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Using Communication Norms for Coordination: Evidence from a Distributed Team

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USING COMMUNICATION NORMS FOR COORDINATION: EVIDENCE FROM A DISTRIBUTED TEAM

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Abstract

In our empirical study of a small, geographically dispersed software development team, we examine the role and importance of communication norms in facilitating effective distributed coordination. Our longitudinal investigation of the ongoing communication engaged in by team members within multiple media highlights the creation and emergence of a number of key coordination norms that were critical to helping the team get its distributed work done.

Keywords: Coordination, distributed teams, multiple media, norms, temporal patterns, virtual work

Introduction

Geographically distributed teams have been receiving a lot of coverage lately in both the practitioner and academic literatures. These literatures recognize that while dispersed teams can bring benefits such as increased flexibility they also represent challenges such as difficulties with coordination. There is also a view, particularly in the practitioner discourse, that dispersed teams need advanced technologies to accomplish their distributed communication and tasks. According to Dave Fowler, Vice President of Groove Networks,

> Many companies…get bitten by jumping into distributed projects too quickly, without equipping their employees and partners with the proper tools and training to work together virtually. (Groove Networks Press Release 2003)

While the use of powerful groupware products may enable better coordination, such tools may not be available in all organizations. Start-up organizations that are financially constrained typically do not invest in coordination technologies, and their members use media such as chat, telephone, and e-mail to conduct their distributed work. Yet at least some of these organizations manage to successfully span their boundaries and coordinate their tasks. An important question then emerges: How do these organizations manage to coordinate across geographic distance in the absence of powerful coordination technology?

We explore this question in the context of our research site—a small geographically dispersed software development start-up that completed a complex distributed project over a number of years. In particular, we examine the role and influence of shared norms in facilitating how the dispersed members coordinated their distributed work.

Theoretical Background

Distributed teams and virtual work have received a lot of attention in the academic literature in recent years (see Sessa et al. 1999). Much of this attention has focused on the challenges of virtual organizing imposed by temporal, geographical, and technical boundaries. Researchers have found, for example, that the use of electronic media across such boundaries presents or exacerbates

such difficulties as reduced speed of information exchange (Cramton 2001; Walther 1995), unevenly distributed information (Cramton 2001; Ocker et al. 2001), problems establishing trust (Jarvenpaa et al. 1998), and increased coordination requirements (Sproull and Kiesler 1991).

The question of coordination is a particularly critical challenge faced by distributed teams as they have to engage in boundary-spanning activities in addition to accomplishing their ongoing work on production tasks. Coordination has been defined as the set of tasks and processes by which groups of actors carrying out activities manage interdependencies, in order for them to perform effectively as a group (Malone and Crowston 1990). Some researchers have looked at the factors that may alleviate some of the coordination issues in a distributed team. For example, Mazvenski and Chudoba (2000) show how coordination meetings helped work teams generate longer-term stability, Kraut et al. (1999) indicate how personal relationships within electronic networks help coordination, and Sproull and Kiesler (1991) examine how using e-mail to schedule activities and increase awareness may help teams in their coordination efforts.

Norms may provide another way of supporting coordination in distributed teams. Norms are expected patterns of behavior that reflect ways of acting that have been accepted as legitimate by members of a group (Hare 1976). They have been seen as critical to the formation and coordination of collective action (Ullman-Margalit 1977). Norms allow actors to engage in socially coherent behavior, helping them to structure their activities in ways that are consistent with community expectations, and to avoid interpersonal problems or personal embarrassment (Feldman 1984). At the group level, there has been extensive research on the effects of norms on group decision making and conformity (Asch 1951). In the context of distributed work, some researchers have explored the role of norms in the choice of media (Dewhirst 1971) as well as the use of new electronic media (Levi 2001; Orlikowski and Yates 1994; Sproull and Kiesler 1991).

Coordination in distributed teams has much to do with the way norms for media usage are established and enacted. As DeSanctis and Monge (1999) emphasize, the redesign of work into distributed and technologically mediated activities will require focused attention on the nature and operation of norms. They note, "As business processes are redesigned, organizations will have to simultaneously find ways to preserve the beneficial norms that have been established while promoting newer ones that are more appropriate to the redesign" (p. 698).

Most of the above research discusses the role and importance of various norms in group processes. However, in addition to understanding *what* communication norms will facilitate coordination in distributed teams, we believe it is also important to understand *how* these norms get established, how they evolve, and how they are sustained over time. As Feldman (1984) suggests, there are two important questions concerning norms: why group norms are enforced and how they develop. In comparison with research on the types and functions of norms, research on the emergence and formation of group norms has been more limited.

