despite popular use of IM, Email, and other social software (e.g., blogs and wikis) in collaborative work, the maintenance of project status awareness among team members remains a critical research problem. Team members often are silent while working on individual tasks until they reach critical issues, and maintain minimum awareness of others' work-in-progress in-between team meetings. The lack of timely project status sharing in teams can critically limit task coordination efficiency, expertise sharing opportunities, and development of other social components in teamwork (e.g., common ground building, and feeling of connectedness). In this context, we report a field study indicating that Microblogging as a light-weight informal communication media can foster timely exchanging of subtle status information (e.g., small milestones towards completing a task; problems/issues one's working on, but not too critical for reporting; undeveloped ideas/thoughts just came out of a conversation; and feedback and comments) among co-workers as social interaction. We also report how such microblog-mediated informal sharing benefited work collaboration in various ways within and across project teams.**

Keywords-Awareness in Collaboration Systems; Social Software Based Collaboration

I. INTRODUCTION

Companies rely heavily on effective collaboration. In order to collaborate effectively, teams need to keep all members up-to-date on project progress, status, issues, and next steps [[5]]. Teams have long relied on email, instant messaging (IM), and regular meetings to share this awareness information. Despite these tools, teams—especially those with remote members—continue to struggle to maintain timely project status awareness of what others have done, are doing, and plan to do next [[14]]. In this research, we explored whether and how microblogging could help address this problem of facilitating timely project awareness, both within and across related project teams.

Microblogging (most notably Twitter) has grown in popularity, because it enables quick and easy sharing with many people, in a non-intrusive manner. A microblog is a short (usually less than 140 character) message posted to anyone who "follows" the author. Could this relatively new technology help to facilitate project information sharing? If so, to what extent and how? While researchers have begun to study microblogging use within companies [7,22,23], none have explored how it is used by related project teams in the workplace or effects on project and group awareness.

In response to such questions, we conducted an exploratory study of microblogging use by a set of related project teams that comprised a functional group within a large company. The goal of our study was to explore whether and how project team members would use microblogging as a communication channel for sharing project information, and how this would affect project awareness. Our contributions are results describing specific ways microblogging affects awareness levels within and across teams and the technology characteristics that lead to these effects.

II. RELATED WORK

Despite a large body of research on team awareness, how to facilitate it remains a critical open research problem [[13]]. A key challenge has been how to support awareness of collaborative processes [[14]]. For example, *what is the status of other team members' work-in-progress? What problems or roadblocks are they trying to solve? What do they plan to do next? How does their plan affect my work and our shared goal? Do I agree with their plan?* Such awareness information is critical for effective collaboration, but often remains implicit until the work reaches critical points.

One area of prior research that explores questions related to what actions team members have already carried out, aims to provide team members with awareness of each others' actions on shared working content (e.g., documents, software code). However, a record of actions on a content object does not help team members understand the goal or objective underlying the actions [[13]]. Another approach to team awareness is radical collocation (e.g., war-rooms), which has been successful at supporting intense team work (e.g., participatory software development) [[17]]. However, it is not always possible to collocate teams. For distributed teams, prior research has mainly focused on replicating in-person social cues to let collaborators extract useful awareness information themselves (e.g., a synchronous workspace system supporting tele-pointers [[5]] or a media space system leveraging the rich information provided in shared video and/or audio channels [[6]]). However, such systems

have not proven significantly helpful for prompting the exchange of implicit task status information [[20]].

Other studies have looked at how CMC tools (e.g., chat, email) might be used to share task status information in project teams. For example, persistent chat systems such as Babble [[1]] and RVM [[9]], were designed to be always-open communication channels between team members. Similarly, daily project status email messages provide more frequent updates on team members' progress [[2]]. Studies of both of these approaches showed that they were helpful for keeping team members in the loop regarding each other's work progress [[1],[2]]. As another example, chat systems offer the ability to broadcast a status message to buddies, though studies have shown that a majority of people rarely or never uses this feature [[16]].

