A Longitudinal Study of Facebook, LinkedIn, & Twitter Use

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ABSTRACT
We conducted four annual comprehensive surveys of social networking at Microsoft between 2008 and 2011. We are interested in how these sites are used and whether they are considered to be useful for organizational communication and information-gathering. Our study is longitudinal and based on random sampling. Between 2008 and 2011, social networking went from being a niche activity to being very widely and heavily used. Growth in use and acceptance was not uniform, with differences based on gender, age and level (individual contributor vs. manager). Behaviors and concerns changed, with some showing signs of leveling off.

Author Keywords
Social networking; Facebook; LinkedIn; Twitter; Enterprise

ACM Classification Keywords
H.5.3 Group and Organization Interfaces

INTRODUCTION
We conducted four annual in-depth surveys of attitudes and behaviors around social networking sites in Microsoft, a large technology company. In May 2008, MySpace was the largest site worldwide, with over 100 million users. Today it has 30 million. Facebook, LinkedIn, and Twitter increased from 75 to 600 million, 20 to 100 million, and 2 to 200 million, respectively. How did this unprecedented technology shift play out in an organizational setting? Our survey data are a unique longitudinal window into one company through an interesting time.

Social networking with family and friends is widespread. Their use in marketing and publicity is growing. Organizational benefits from employee use are less clear. Some organizations ban the use of public sites such as Facebook, although blocking employee access via smart phones is difficult. Organizations that allow access may reveal how the use of social networking sites can be beneficial or distracting in such a setting.

New communication and collaboration technologies often encounter initial organizational resistance. Email, instant messaging, and employee blogging were first used mainly by students and consumers to support informal interaction. Managers, who focus more on formal communication channels, often viewed them as potential distractions [4]. A new communication channel initially disrupts existing channels and creates management challenges until usage conventions and a new collaboration ecosystem emerges.

Email was not embraced by many large organizations until the late 1990s. Instant messaging was not generally considered a productivity tool in the early 2000s. Slowly, employees familiar with these technologies found ways to use them to work more effectively. Organizational acceptance was aided by new features that managers appreciated, such as email attachments and integration with calendaring.

Many organizations are now wrestling with social networking. About half of U.S. companies reportedly block sites or have restrictive policies [9, 17]. Echoes of past email and IM debates rage in the trade press [6]. Change could come more quickly this time: People are accustomed to using new technologies, adoption is less expensive, work-life boundaries are eroding, and the use of these technologies by successful people in government and entertainment is discussed in the media.

In 2008, two years after Facebook became available, the size of its Microsoft "group" indicated that it was used by over one-third of all employees. How were they using it? How much if any was for work purposes? How did use or attitudes vary with role or age? Whether using such sites at home or work, employees are learning what they can provide and are developing skills in using them.

Different social networking sites have been popular at different times and in different countries [16]. Over half of the Microsoft employees are in North America. The others are distributed around the world. In 2008, we found some use of Plaxo and international use of Orkut, Bebo, QQ, and other sites, but it was minimal and has diminished [10]. The primary sites from 2008 to 2011 were LinkedIn, Facebook, MySpace, Twitter, and Live Spaces. Live Spaces was a commercial product endorsed for internal use. An internally-developed microblogging tool was released in 2010 but does not figure prominently in the data.

Today, over 80% of our employees and over 10% of the world population are active Facebook users. Most joined during the three years spanned by our study. Past experience with new technologies indicates that employers

who can trust employees not to misuse them can benefit from employee use. The nature of potential benefits and the optimal approach to realizing them are unpredictable. Should employees use external sites that include non-employees? How will social networking tools that are restricted to an organization's intranet fare? Will people visit and update multiple sites? Will integrated tools that span external and internal social networking be embraced?

Surveys of the public and analyses of public feeds are useful but do not reveal organizational behavior. Snapshots of use in one organization at one point in time provide insights, but longitudinal studies of a relatively stable population can reveal dynamics in greater detail.

Many of the 90,000 employees at Microsoft are early adopters—but the rest of the world is catching up. When the study began in early 2008, Facebook and Twitter had been available to non-students under two years. There was no published research on enterprise social networking use.

The history of adoption of earlier communication technologies provided strong grounds for hypothesizing that attitudes and behaviors would begin conservatively and evolve to show more acceptance of social networking site use for work purposes. The literature discussed next emerged in the course of our study, but did not motivate it.

LITERATURE REVIEW
The media and the research literature focus mainly on Facebook and Twitter use by the general population. Facebook data are not public, so most research is in the form of surveys and interviews. A partial exception is the Burke et al. [1] examination of social capital, which used Facebook server logs as well as two surveys of volunteers from a general population of Facebook users, conducted 8 months apart. The Twitter API provides streams from users who do not opt out, enabling collection and analysis of large-scale samples [e.g., 7, 12, 14]. These reports have some validity as single snapshots of the general population.

