USING COMMUNICATION NORMS FOR COORDINATION: EVIDENCE FROM A DISTRIBUTED TEAM[1]

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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 norms that were critical to helping the team get its distributed work done.

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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 sophisticated 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 sophisticated groupware products may enable better coordination, they may not be available to 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 email to conduct their distributed work. An important question that emerges thus is how do these organizations manage to coordinate across geographic distance in the absence of explicit coordination technology?

We explore this question in the context of our research site—a small geographically-dispersed software development start-up. 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 (Walther 1995; Cramton 2001), unevenly distributed information (Cramton 2001; Ocker et al. 2001), issues of trust (Jarvenpaa et al. 1998), and increased coordination requirements (Sproull & Kiesler 1991).

The question of coordination is a particular 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 is 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 & Crowston 1990). Some researchers have looked at the factors that may alleviate some of the coordination issues in a distributed team. For example, Mazvenski & 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 & Kiesler (1991) examine how using email 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). Norms have been seen as critical to the formation and coordination of collective action (Ullman-Margalit 1977). In the context of distributed work, some researchers have explored the role of norms in the use of new media such as electronic mail (Sproull & Kiesler 1991; Orlikowski & Yates, 1994; Levi 2001). 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 inter-personal problems or personal embarrassment (Feldman 1984).

Coordination in distributed teams has much to do with the way norms for media usage are established and enacted. As DeSanctis & 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 (DeSanctis & Monge 1999, p.698).

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.

Feldman (1984) highlights four different ways in which norms may form in groups: norms may be created explicitly by others; norms may emerge through critical events in the group's history; norms may develop through primacy (the first behavior pattern that emerges in a group sets group expectations); or norms may be the result of carry-over behaviors from past

situations. Bettenhausen & Murnighan (1985) also discuss norm formation in groups, arguing that norms are formed due to existing similarities or dissimilarities between individuals' prior beliefs and the group's current beliefs. Individuals either conform to the group beliefs or challenge them based on the extent of dissimilarity. Gersick & Hackman (1990) observed that interaction norms are often set initially and implicitly through members' prior experiences. They 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" (pp. 75-76). When members do not share previous task experiences or background, it may take longer for shared conventions and norms to emerge (Bettenhausen & Murnighan, 1985).

In the context of distributed teams, the issues of norm development and usage are likely to be more dynamic and uncertain (DeSanctis & Monge 1999; Mazvenski & Chudoba 2000). In addition, the nature of media use within such distributed teams influences how and when norms may emerge (Orlikowski & 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 (Fulk et al. 1987; DeSanctis & Poole 1994; Markus 1994; Finholt & Sproull 1990; Sproull & Kiesler 1991). Further studies have also shown that media use is not stable but evolves over time through a variety of deliberate and emergent changes (e.g., Orlikowski & Yates 1994; Orlikowski et al. 1995; Walther 1995; Lee at al. 1999; Chidambaram 1996).

For the purpose of this study, we study the emergence and use of coordination norms in a geographically distributed team setting. We focus 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),[2] was a start-up established in 1996 to develop a complex systems software product. The company included the founder and

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

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 U.S., 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. 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. Email was the most economical medium and was thus used very frequently. The emails were normally sent to everyone on the team but every once in a while the members also exchanged dyadic emails. 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. That LC was a well coordinated team is obvious from its longevity, from the lack of significant flaming content, from our interviews with various members, and from the fact that almost all the LC members remain very good friends who still talk regularly on the phone today, even though they parted ways in mid-2002. Most notably, the members successful completed the development of a high-quality and complex systems software product.[3]

[3] Keith is actively trying to commercialize the LC product but this effort has been hampered by the recent and persistent downturn in the economy.

Research methods

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

- **Email messages:** We have almost all the email messages exchanged among LC members over a 4-year period from Dec 1996 to December 2000.
- **Phone records:** We also have the records of phone communication between various LC members between mid 1997 and December 1999. Unlike with the email 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/time when the phone call was made, and the length of the phone conversation.[4]
- **CVS logs:** LC members relied on CVS (Concurrent Versioning System) to maintain their code. The CVS management 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 of the full-time LC members, 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 email and CVS data for a longer period. We believe that this period of two and a half years should be adequate to 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.

[4] For this version of this paper, we draw primarily on Dan and Robert's phone records. We only recently received Keith's complete records and will conduct an updated analysis when the new data has been entered.

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 upfront, 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 established upfront

LC members established only a few norms upfront 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 email. 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 email that would have been something that could have been shown (or) put in your face in the court. So don't put anything in email 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 triggered by an event or problem

Many norms could not be pre-planned 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 that threatened 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 email 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 email messages. Such standardized communication types constitute genres that are habitually enacted by organizational members to realize particular social purposes in recurrent situations (Yates & 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 emails 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" emails 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 email 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, email 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 email and even group chat (e.g., see Handel & 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 that 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 emails, and committing several pieces of code to the server.

