Abstract
Distributed work teams are increasingly being implemented to enhance organizational flexibility and competitiveness in today's complex and rapidly changing work environment. Electronic media is used to enable or facilitate their communication. Though an increasing number of employees work in such settings, there is little investigation of the performance of communication-based work processes in supporting their work in the multiple teams. The objective of this research is to investigate communication-based work processes necessary in different types of distributed work teams, and the ways in which communication modes can be used most effectively to support these processes. The study explores these relationships using a multiple case study approach, taking into consideration individuals’ multiple and often overlapping team memberships. In this paper we report initial findings from the research, which was conducted in two major information technology companies.

1. Introduction

Advances in information technologies have enabled new organizational forms and new ways of structuring work. In recent years it has become normal for workers to have access to multiple communication technologies and to use these to work at a variety of locations with multiple distributed colleagues. At the same time, individuals typically belong to more than one type of team within an organization concurrently. One individual may belong to a workgroup, work on a specific project team and serve on a number of task forces, for example. The work environment is therefore becoming more complex as the number of communication modes available to individuals explodes. The management of the ensuing multiple relationships has also become more complicated.

In the age of the knowledge economy, most tasks accomplished as part of one’s job require some form of communication. For long, researchers have investigated organizational communications, both formal and informal. Yet, we still need to understand better how communication-based tasks can be better supported to lead to efficiencies in an environment where individuals are distributed, and belong to multiple teams simultaneously. Is more communication technology the way to increase effectiveness of team-based work by individuals? Do different communication-based tasks require different technologies for efficiency? What other organizational factors impact these communication mode choices and their potential impacts on team effectiveness?

In this paper we report initial findings from an in-depth study of the communication-based work processes and supporting technologies.

2. Theoretical background

2.1 Virtual work

There are numerous definitions of distributed or virtual work that are inappropriately used interchangeably in research [19]. Virtual work is an all-encompassing term representing work environments where employees are physically separated and/or temporally separated from their co-workers or their work location some or all of the time [3], and perform interdependent work activities [8]. A wide range of work environments may be considered virtual, including geographically distributed work teams, global project teams, inter-organizational teams, and non-traditional work environments such as telecommuting, hoteling, and satellite work centers. In this study we look at intra-organizational distributed or virtual work teams.

2.2 Teams

Regardless of the specific type of work environment, individuals must manage multiple relationships to work productively. As organizations have become flatter and more team-based, individuals are often members of multiple teams with varying roles and responsibilities.
Cohen [5] identifies four general team structures found in organizations: traditional work teams, long-term project teams, and network design structures, which we call short-term project teams, and parallel teams. The
The work being performed will vary in the extent to which an organizational context information-related process or product and who work in individuals whose tasks involve some common business world.

Projects, and they are a frequent occurrence in today’s individuals geographically dispersed and working for the to be accounted for. These teams are made up of temporary but have a defined objective. Examples of parallel teams include task forces and quality teams. Individuals in organizations are often members of some combination of these teams, e.g., a permanent work team and multiple short-term project teams, with some team members distributed. When considering teams in the context of virtual work environments, virtual teams have to be accounted for. These teams are made up of individuals geographically dispersed and working for the same organization, or working for different organizations. Typically, these virtual teams are put together for specific projects, and they are a frequent occurrence in today’s business world.

For this study, we define a team as a collection of individuals whose tasks involve some common information-related process or product and who work in an organizational context. The activities performed by team members must be coordinated to be effective, and the work being performed will vary in the extent to which the members must work collaboratively. In this context, we use the words team and group interchangeably.

### 2.3 Communication and virtual work

It has long been recognized that organizations can be viewed as networks where people and groups are joined together through interactive, communicative relationships. In virtual work environments, communication becomes much more complex, and individuals and groups have many choices of different communication media to use. Communication is the essential backbone behind virtual work and organizations. When performing work activities in a distributed environment, individuals access information and communicate with colleagues from a variety of different physical locations, and possibly at different times. Work no longer occurs in a shared context as in the traditional office, but involves the diverse input and perspectives of colleagues in a number of different physical contexts. A review of recent literature on distributed and virtual work environments reveals that communication is the most researched construct. The studies often investigate communication patterns and how changes in these patterns are introduced by the virtual environment. Researchers explore whom people tend to communicate with most, the factors influencing the development of these patterns (e.g., task characteristics such as predictability), and differences in communications with different partners (e.g., managers vs. colleagues).