Many of the organizational use studies are of prototypes, notably the Beehive, BlueTwit, and Timely systems built, used, and studied at IBM [e.g., 5, 8, 19]. Researchers interview employees and analyze usage logs. These systems generally have relatively low organizational uptake and a limited active lifespan, but are considerably more informative than more limited tests of prototype systems. Companies such as Deloitte and CA Technologies report high uptake of internal systems, but details are unavailable.

The most relevant studies examine employee use of widely-used social networking sites. These are discussed next.

Turner et al. [18] surveyed members of a small company about their full range of communication channels and interviewed 23 of them, in May 2008 and May 2009. Not surprisingly, use of IM, blogs, Facebook, LinkedIn and Twitter reportedly increased over the year.

Zhao and Rosson [21] recruited eleven heavy users of Twitter at a large IT company in late 2008, using personal contacts and 'snowball' referrals. Heavy users may not be typical, but they can identify useful features and today's heavy user might (or might not) be tomorrow's average user. Twitter was used in their organization for 'life updates' or personal status, for sharing information with friends or colleagues in real time, and as 'personal RSS feeds' to monitor trusted external sources for news or links.

In early 2009, Zhang et al. [20] studied one organization's use of Yammer, a Twitter-like tool, typically restricted to employees, that has unlimited post length. They report categories of use similar to Zhao and Rosson: to broadcast status, usually group or business unit rather than personal; questions or directed messages for real-time interaction; and items of interest (an employee becomes an "intermediary RSS feed" relaying information from outside). 1.5% of employees (458) used Yammer, almost all of them over 30 years old. About 25% were also active Twitter users. With such limited adoption, even enthusiastic users had difficulty finding value in Yammer. Some followed specific individuals; other followed everyone in the company who posted to Yammer. Hashtag use was rare, perhaps because of the low volume of use.

In the spring of 2009, Ehrlich and Shami [5] compared uses of Twitter and BlueTwit, a Twitter-like internal IBM tool that allows posts of 250 characters. BlueTwit had been available for a year and adopted by one third of 1% of IBM employees. 34 employees who actively used both BlueTwit and Twitter were identified and studied. On average, they tweeted 561 times over four months, or four times a day. 57% of the tweets were from the five heaviest users, who averaged 18 in a day. (In contrast, Zhao and Rosson's heaviest user posted four times a day). The authors found less status posting and more information or comments directed to specific individuals than is reported in studies of the general Twitter-using population. (This is consistent with what we heard from power tweeters, a small minority of employees.)

The use of the Facebook-like Beehive application deployed at IBM was affected by its restriction to employees. Absent are the tensions that arise when 'friends' include colleagues, social friends, and family. Absent also are privacy concerns that arise with public sites [3]. Nine months after deployment, employees were using Beehive to share personal information, to promote themselves by describing skills and accomplishments, and to campaign for projects. Beehive was not being used to find information or get quick answers to questions.

In mid-2008, 10% of IBM employees had Beehive profiles. Facebook and Twitter had been in corporate use for about two years. A year later, in their organization, Turner et al. [18] found the norm to be once-a-week use of Facebook and Twitter. They predicted that corporate use of Twitter would thrive, which as we will see remains uncertain.

Finally, a report on the first of our four surveys, conducted with Meredith Skeels, was published in 2009 [16]. As a contrast to the Beehive use, we found that in mid-2008, 49% of employees had Facebook profiles, 52% had LinkedIn profiles, and 6% had Twitter accounts. About 20% were daily users. Those who reported using the sites for work identified the creation and strengthening of weak ties as a key benefit. Tension arose from having contacts from different groups: colleagues, managers, external friends and professionals, family members, and so on.

METHOD
On four occasions a year apart, 1000 of the approximately 90,000 full-time Microsoft employees were randomly selected from the company address book and emailed an invitation to take a survey on communication technologies. The invitation was worded ambiguously to avoid discouraging non-users of social networking sites. Those invited once were subsequently excluded, due to possible behavioral influence from taking the survey. As an incentive, participants were entered in a drawing for a digital appliance. The surveys closed in May of the years 2008 through 2011. This paper addresses the evolution of behaviors and attitudes over the years.

Most published organizational studies are "snapshot" studies of heavy users recruited by word of mouth or examining system logs. These studies of early adopters of quickly-evolving technologies have value. Different things are learned by examining representative samples over time.

Our survey covered demographic information (age, gender, role in company), behavior, and attitudes toward social networking sites. People were asked their level of agreement or disagreement with statements such as 'I think social networking software (Facebook, MySpace, LinkedIn, Friendster, etc.) can be useful for personal socializing/networking,' and '…can be useful for networking within Microsoft.' We asked which sites were used, how frequently, and the frequencies of a broad range of activities, such as posting a picture or inviting people in different categories to connect. Open-ended questions let respondents discuss thoughts, experiences, and concerns (if any) with social networking software use.