The norm of short, frequent phone calls enabled LC members to coordinate more effectively, with their interactions almost simulating those of a co-located 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 email 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 email side, is going to sit on the side of the email 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.

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	Email		
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	Email		
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	Email		
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	Email		
9:17 PM	Code commit		
09:19 PM	Email		
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	Email		

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 the average length of Robert's phone calls to Keith declined over the years.[5] Both of these trends are statistically significant.

Figure 1: Count of phone calls from Robert to Keith

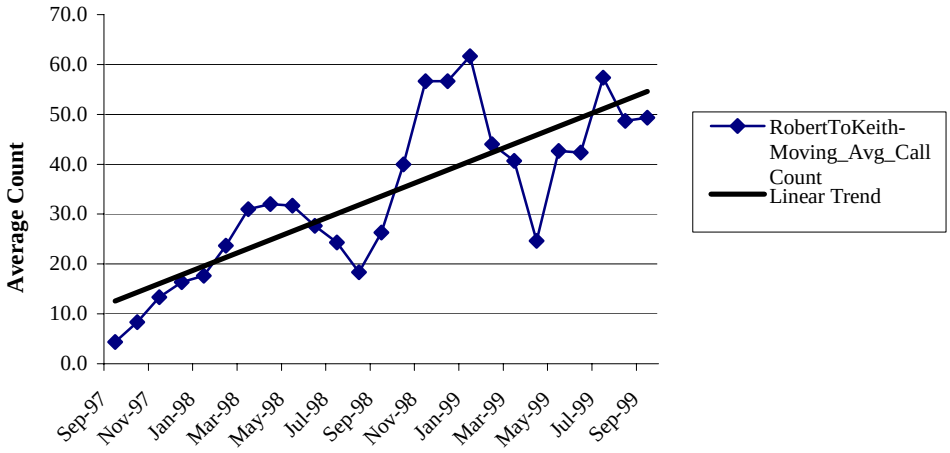


Figure 2: Length of phone calls from Robert to Keith

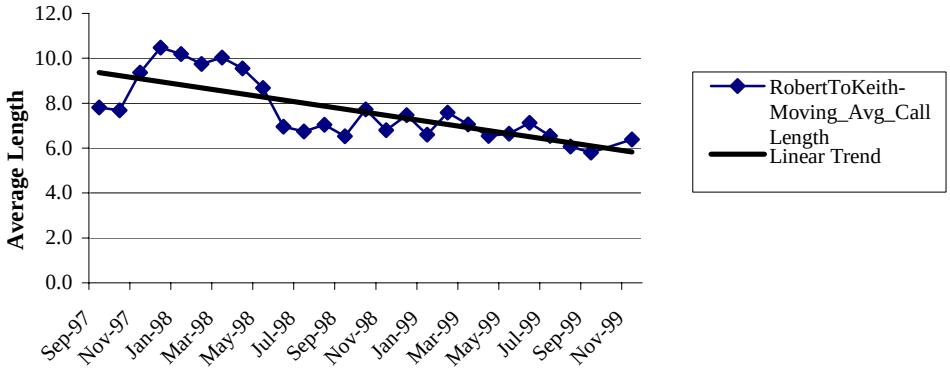


Table 2 provides the correlation coefficients for trends in phone call length and counts for some significant dyads. As seen in this table, there is a significant negative correlation between time and length of phone calls for all three dyads—that is, the length of phone calls in each dyad

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

decreased over time. At the same time, the number of phone calls from Robert to Keith and to Dan increased significantly over time.

Table 2: Correlation coefficients between call parameters and time

	Call Length (moving Average)	Call Count (moving average)
Robert To Dan	-0.6898** (0.0001)	0.4119* (0.0365)
Robert To Keith	-0.7571** (0.000)	0.7311** (0.000)
Dan to Keith	-0.5273** (0.0011)	0.2691 (0.1237)

*$p<.05$
** $p<.01$

These correlations cannot be easily explained by such factors as technological improvements. We asked during our interviews whether telephone costs had become cheaper in 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 never really considered them. 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 trends, since the timing of these changes did not coincide with these observations.

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. So 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 in LC's case what much media literature has already suggested (Kraut et al. 1998; Postmes et al. 2000)—that media norms evolve in response to changing context and task.