Researchers on norm formation have suggested various reasons and ways by which norms may get formed. Friedkin (2001), for example, discusses the role of social influence in norm formation, while other researchers have highlighted the role of prior beliefs and history (Bettenhausen and Murnighan 1985; Druskat and Pescosolido 2002; Gersick and Hackman 1990; Opp 1982). Gersick and Hackman argue that when members "have common previous task experiences, or share a common set of subcultural norms," they "may simply proceed to do what everyone knows should be done, and a pattern of habitual behavior may be established without any explicit thought" (1990, pp. 75-76). When members do not share previous task experiences or background, it may take longer for shared conventions and norms to emerge as members may challenge these prior beliefs (Bettenhausen and Murnighan 1985). Feldman presents additional ways in which norms may form: norms could be created explicitly by others, norms could emerge through critical events in the group's history, or norms could develop through primacy (the first behavior pattern that emerges in a group sets group expectations). Most researchers have suggested that norm formation is an episodic process (for an exception see Opp 1982). For example, Bettenhausen and Murnighan (pp. 257-258) argue that the process of norm formation is "subtle but swift."

We argue, in contrast, that norm formation is sometimes a more emergent process. In the context of distributed teams especially, the issues of norm development are likely to be more dynamic and uncertain (DeSanctis and Monge 1999; Mazvenski and Chudoba 2000). In addition, the nature of media use within such distributed teams influences how and when norms may emerge (Orlikowski and Yates 1994). At the same time, media use itself is shaped by a variety of contextual conditions such as social influence, group characteristics, and nature of tasks (DeSanctis and Poole 1994; Finholt and Sproull 1990; Fulk et al. 1987; Markus 1994; Sproull and Kiesler 1991, Yates et al. 1999). Further studies have also shown that media use is not stable but changes over time through a variety of deliberate and emergent changes (e.g., Chidambaram 1996; Lea at al. 1999; Orlikowski and Yates 1994; Orlikowski et al. 1995; Walther 1995).

In this study, we examined the emergence and use of coordination norms in a geographically distributed team setting. We focused not just on norms for using a particular medium, but norms regarding the interdependent use of multiple media in the situated context of everyday work. In the following section, we discuss the research setting and method, and then proceed to a discussion of our findings.

Research Setting and Methods

Research Setting

The organization that we studied, Little Company (LC),[1] was a start-up established in 1996 to develop a complex systems software product. The company included the founder and primary financier, Keith, and four other members: Robert, Dan, Martin, and Fred. Three of the five members, Keith, Robert, and Dan, worked full-time in LC, while Martin and Fred worked part time on the LC project until 1999, after which they stopped playing an active role. The five members were geographically dispersed from the start. Keith and Dan were on the east coast but in different cities, Robert lived in the central United States, and Fred and Martin were in the same city on the west coast. These five members each had ties to one or more of the others prior to working together in the LC start-up company: Dan, Keith, and Fred had gone to college together; Dan and Keith were friends and had written papers together; Keith and Robert were friends and had worked together; and Fred and Martin had worked together many years ago and were friends who lived in the same city and met regularly.[2] Martin was only known to Fred, making him the least connected of the group. In fact, Robert and Dan never met Martin face-to-face throughout their tenure as a work-team.

LC was a typical self-funded, start-up company that operated under strict financial constraints. E-mail was the most economical medium and was thus used very frequently. The e-mails were normally sent to everyone on the team but every once in a while the members also exchanged dyadic e-mails. Telephone calls—including both weekly group phone meetings and dyadic phone calls—were also used frequently. Face-to-face communication, however, was very rare at LC, and it never included the entire team. The members did not use other media such as fax and Internet chat.

We chose to study LC because it provided an example of a work team that had successfully managed to facilitate effective coordination and camaraderie among its various members. Our interviews with various members indicate that almost all the LC members remain very good friends to this day, still talking regularly on the phone even though they parted ways in mid-2002. That LC was a well-coordinated team is obvious from its longevity, from its high process productivity,[3] the lack of significant flaming content, and, most notably, from the fact that the members successfully completed the development of a high-quality and complex systems software product. While the LC product has yet to become commercially viable (an effort that has been hampered by the recent and persistent downturn in the economy), it has proven to be technically superior on many metrics, including its significantly faster transaction turnaround time when benchmarked against a commercially successful competitor (more than five times the competitor's time), and its extensive compatibility with a range of software platforms.

Research Methods

Our analysis is based on data obtained from LC archives and interviews with various members. The archival data include the following:

- **E-mail messages**: We have almost all the e-mail messages exchanged among LC members over a 4-year period from December 1996 to December 2000.

[1]Names of the company, its products, and organizational members have been disguised for confidentiality purposes.

[2]These meetings were primarily as friends and sometimes involved discussions about the business aspect of LC's work but did not concern the core LC product.

[3]LC members wrote, on average, 100 to 150 lines of code per workday per person. This productivity rate is significantly higher than the industry average (Software Metrics 2002).

- **Phone records**: We also have the records of phone communication between various LC members from mid-1997 to December 1999. Unlike with the e-mail messages, we do not have access to the actual conversations exchanged among members via telephone. However, from the phone bills of LC members, we are able to establish who made a call, who received the call, the date and time when the phone call was made, and the length of the phone conversation.