We also recorded in-depth interviews with 46 employees selected to provide a range of ages, roles and levels in the company, geographic locations, and attitudes (positive or negative) toward the usefulness of social networking software for work. Most were survey respondents who indicated a willingness to follow up. A few were developing prototypes of internal social networking tools. Others were active users identified through distribution list activity or referrals. We followed internal email discussion lists that cover social networking tools and technologies, which primarily attract heavy users and evangelists.

Most interviews were conducted in the informant's office, lasted about an hour, and were recorded with permission.

Eleven geographically distant employees, who worked in Asia, Europe, South America, and North America, were interviewed by phone or during visits.

We asked for their professional background, prior experience with social networking sites, and current use: how, when and why they started using a system, when they access it, how their use evolved, and what if anything they felt it is useful for. We covered family members, former schoolmates, and work colleagues, asking them to approximate the number of different connections. If they posted information, we asked what they posted or avoided posting. We asked them to speculate about the future of social networking.

For most interviews, including all in the first year, we typed up notes and where they did not coincide, referred back to the recordings. With early interviews and free text survey data, Atlas.ti was used for open coding. A list of themes gradually stabilized; the same themes recurred in subsequent interviews and fewer new themes emerged. Interview analysis is described further in our report on the first survey [16]. In subsequent interviews we noted some new themes emerging. However, this paper focuses mainly on the trajectories found in the annual survey data.

RESULTS
The survey response rates were relatively high, ranging from 42% to 45% of the 1000 invited. Respondents seemed representative: 45% were from the headquarters region, as are 45% of employees 23.0% were female, and as of this writing, 23.8% of employees are women. We asked employees to place themselves in one of five age ranges. In 2008 the mode was 26-35, in subsequent years 36-45, reflecting the aging employee base, which now averages 38.4 years. The major product development roles—developer, tester, and program manager—are roughly equally represented and comprise about 45% of our sample. Sales, marketing, and product support were about 32%. Other roles were much less numerous. Roughly 1% were executive level, 27% served in managerial or supervisory positions, and 70% were individual contributors.

We had large samples and are only generalizing our results to Microsoft population. The 95% confidence intervals for the results reported range from ±2% to ±4%. For example, the rise in daily use of LinkedIn from 6% in 2010 to 15% in 2011 is highly reliable, with 95% confidence that the first is no higher than 8% and the second no lower than 13%. (Table 1 and Figure 1). The earlier rise from 4% to 6% was probably real, but not noteworthy. The discussion focuses on significant changes that seem particularly interesting.

Pattern of Overall Increased Use
Table 1 covers the five most frequently used sites. Some other sites were frequently used by employees in particular regions, but overall their use was much lower.

Percent of all employees	Facebook				LinkedIn				Twitter				MySpace				Live Spaces			
	2008	2009	2010	2011	2008	2009	2010	2011	2008	2009	2010	2011	2008	2009	2010	2011	2008	2009	2010	2011
Never Used	36	23	13	12	41	33	22	18	**88**	**68**	**44**	**39**	48	61	56	61	53	50	51	60
Only Read	16	7	6	4	7	5	3	2	6	11	15	12	21	13	14	15	8	7	5	4
Have Profile and Use	46	67	78	82	**49**	**58**	**71**	**77**	5	18	36	40	**25**	**15**	**17**	**9**	32	36	36	28
Use Daily+	**17**	**29**	**41**	**52**	**4**	**6**	**6**	**15**	**2**	**6**	**10**	**11**	4	1	0	1	5	4	3	3
Use Several Times / Day	**5**	**8**	**14**	**20**	1	1	0	4	1	3	4	5	1	0	0	0	1	1	0	0
Had Profile, Don't Use	3	4	3	**2**	3	5	3	**3**	1	3	5	**6**	6	10	13	**15**	7	6	8	**8**

Table 1. The five most frequently used sites. Daily+ is daily plus several times in a day. Bold items are emphasized in the discussion.

The sharp increase in reported use of social networking sites from 2008 to 2011 is unsurprising, but the details provide a richer picture. In 2008, slightly more employees had LinkedIn profiles than Facebook profiles (49% vs. 46%), but fewer used LinkedIn daily. In 2011, 82% reported using Facebook, which may be reaching a ceiling. Through 2010, the dominant mode of Facebook use was 'Occasional,' but in 2011, over half reported using it daily and 20% several times a day. LinkedIn use rose slowly until 2011, when more employees reported joining LinkedIn than Facebook in the previous year. Although the survey was completed before LinkedIn garnered attention by going public, daily use of LinkedIn rose 250% and surpassed daily Twitter use, which may have plateaued in 2011. Figure 1 depicts the daily use of the three most active sites.

