A Case Study of Micro-blogging in the Enterprise: Use, Value, and Related Issues

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ABSTRACT

This is a case study about the early adoption and use of micro-blogging in a Fortune 500 company. The study used several independent data sources: five months of empirical micro-blogging data, user demographic information from corporate HR records, a web based survey, and targeted interviews. The results revealed that users vary in their posting activities, reading behaviors, and perceived benefits. The analysis also identified barriers to adoption, such as the noise-to-value ratio paradoxes. The findings can help both practitioners and scholars build an initial understanding of how knowledge workers are likely to use micro-blogging in the enterprise.

Author Keywords
Micro-blogging, Yammer, Twitter, social media, enterprise

ACM Classification Keywords
H4.3 Communication Applications

General Terms
Human Factors

INTRODUCTION
During the last couple of years, micro-blogging — a kind of blogging where users publish snippets of information about their daily activities and thoughts—has become the newest Internet trend. Online micro-blogging services such as Twitter.com, which provide an alternative communication and social networking channel, have quickly become popular. On Twitter.com, millions of people post short text-based updates – known as tweets – about "What I am doing". Topics range from their personal life and work, to current events, news, and interesting observations and thoughts. The tweets are published on the authors' personal Twitter page and sent to their followers – people who subscribe to other people's tweets. By following a group of

people, users manage awareness of what's happening to their family, friends, and communities.

This new social medium also has attracted attention from the business world. Variants of Twitter have begun to appear in the enterprise environment. Micro-blogging, which provides a light-weight and easy tool to post brief updates about daily activities and thoughts may help support knowledge sharing and communication in corporations. However, the relative benefits and liabilities of corporate micro-blogging are not yet fully evident. Nor is it clear how corporations should adopt and use micro-blogging in their work environments.

As an initial effort to gain a systematic understanding of the adoption and usage of micro-blogging in corporations, we examined how people used Yammer – one of the most popular corporate Twitter clones – in a large corporation during a five month period. We used multiple methods to collect and analyze data. We examined the character and genre of Yammer messages, users' human resource (HR) profiles, usage statistics, and the followers in their social networks. Then we conducted a web-based survey and in-depth interviews with users to probe their opinions and experiences with Yammer. The data were synthesized and triangulated from multiple perspectives to understand how people within the corporation adopted and used the micro-blogging service. This study sheds light on how to harness micro-blogging to improve knowledge sharing and social interaction in an organizational context. To the best of our knowledge, this is the first systematic examination of micro-blogging within a corporation using empirical data.

The paper is organized as follows: First we will review related work; second we will describe our methodology and data sets; then we will explain the data analysis and results in detail; we will conclude the paper with a discussion of our findings and contributions.

RELATED WORK

Micro-blogging
People use micro-blogging to update their family, friends and colleagues about their whereabouts, activities, and interesting thoughts [12][14][19]. In contrast to traditional blogging activities, micro-blogging offers a quick and easy

way to send a short text message from a computer or mobile device [17]. Barriers to participation have plummeted because micro-blogging is pervasively accessible and is a low-cost operation, both in terms of time and cognitive load [14]. Consequently, the population of micro-bloggers has grown explosively and tremendous amounts of information have been generated. This plethora of rich social interaction data provides fertile ground for research on this new social medium. It is important to understand how micro-blogging affects people's informational behavior and social interactions, and to ask whether this new social medium can be harnessed to make our work more productive.

Most early studies on micro-blogging were based on Twitter.com, which is the most popular micro-blogging service. Krishnamurthy et al. [13] has crawled publicly available data sets from Twitter to identify different classes of Twitter users and their behaviors, geographic growth patterns, and the current size of the network. Java et al. [12] have studied the topological and geographical properties of Twitter's social network (the network of who is following whom). Using link analysis, they identified three categories of users: information sources, friends, and information seekers. They also did some informal manual coding to categorize users' conversations into the following four categories: daily chatter, conversations, sharing information/URLs, and reporting news. Another social network-focused study is Huberman et al. [8], who compared Twitter's "following" network and "friend" network. Recently, Honeycutt and Herring [7] studied the corpus of the Twitter messages with a particular focus on analyzing messages to understand how Twitter's design affects its potential as a collaboration tool.

The business community has recently become interested in micro-blogging. Yammer [20], which is a corporate version of Twitter, has been adopted by many companies. Enterprises hope that it will empower knowledge exchange and sharing, and enrich interactions among employees. The primary difference between Twitter and Yammer is that the former is open to any web user while the latter is restricted to employees of the enterprise. However, because enterprises have limited experience in micro-blogging, people are still making sense of what role it may play in the work environment and how it might affect knowledge exchange, collaboration and social interaction within an organization. Systematic research is needed in this emerging area.

The first study in this area was done by Zhao and Rosson [22]. They interviewed 11 Twitter users in a large IT company. Using a conceptual framework of possible beneficial consequences of informal communications, they analyzed the potential impact of micro-blogging at work and provided valuable insight into why and how people micro-blog and how to support micro-blogging in an organizational context. Similarly, Gunther et al. [6] used the discussion data from four focus group sessions to model

the adoption of micro-blogging systems in the workplace. They summarized that adoption could be influenced by four key factors: privacy concerns, communication benefits, perceptions regarding signal-to-noise ratio, and codification effort. While these studies build an important understanding of how people view micro-blogging in the workplace, they both relied on a limited number of interviews or focus group discussions. Neither of these studies was based on broad sets of user data. Moreover, in those studies, participants' micro-blogging experience was mostly based on Twitter, as opposed to an internal micro-blogging tool designed for corporate use.