Another research question concerns support for awareness *across* project teams. Studies of informal communication in the workplace have explored ways to enhance impromptu communication (e.g., water-cooler conversations) among colleagues, so as to improve information and idea sharing, opportunistic collaboration, and organizational innovation at work [[13],[19]]. System designs that increase social cues based on social presence and media richness theories (e.g., media spaces) have been helpful, but have not significantly effected informal communication among colleagues separated by walls and distance [[20]]. Recent studies of social software tool usage (e.g., blogs [[7]], social tagging [[12],[18]], public displays [[3]], and social network systems [[4]] within companies have shown that they help facilitate general social awareness, information sharing, expert identification, and interpersonal connectedness [[3],[4],[7],[12],[18]]. However few studies have shown that social software were popularly used for sharing and exchanging project-relevant status updates among colleagues.

Recent research points to microblogging as a candidate for facilitating informal exchanges among colleagues that could have both informational and social impact on collaborative work [[22]]. The lightweight characteristics of microblogging (brevity, open broadcasting, voluntary readership, and mobility) could prompt frequent updates about individuals' work activities, that colleagues would not otherwise share with heavier-weight or interruptive communication media [22,23]. However, no research has studied whether and how microblogging might impact collaboration in project teams.

III. APPROACH

We conducted a five-week controlled field study of microblogging within a functional department in a large IT company. Our participants were 40 employees comprising 13 project teams; 29 participants were co-located in a single building, and 11 were remotely located. Project teams were independent of each other, but needed to maintain a relatively up-to-date, high-level awareness of each others' goals and accomplishments, because projects were working in the same field and transferring ideas and results into the same

product groups. Projects typically last one year, sometimes multiple. The participants included 7 managers, 16 researchers, 11 software engineers, and 6 interns.

This field study used Yammer [[21]] to provide a private microblogging network. Instead of using the company-wide Yammer network (us.company.com), we created a private Yammer network for the functional department. "Groups" was a key feature of Yammer that allowed us to study microblogging within and across project teams. Such scoped audiences are different from those offered in large company-wide networks, in which users may feel uncomfortable posting very specific, detailed, or sensitive information. We created one Yammer group per project team in advance, and invited participants to join their project groups in Yammer. In this private microblogging network, participants can follow other individuals as well as project groups, and they can post to either the entire network (*functional department*), or to a group (*project team*). To help participants get started, we provided a Yammer tutorial at their team meetings, asked participants to read and post to Yammer at least once a day. We also gave examples of what they could post, including task status updates, questions, ideas, and social information. Despite these instructions, we should emphasize that we had no power to *require* Yammer use.

Both surveys and interviews were used in the study for collecting background and feedback information from participants. A survey was completed by participants both before and after the study (32 participants completed the pre-survey and 28 completed the post-survey). The pre-survey helped us understand the current mechanisms and tools used to garner awareness. The post-survey asked about how and when users read and posted to Yammer, the types of information they found interesting, how it differed from other communication tools if at all, and general likes and dislikes. After the study period, we conducted one-hour, semi-structured interviews with 17 users with varying usage levels, project teams, job roles, and work locations. Interviews probed how microblogging affected project team and functional group awareness, what types of posts were considered most interesting, what types of actions or interactions resulted from microblogging use and general impressions.

We coded microblogs posted from weeks 2-5 of the study for the type of content being shared. Posts from the first week were excluded, because users were mostly experimenting with the tool. Open coding was employed in our first coding pass. We combined codes into the seven categories (as shown in Table I.), with rules of how to apply these codes. In a second pass using these rules, one person coded all posts and a second coded 20% of the posts. The interrater reliability for the two coders was Kappa=.80 (p<.001). When more than one category applied, which happened infrequently, we chose the category describing the majority of the post's content.
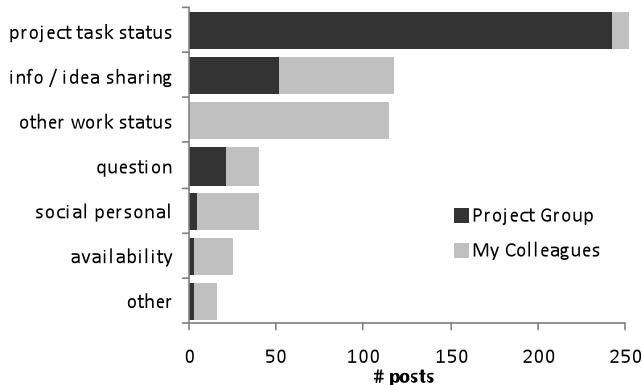
Figure 1. Frequency of original posts sharing different types of information. Distribution of original posts between project groups (black) and the entire department network (gray) is shown.