Employee Twitter profiles increased 8-fold over three years, but its ubiquity in the media led us to expect more than 11% of employees to report daily use. Moreover, Twitter is experiencing greater churn (bottom row of Table 1). 13% of Twitter profiles have been abandoned (46% of employees created a Twitter profile, 6% discontinued use). In contrast, Facebook lost 2% and LinkedIn 4%. MySpace use declined rapidly, with 62% of users abandoning it. Live Spaces, once promoted internally, lost 22% of its users after being rebranded and de-emphasized.

In 2008, 5% of employees claimed to know nothing about social networking sites. In 2011, only 1% did. In 2008, 61% reported that they had been using social networking sites for 0-2 years; by 2011 that had fallen to 26%. Those reporting more than 5 years' use rose from 9% to 32%.

Basic Attitudes Toward Social Networking Site Uses
Attitudes were assessed by asking about four uses of social networking: for fun, for personal socializing and networking, for networking with external professional contacts, and for internal networking within the company. Table 2 shows data from the five point scale, after merging strongly disagree and disagree, strongly agree and agree.
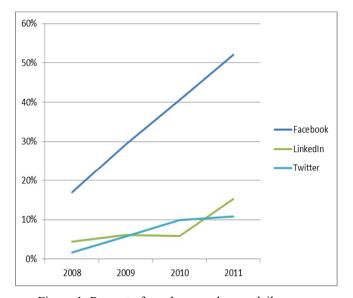

Figure 1: Percent of employees who are daily users.

More people now see benefits in all categories. Most saw personal benefits early; 80-90% agreement may be a ceiling. Utility for external professional networking rose, with only a quarter of the employees still unconvinced. But for internal networking, about 20% of employees remain convinced it is not useful. 30% are neutral, and half see it as beneficial—relatively weak support. Of course, contrasted with email, which took decades to attain broad acceptance, a 13% rise to majority support in three years is significant.

Interviews revealed sources of skepticism about internal use. One executive we interviewed considered social networking to be a diversion, a "productivity killer!" An individual contributor who worked within yards of his teammates saw no use for it. Some employees distant from headquarters were concerned that upper management might disapprove of its use. We interviewed young overseas employees, active users of social networking outside work, who seemed surprised by even the *idea* of using it at work.

A common source of uneasiness about internal use was that people's social networks transcend company boundaries, limiting what can be said on work topics [16]. Nevertheless, only one in five remained negative. The 28% who reported being neutral in 2011 could be persuaded by the positive majority of their colleagues, some of whom in interviews described building and strengthening weak ties with colleagues and getting quick answers to questions, benefits also reported in the literature.

In early 2010, a microblogging tool accessible within the Microsoft corporate firewall was released. By May, 2011, 21% of the employees reported having a profile. This launch may have opened minds to internal possibilities. It could help explain the jump in sentiment favoring internal networking [Table 2].

Access Control and Concerns about Use
Figures 2 and 3 show a steady increase in the use of access control settings and a modest rise in concerns about social networking sites. Some privacy concerns arose in interviews and in responses to open-ended survey questions. Social networking sites had few access control features in 2008. Facebook added them slowly, given its underlying conviction that sharing is good. The account of our first survey [16] goes into considerable detail about employees struggling with the diversity of their friends. Some mused about creating multiple aliases, but no one we interviewed had done so. People are not keen to expend energy on managing access control, but do report more use of available tools. In response to queries about concerns with social networking, most report them to be minor.

A Gender Difference
Women only comprise a quarter of the workforce, but men and women occupy the same roles. Contrary to some stereotypes, there are only 20% more male developers, testers and program managers. Executives are disproportionately male, but women are otherwise roughly equally represented in management and supervisory positions. 10% more women are in the 36-45 age range, with 5% more men in each of the 25-35 and 46-55 spans.

In 2011, women surveyed were proportionally more likely to report being daily Facebook users, 56% vs. 51% of men.
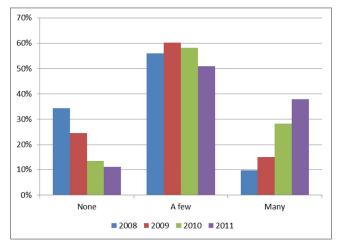

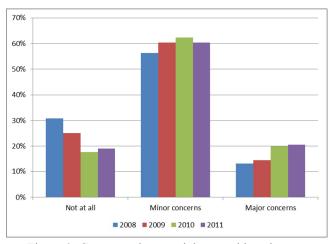Figure 2. Changes to access control settings.

Figure 3. Concerns about social networking site use.

A higher proportion of women than men (5% to 11%) agreed that sites were useful for each category in Table 2.

Use of access controls and concern about networking sites show an inverse gender pattern. The genders are equal in that about 10% ignore access control settings altogether and 20% express no concerns. However, 46% of women report setting many access controls versus 35% of men, yet only 13% of women have major concerns about the sites, versus 23% of men. Men do less to control how they appear and worry more about the consequences.