Until this study, there has not yet been a systematic examination of a corporation's adoption and usage of micro-blogging tools, mainly due to the lack of empirical data. In our prior working paper [23], we described Yammer's growth and spreading process and qualitative analyzed different user types and content. However, the analysis is rather preliminary and did not touch fundamental issues about how Yammer is used and valued by different corporate employees in their work context, as well as its limitations.

Social Networking Applications in Workplace
Although micro-blogging is still new in corporations, communication and social networking applications have long been adopted and studied in their organizational context.

The first type of study focuses on making sense of how a new medium is adopted and used in the workplace. For instance, researchers at AT&T used both quantitative and qualitative methods to study the character and function of IM in the workplace [10][15]. They found that IM in the workplace not only supports rapid, single-purpose interactions but also supports a broad range of complex work activities. Similarly, Jackson et al. [11] combined usage statistics, targeted surveys, and interviews to study an employee blogging site at large corporations and discussed the general benefits of corporate blogging, its benefits to the corporate community and collective employee knowledge, as well as related barriers. Other similar studies can be found at [2][4].

The second type of study focuses on specific aspects of media use, such as motivations or barriers. By analyzing behavioral data and conducting user interviews on IBM's internal social networking site, DiMicco et al. [3] found that people use internal social networking to build relations with their weak ties and to reach out to employees they do not know. They found that people's motivations for participation include "connecting on a personal level with coworkers, advancing their career with the company, and campaigning for their projects". Similarly, Yardi et al [21] used log analysis and interviews to study users in a large internal corporate blogging community. They found that employees expected to receive attention when they contributed to a blog, but often these expectations went

unmet. They argued that "attention economy break down" is a major barrier for corporations to adopt new social media like blogs, wikis, and social networks. They suggested that building a better understanding about what information people should pay attention to and where it resides will help people perform their job more effectively.

Because this paper is the first case study to systematically examine micro-blogging in a large corporate environment, we followed the approaches used in the first type of studies described above. However, our study is also informed by the theories and findings discussed in the second type of studies, particularly in the design of interview questionnaires and analysis of related data.

METHODS

Yammer is a Twitter clone for corporations. It is meant to be "a tool for making companies and organizations more productive through the exchange of short frequent answers to one simple question: 'Share something with My Colleagues?'" [20]. It differs from Twitter in several ways: only employees with a valid company email address can join a company's Yammer network; Yammer does not have the 140 character limit on messages; Yammer supports attachment to messages; and Yammer allows users to create private or public groups. Figure 1 shows a screenshot of a sample Yammer network.
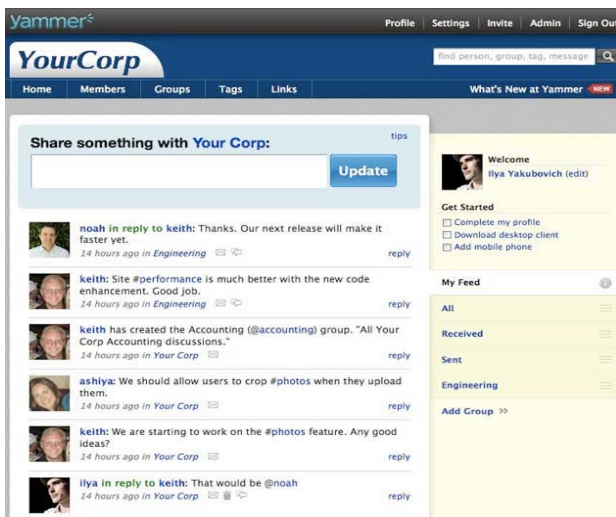

Figure 1: screenshot of a corporate yammer [20]

The company (XB, a pseudonym) we studied is a Fortune 500 company with 30K+ employees worldwide. The business of the company includes manufacturing, servicing, and software. The company did not officially initiate Yammer usage. Rather, it was independently initiated by an employee in the communications group at the company, in late 2008. The initiator invited people that she knew, including people in her own group and other parts of the company. Yammer was viewed as a grass-root initiative that IT agreed to pilot. It was not promoted or even mentioned in any formal corporate communications. Its growth was through email and word of mouth invitations.

Yammer had 458 unique users, who posted 3391 messages by the end of April 2009, when we obtained the raw data for this paper. Figure 2 shows the user adoption curve at XB Yammer. More details of the XB Yammer adoption process can be found in [23].
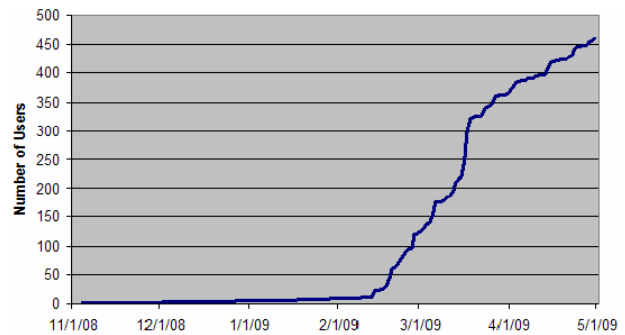

Figure 2: user adoption curve of XB Yammer

Our exploratory analysis of the use of micro-blogging within XB is based on four types of data: Yammer usage data, which includes all messages posted, user profiles, and logs of who invited whom and who follows whom; users' organizational information from the human resource (HR) database, which includes the user's job function, office location, job titles, and seniority, etc.; interviews with 18 users with different participation patterns; and a web based survey sent to all 458 users.