Communication in distributed teams must be supported to some extent by appropriate communication technologies. Consequently, another dominant stream of research on communication in the virtual work environment examines communication mode choice, most often investigating e-mail, telephone and face-to-face communication. Different theories have been used to conduct these studies, including media richness, social presence and social information processing.

### 2.4 Communication-based work processes

Fundamental to the performance of organizational work activities are communication-based work processes, i.e., work processes which are accomplished through conversations and communicative practices between individuals. Examples of these activities are the sharing of corporate knowledge and culture, negotiation, conflict resolution, relationship development, information gathering, information dissemination, and coordination. An important distinction must be made between these communication-based work processes (processes that require the use of communication activities) and communication-enabled work processes (processes that can occur without communication but that are facilitated by communication activities (e.g., knowledge creation)).

Communication-based work processes are essential to the functioning of organizations and teams. For example, informal communication is important for transmitting organizational culture and knowledge across different functional and hierarchical levels. In telecommuting, communication requirements in work groups can significantly impact perceived performance and productivity. Knowledge is created as individuals exchange and combines knowledge in social contexts through mechanisms such as meetings and phone conversations. Information technology may augment knowledge sharing by providing a central repository, and tools for finding and extracting needed knowledge. Effective working relationships are developed over time and through communication incidents as individuals move through stages of increased mutual understanding. Coordination of organizational activities often occurs through communication between employees and their management, and involves "integrating or linking together
different parts of an organization to accomplish a collective set of activities" [25]. Regardless of the specific job functions or objectives, these processes are crucial to effective organizational or team performance.

2.5 Communication modes and technologies

The communication infrastructures for distributed work teams include face-to-face (FTF) (e.g., formal or informal discussions), telephone (e.g., audio conferences, voice mail, phone conversations), and communication technologies (e.g., e-mail, electronic discussions, chat, PDA’s, and others). Increasingly, communication technologies are structured to provide knowledge-sharing capabilities to organizations (e.g., intranets or groupware).

2.6 Communication-based work processes and team effectiveness

Little research has examined how communication-based work processes are accomplished in the virtual environment and how this influences the team effectiveness. One study investigated factors leading to team effectiveness in three globally distributed teams [18]. They found that regular FTF meetings were essential for effective performance. Other studies have investigated the influence of communication activities such as knowledge-sharing [11] on communication mode choice. These studies, however, have concentrated on characteristics of the task, such as solving complex problems [11].

Most of the research on teams in the context of virtual work environments has focused on studying one team structure at a time, without consideration for the overlapping nature of the multiple team memberships of individuals. In addition, the majority of research on the use of new electronic media by work teams has compared groups using technology to those working FTF. The research has explored work in laboratory settings where participants are selected only for those experiments [12], and where students are often used as subjects. While providing increased understanding of the use of technology by groups, this research has limited practical application. Some recent studies investigate teams in organizational settings, but tend to be limited to the looking at the adoption of electronic media (usually e-mail) or collaborative tools in organizations [e.g., 16,17,9,14].

2.7 Research questions

Though an increasing number of employees work cooperatively with individuals in a variety of different locations and types of virtual work environments, there is little investigation of the performance of communication-based work processes. There is therefore a critical need for understanding the actual communication needs of distributed work teams, how they can be best supported, and the factors influencing the performance of these groups. The purpose of this study is to begin to fill this void by investigating communication-based work processes necessary in different distributed work teams, and the ways in which communication modes can be used most effectively to support these processes. A variety of contextual factors (e.g., incentives, organizational culture, etc.) are also included in the research. Because we believe that there is a systemic relationship between the above mentioned constructs, we use a multiple case study approach to investigate the following questions:

1a. What is the relationship between the communication-based work processes being performed and the communication modes used by members of different types of teams?