Percent of employees	Disagree					Neutral					Agree			
	2008	2009	2010	2011		2008	2009	2010	2011		2008	2009	2010	2011
Fun?	7%	5%	4%	5%		22%	18%	13%	12%		72%	77%	83%	83%
Personal socializing?	5%	4%	2%	3%		12%	8%	7%	7%		83%	88%	91%	90%
External professional?	14%	11%	8%	9%		25%	22%	20%	19%		61%	66%	72%	72%
Internal networking?	24%	23%	21%	21%		38%	32%	33%	28%		38%	46%	46%	51%

Table 2. Social networking sites are good for…

Age

In 2008, Facebook and LinkedIn use varied with age, but not the same way. Facebook use was inversely correlated with age, as you would expect. In contrast, LinkedIn was not aimed at students and did not appeal to young employees. Use showed an inverted-U pattern, rising with age until the 36 to 45 age range, then dropping.

In [16], we described LinkedIn's appeal to professionals in the 25 to 40 age range. It is a self-updating address book they will own if they change jobs. It enables them to track college classmates who have dispersed and friends from high school who are no longer seen in the summer and holidays. It is a free, professional website for marketing yourself without drawing your employer's attention to a future job search. Its greatest appeal for some was as a way to connect with people met at an event, much more effective than business cards that sit untouched in a drawer. An invitation to connect is minimally intrusive or presumptuous; it can be ignored or accepted, but if accepted does create a link that can be used.

As seen in Table 3, the LinkedIn pattern is much less pronounced in 2011. Daily LinkedIn use is flat, rising among older employees. There could be several factors: roles differ with age, senior employees may make more use of LinkedIn groups, or older employees may search for people with a long employment history, which is more likely to be found on LinkedIn than Facebook.

The Facebook use pattern also evolved. In every age category, 84-87% of employees have profiles. Now, frequent use falls off with age. Note that 41% of the 25-and-under employees report using Facebook several times a day. Will this also spread to older age categories? Email use once exhibited a similar pattern, heavy use by young employees and occasional use or none at all by their elders.

Individual contributors and managers

The attitudes of managers towards social networking were a surprise. In 2008, proportionally fewer rated social networking sites useful for internal networking (32% vs. 40% of individual contributors) but more saw value for external professional networking (71% vs. 59%). Both groups became more favorable, but by 2011 managers were

		< 26	26-35	36-45	46-55
Facebook	Created Profile	85%	87%	84%	84%
Facebook	Uses Daily	70%	59%	47%	42%
Facebook	Several Times / Day	41%	22%	17%	16%
LinkedIn	Created Profile	74%	78%	83%	81%
LinkedIn	Uses Daily	15%	14%	14%	23%

Table 3. Employee Facebook and LinkedIn use by age in 2011.

proportionally *more* positive about internal networking potential: 58% vs. 50% of individual contributors. We interviewed executives, some positive and some negative toward social networking, but the survey sample was too small to analyze.

Correlated with this, by 2011 more of the younger age groups saw utility for fun and personal life, but the oldest group saw the greatest potential for the work-related uses.

Range of Uses of Social Networking Sites

For 20 different activities, we asked people whether or not they engaged in them on social networking sites and if so, how often. Every activity saw increased use, most dramatically between 2008 and 2010. For example, in 2008, 19% of employees reported using sites to keep in touch with external friends on a weekly basis and 25% never had. Two years later, 56% reported keeping in touch with external friends at least weekly on these sites, and only 14% reported never doing so. In a company of 90,000 employees, about 10,000 had done this for the first time. Between 2008 and 2010, each of the 20 activities was used *for the first time* by 5,000 to 20,000 employees.

In 2011, the overall growth in activity continued, but some activities plateaued or declined in frequency. For example, 'connect with new family members online' gained in frequency from 2008 to 2010, but declined in 2011, perhaps because people had run out of family members who had not yet connected but were willing to do so.

DISCUSSION

Social networking sites will be used

Some organizations, like some countries, try to block access to Facebook, Twitter, and other social networking sites. On a recent visit, an IT architect at a tech company that blocks access observed that employees there used smart phones to circumvent the ban. With a laugh, he mused about whether the company might arrange with local telecoms to black out the area.

We also met with representatives of a major manufacturing company that blocked Facebook and Twitter but years ago had approved LinkedIn, which it saw as a repository of web pages. LinkedIn has added interactive features, supporting activities that led to the others being banned. However, employees now rely on LinkedIn, so banning it was not being considered. "The camel's nose is in the tent."

In the past, some countries and organizations that blocked Internet access found that it put them at a competitive disadvantage. This may be repeated with social networking tools, as organizational use of the sites matures.