IV. What Did Teams Microblog About?

Before discussing impacts on collaboration awareness, we examine what participants microblogged about. We begin with a general quantitative overview of Yammer usage, based on a descriptive analysis of Yammer posts. We then characterize the nature of posts, drawing from interviews, survey, and microblog content.

A. Participation and Usage Practices

In four weeks of use, a total of 886 posts were generated by 38 of our 40 participants (8 users posted more than twice a day, 10 users posted daily, 9 users posted several times a week, and the remaining 11 users rarely posted). Overall, about half (419) of the posts were directed to the project groups. Seven project teams posted to their groups more than once a day, ranging from 1.6 to 5.1 posts per day. The other 6 project teams reported not using the system much either for lack of critical mass, or because they met daily or sat in the same cubicle which provided enough awareness.

Counting only posts that were *original* (i.e., not replies to other posts), 91% were work-relevant. These included project task status (44% of all original posts), information and idea sharing (19%), other work status (18%), questions (6%), and work availability (4%). Personal and social information were relatively uncommon (6%) as were posts falling into the "other" category (3%). **Error! Reference source not found.** shows their relative frequency.

As can be seen in Figure 1, posts related to project status were not only the most common but were almost exclusively directed at the project groups. In contrast, the other six categories were posted more broadly to the entire functional department. Interestingly, the category of "other work status" were always shared more generally; these posts contained content such as *"in a four-hour management meeting with [the lab director]"*; or *"reviewing papers for CHIMIT"*. These status updates are not specific to a project and in fact might be particularly interesting to other colleagues who are engaged in similar or related non-project

activities. It is also interesting that social and personal posts (e.g., *"Getting excited about seeing HP6 today with the summer interns!"*) were relatively rare, not appearing as much as we expected.

TABLE I. TYPES OF MICROBLOG POSTS FROM THE STUDY.

Project task status	*"Implementing delete for sqlite logs"* *"uploaded new UI sketches to design wiki... https://..."*
Other work status	*"in a four-hour management meeting with [the lab director]"*; *"reviewing papers for CHIMIT"*
Info / idea sharing	*"Just talked with [a colleague] at [another lab]: They're currently working on UI widget design for the [project] integration in [a product]..."*
Question	*"Why do we need to have components in Every Object? There ought to be a better way."* *"Where can I print a poster? I need to print one for [the conference]."*
Social / personal	*"headed to Napa for a day of wine tasting and sight-seeing"*
Availability	*"Home sick, feel like my head is going to explode"* *"I'm on vacation tomorrow (Jul 31); heading to a friend's wedding..."*
Other	*"[Project name] is bringing sexy back."*

B. Content Characteristics

In addition to the comprehensive seven-way classification of posts summarized in Figure 1, we carried out an informal analysis of the interviews, searching for themes related to posting content. In the following summary, pseudonyms are used to protect anonymity of participants.

1) Content is Non-critical

From an information sender's point of view, most of our participants reported that many of the items they posted reflected small and low-criticality updates. Examples include small milestones, issues that one is working on, or an interesting meeting with someone. Such updates are not likely to be shared with colleagues through email or IM, but might come up if they bumped into each other in the hallway.