His 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 trend in his communication with Keith (and larger correlation coefficients) than Dan did. It seems that Robert had to adjust and adapt much more, probably owing to the large difference between Robert and Keith in their personal preferences for media use. In fact, Dan hinted at this adaptation over time, by noting that "Robert got much better with 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, during 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 were not strong on the business aspect of running an organization they had a hard time working on their business plans. As a result, the calls again 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 last cell in Table 2 (count of phone calls from Dan to Keith over time) becomes statistically significant. This additional finding further confirms the fact that LC members adjusted their norms as 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 needs. But norms also developed about *when* individuals could call each other. In this case, similarly to the previous one, different individuals learned differentially about when to call others in the group. Figures 3 and 4, which superimpose data on call times from the three different years, show this difference. Figure 3 depicts Dan's phone calls to Keith by hour of the day. Time of a call is often a function of two things: caller's temporal preferences and receiver's temporal preferences. Figure 3 shows in all three years—1997, 1998 and 1999—similar temporal patterns for phone calls from Dan to Keith, suggesting that their preferences for call time remained the same over time.[6] However, the situation looks slightly different when we look at Robert's phone calls to Keith in Figure 4. 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, we 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.

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

Figure 3: Dan's phone calls to Keith by Hour of the day

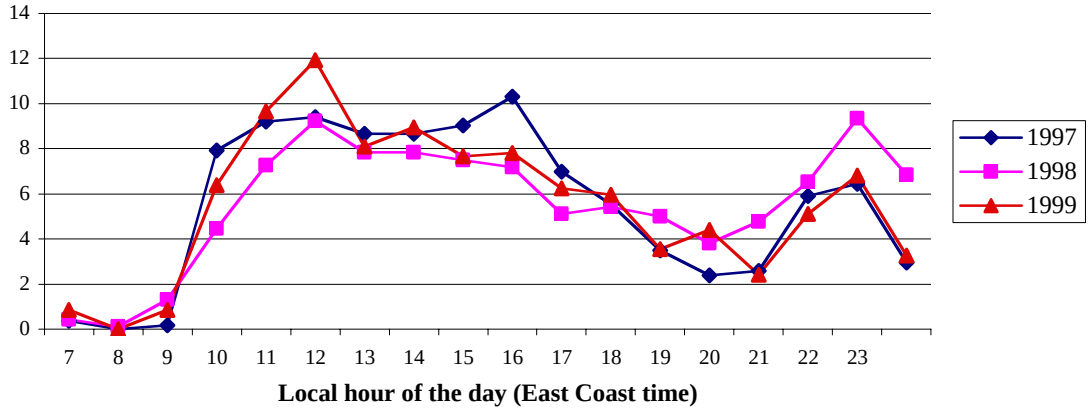
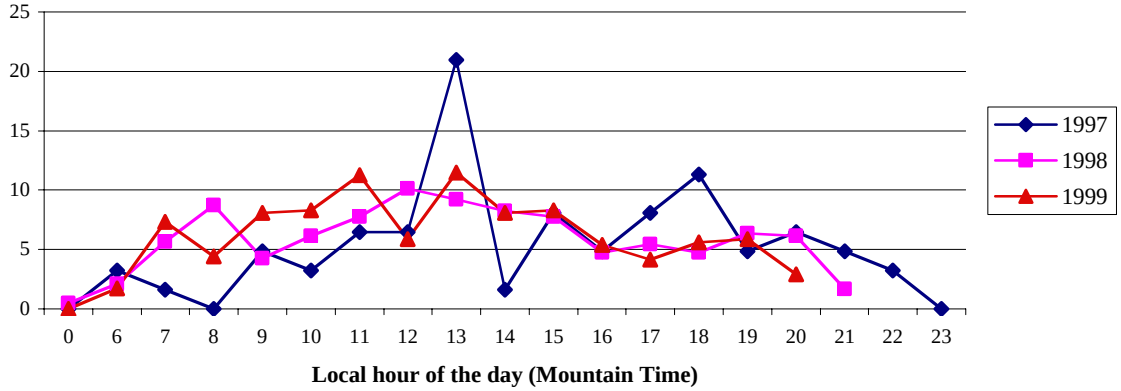


Figure 4: Robert's phone calls to Keith by Hour of the day



Increasing communication in periods of high activity: We identified a third emergent norm around 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 everyone else's work. Wrong code could cost everyone many hours of wasted work and re-work due to the many interdependencies between individual modules. Code commits had to be coordinated so that people did not interfere with each other's work. 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.

Yet, Figures 5 and 6 show a different story in 1997 than in the following two years. In Figure 5, we have shown number of commits per day on the x-axis and the percentage of annual phone calls per day on the y-axis. In Figure 6, we have shown number of commits per day on the x-axis and the percentage of annual emails per day on the y-axis.