We did not find universal consensus regarding the value of social networking to enterprises. The skeptical 20% have not wavered appreciably, and it is easier to show a potential for distraction [7] than to prove a productivity benefit from a communication channel that may be only used for minutes a day to strengthen ties and get quick answers.

Given the intense pressure to produce productivity impacts, studies will be produced, but they are unlikely to be definitive. It was impossible to prove that previous communication technologies increased productivity. In the 1990s, organizational theorists still argued that email reduced productivity. In the 2000s, leading analysts recommended that organizations block IM [4]. Yet these tools were eventually deemed mission-critical in most organizations, despite the absence of conclusive studies.

The rapid rise of managerial belief in workplace benefits suggests that acceptance could come quickly this time. The well-publicized frustration of the Obama team over the inability to use such tools when they arrived in the White House in 2009 revealed that an effective team was really *using* the tools, not posturing to attract the youth vote. One spokesperson described the transition as "like moving from an Xbox to an Atari." This news led our customers to inquire about social networking software. Widespread reports that social media have driven events in the Middle East, some of which appear credible, contribute to a sense that social media can aid serious undertakings.

Even when the tools are used for non-work purposes, employees develop skills and insights into what the tools can do. For example, when a question posted on a social network draws a quick answer, the effectiveness of the medium for Q&A is demonstrated, whether or not the question is work-related. Morris et al. [13] brought in experienced users with real problems that required search. They were asked to simultaneously post a query to their social networks and look for the answer with their search engine. More often than not, the answer came back more quickly from the social network. There is a collective cost to their network in fielding queries, but this illustrates a possible benefit beyond strengthening ties.

Many employees we interviewed felt strongly that social networking helps them work more efficiently. "I can't recall how I did this job without LinkedIn," said a recruiter. One external informant works for a company that blocks social networking sites and issues employees a phone that also blocks them. So he carries two phones and engages in communication over which the company has little control.

External sites vs. internal tools

A great tension over using public sites at work is that they span the firewall [16]. Many people we interviewed first networked with family or friends (including colleagues from previous jobs), then added current work colleagues. As a result, accessing the site inevitably introduces non-work distractions, and posting to such sites constrains or puts at risk work-related discussions.

Possible solutions, each with challenges:
(i) Find an external tool that supports subgroups.
(ii) Acquire an internal tool that only connects employees.
(iii) Acquire a tool that aggregates different sites, one of which is restricted to employees.

Internal tools are exemplified by the IBM Beehive and BlueTwit prototypes. Yammer is a commercial offering that restricts communication to people inside a corporate firewall, although it is externally hosted. Internal tools face challenges in achieving critical mass of use and coexisting with popular external tools. The IBM studies described use by under 2% of employees for the microblogging tools and about 10%, after years of promotion, for Beehive. Prototype development ceased; more limited networking features were added to existing products.

How many employees who actively use Facebook or Twitter will adopt another tool with similar functionality? Few with a public site that includes work colleagues may be willing to set up and manage another. But if they do, their experience will facilitate using it effectively.

People we interviewed raised these issues. They would like to be able to direct some posts to work colleagues—this emerged repeatedly—but they have limited bandwidth for creating and managing multiple groups. The access control features Facebook has slowly added remain limited and may never be simple enough to use effectively. And the question of data security would remain.

There may be opportunities for internal tools that aggregate feeds from public tools. For example, Deloitte's D Street, an internal Facebook-like site built on SharePoint, is reportedly used actively by 75% of the large, distributed company. Integrated with other internal tools, it was introduced with a support team that will custom design features for workgroups, and with a tolerance for including discussion of non-work activities (such as hobbies) within the firewall. It includes an aggregator that accesses external social networking sites [15].

The conflict between proprietary and mass-market solutions is a recurrent thread in the history of communication tools. Consider instant messaging. A closed system could insure security but require that IM-savvy users learn a new interface. Prying employees away from familiar clients is difficult. The U.S. military developed a highly secure communication system, used in war games, but in Desert Storm, young soldiers under pressure opted to use the unsecure commercial IM they used every day. This led the military to inquire into having security features added to commercial clients (personal communication).

Several people we interviewed mused that it would be nice to have distinct Facebook or Twitter profiles for work and for social purposes. Only one was taking steps to try it. Facebook was initially developed for students with few demands for online social compartmentalization. It has added grouping features, but creating and maintaining multiple groups requires time and effort, and must then be remembered. A work colleague who is also a friend—which group is she in, or is she in both? Can I easily post to everyone I want to? In addition, employers must overlook the risk of hacker attacks through these sites and grow comfortable with external hosting of business information.

Major platform developers can provide IT departments with the tools to build D-Street-like integrated solutions. For social network sites to do the same would require a major investment in integrating with other enterprise systems.