Aaron, a participant who often works remotely from home, had trouble finding an easy way to keep his team in a close loop of his activities using traditional communication media (e.g., IM, email). He reported that Yammer reduced the threshold for mentioning things like small tasks he's working on and small issues he's resolving. Because posts were not directed to individuals, he thought that readers are not obligated to read and reply. In his words, *"Then Yammer was a place in between [emails and IMs], because it is*

acceptable to say that here is the things I've been working on, you don't have to answer me. I probably will have it figured out in the next two hours on my own." [Aaron-1]

Other examples include news/articles just discovered, random ideas from a conversation, noteworthy items from a talk, a pleasant meeting with a business partner, or other personal experience. Edison, a UI designer, reported that voluntary readership in microblogging practice made him more willing to share news, articles he finds interesting, but previously had hesitated to spam others' email inbox about:

[Edison-1] "It's an alternative channel for me where it's a little less imposing. Because before if maybe I find a nice paper I think other people should read, I send them an email about it. The threshold for me to send an email is pretty high because I know, then they have to manage that, and I don't expect them to read or write, since this is just kind of like 'oh, this is a nice paper'. But if I put that in Yammer, it's a little less committing because if they want to read it, if they don't they can ignore it. And then I feel better because I am not leaving spams in their emails anymore, which I think is nice. So its kind of just having that alternative way to broadcast to my team, my co-workers is really nice."

2) Information has finer granularity

Another characteristic of the microblog status updates was their detail (e.g., lower level steps) relative to other status sharing options (e.g., weekly reports). As Jeremy (a team lead) said, "*more frequent and detailed updates than I would get in the meeting.*" Aaron, a team member working on a software development project, compared a status report with his posts in his project group on Yammer. He said,

[Aaron-2] "We do self-report every week. We have a weekly meeting, and we talk about what we did for the last week, and what we were planning to do next. So we do that in our weekly meetings. But the things that I post on Yammer for what I am about to do now, are lower level, smaller things that I wouldn't, you know, I would tell them in our weekly meeting what I did last week. But then, it's too late right, and if I tell them what I am gonna to work on next week, it's more general than things I post on Yammer. So on Yammer, I can say more specifically here's what I am gonna work on for the next 2-3 hours. That's stuff, if there weren't Yammer, I wouldn't have told them. I didn't have a channel for doing it before. There wasn't a good way to do for it, even if I knew I needed to, but I wasn't really doing that and Yammer made it possible for me to do that."

From a manager's point of view, many have reported that they discovered many low-level steps and issues that team members have gone through to achieve their tasks that otherwise they wouldn't know about. As Jim said:

[Jim - 1] "So I learned something about somebody that I work with closely, [Mark, a team member]. He didn't tell me directly, and it's probably that he didn't think that I would probably be interested. He sort of said it to the [project group] on Yammer. And it's more about what he has been doing at the time, right, like he is doing X. I know he is doing something related to X, but I didn't know he is exactly doing X. So I find it out from reading the Yammer."

3) Audience-targeted Broadcasting

While the broadcast nature and brevity characteristics of microblogging reduced threshold for sharing low-criticality content, we also found that the expected audience scope is a factor affecting whether and what people share in microblogging. In contrast to prior studies of company-wide social networking [4] [22], the microblogging network created for this study was relatively small in size. As our analysis of posts also showed previously, 91% of all posts were work-related, and 44% were project status. Our participants reported that the project groups and the microblogging network within the functional department helped them to identify items from their daily work activities that might be relevant or of interest to the audience.

Many participants mentioned that project groups provided a context that prompted the sharing of detailed task-relevant information to teams; such updates would be less likely shared in the larger functional department, because the updates would not be relevant and interesting to people outside the teams. As Edison described, *"Within the team, you know I might say fixing bug no.12., but you know, to the outside world it would be annoying if they don't know every bug I was fixing." [Edison-2]*

While the project groups helped provide a receptive context for posting project relevant content, the functional department network set up in the study provided another predictable audience, where everyone knows everyone and they work on related projects to achieve related goals. With this audience in mind, our participants reported that they were also able to easily find relevant content to share, in contrast to situations where they are not sure of their audience composition. As Simon said when comparing this with a company-wide social networking site,

[Simon-1] "So here the Yammer is much more, I know my audience and I guess the content is very fine-grained for them. You know if I am gonna say something project specific, that only they will understand. And on [an company-wide social networking site], I think its way more general ... so yah it's a much more broad audience."