1b. How does this relationship influence the effectiveness of the team?

2a. What is the relationship between contextual factors in the work environment and the support of communication-based work processes being performed by the communication modes being used?

2b. How does this relationship influence the effectiveness of the team?

3. Methodology

Given the lack of studies on technology support for communication-based processes used by individuals with overlapping team memberships in virtual work environments, a study of real world organizations is necessary to further our understanding of this area. An appropriate methodology for studying complex phenomena in organizational settings is the multiple case study approach [23,28].

3.1 Research sites

Using a case study approach requires a clear delineation of requirements and boundaries for the sample. We needed the settings for the case studies to have enough similar aspects that there would be some comparable properties [20,28]. We selected the sales divisions of two major (Fortune 100) companies in the information technology industry (referred to as Firm A and Firm B). The divisions included multiple managerial teams who cooperated in some fashion to attain divisional objectives. Top management of the division in each company was supportive of our research. Both companies are global in scope. The organizational units in which we gathered our data had been undergoing some organizational restructuring and both companies supported, and in fact are dependent on, the idea of
distributed teams. The extent to which individuals worked remotely differed between the two companies, as did other organizational factors. Approximately 25% of the employees in each division were selected to participate in the interviews. Table 1 indicates their demographics.

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3.1.1 Firm A. The service division has two functional areas: sales and technical. The technical side is divided into two functions: the Technical Specialist, and the Support Manager. On the sales side, there are Account Representatives. The Account Representatives are responsible for identifying, creating, and cultivating new opportunities, as well as attending dedicated accounts, depending on their size. The Account Representative identifies the need for particular solutions or technologies, and then brings in a Technical Specialist. The Technical Specialist educates the client on the technology and how it will work in the client's environment. Internally, the Technical Specialist is charged with advising and educating other employees in the division on the newest technology developments. The Support Manager is also technically oriented and works closely with the client to provide post-sales service. The Support Manager is primarily concerned with current products and technologies, whereas the Technology Specialist is more oriented toward emerging technologies. Firm A recently adopted an "office-free" environment. The Support Managers and Account Representatives are not assigned dedicated work spaces. They can reserve office space in a 'hoteling' fashion. They are encouraged to spend more time at customer sites and may also work at home. Technical Specialists are assigned dedicated office space, but may also work at home when appropriate.

3.1.2 Firm B. Firm B's organizational structure is somewhat more complicated than Firm A's. It has four functional areas: Service Managers, Product Specialists, Client Managers, Off-Site Services. This Divisional unit in Firm B is dedicated to one very large customer. They are charged with sales and service of technology products for this customer. They have contracts to maintain the products, and service them when there is a system failure. Service Managers are responsible for reacting to customer concerns and emergencies. Product Specialists identify new service opportunities for their products, and sell the actual product. Product Specialists have other customers in addition to the main customer served by this Division. Client Managers work very closely with the Service Managers on technological issues, and identify opportunities for additional products and services needed at the client site. Finally, Off-Site Services execute services that have been outsourced for the Division's customer and other customers of Firm B. The Client Managers and Service Managers have dedicated offices primarily at the customer location. Product Specialists are located at a separate Firm B location in the same region. Off-Site Services personnel are located in other locations across the country. Firm B is supportive of work at home, and some employees use this opportunity.

3.2 Data gathering

Data collection took place at the convenience of the participating organizations. Case study researchers should use interviews and documentary materials as their main data sources [21]. Consequently, our primary data collection was performed through semi-structured interviews with both managers and professionals within these organizations. We also collected existing paper documents, and observed the physical work environment and the various communication technologies and applications available in each company. Documents collected include workplace physical layout diagrams, organizational charts, job descriptions, policy manuals, and publicly available financial/size/industry data.