- **CVS logs**: LC members relied on CVS (concurrent versioning system) to maintain their code. The CVS tool is a version management system, primarily used to share source code among multiple participants. The CVS system provides a central repository for the code, and individuals can check files out of this repository, make changes to them, and then check them back into the repository. We have access to the logs generated by the LC members, and these indicate when a file was uploaded (checked back into) the system, the file's name, its version number, lines of code changed, and other comments. For most of these logs, we can also identify which of the five members authored the changes to the file and thus generated the log entry.

In addition to this archival data, we have been able to interview four out of the five members to understand their activities, media use, communication patterns, and relationships. These interviews also helped us to trace the timeline of key milestones—both personal and professional—that influenced the lives of the LC members. In addition, we have had regular contact with one core LC member, who has served as a key informant in our research.

Since we are constrained by the availability of phone records from mid-1997 to end-1999, we are using that particular window as our period of analysis, even though we have e-mail and CVS data for a longer period. We have reviewed e-mails and code logs outside this analysis window and found the content very similar to that within it. We, therefore, believe that this period of two and a half years should be adequate for identifying how LC members used communication media to coordinate their distributed work and how coordination norms to facilitate this work were established and emerged over time.

Enacting Coordination Norms at LC

We found that LC members used various communication norms to enable their ongoing and distributed coordination. In particular, we found that these norms were enacted in three primary ways: norms that were established up front, norms that were created in response to a triggering event, and norms that emerged over time. In what follows, we discuss each of these and illustrate them through drawing on examples of specific norms that LC members used to coordinate as a team.

Norms That Were Established Up Front

LC members established only a few norms up front before starting to work together as a distributed team. Some of these norms were stated explicitly and were drawn from members' previous work lives. These were established to prevent problems that members anticipated might arise in the future. One such norm was to avoid confidential content in e-mail. Dan explained this in his interview:

> [It is] not like we were ever in a position to abuse our monopoly power, but if we were, we wouldn't have talked about it in e-mail that would have been something that could have been shown (or) put in your face in the court. So don't put anything in e-mail that you would ever be embarrassed to see waved around in public.

Dan explained that they established such a rule because they had witnessed embarrassing situations in their previous work lives. Other norms established up front were implicit, such as the clear effort to limit messages to a single subject. While only a few communication norms were established at LC's formation, we found that many other coordination norms were enacted over the course of the team's work.

Norms That Were Triggered by an Event or Problem

Many norms could not be preplanned since it was difficult to anticipate *a priori* all the contingencies that may arise for the team and its members. In particular, unexpected events or unanticipated problems encountered over the course of working together created occasions for LC members to create certain norms. The trigger was usually an observable (and undesirable) event or problem, and LC members explicitly established norms to avoid recurrence of the event or problem. While the first category of

norms that we identified could be seen as preventive, the norms created in response to triggering events were more corrective in nature. Their purpose was to provide a solution to a problem that had generated the problem or undesirable event. Two such norms that we observed at LC were triggered by conflict and ambiguity.

LC members were surprisingly congenial in most of their dealings over the length of their four-year collaboration. However, during the first few months of their work together, a major conflict between Roger and Keith erupted, threatening Robert's involvement in the company. The conflict centered primarily around differences of opinion about how to develop a particular module in the LC software product. It also probably reflected the initial strains of distributed work as LC members learned how to collaborate across geographic and temporal distance. Over the course of discussions, they realized that there was a misalignment of goals, perhaps due to a lack of communication among the team members. Fred volunteered to mediate the deadlock between Robert and Keith. As a result, Robert sent out an e-mail saying,

> Fred and I would like to start having regular technical discussions. Fred proposed having the first one on Thursday morning. Please send me a list of times that fit your schedule and any items for the agenda.

Robert and Fred saw regular technical discussions as a way of increasing communication on work assignment, status, updates, etc., and thus avoiding potential misunderstandings. As a result of this conflict, the norm of having weekly technical (phone) meetings was established at LC.

Norms were also created over time to address ongoing problems. One recurrent problem was that of ambiguity. LC members responded to the ambiguities associated with the different types of communication they were sending by explicitly setting rules to standardize the form of certain e-mail messages. Such standardized communication types constitute genres that are habitually enacted by organizational members to realize particular social purposes in recurrent situations (Yates and Orlikowski 1992). In LC, the creation of genre norms helped to generate shared expectations about what was being communicated, to whom, and when. One such genre was the "update notification" genre. LC members sent e-mails to each another informing each other about recent updates to code that one of them had made. Initially, LC members used various forms of update e-mails with different kinds of subject lines. Over time, however, as the number of code commits increased, it became more important to keep track of them. So in February 1999, Robert sent out an e-mail to all LC members stating:

> In order to facilitate the automatic collection of features for each new release, please use the words "new" and "server" (in that order) in all messages announcing new features that you check in.