What does the success of LinkedIn tell us?
Survey data informed by some interviews directed attention to the related and possibly countervailing issue of information overload on one channel. As the size and diversity of my network grows, as my audience becomes more diverse, posting items of interest to a small subset is less appealing. Any given communication may seem odd to a subset of my network. Use of a site for strengthening ties diminishes when it becomes a public broadcast channel.

This creates an opportunity for specialized, differentiated tools. Almost all of the 77% of Microsoft employees with LinkedIn profiles also have Facebook profiles. LinkedIn serves a different function for them. The spike in daily use in 2011 could be a harbinger. Should Facebook allow alternative views, one of them professional? Would that be confusing? Do people prefer to conduct different activities in different places? More niches may develop that carve off social networking activity. An enterprise client that provides access to an internal social networking site and to LinkedIn, Facebook, Twitter, and others could succeed.

Twitter and microblogging
The lack of a significant rise in Twitter adoption in 2011 was unexpected. In each of the two previous years use had doubled. In this section we provide some background and explore possible contributing factors.

Sites such as Friendster, Orkut, Bebo, and Plaxo helped prepare people for the public release of Facebook in 2006. Twitter, also released in 2006, had fewer widely-used antecedents. It did not support photos, games and other popular features. Its open platform allowed applications to be built on it, but each had to attract a user base. Twitter's broadcast nature was critical to its success. It appealed to people in media and public relations. Adoption by celebrities provided sensational visibility by 2009.

In 2011, Twitter profiles increased from 36% to 40% and daily use from 10% to 11% of Microsoft employees. At that pace, it will take a long time to reach existing LinkedIn and Facebook levels, and the latters' use is still rising.

What might explain Twitter's slow growth despite its high visibility? Its limited functionality? Twitter is less well-defined: Some consider it to be a broadcast medium, others use it to interact with friends. Facebook (and to some extent LinkedIn) have been redesigned to promote real-time or several-times-per-day communication, invading Twitter's niche. The internally-developed Microsoft microblogging tool could be a factor: Only 2% of employees report using it daily and another 8% occasionally, which might draw enough work-related Q&A and status messaging to lower the incentive to use Twitter.

A 2009 Nielsen Online report put Facebook's retention rate at 70% and Twitter's closer to 40%, but the analysis relied on web access and ignored the growing use of phones and aggregators [12]. We found minimal abandonment of Facebook and LinkedIn. Twitter's 13% abandonment would be inconsequential if adoption was still doubling, but it is significant when adoption rises 10% in a year. Interviews discussed below revealed some resistance to microblogging, but the nature of the objections suggested that there is potential for growth if microblogging potential is realized and a critical mass of use is attained.

A decade ago, some weblogs were for friends and families, such as LiveJournal blogs, while others focused on journalism, public education, and self-promotion. Some 'A-list bloggers' in the second camp argued that the former were not "real blogs." Microbloggers show the identical pattern. Some tweet to close friends and family, others seek a large audience.

Our interviews indicated that social network sites undermine both forms of blogging. Many LiveJournal blogs were relatively heavy-duty ways to share ephemeral news. LiveJournal use has declined. We interviewed 'serious' bloggers who also reported a decline in blog posting, not always by plan, as their tweets and status updates increased.

Which use is appropriate at work? A few people we interviewed couldn't see why a serious person would be attracted to Twitter, which they saw as just a way to post casual notes to fill idle moments. One young program manager used Twitter enthusiastically to follow trends outside work, but saw no place for it at work: "For broad messages, the broader they are at work, the more careful you have to be about what you say… precise, specific. I don't really see Twitter being built for that… Email is bad enough… if they had Twitter that would just be insane."

Others reported benefits from sharing information, getting quick answers to questions, and strengthening ties. One recruiter used the full range of social networking tools and was enthusiastic about their value for engagement and sharing information, but her "worry-wart side" felt that "we as professionals have learned some lessons about email… things you don't say… I don't know that everyone has made that leap of understanding about microblogging yet."

Yammer users studied by Zhang et al. [20] mostly followed colleagues. Microblogging has a lower barrier to entry than blogging; celebrities and politicians who could not credibly blog can microblog. The publicity given to the tweeting of Oprah, Shaq, and Sarah Palin did not enhance the perception that it is a serious medium. Public relations, marketers, and journalists saw the potential of microblogs as they had for blogs [4], notably for live coverage of events. But this is of professional interest to a narrow band of employees in most organizations.

The opportunity for microblogging lies in the fact that many employees were unaware of useful features, such as

the use of hashtags to signal topic and enable searching, or the capability of directing tweets at an individual in a publicly visible and searchable stream using the @mention convention. The potential for these features was expounded on by a heavy user of Twitter in 2009 for whom search had been transformed:

"Searchability is really the biggest power of it. It gives you the pulse of *now*, what's being talked about *now*, what's trending right now, information about the information, and if you're able to act on that and do something, it's really powerful." He extended it to the organization, "tapping into knowledge management, the hot topic in the organization."