Figure 5: Phone as a function of code activity

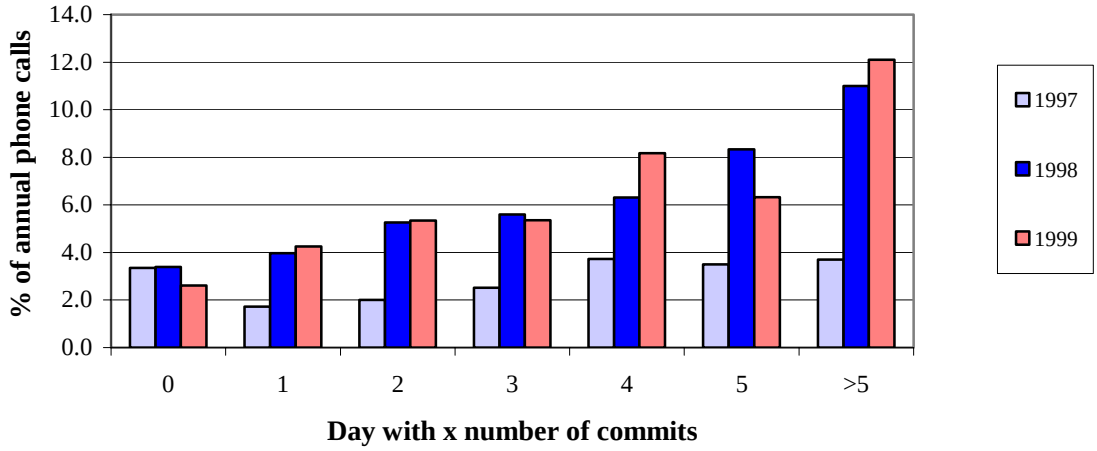
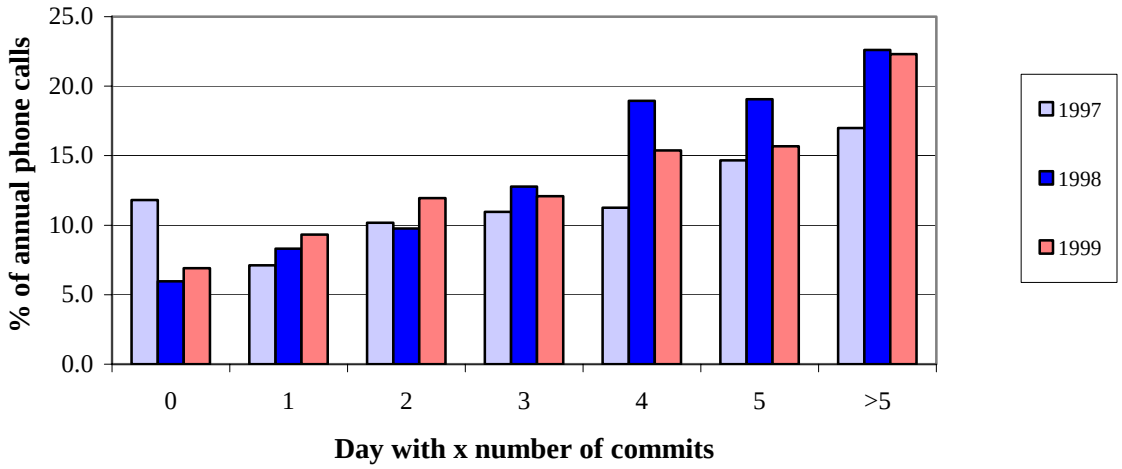


Figure 6: Email as a function of code activity



Over time, LC members developed the 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 similar to 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 email and phone—was necessary to coordinate during times when there were a high number of commits. And this learning stayed with the members through 1999. This finding implies that even communication norms that are central to the effective coordination of task may take some time to emerge. 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.

Because the total number of commits looked very similar over the three years, we can rule out competing explanations such as changing task situations.

Conclusion and Implications

We found that multiple norms were used at LC and that these norms were created and emerged in a variety of different ways. The members at LC used some of Feldman's processes to form and develop their norms. That is, they established some norms upfront 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 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. Emergent 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 other members on the team, or the group as a whole. In this respect, LC's norm formation resonated with that of the groups studied by Bettenhausen & Murnighan (1985).

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 important 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. 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 modularizable. 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 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, email, 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 email 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.

Some researchers such as Spich & 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 many multiple boundaries, it may be useful to make a conscious effort to identify prior and tacit individual expectations so as to more effective 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 & 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 and prevents unexpected surprises. Our findings highlight the value of communication norms across the use of different media in creating this shared understanding. Moreover it shows that these norms are often created upfront (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 more generally.

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