V. IMPACTS ON COLLABORATION AWARENESS

As suggested in the previous section, microblogging filled a communication niche for sharing less critical, specific updates relevant to their daily work activities. Unlike using IM and Email, posts do not have to be directed to individuals, thus users were able to share non-critical information, without worrying of being "rude". In contrast to writing emails, short posts reduce efforts and enabled frequent sharing as relevant work was happening. Focused groups (e.g., project groups and the small network within the functional department) formed an easy-to-understand audience, in turn helped users to know what to post.

We now turn to a discussion of how microblogging in the study had impacted collaboration awareness in project teams and across related projects in the functional department. Building from the informational and social conse-

quential benefits suggested by Zhao & Rosson [[23]], our findings reveal more detail about how microblogging can impact co-workers' collaboration awareness in day-to-day teamwork activities.

A. Impact on Project Team Awareness

As mentioned previously, items related to project task status were most common as posts. We now discuss whether and how people thought project-specific microblogs helped to improve their project awareness and more specifically what sorts of value they perceived.

The survey result indicates that, as shown in Table II, teams that used the system more often (as noted as the number of total posts) tended to perceive a more positive impact of Yammer on their team project awareness. In the following, we use examples from interview data to illustrate how microblogging affected team awareness.

TABLE II.   SURVEY RESULTS OF PERCEIVED YAMMER IMPACT ON TEAM AWARENESS, WITH THE TEAMS THAT ACTUALLY USED THE SYSTEM

	A[4]	B[5]	C[2]	D[3]	E[3]	F[2]	G[2]	Total[21]
1.Team members' progress related to the project	3.8	4.2	5.0	4.0	3.0	3.0	1.5	3.5(1.12)
2.Team members' plan of working on next for the project	2.3	2.8	3.0	3.0	2.3	2.0	1.0	2.3(0.71)
3.Problems and roadblocks team members are experiencing related to the project	3.5	3.8	4.0	3.3	2.3	2.5	1.0	2.9(1.05)
4.Team members' personal life activities	2.0	2.8	1.0	2.7	1.7	2.0	1.5	1.9(0.64)
Average of (1,2,3)	3.2	3.6	4.0	3.4	2.6	2.5	1.2	2.9(0.94)
# of posts	107	76	44	39	37	36	32	

1) Posting as work is being carried out enabled timely communications and feedbacks

Participants reported that microblogging led teams to initiate timely communication. As illustrated in [Aaron-2], microblogging provided a communication niche for posting less critical steps/issues, and asking lightweight questions that they would not have mentioned otherwise. These in-context updates enabled others to initiate timely conversations and information and feedbacks got exchanged as work in progress. For example, in Aaron's team, Yammer posts supplemented weekly code reviews and helped to uncover potential issues early on, as described by the team manager:

[Tracy-1]"We have once a week code reviews. In those code reviews we go over all the check-ins in the code base for that week. We'll go over things we don't understand… but on a week where there are a lot of check-ins we won't go through everything that happened that week… So this back and forth [on Yammer] with [Aaron] has been more frequently than once a week and it's actually before you check it in, which I would hope saves you time, because once you check it in it's a pain to go back and change it, you've already decided on strategy…"

In turn, Aaron also had his chance of providing timely information and knowledge to other team members' work:

"Here is another example, here was [a post] about using HTML unit as a [sever] that [a team member] was working on, and I knew someone's done that a couple of years ago and she didn't know it, so I let her know … I said 'a summer intern with this other group two years ago tried using HTML unit as a [server]'. So that was something I think she wouldn't have brought that up if there won't Yammer." [Aaron-4]

Participants also reported that microblogging allows team members to pose lightweight questions about small issues (mostly technical problems), questions that otherwise would have gone unasked in more directed tools like email and IM. As a team lead said, *"Unless the roadblock was really really bad, then probably I wouldn't normally mention it in email or ST, but if they post it in Yammer and there is someway I can help, that often helps to make the project go a little quicker." [Jeremy-1]*

2) Project status posts provided more context for later communication in meetings

While all teams met regularly to share project status, microblog posts provided lower-level details about what each member is working on. Information at this low level of granularity was helpful for establishing a context that enabled communication in the meeting more efficient, as Jeremy described:

[Jeremy-2] "I get more frequent and detailed updates from Yammer than I would from a meeting. It also helps when I'm going into the meeting, if I have that context, I don't have to sit there and try to level-set with everybody to try and understand where they are with the things they agreed to work on in the last meeting… I think it makes the meetings much more effective… You can get past 'here's what I did' and get straight to, 'here's the problem I had' and start brainstorming what to do next to try and work around them."