We first analyzed characters of the posted messages. We manually coded 300 randomly sampled messages to examine the content that people shared in Yammer. After that, combined with HR information, we examined who the current Yammer users are and their posting patterns. These analyses allowed us to identify different types of users and correlate them with their posting behaviors. Then we conducted in-depth face-to-face or telephone interviews with 18 users from different usage groups.

Finally, we conducted a web-based survey to collect information that we could not otherwise obtain: users' perceptions about Yammer's value and users' reading behaviors. The survey questions were created based on the understanding that we had developed through the analysis of usage data and interviews. The survey contained 17 closed-ended questions and 3 open-ended questions. Because related research about IM and Blog suggests that frequency of use may affect people's behavior and perceptions of value [10][11], our survey was not completely anonymous. We replaced users' names with unique IDs, and then associated them with users' non-private HR information and number of Yammer posts, in order to match people's survey responses with their HR background and Yammer participation behavior. We sent email survey invitations to all 458 users and received 160 responses (about 35% response rate).

RESULTS

Analysis of Message Character & Genre

General character of messages

As we described earlier, Yammer differs from Twitter, in that it does not have a 140 character message limit, and it allow attachments. We first checked if this makes a difference. We found that 46% messages are longer than 140 characters. The average message length is 173 characters and the standard deviation is 171. Only 1% of messages have an attachment. This tells us that posters in Yammer utilize the extra message capacity provided by Yammer. Also, 16.5% of Yammer messages have an embedded URL. By contrast, in Twitter, people often use tiny URLs to save space. An interesting question raised in this analysis is: do Yammer's longer messages imply that people have less incentive to be succinct? Furthermore, it remains unknown whether message length could impede Yammer's use as a micro-blogging system in the workplace. For instance, it definitely takes longer to scan a page of messages in Yammer than Twitter.

Another salient feature of Twitter micro-blogging is the use of hash-tags to identify topics and the use of @ to post targeted responses. In XB Yammer, hash tags were used in only 84 messages (2.4%) and there are only 15 tags. There were only 17 '@' used for targeted responses. More importantly, these signs were mostly used by a small number of users. The infrequent use of these specific signs may be because Yammer supports these needs with different functions: user-created interests groups and the ability to send private messages to colleagues. For instance, there are already 26 user groups created in XB Yammer. However, the limited usage of these features may be because most users are still unfamiliar with them.

Genre of messages

Previous studies have shown that the light-weight update operation, combined with the pervasive access of micro-blogging, enables frequent, timely updates on a person's daily activities and thoughts. To understand what was posted in XB Yammer, we randomly sampled 300 Yammer messages and manually coded them. Based on the literature [12] [22], we developed an intention-oriented classification scheme as following:

- "Me": The author posted something about him or her self, including what she or he is doing in life or work, or self-introduction to the community.

- "Conversation seeking": the author posted something seeking a reply, such as asking for comments on an issue. We also put messages directed to a specific person under this category.

- "Share news or new found": the author posted news, events, or URLs to share with others. Note this includes internal news like "*there is a social media workshop at world headquarter tomorrow*", and

external news like "*Check out the iphone 3.0 preview at http://www.engadget.com...*"

- "About Yammer": the author posted something about Yammer, including technical Q&As about using Yammer and related discussions or announcements.

- "Others": the author posted anything that cannot be categorized into those four categories.

To further understand what's going on in each category, we have defined sub-categories under them, which are shown in bar charts in Figure 3. Note that some messages could be categorized into multiple categories, such as "I am reading news about iphone 3.0 at http://www.apple.com." Thus, we added priority rules to coding scheme: "About Yammer" > "Me" >"Conversation seeking" > "Share news" > "Others". Using this coding schema, two coders independently coded the sampled messages. The kappa coefficient of the two coding results is 0.81 (high agreement) at top categories and 0.58 (moderate agreement) on the sub-categories. After the independent coding, coder 1 re-coded the sampled messages by combining the two coding results.
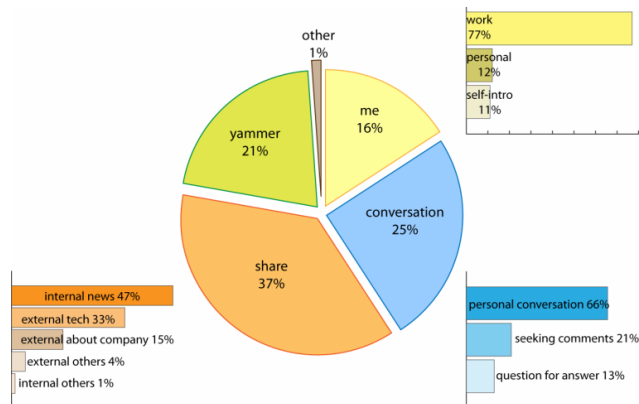