The interviews were taped, after agreement to do so had been obtained from the participants. To reassure participants of the confidentiality of the research, they were not asked to provide personal information. We therefore obtained only name, job title, gender (observed), and job and company tenure. The semi-structured interviews lasted on average 50 minutes. The respondents were asked to describe their experiences in various teams they were members of. There was particular emphasis placed on understanding their use of communication technologies, the precise communication-based work processes for which these technologies were used, identifying other factors such as incentives, training or culture that may affect the use and effectiveness of the technologies, and obtaining their perceptions of team and communication effectiveness. The taped interviews were transcribed verbatim into text files. It took approximately three to four hours per each 50 minutes of taped interview for transcribing the interviews into files.

3.3 Data analysis

Data analysis has been on-going for a number of months, given the richness of the data collected. A number of themes have been identified through several coding passes, and are presented in this paper. However,
it should be noted that further analyses will lead to the emergence of new themes and models, which will be integrated into our results as we continue the process.

The goal of our analysis was to investigate the use of communication technologies to perform communication-based work processes, and the factors influencing effective communication performance and team effectiveness. Based on these key variables we had developed an initial list of categories (constructs of interest). This list was refined after the interviews were completed to reflect knowledge gained while conducting the interviews and additional knowledge of published research. This preliminary list was compiled, discussed and modified several times [20]. Once we agreed on categories, we each coded one interview file separately. We then compared our coding and discussed the differences until agreement was reached on the categories, meanings, and future coding procedures. We then coded two interview files independently using a revised coding template, which provided structure for the qualitative data analysis of the interviews. However, it also allowed flexibility in the coding for new or unexpected findings [20]. After these two files were coded, further discussions were held. Given the relative consistency of coding at this point, we proceeded with coding the remaining files.

4. Results

The amount of data collected during the interviews was astonishing. Yet, through the multiple coding passes, important findings emerged. The researchers were particularly interested in the relationships between the constructs of interest. Not surprisingly, a set of complex relationships emerged from the data analysis. This section presents findings from our initial analyses for the relationships between communication-based work processes, communication modes used, the resulting effectiveness of these choices for the individuals and their teams, and the mediating effects of the organizational factors on these. Figure 1 presents a high level model of the complex relationships found in the study. We discuss the main findings in this section and illustrate them with quotes from the subjects. The data provided here represent only a sample of the collected data. For sake of simplicity we provide only one example even when we indicate that “many individuals” reported something. First, we present which technologies were available and used, and the types of teams identified in the divisions.

4.1 Technology availability

Both organizations and the divisions we were studying were heavy users of technology. In both divisions, e-mail, voice-mail, teleconferencing, and pagers were heavily used. Employees in Firm B used cellular telephones significantly more than in Firm A. Personal Digital Assistants were available and usage encouraged for employees in both companies, but usage was not generalized.

In both firms, chat (instant messenger) features were available and usage seems dependent on employee preference. Desktop video conferencing was available in both firms but not widely used. In Firm B, a variety of groupware products were available and used on a limited basis, primarily as a knowledge repository for the division. In both organizations, there was wide-spread use of intranets for information dissemination. Although both firms also used their intranet as a knowledge-sharing facility, Firm A was more advanced in this area. Project tracking software was available in both firms but rarely used.

4.2 Teams and team effectiveness

Individuals indicated the various types of teams they were members of. Employees in both organizations were members of a traditional work team and multiple short-term project teams. Based on the information provided, no long-term project teams could be identified in the two divisions. However, a significant number of employees in each organization were also members of at least one parallel team of the task force type. There were two different types of short-term project teams identified. First, subjects were all members of at least one short term project team that included only members of the division. Most subjects were also members of short-term project teams that included members from a different geographic location, and who usually had different reporting relationships and objectives (i.e., outside of the division). We refer to these as virtual project teams. In this section we describe the team structures as presented by the participants, and their overall perceptions of effectiveness of the team.