Several teams also found Yammer posts a valuable reminder for issues to discuss in more detail during meetings:

[Aaron-5] "[Our manager] wrote a Yammer post suggesting we talk about [an issue raised on Yammer] during the next meeting, but she forgot… If it weren't for Yammer, we would have forgotten that we needed to talk about [the issue] in the meeting... It made me aware that we should talk about this during the meeting, so I could remind her."

3) Knowing what collaborators have been up to provided better social awareness and social presence

A time-based stream of team members' work updates provided greater social awareness of team partners, which in turn was helpful for managing expectations about others for collaborative work. For example, as Edison described, he was expecting someone to solve some bugs. But from Yammer, he knew that his team member was doing training and meetings, and so cannot focus on the bugs right now. This helped him manage expectations.

Microblogs also provided more contextual awareness than the busy, offline, online status typical in IM clients. This is extremely useful when users want to ask help from someone at their idle time, as described by Edison:

[Edison-4] "So there are times where, like, I noticed [a team member] you know he is like a machine, he is the pipe. He is doing all these things. And I have all these small little projects which I could use the help from a developer. And I thought, oh, maybe, he would like to take a rest, you know, something different. Because it would take him you know like a few hours to do this and maybe he is exciting about it. So I can kind of see he said, I finally did something, you know, it's working, and I was like, oh okay maybe he has a few moments to help me out now. Otherwise if I don't hear or see from him at all, like I don't see what he is doing, is he really available, is he not? Does he busy? Or maybe he wants or doesn't want to do something. I guess I get a better impression."

B. Awareness Beyond the Project Team

Microblogging was also valued in facilitating cross-project awareness in the functional department. As shown in Table III, although in general participants perceived relatively low impact on cross-project awareness, there is a significant difference between participants who checked other projects' posts regularly from those who didn't (t(25) = 5.211, p < 0.05). Some participants reported that they did not check other project updates often, mainly because these project-specific posts were too low-level to understand without an overall project context, which was a surprising finding and we will discuss it in detail in the next section. We now turn to describing how microblogging has helped improve cross-project awareness for those who checked other groups frequently and their perceived values.

TABLE III.   SURVEY RESULTS OF PERCEIVED YAMMER IMPACT ON CROSS PROJECT AWARENESS

Questions	Total[27]
1. other project teams' day-to-day activities	2.6 (1.5)
2. what other project teams' plans to work on next	2.1 (1.2)
3. problems or roadblocks other project teams are experiencing	2.1 (1.2)
Cross project awareness: Average (1,2,3)	1.9 (1.3)

T-test					
	Read other teams	N	Mean	Std. Deviation	Std. Error Mean
Yammer impact	0	15	1.4667	.63994	.16523
	1	12	3.2222	1.09483	.31605

1) Public groups enabled both inputs from outside core teams and learning experience from related projects

An effect of openly sharing project information among a broader but focused network of colleagues was that people outside teams could read project-related posts (12 participants reported doing this regularly, see Table III). These outside followers read another team's posts because they may have played a peripheral role (e.g., consulted for advice), worked on related projects (e.g., dealing with similar technical problems), or were simply interested.

The public microblogging environment made it possible for people outside the core team to be aware of a project's progress; this at times prompted them to initiate conversa-

tions with core team members, provide helpful ideas or information, or respond to questions. For example,

[Simon-2] "I get a lot from [a core team member] on [a project], which is a project I'm somewhat aware of... but from him I get, 'OK, I made the background white today. There's a new update, here's the link.' And I follow it... I can see it right away... I was able to have a conversation with [the project lead] about that later that day, which otherwise, I would have missed that conversation. I wouldn't have been a part of it."