Figure 3: coding analysis result

The result is shown in Figure 3. From the figure, we can see that the messages posted in Yammer are quite diverse. At the top category level, the biggest portion of the messages is about sharing non-personal news or new findings. Within this category, sharing internal news is a major topic. For example, communication news such as "*Our quarterly newsletter is going to be on the intranet by Monday…*" and new products or technologies like "*check out our new map application demo at http://...*". This indicates that Yammer gives employees a place to publish their local news at the corporate level, which was close to impossible to do previously. About one third of the messages in this category are about sharing external technology news, such as "*Apple is releasing a preview of iPhone 3.9*". 15% of these messages are external news about the company, and many of them are actually customers' comments made on Twitter about company products. These comments were forwarded to Yammer by users who were also active on Twitter. In this case, Yammer was used like a news group list.

The second biggest category of messages is conversation seeking. Within this category, 21% of messages are about raising a general issue to solicit comments and opinions, and 13% of them are seeking answers to a specific question. 66% of these messages are targeted to one or more specific people. In our sampled messages, the average number of replies to these conversation seeking messages is about 2.4 (STD: 2.1), and the longest threads have 12 replies. There might be several possible reasons why people used Yammer instead of other tools, such as Email or IM, for conversations. First, Yammer is the only company-wide grass-roots community. There are no other forums or places where employees can post messages to a company-wide audience. Second, our survey and interviews found that people think Yammer is an effective way to get responses from people whom they do not know, compared to Email or IM. Even for people one already knew, users thought sending a message or asking a question in Yammer was less formal than in Email, which was convenient on many occasions (i.e. asking a remote colleague's opinions on the new iphone).

Surprisingly, only 16% percent of the messages are about the poster himself or herself or about what he or she is doing. Within this category, the majority of messages are about the person's work, and only 12% of them are refer to personal activities outside work. We only found one message where a person mentioned that he is going to "*have a cup of coffee*". This is very different from findings by Java et al. on Twitter [12], in which they found that "most posts on Twitter talk about daily routine or what people are currently doing. This is the largest and most common use of Twitter".

Finally, 21% of conversations are about Yammer-related topics, which indicate that Yammer is still in its early adoption stage at XB. People are still in the process of discussing and negotiating the use, regulations, and concerns of using Yammer in the workplace.

Summary

Above all, by examining message content and categorizing it into genres of content, we found that Yammer is used quite differently from Twitter on the Internet. On the one hand, in some respects Yammer usage is similar to Internet micro-blogging usage: the messages are relatively short; many of them are about general news or activity updates. On the other hand, we felt that Yammer is also used like an Intranet forum where diverse types of information are published or shared, groups are formed, and people have long conversations. It serves many communication needs within the organizational context. These differences could be because Yammer has some different features, such as user groups and unlimited message length, but we believe that the corporate context and culture are more important factors here. At last, we should also be aware that XB Yammer is still in its early adoption stage and its use is continually evolving.

Analysis of user characteristics, behaviors, and attitudes

Next we examined users' behaviors and their opinions of Yammer in XB by combining user demographic information with usage statistics and feedback from the survey and interviews.

Demographic information

There were 458 users (1.3% of total employees) by the end of the study period in April 2009. These early Yammer users represent a broad spectrum of employee across 16 different business units in 45 US cities and eight international cities. These users came from more than six organizational units and 27 unique job functions, as shown in Table 1. These Yammer users have diverse backgrounds. However, by comparing the distribution of job functions among Yammer users against the job functions across the whole corporate employee population, we can see that Yammer has not been equally adopted by different groups of corporate employees. Engineers and IT are the most tech savvy groups in the organization. Marketing, corporate communications, HR, and field service operations have strong communication needs in their daily work. Forty-five percent of Yammer users are managers or above, which is significantly higher than the percentage of managers in the company (10%). This indicates that Yammer is currently more broadly adopted by employees at the mid-level of corporate hierarchy.

Job Function:	% in All employees	% in Yammer users	% in Survey respondents
Engineer	5%	50%	32.50%
Marketing	2%	19%	15.60%
IT	1.9%	11%	11.50%
HR & Comm.	1.5%	8%	14.20%
Field Service	11.9%	5%	4.80%
Other 22	22.5%	7%	21.40%

Table 1: user breakdown by job functions

The survey results provided additional demographic information that we could not obtain from HR data, such as age range. Among 160 survey respondents, 58.3% were between 29 to 45 years old, 30.9% were 45 or above, and 7.9% were under 29. Furthermore, the survey also asked about users' familiarity with Twitter: 24.8% were active Twitter users; 24.8% were inactive users; 48.9% knew about Twitter, and 1.4% did not know about it. This again indicates that these early adopters are relatively tech-savvy and are more open to new media. 458 users were surveyed and 160 responded. To determine if survey respondents were representative of all Yammer users, we compared HR attributes of survey respondents with all Yammer users. Our assessment found that survey respondents constituted a rough representative sample of all Yammer users across job function, hierarchy and location. For example, as we can see from the last column of Table 1,

it includes users with various job functions but biased towards Yammer users in "other" job functions.