From that point on, e-mail messages indicating the submission of code updates included a subject line beginning with "New on server…"

The examples in these two sections highlight the creation of norms that were either established at the outset of LC's work (either explicitly stated or implicitly carried over from previous work experiences) or that were created explicitly in response to some event or problem that was triggered during the course of working together. Norms at LC also emerged gradually and more implicitly over time.

Norms That Emerged over Time

Some LC norms emerged through members' ongoing process of interacting over time, as they developed recurrent routines that enabled their coordination of tasks and alignment of temporal rhythms. Such norms emerged as slow adjustments and subtle adaptations to members' preferences, working styles, and task situations, and often did not involve any explicit discussion by the members. We describe three such emergent norms below.

Using frequent, short phone conversations: Telephone is often seen as more intrusive than other media such as e-mail and even group chat (e.g., see Handel and Herbsleb, 2002). Based on this perceived intrusiveness, we expected LC members to collect their thoughts and queries and make a small number of long phone calls rather than many short ones. To our surprise, we found that LC members had developed a different norm. In particular, a norm of many, short, and frequent phone calls for even the simplest of queries emerged over time. This is evident from the multiple short phone calls that are a daily routine in LC members' lives. An example of this is offered in Table 1, which details the communication exchanges engaged in by Dan during one day in 1999. As evident here, Dan had multiple short exchanges with Keith during his workday, interspersed with sending out a number of e-mails, and committing several pieces of code to the server.

Table 1. A Day in Dan's Life

Time Period	Action	To/From	Conversation Length (minutes)
10:18-10:23 AM	Phone	from Keith	5
10:33-10:45 AM	Phone	to Keith	12
11:17-11:20 AM	Phone	to Keith	3
11:47-11:53 AM	Phone	from Keith	6
12:08-12:12 PM	Phone	to Keith	4
12:35-12:38 PM	Phone	to Keith	3
12:42-12:44 PM	Phone	to Keith	2
1:06-1:09 PM	Phone	from Keith	3
1:17-1:20 PM	Phone	from Keith	3
2:05 PM	Code commit		
2:06 PM	E-mail		
2:37-3:32 PM	Phone meeting with all LC members		
3:34 –3:37 PM	Phone	from Keith	3
3:39 PM	Code commit		
3:40 PM	E-mail		
6:27-6:30 PM	Phone	from Keith	3
6:47-6:50 PM	Phone	from Keith	3
6:56 PM	Code commit		
6:59-7:00 PM	Phone	to Keith	1
07:00 PM	E-mail		
07:10-07:13 PM	Phone	to Robert	3
8:47-9:00 PM	Phone	from Keith	13
9:10 PM	Code commit		
09:11 PM	E-mail		
9:17 PM	Code commit		
09:19 PM	E-mail		
9:19-9:26 PM	Phone	from Keith	7
10:29-10:32 PM	Phone	to Keith	3
11:23-11:25 PM	Phone	from Keith	2
02:51 AM	E-mail		

The norm of short, frequent phone calls enabled LC members to coordinate more effectively, with their interactions almost simulating those of a colocated team. However, when we explored how this norm had been created, we realized that it evolved over a period of several months as the team members learned to adapt to the task and to each other's preferences. As we learned in our interviews, Robert and Keith differed widely in their preferences for phone conversations: Robert hated to use the phone, while Keith preferred it. Keith noted,

> There are extreme places over here where you have to use the telephone and there are extreme places over there where e-mail is clearly the right answer, and there's a big middle ground. And what I am essentially saying is that Robert is going to put it over on the e-mail side, is going to sit on the side of the e-mail thing, and I'm going to sit on the side of the telephone.

But over time, for the sake of coordination and in response to Keith—who was the founder and primary financer of the start-up—Robert and Dan adapted their phone call patterns. They learned to accept both making and receiving short and frequent phone calls.