Participants told us that these interactions with peripheral project followers would not have otherwise occurred, because email and IM messages would not be sent to them, and they did not attend group meetings. For instance,

[Simon-3] "there is a lot of stuff I found in Yammer, probably should have been in email, but I probably wouldn't have been copied. So [Joe, a team lead working on related projects] might email others about what he's working on, specifically working on [a project goal], but I wouldn't have known that. And especially stuff from [Tracy, another manager], I never have emails from her, but Yammer's the way of keep tracking some staff she is working on, and especially stuff that is relevant to me. So she's been talking about [a potential collaboration with a product team], so I learned about that from Yammer. Well, [another project with little involvement] is another good example, [a developer on the project] email his team about what he's updating about [the project], but this I can't see it, because I am not actively involved in it every week"

In addition to enabling inputs from outside members, some participants also reported that they were able to learn from related projects by reading their project group posts. For example, Jeremy followed another project team that works on similar technical problems.

[Jeremy-3] "It is interesting to hear their day-to-day conversations about how they are dealing with bugs in different versions of browsers and how they make their code to work with them. That gives me a sense of how tightly couple they are with browser technology and what's problem in browser that I would hit if I write an extension, which I do from time to time."

2) Microblogging enabled learning more aspects about and building stronger social connections with people beyond one's immediate working teams

Several participants commented on how Yammer let them discover aspects of other peoples' work and interests they likely would not have otherwise learned, as Jim reported, *"I get to know other people I otherwise wouldn't know. Like I read more about [a colleague] on Yammer, you know otherwise, the most contexts I had with her was Tea Time. And I now know a little more about [the colleague], that's quite different than what I've got in the other way. I can count that in the good category." [Jim-2]*

Participants found this valuable for giving them useful ideas or information, and for enhancing collaborations by helping them identify shared interests and build stronger social ties. For example, Simon reported, *"I feel like this is really good for my productivity. I'm more aware of what people are doing a lot more and I feel a social connection with people a lot more. It's both that I can make business decisions and that I*

can feel closer to people and more comfortable with people."[Simon-4]

Especially for participants who worked remotely, Yammer helped them to see what other projects and other people are up to and thinking about, beyond just people they work closely. This helped form a stronger feeling of connectedness with the larger department, as described by Jeremy:

[Jeremy-4] "I feel tremendously more connected to especially folks in [the department], where I get a sense of what they are working on in more regular basis than I would normally. If I were local, I would get it from hallway talk or occasionally lunches or things like that. Those things just don't happen when you are remote ... You know being able to widen the scope beyond just my immediate team and to see about our second and third lines of organization, that's for me just very helpful without being overwhelming."

VI. ISSUES AND DESIGN IMPLICATIONS

We have shown that microblogging helped facilitate awareness within a project team, as well as in a larger functional group of related project teams in this five-week controlled field study. Some features of a microblogging system will be critical for a light-weight informal communication media to be effective for team awareness. This include: (1) posts are short, thus there is a low threshold for frequent updates as work is being carried out; (2) asynchronous, undirected posts are unintrusive to readers, thus there is a low cognitive threshold for posting non-critical work information (e.g., small milestones, undeveloped ideas/throughts); (3) relevant and focused audience (e.g., project groups and the small network within the functional department) help form more specific, relevant content to be posted.

We also acknowledge that perceived values in this study would rely on sustained microblogging use, which might be affected by many factors, such as organizational culture and management. Though we got relatively good adoption during the 5-week study, we can't claim long-term retention. In this section, we discuss some issues for future research on design of microblogging support for project teams.

A. Audience-based Microblogging

First, a mechanism for creating focused, easy-to-understand audience sets is important for enabling users to know what to post (which could help adoption) and improves the value of posted content to readers. These might be project groups, a larger functional group, or communities of shared interest within a company-wide system. However, accomplishing this within a very large microblogging network could be a major challenge.