Usage statistics

Table 2 shows message posting volumes breakdown for all users. We can see that users' posting activities are highly skewed. Fifty nine percentage (278) users have never posted a message. About 10% (46) users posted more than 10 messages, and about 1% (5) users posted more than 100 messages. This highly skewed posting pattern is similar to what was found in Twitter [13] and is commonly observed among many online communities [16]. This suggests that Yammer participation patterns are similar to other online social systems, where a relatively small number of users contribute majority of the content and most users either contribute sparsely or only lurk.

| # of Posts	Users	Survey resp.	Survey/Users
0	278	61	21.9%
1~10	131	60	45.8%
10~50	33	23	69.7%
50-100	8	7	87.5%
100+	5	5	100.0%

Table 2: users' posting volume breakdown

Table 2 also reveals survey respondents' posting volumes in comparison to all users. We can see that clearly the more actively a user posted in Yammer, the more likely he answered the survey. So, the survey results are biased toward active users. Nevertheless, because we had a large number of in-active users among the survey respondents, we believe that the survey is still somewhat representative.

Usage data did not include user login or reading data, so the survey asked "how often do you read Yammer" As shown in Table 3, about one-third of respondents read it at least once a day, about one-third of users read it occasionally, and about one-third of respondents stopped reading after few days of trial. These percentages reflect an interesting trial->stay->use ratio for a new social media.

Real time	7.0%
Couple of times a day	8.9%
Once a day	15.8%
Occasionally	6.3%
Only when prompted by others	29.1%
Read for a few days, then stopped reading	32.9%

Table 3: How often a user read Yammer (survey)

We also compared users' reported reading frequency with their posting volumes, as shown in Figure 4. Not surprisingly, active posters tend to read more frequently than inactive posters. However, there are users who have not posted any message still read Yammer at least once a day. This indicates that there are some pretty active lurkers.
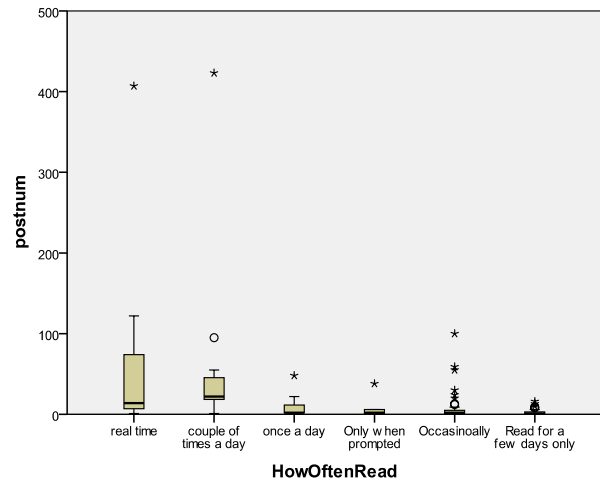

Figure 4: Boxplot of how often users read and post to Yammer

Perceived Usefulness, Value, and Benefits

The survey directly asked several important questions about users' perception of Yammer's value. Table 4 summarizes the answer of the question "*Rate the overall value of Yammer: is it a useful tool to you*"? 30.1% users either 'strongly agree' or 'agree' that Yammer is an overall useful tool to them; 43.9% either 'disagree' or 'strongly disagree'; and 26% are 'neutral'.

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
7.5% (11)	22.6% (33)	26.0% (38)	28.1% (41)	15.8% (23)

Table 4: Is Yammer a useful tool for users (survey)
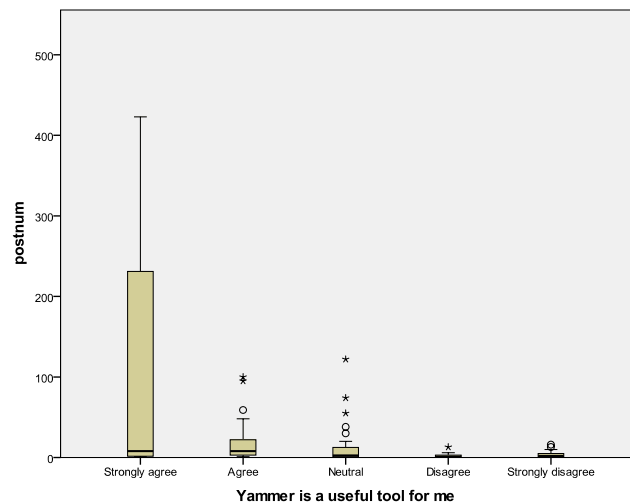
Figure 5: Box-plot of user perceived usefulness of Yammer vs. their posting volumes

Figure 5 shows the relationship between users' perceived value of Yammer and their posting volumes. We found that users who valued Yammer more tend to post more messages (the correlation between the perceived value and the logarithm of posting number is 0.40). There are some

users think that Yammer is very useful to them even though they did not post anything. This indicates that just reading can still be valuable for them. We also compared users' perceived values to their reported reading frequencies. Not surprisingly, these two numbers are correlated (correlation=0.65). Regular readers value Yammer more than less regular readers; and none of the users who "read a few days after joining, then stopped reading" think that Yammer is useful to them. Interestingly, even some users who regularly read messages remain neutral about Yammer's perceived usefulness. This might imply that they haven't yet seen the usefulness of Yammer but are willing spend time to explore it.