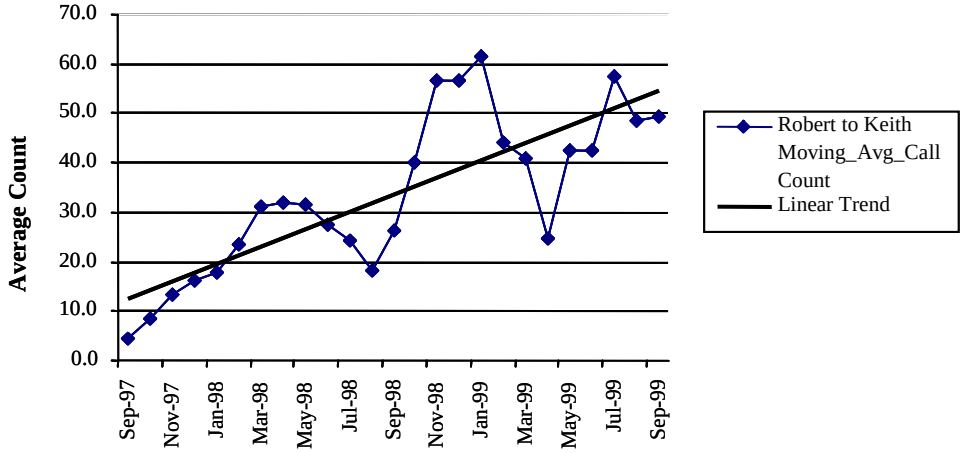

Figure 1. Count of Phone Calls from Robert to Keith

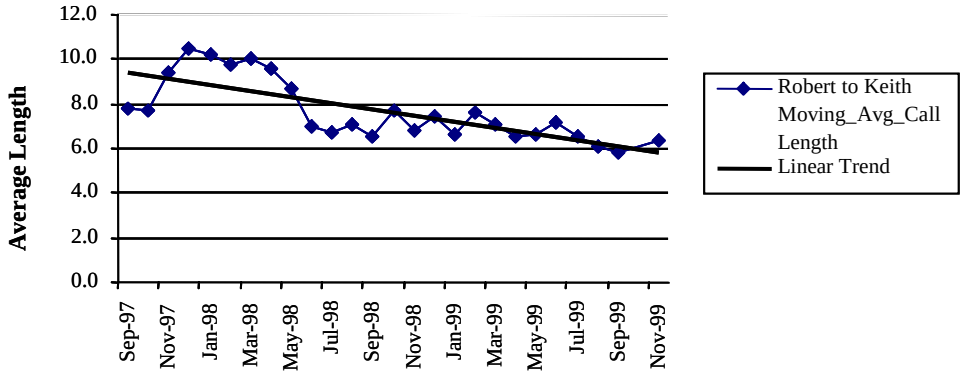

Figure 2. Length of Phone Calls from Robert to Keith

We analyzed the call pattern—call counts and length—for various dyads to see how these evolved over time. As shown in Figures 1 and 2, there was a clear trend in both the count of calls and the length of calls. Figure 1 shows that the average count of phone calls from Robert to Keith increased over time, while Figure 2 shows that the average length of Robert's phone calls to Keith declined over the years.[4] Both of these trends are statistically significant.

Table 2 provides the correlation coefficients for trends in phone call length and counts for the significant dyads. As seen in this table, there is a significant negative correlation between time and length of phone calls for all three dyads—that is, the length of phone calls in each dyad *decreased* over time. At the same time, the number of phone calls from Robert to Keith and to Dan increased significantly over time.

These correlations cannot be easily explained by such factors as technological improvements. During our interviews, we asked whether telephone costs had become cheaper over this period. According to Dan, phone calls had become somewhat cheaper, but because phone expenses were such a small proportion of LC's costs, they were never really a factor. Changes in technology, such as members adopting additional phone lines or high speed Internet connections that would free up the phone, also do not explain the observations, since the timing of these changes did not coincide with the evident trends.

[4]For both call count and call length, we take a moving average over a three-month period to smooth out noise and erratic fluctuations.

Table 2. Correlation Coefficients between Call Parameters and Time

	Call Length (Moving Average)	Call Count (Moving Average)
Robert to Dan	–0.69**	0.41*
Robert to Keith	–0.76**	0.73**
Dan to Keith	–0.53**	0.27
Keith to Robert	0.45*	0.43*

*p < .05
**p < .01

Two explanations that seem potentially relevant were adaptations over time and changes in task over time. As Dan explained, when asked about the trend in his interview,

> There were two things that I would think might cause it (the trend) to happen.…one is that we are getting better at our use of the phone and we are just wasting less time. Actually I think we are spending a decent chunk of every day on the phone. The other possibility is that in the beginning we were doing much more design work where we had to hash things out. In the later half, all the foundations were in place, all the architecture was figured out, and it was more a matter of, "Oops got a bug. Is this your bug?" Talk about the bug, and go fix it.

The second explanation that Dan provides demonstrates, for LC, what much of the media literature has already suggested (Kraut et al. 1998; Postmes et al. 2000): that media norms evolve in response to changing context and task.

Dan's first explanation—learning over time, whether about the task or how to use a medium such as the telephone to achieve better coordination—differed for different people on the LC team. Even though the task was changing in a similar fashion for everyone, Robert showed a much steeper shift in his communication with Keith (and larger correlation coefficients) than did Dan. It seems that Robert and Keith had to adjust and adapt much more to each other, probably owing to the large difference between Robert and Keith in their personal preferences for media use. Keith, in fact, explained this difference between Robert and himself in an interview:

> Roger comes from a tradition …[of] Pennsylvania Dutch, where they write a lot of letters to family members. And they didn't have the telephone. My family…Jewish people, you know, [had] multiple telephone lines … and, so, I think there is clearly that cultural bias.