The concept of a group that can be followed and posted to is not new to Yammer and various third-party solutions have emerged to provide groups for Twitter users (e.g., Tweetworks, www.tweetworks.com). However, open questions remain concerning how to help users create and maintain a system of groups that reflects project teams, functional departments, and other focused communities. This

problem is evident in a Yammer network for all U.S. employees of the same company, which was created over a year ago by an unknown employee. While 37 groups have been created, all but 2 have fewer than 10 messages; and the entire network of 1093 members only has 2.4 messages per user on average. We were able to instantiate a more focused social and organizational context in this study by limiting our network to participants and carefully creating the project groups; the relative lack of focus in the company's U.S. Yammer network suggests that further research is needed to foster groups that would facilitate project and functional group awareness within larger networks. We described our automatic creation of project teams as an artifact of this study, but it may be that a simple "service" like this is a critical element in promoting project-specific posts.

B. Lack of Audience Feedback

Another audience-related issue concerned feedback. On one hand, the project groups and the small Yammer network formed an easy-to-understand audience, on the other hand, microbloggers didn't get enough audience feedback in this small network practice, which might eventually affect sustained use. As one participant Jim reported, at the beginning he found that Yammer was an easy way for him to share with others about his exciting work process. However, lately without much feedback from his co-workers, he was not sure whether anyone actually read his posts or who really care what he has to say. As he put it:

[Jim-3] "The question I have for my investment of doing that. Does it matter? Does anybody care any of it? I don't know. And if someone said it's good, I will do it again, otherwise, I might just stop."

Biased perception of audience set was much smaller than what it actually is. Some participants reported that they tend to think audience as those who they see often post on Yammer. Given there were more readers than posters in the study, this perceived audience was actually much smaller than the reality. Clearly, the existing feedback mechanisms (e.g., the thumb-up like button and reply feature) in the microblogging system haven't been used frequently enough to provide users an accurate mental model of who their readers are. Like in Television and Radio broadcasting, it might be useful to have a mechanism of easily gathering feedback information from audience, such as who read my posts.

C. Group-Focused Posts Were Very Contextual

While a focused group can help to form an easy-to-understand audience expectation, it also prompts sharing of audience-targeted information that might be too contextual for people outside the group to understand. This would be a potential barrier for facilitating cross-project awareness and informal communication among different project teams and functional groups. As seen in this study, a surprising finding was, as many participants reported, that project-specific posts from other teams were too low-level and technical to understand if without a background context of the project status, as Jack described

[Jack-1] "… That makes me less interested to follow other groups. If there were more high level interaction in the group, then I am who is outside the group can easily understand and capture what is their plan, their thinking, things like that right, that might benefit me"

This raises another challenge to the question of how to foster focused groups and predictable audiences, and at same time facilitate sense-making of group-specific contextual posts. Some of our participants suggested that a mechanism for providing a high-level summary of project status information could be helpful in setting the scene for outsiders. However this remains as an open question, namely what and how much information would be meaningful and helpful in making sense of the contextual posts.

VII. CONCLUSION

In this paper, we have presented a study of microblogging use by a set of project teams that comprised a functional group within a large company. We found that microblogging were used as a lightweight informal communication media by co-workers, filling a niche of sharing less-critical, non-action required, but still important work related updates (e.g., small steps just achieved towards completing a project task; problems and issues one's working on, but not critical enough for reporting). This information was microblogged in a much finer granularity than communication in emails, IMs, blogs, company-wide SNSs, or formal meetings and reports. We also reported that this microblog-mediated informal communication benefited work collaboration in project teams. Our main findings indicate that

(1) Microblogging supplemented other forms of team communication, helping teams initiate timely conversations as work being carried out, acquire more context enabling more effective communication in meetings, and obtain more contextual presence of each other that is useful for managing work collaboration.

(2) Microblogging was valued for facilitating cross-project team awareness within a functional group, garnering participation on projects from non-core team members, and building stronger social connection with colleagues beyond one's immediate working teams.

(3) A scoped, easy-to-understand audience size was important to the adoption of microblogging and the perceived value of posted content.

Our observations also provided directions and issues to be addressed for future research on supporting collaboration awareness with microblogging, including how to best foster focused groups and easy-to-understand audience in larger microblogging networks; how to encourage and support a higher degree of feedback from post viewers; and whether and how background information can be provided to facilitate sense-making of contextual information posted to specific groups.

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