We further correlated answers to the value question with HR attributes. One interesting finding is that users with manager titles report more perceived usefulness (mean=3.1 in the scale of 5) of Yammer than others (mean=2.1). This indicates that these mid-level managers may have stronger connection needs. Surprisingly, there is no correlation between a user's age and their perception of Yammer's value. However, this may be due to our relative small sample size of users below age 29. Users who have more Twitter experience tend to value Yammer more than those with less experience, this hints that the previous work [22] based on interviewing Twitter users may be biased.
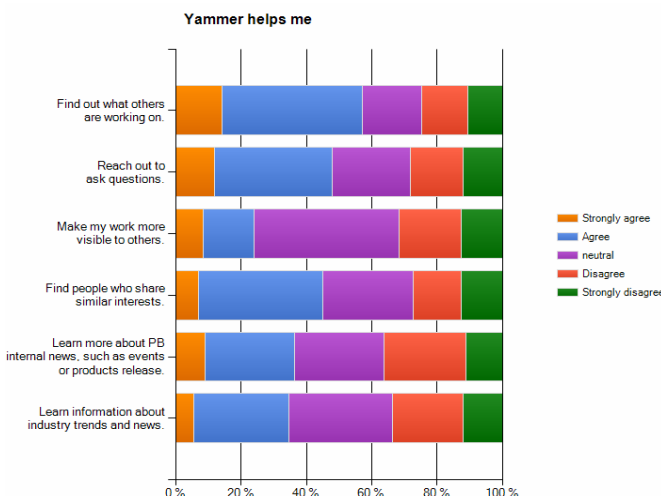

Figure 6: Yammer helps me … (Survey)

The survey also asked users how Yammer helps them. As shown in Figure 6, users responded that Yammer helps most to "find out what others are working on". Other perceived values include "reach out to ask questions", and "find people who share similar interests". The least selected choice was "make my work more visible to others." These results indicate that Yammer helps support informal communication, increase awareness, and build potential relationships, which relates to previous work on other similar social media [3][4][6]. However, Yammer's value in helping "learn more about company internal news" and "learn information about industry trends and news" was not as high as expected. As we found earlier in the content

coding analysis, the largest portion of the messages are about internal or external news; less than 16% of the messages are about individuals talking about their current work. This indicates that we may want to encourage users to post more about their individual work on Yammer.

The "Noise-to-Value Ratio" paradoxes
There is a high correlation between the ranked answers of two questions: "Is Yammer useful to me?" and "How often do you find relevant information on Yammer?" The Kendall tau-b rank correlation coefficient is 0.729. Figure 7 shows the stacked bar chart of answers to these two questions. The color represents ranked answers to the question about usefulness. From this figure, we can see that difficulties for finding relevant information may be a major factor for users who don't find Yammer useful. This was also confirmed in several interviews: *"haven't seen anything useful on it…all it seems to be is names of people I don't know with information that I don't know how to apply to my day-to-day job in the company."*
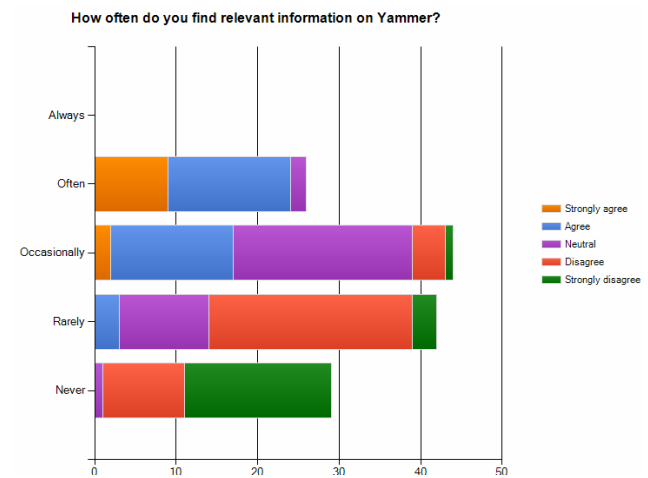

Figure 7: How often do you find relevant information vs. Is Yammer a useful tool for you (Survey)

Twitter provides two ways to address the noise and relevancy problems: by following selected people or following specific topics (with hash tags). As we described earlier, Yammer supports both functions, though hash tags are not widely used. Yammer also supports topics with user groups. We examined whether use of these functions affects a user's ability to find relevant information more easily. Figure 8 shows the cross-tab results of how frequent users used a "focus" feature versus how often they found relevant information. From the figure, we can see that "select people to follow" is the most reported feature but its help on finding relevant information is not as good as "I sign up for groups". Actually, the percentage of users who rarely or never find relevant information in this group is close to the percentage of users who "don't know how to limit their focuses", which is the worst-served group. The "don't know" group of users is relatively small, and some training should help them a little bit. Interestingly, there are some users who "try to read everything" and still often find

relevant information. Further examination of their profiles indicates those are very active users who spend a lot of time on Yammer.
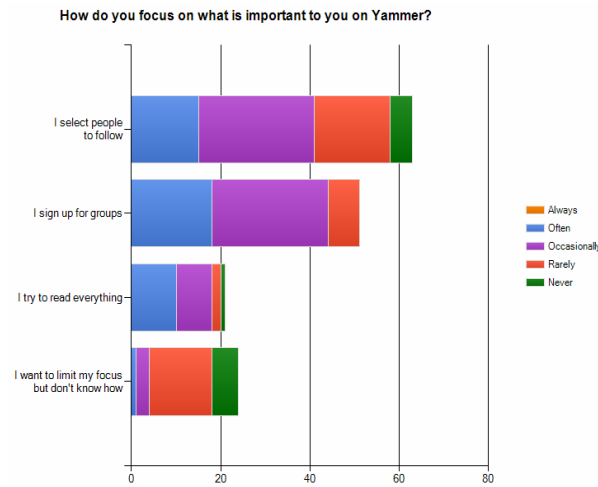