Dan too hinted at this adaptation over time, by noting that "Robert got much better with the phone."

Although the call count was increasing and the conversation length was decreasing for all dyads, this trend reversed at the end of the period we studied, around September 1999. According to our interviews, this period represented a shift in LC's task from technical design and coding to business development. Since LC members, by their own admission, were not skilled in the business aspect of running an organization, they had a hard time working on their business plans. As a result, their calls got longer and fewer. In fact, if we remove the post-September 1999 period from our correlation analysis, we find that the coefficients increase considerably, and the count of phone calls from Dan to Keith over time becomes statistically significant. Also, without this period, call lengths from Keith to Robert show a statistically significant declining trend just like all the other dyads. This additional finding further supports the view that LC members adjusted their norms as their tasks and situations changed.

Adjustments to others' temporal rhythms: We have shown how different individuals learned to modify their frequency and length of phone calls in response to task and coordination requirements. But norms also developed in relation to *when* individuals could call each other. In a similar fashion, different individuals learned differentially about when to call others in the group. Figures 3 and 4, which superimpose data on call times from three years, show this difference. Time of a call is often a function of two things: caller's temporal preferences and receiver's temporal preferences.

Figure 3 depicts Dan's phone calls to Keith by hour of the day, and shows similar temporal patterns for all three years—1997, 1998, and 1999—suggesting that their preferences for call times remained the same over time.[5] However, the situation looks

[5]They may have established this pattern during their long friendship before the formation of LC.

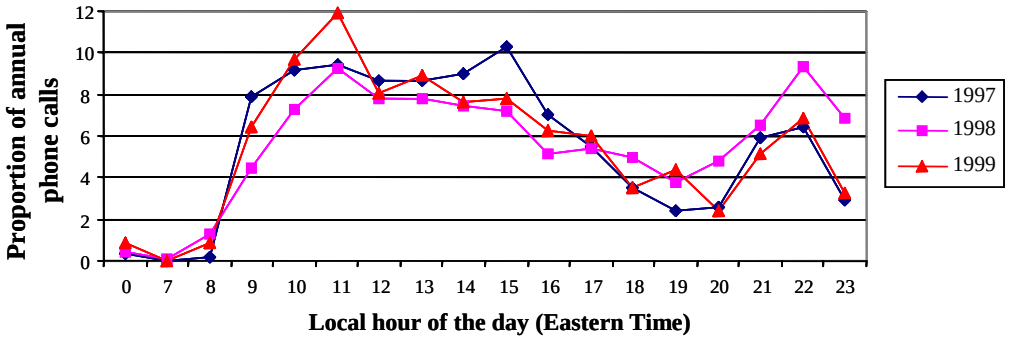

Figure 3. Dan's Phone Calls to Keith by Time of Day

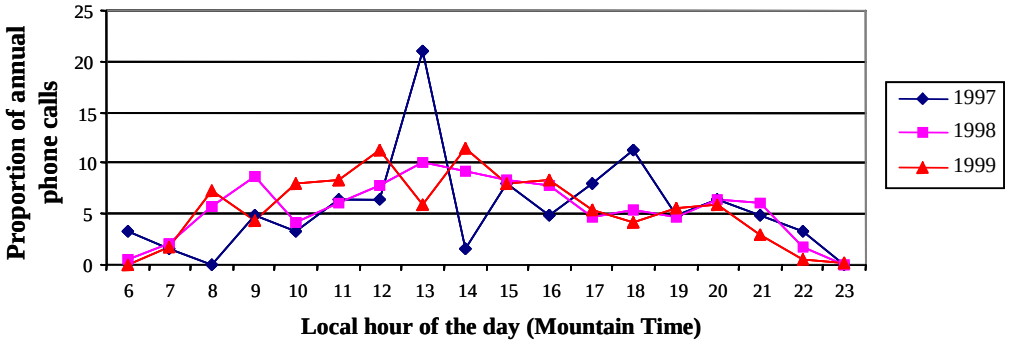

Figure 4. Robert's Phone Calls to Keith by Time of Day

slightly different in Figure 4 when we look at Robert's phone calls to Keith. While the temporal pattern for Robert's calls to Keith looks similar in 1998 and 1999, the pattern for 1997 looks quite different. As we could find no change in either Robert's or Keith's situations during this period, we might suggest that Robert learned over time when it was right to call Keith. For example, Robert seems to have learned to stagger his phone calls to Keith over the day rather than to have peaks and troughs.

Increasing communication in periods of high activity: We identified a third emergent norm that was associated with LC activity levels. Code commits, when members changed the working version of the system, were significant events in the work schedule. A change made to the code and committed to the central repository had implications for all members' work. Wrong code could cost everyone many hours of both wasted work and rework due to the many interdependencies between individual modules. Code commits had to be coordinated so that people did not interfere with each other's efforts. Referring to this in his interview, Dan commented, "If you committed something, you gotta tell them that you did it. And you gotta ask them if it is OK." Commits, therefore, seemed to demand a higher degree of communication for effective task coordination. The following two figures depict the relationship between the number of commits per day and (in Figure 5) the percentage of annual phone calls per day, as well as (in Figure 6) the percentage of annual e-mails per day.