For him, search had shifted from seeking static web information to cutting a path through a dynamic, constantly-flowing tweet-stream. He set up feeds on topics of interest, some short-term, such as discussion of cultural activity in a city he planned to visit.

Recall the study in which social networks bested search engines [13]. The drawback, that querying friends interrupts them, does not apply to searching. Subsequent to this 2009 interview, search engines began including coverage of social networking feeds. Twitter's search was itself described as the world's fastest-growing search engine [2].

Employees described the use of social networking sites for marketing. Some Twitter searches today yield a string of commercial ads; others yield people tweeting conversationally about a topic. This evolution could affect perceptions and uses of the medium.

To summarize, a key finding is that non-tweeters were unaware of potential uses of the medium. As this changes, microblogging use could increase. We recorded slowing growth, but use could reach a critical point after which adoption would increase more rapidly.

Burnout? The limits of social networking

Mass media oscillate between hype and disparagement. Some argue that Facebook is anti-social: "I used to respond immediately to friend requests. But in the past six months I'm tired. I'm just tired." [11]. What do the data tell us?

Our quantitative data provide no evidence of significant burnout. MySpace was abandoned, but overall use of social networking continues to expand, with very little abandonment of today's leading sites. However, some active users we spoke with are reassessing, claiming to have discovered limitations of social networking tools.

"No one plans anymore. It feeds into some bad personality traits… People tend to lose the sense of commitment being important because there might be something better that hasn't been posted yet. So people are much more cagey about things."

"Twitter gives you a fake sense of connection with somebody that isn't real… If you don't talk with someone for three months and then you pick up the phone and call

them, that's how you fill the gap in, you don't know what they've done at all, you have to do all the hard work yourself. Where if you've been on Twitter you might not see them for a year, when you do see them again, it's not like you haven't seen them for a year 'cause hey, you know what they did yesterday, you know what they did two weeks ago, you know what vacation they went on six months ago, so you *think* you know what they've been up to, and you *think* you know what they're feeling, but you don't actually. You just know the little message that they send and it's completely out of context."

The insight may not seem startling, but it can strike a person as a revelation: Social networking sites can create ties and strengthen weak ties, but only to a certain degree. In the end, one is interacting with crafted online personae of other people. There is a point after which use does not further strengthen a bond, and over-reliance on social networking for communication could weaken a strong tie without those involved realizing it.

Understanding this could drive some people away from social networking sites. It might enable others to engage appropriately, by setting accurate expectations about what can and cannot be achieved through interacting online.

CONCLUSION AND DIRECTIONS

In 2008 we set out to examine public social networking sites as perceived and used by 90,000 Microsoft employees. Historically, new communication technologies encountered resistance that slowly dissipated. Social networking sites typically span company firewalls; despite their speed of adoption around the world, many organizations block their use. We set out to see how they are used in an organization that permits use, and how that shifted over three years.

Microsoft is not a typical organization, despite its diverse and aging workforce. It has a high proportion of early-adopting technology users. Its publicized relationship with Facebook may affect attitudes and behaviors. Our findings are an existence proof of some behaviors and an indication of developments to look for in other organizations.

Use of social networking sites by professionals in our organization expanded dramatically. Much of it is personal, but employees have come to see its value for work. Facebook and LinkedIn have near-universal adoption. Co-existence with them seems a requirement for internal tools. Tight integration could allow employees one-stop shopping. Search engines within such tools could compete with standard search engines that increasingly mine social network sites. An ongoing challenge, as work-life boundaries erode, is to gracefully span the firewall.

Frequency of Facebook use by the youngest cohort continues to grow. What are the implications for the future of social networking in the enterprise? An unexpectedly high use of LinkedIn continues to be centered on 25-45 year olds, although age differences have declined. We saw Twitter expansion slow in 2011 after two years of strong

growth. But microblogging could reach a critical mass and resume rapid growth or it could be integrated into established platforms and applications.

We recorded a modest increase in the use of access controls and in concern about sites. Women were somewhat more likely to be heavy users, more likely to use access controls, and less likely to express major concerns.

Generational differences and accommodation were evident. We spoke to one veteran recruiter who has a conservative side; she remarked that she didn't want to see pictures of her pastor drinking on Facebook sites. She uses social networking sites heavily when recruiting students. How did she feel about Facebook pictures of job applicants drinking?

"It's that's degree of judgment. Unless you're talking about 'you just got released from jail' I'm probably OK with most of it. Would I walk away from a student with a beer bong in his mouth? No. You know, I mean, whatever, that's what college is about, right?"

Interviewer: What if it's a marijuana bong?

"Yeah, that one, it's like, maybe it's a poor judgment, you don't post that on your Facebook page… But I hired creatives for years, that's what makes people creative."

Attitudes change. It is a unique period of transformation.

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