Figure 8: How do you focus on what is important to you vs. How often you find relevant information on Yammer (Survey)

We further examined the "following people" feature to explore how we may make better use of it. The scatter plot in Figure 9 shows the distribution and relationship between the number of a person's followers (users that follow the person) and followees (users that the person follows). The two numbers are highly correlated (correlation=0.75). The median of one's followees is 21 and the median of followers is 16. There are several users that have both a very large number of followers and followees. A further check reveals that they are those most active posters.
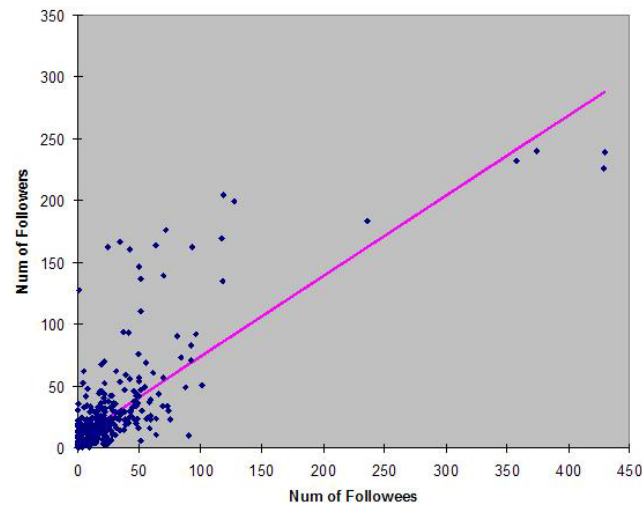

Figure 9: the plot of number of one's followers vs. number of one's followees (following network analysis)

Figure 10 shows the survey results of the criteria that people used to select people to follow compared with how frequently they find relevant information. Two strategies stand out: "I follow people I know" and "I follow people who have posted interesting topics in the past", the

reciprocal-following strategy (follow people who follows me) is used but not as frequently.
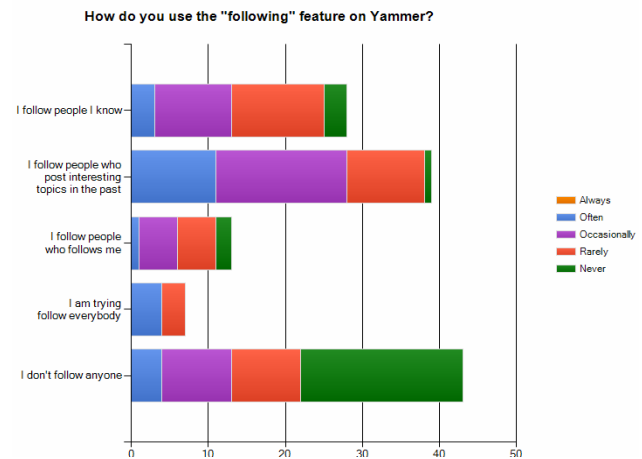

Figure 10: how do you use the "following" feature vs. How often do you find relevant information on Yammer (Survey)

An interesting problem is identified by cross-checking this survey question with another related one. In the survey question about how Yammer helps people build connections, 55.3% of users value "help me connect with people that I don't know", while only 39.3% of users value "help me connect with people that I already know". Thus, following one's known peers is not as valuable. However, on the other hand, to follow "people who post interesting topics in the past" is not practical. As one of the interviewees suggested: "*I believe that a fundamental flaw in the Yammer model is the "following" concept. Effectively I follow all. It seems to me that following assumes that you know who has interesting information to you. If you already knew the answer you wouldn't bother with Yammer - you'd just talk. The entire point is that you don't know where you'll find insights or be able to help.*" We call this issue the "following paradox" problem. Currently, Yammer provides following recommendations for its users, but its recommendations do not make sense for most of the users we interviewed. We believe that this may be one of the most important features of Yammer that needs to be improved. Currently, using the group may be the most practical way to handle this paradox.

Another observed noise-to-value ratio issue is the local context and global audience paradox. In the survey question about how users want to use Yammer to connect to others, 23.4% survey respondents value its help to "connect with people in my work location" while 57.7% value its help to "connect with people in different work locations". Although Yammer broadcasts messages to the entire organization, the messages and discussions are usually local. This lack of contextual information sometimes impedes immediate understanding by readers outside the poster's work group, which in turn increases the users' frustration like *"I don't know why he posted this".* Furthermore, posters don't know who the readers will be,

which also impedes their posting, like "*I think this is part of my hesitation…who can see what you are posting there. I question who can see it and what they are going to do with this information.*"

Summary

In this section, we analyzed XB Yammer users from multiple perspectives. The analysis of demographic information shows who these early adopters are. As a grass-root social networking application, we can see that it reached different parts of the organizations. Some groups adopted Yammer more actively than others. Comparing the demographic information and usage data of survey respondents with all the Yammer users, we found that that our survey is largely representative of the community at large, though it is biased towards active users. Combining usage and survey data analysis provides a relatively clear picture of the different types of users, and their perceived value of Yammer as a tool. At last, by combining the analysis of the survey, interviews, and the following network, we identified the noise-to-value ratio problem in the current Yammer deployment, as well as the limitation of its following feature.