As evident in these two figures, there is a shift over time. It appears that LC members developed an implicit pattern of increasing communication during the days when they had multiple commits. Figure 5 shows that in 1997, the percentage of phone calls made on a day with no commits is not too different from the percentage of phone calls made on a day with more than five commits. However, by 1998, LC members had learned that increased communication—both by e-mail and phone—was necessary to coordinate their activities during times when there were a high number of commits. And this learning appears to have stayed with the members throughout 1999. In addition to highlighting the emergence of useful norms over time, this finding suggests that even those norms that are central to the effective coordination of tasks may take some period of time to emerge and become customary.

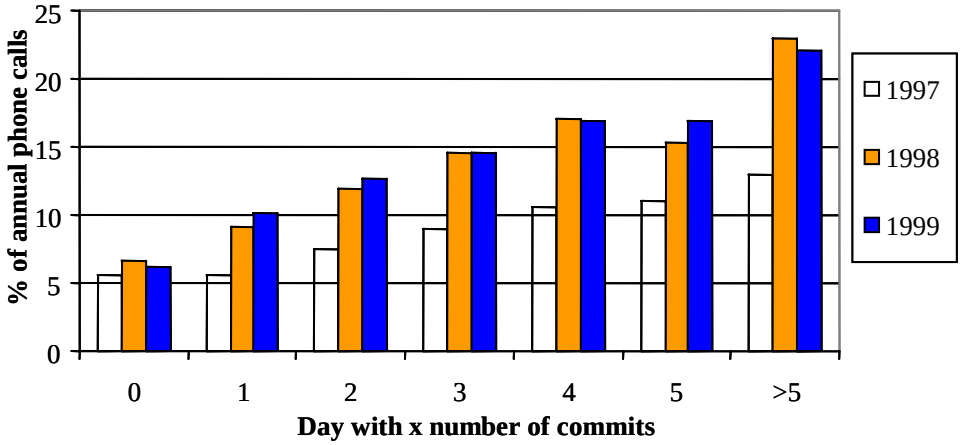

Figure 5. Phone as a Function of Code Activity

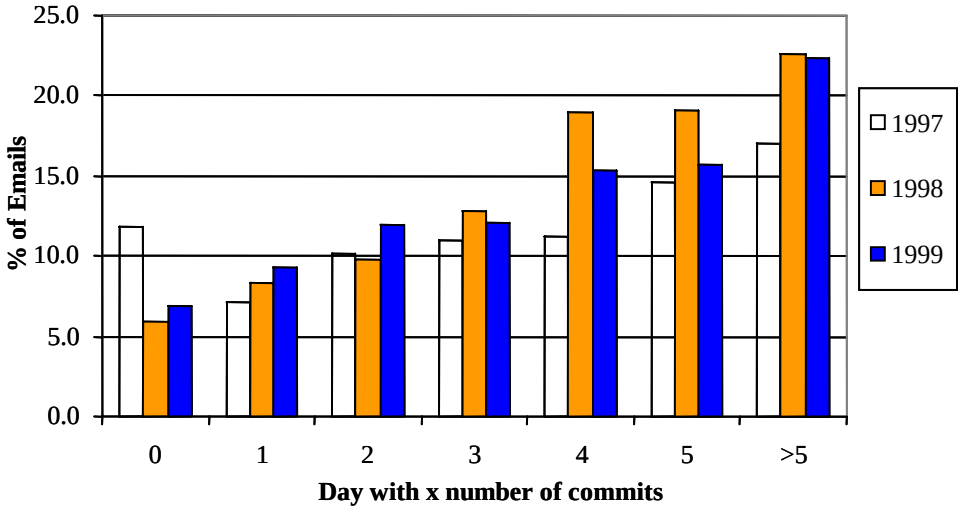

Figure 6. E-Mail as a Function of Code Activity

When queried about this pattern, Dan commented,

> We took too damn long to develop the protocol. We should've been doing it from the beginning. We finally did it for coordination. So we don't step on other people's toes.

As the total number of commits was relatively similar over the three years, changing task situations are unlikely to have influenced this pattern.

Conclusion and Implications

We found that multiple coordination norms were used at LC over time and that these norms were created and emerged in a variety of different ways. As discussed earlier, Feldman (1984) suggested that norms could be formed in four different ways: be explicitly mandated by a supervisor, emerge from critical events, develop through primacy, and be carry-overs from the past. The members at LC used some of these processes to create and develop their norms. That is, they established some norms up front as a result of their prior experiences, and they set some norms explicitly in response to difficulties they encountered over time. Feldman's

categories focus almost entirely on norms created as episodic events, however, and thus they do not account for norms that emerge from the everyday adjustments and adaptations that members engage in as part of their ongoing communication practices. We found this category of emergent norms to be particularly dominant at LC. These norms tended to emerge slowly over time as people subtly and often tacitly adjusted and adapted their individual practices, preferences, and expectations to be more aligned with those of other team members or the group as a whole. In this way, our findings resonated with those of Yates et al. (1999) around the establishment of genre norms in a community. They found that some genre norms were actively and deliberately shaped by community members while others gradually took shape through variations and migrations.