DISCUSSION

The recent rapid public adoption of micro-blogging raises many questions about how this new technology might be beneficial in an enterprise setting. We were in the fortunate position of being able to collect and analyze a rich data set about Yammer in a large corporation. As the first detailed case study that systematically examines micro-blogging in the workplace, we chose to cover a broad range of topics that are important for both practitioners and scholars. Such questions include: How is micro-blogging used in an enterprise? Is it similar to Twitter's use on the internet? Who are the users? What are their behaviors? What is the value of the new tool for them? And, what are the barriers to adoption? We believe that answers to these questions can provide context that is an essential prerequisite to further theoretical inquires. Contextual understanding is also required for adoption planning. This topic is timely because adoption of micro-blogging tools is likely to accelerate and there is growing interest about it within the CHI community. This paper also demonstrates the strength of triangulating multiple research methods, including qualitative and quantitative, and correlating different data sets. Absent this approach, many of our insights would not have been possible.

Both content and user analysis indicates that Yammer use on a corporate intranet is different than Twitter use on the Internet. Employees use Yammer more for publishing news about their groups or business units instead of news about themselves; there are long conversations and discussions in Yammer, which are features of intranet community forums. People signed up for user groups instead of relying on hash tags. These differences indicate that micro-blogging's capabilities have been adapted to people's work environment, diverse communication needs, and organizational culture. This represents more than a simple migration from the Internet to a corporate intranet. Theoretically, this finding is not ground-breaking because previous work on other social software systems has already indicated that intranet and Internet usage differs [2][21]. However, understanding what these differences are will help us re-design these systems to better fit the new workplace needs. For instance, Yammer's interface did not support long threaded discussion well, as one interviewee described: "*Sometimes it is difficult to identify conversation threads. Question is, where does it begin?*" (Note: by the time we wrote this paper, Yammer had started to provide a threaded web interface).

There are clearly different types of users in Yammer. Combining individual usage statistics with survey results enabled us to examine behaviors and perceptions with tremendous granularity. We can identify users from their posting activities, reading behaviors, perceived value and benefits, and features preferences. For instance, we've observed some active posters who are still trying to determine whether Yammer is worth their efforts, while other silent readers derive great value from reading Yammer messages. One interviewee's comment summarized this point: "*Everyone has their own criteria how to use it.*" These findings can be connected to the Uses and Gratifications Theory, in which "media users play an active role in choosing and using the media … a media user seeks out a media source that best fulfills the needs of the user" [1]. We believe that this study's comprehensive understanding of Yammer users' behavior and perceptions has both strong practical and academic value.

The major benefits of Yammer that users reported are: staying aware about what others are working on and making new connections. These findings are closely related to both social awareness theory and weak-tie theory [3][22]. Content analysis indicates that these benefits are currently under-served in XB Yammer because most frequent posts are about internal or external news. This suggests that some practices may need to be changed. Furthermore, at the organizational level, combining content genre, user demographic information, and survey analysis, we felt that micro-blogging supports the emerging grass-roots communities of interest that traverse organizational, geographic, and hierarchical boundaries.

Yet the study also found that this medium has significant limitations that could impede both broader adoption and overall efficacy: the noise-to-value paradox. While enterprise micro-blogging provides capabilities such as groups and following to handle this paradox, these capabilities are imperfect and many users are unfamiliar with them. We also observed other barriers, such as security concerns about sharing sensitive information outside the corporate firewall. These are general barriers for many similar social medias thus we chose not to discuss them deeply here.

There are two caveats to our study. First, although we have five months of data, Yammer is still in the very early stages of adoption. The number of users in our data set is only about 1.3% of the company's total employees. It is difficult to evaluate whether this is a good adoption rate because Yammer has not been formally promoted in corporate communications, unlike traditional tools. As a grass-root social networking application, Yammer relied on word of mouth to grow and on community activities to maintain momentum. By the time we finalized this paper (January 2010), Yammer's user population has almost tripled (1354 users), which indicates that Yammer adoption has been steady. Nevertheless, we believe that our findings should be limited to the early stage of Yammer adoption. Because Yammer is a novel tool, users are still learning and making sense of how to use it. Overtime, employees' understanding about micro-blogging is likely to change, which may lead to changes in perceptions of value and usage patterns. We will continue to monitor and investigate those changes in future work. Second, XB Company is a traditional large corporation. Yammer is its first company-wide grass-roots community. Employees use it for a variety of work-related purposes, even when it is not the optimal tool. While examination of enterprise micro-blogging offers valuable insight for our corporation, micro-blogging usage may vary in other companies that have different cultures and information infrastructures.

ACKNOLWEGEMENT

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