Our identification of different types of coordination norms created at different times and through different processes may also offer some interesting insights into how distributed or virtual teams can work effectively over time. That is, at the initial stages, team members may establish some *preventive norms* through deliberate discussion and reflection on prior work experiences and situations encountered. Then as work proceeds and the team members begin to interact and coordinate over time, they will encounter difficulties that will trigger some remedial action, in particular, the creation of *corrective norms* that attempt to respond to an unexpected event or undesirable problem. Finally, the ongoing interaction of team members will also generate, albeit more tacitly, a number of *adaptive norms* that reflect members' continuing learning about each other, their tasks, their use of media, and their team as a whole, and what is required to coordinate collectively and effectively over time.

Our study has highlighted how valuable it is to study the dynamic processes involved in ongoing distributed teams. Our access to communication practices over time afforded a rich and longitudinal window into the recurrent workings of this distributed team, and generated our insights into different types of coordination norms—preventive, corrective, and adaptive—and the multiple processes that constituted these over time. While LC is a particular setting, with specific interactions and conditions, we believe that the findings learned here offer interesting suggestions for further research in other empirical contexts.

Our LC team consisted of people who already knew each other before they came together as a team. Yet they took some time to develop their set of effective norms. Indeed, one of the reasons that the core LC members could do without face-to-face communication was that they had such similar prior backgrounds. This allowed them to establish the communication norms in electronic media usage much more easily. But this may not have held true for peripheral members such as Fred and Martin, who may have needed more time and greater face-to-face interaction with the rest of the team to integrate their own norms with those of the others. In a team consisting of members from diverse backgrounds, a more concerted effort may be needed to engage everyone. Further research is needed to examine how coordination norms might be created and evolve for teams of strangers, or teams without any prior experience of working in geographically distributed conditions. Also, LC members were engaged in developing software that was somewhat modular. It would be interesting to see if there are differences in norm development in teams engaged in other work, particularly where there are greater task interdependencies. Further investigation is also needed to understand the role and development of coordination norms in larger teams. It may be much more difficult to establish norms in teams that are larger in size.

In a larger team, it is likely that team members would be using multiple media. A limitation of our data is that we were only able to study coordination enacted through three media: telephone, e-mail, and server logs. However, the findings we have identified for coordination within these few media should still have implications for other teams using at least these media. Our study has also shown how relatively simple media such as telephone and e-mail may be used in such different and effective ways for the purpose of coordinating complex, distributed work. The use of more sophisticated new media may offer still more opportunities for team members to develop norms that facilitate their distributed coordination.

Our research showed the beneficial impact of using coordination norms within a distributed team. But as Gersick and Hackman (1990) suggest, routines and norms can also lead to dysfunctional outcomes such as the miscoding of situations, reduced innovation, and inertia to change. While we did not observe the development or use of these kinds of norms at LC, it would be useful to study how and why some norms might be associated with problematic outcomes in certain settings. In particular, the distributed context of geographically dispersed teams can often generate some ambiguity about expectations (Cramton 2001) and this could generate coordination norms whose use leads to unanticipated negative consequences.

Some researchers such as Spich and Keleman (1985) discuss how important it is to explicitly share norms in order to increase group effectiveness. At LC, individual members came from similar educational and work backgrounds and, therefore, even though their personal styles differed significantly in some cases, they still shared many experiences and conventions. In distributed teams that span multiple boundaries, it may be useful to make a conscious effort to identify prior and tacit individual expectations so as to more effectively reach a common ground through integrating these into explicitly specified and shared group norms. This may speed up the process of creating a more effective coordinated team. Our findings also resonate with those of Mazvesnki and

Chudoba (2000) in highlighting the value of having team members develop shared understandings of each other's preferences, rhythms, and work styles, having team members actively engaged in communication during times of difficulties, and ensuring that team members adapt their communications in response to changes in their context.

Our study has emphasized that effective coordination in distributed teams requires the development of shared expectations and alignment of temporal rhythms. This enables a common understanding among team members that can often prevent problematic surprises. Our findings highlight the value of communication norms across different media in creating this shared understanding. Moreover it shows that these norms are often created up front (in a preventive coordination move), but then that they will change and evolve over time in response to problems, events, and adjustments to task and preferences (representing corrective and adaptive coordination moves). While our illustrations of norms were specific to LC, we believe they offer interesting implications for coordination in distributed teams in general.

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