4.2.1 Traditional work teams. Members usually had similar jobs and reported to the same manager. Although the members were competitive, i.e., they were judged against each other in evaluations by management, they appeared to agree on the common goal of the group. They were supportive of each other, contributing knowledge they had acquired to others in informal conversations and group meetings. There was no discussion of lack of trust in these groups. This may be due to their low level of interdependence. Managers were supportive of their work and were available to help them out or give advice when necessary.

"...it's impromptu... they stop by my office, every one stops by at least once a day. ... Yea, from there they sit down and chat. The jobs that we have are very stressful. ... , they vent a lot because they can't vent with the customer and they need an
outlet and so they use me as a sounding board and they can just cry and moan on my shoulder and know that they can leave in five minutes and feel better, and they know that I've been there and done that and I feel for them." [Male manager, Firm B]

Membership in these traditional work team was relatively stable, and communication patterns tended to be regular, e.g., weekly/monthly meetings or calls, etc.

"Yea, there is a monthly meeting with the [account] team and I also have a monthly meeting with my manager - a one-on-one meeting -- and that is it for this team." [Male, Firm A]

4.2.2 Task force (parallel teams). Members of task forces came from various parts of the account teams. There seemed to be few problems with group communications and negotiations in task forces. Their overall objective was clear, but the group had to determine the process they would use and the specific recommendations they might make. The only major problem encountered was finding time to devote to the task force, making meetings difficult to schedule.

"[She] has been very good at empowering the team in doing all that because obviously she can’t do all. And we are empowered to do these kind of things." [Male Manager, Firm B]

4.2.3 Short-term project teams. Individuals in both divisions were typically members of multiple short-term project teams. The life span of the teams varied with characteristics of the project. The team had specific objectives and there was interdependency among members to meet these objectives. Individuals reported a more complicated work environment when discussing these teams, with many communication challenges. For example, assigning tasks and ensuring that tasks were completed proved more complicated for these teams.

"It’s ownership of an action or activity. ... What individual is going to do this to complete a task or a set of tasks, or who owns this task and who will get it done. Sometimes you miss that in the communication and somebody buzzes through and email about this little task that we were supposed to do which ended up being important and it wasn’t done... " [Male, Firm A]
4.2.4 Virtual project teams. In these teams, which are similar to short term project teams, at least one member was located in a different geographic area, with some members reporting to different functional areas or outside of the division. There seemed to be no difficulty in forming those teams, even though it could be expected that finding the right members from other parts of the company would be a problem. However, similar concerns as those of project teams were expressed when asked about work in this type of team. In addition, problems were reported on the difficulty of securing the attention and commitment of the virtual members. Issues of communications in global virtual teams were also mentioned.

"And then communicating via email is dangerous because -- and especially globally -- they just don't understand unfortunately how to take your email -- you know you are writing it one way and often times they are not clear and often times it's lost in the translation, you really have to be careful how you communicate with that vehicle." [Male, Firm A].

The subjects suggested that there were no long-term project teams in the divisions. We must reiterate that individuals were members of many types of the teams mentioned above, often of all the types of teams. Generally, traditional work teams and task forces worked fairly well, while project and virtual teams faced a more complex environment and did not fare as well.

5. Discussion: emerging relationships

A number of relationships emerged from our initial analyses. To respect space limitations, we present a very high level discussion of these relationships. The discussion is generic for communication-based work processes. However, we can generate a refined model of relationships for each communication-based work process. These models will be presented at HICSS.

5.1 Teams, technology, and effectiveness

Both firms provided numerous technologies to individuals working both remotely and in the office. Within the divisions, the most used communication media in Firm A were email first, followed by phone/voice mail, cellular phones, and pagers. In Firm B, the most popular communication media were voice mail/phone, pagers, cellular phones, then email. Not surprisingly, in Firm B the expected response time for emails is two days, while in Firm A it could be as low as four hours. Firm B tends to hold more face-to-face meetings than Firm A.

Individuals reported using a variety of these different communication modes and strategies within the various teams they were members of. For example traditional work team members used regularly scheduled formal meetings as ways to disseminate information and share knowledge with one another. They had limited interactions the rest of the time. Maybe because of their lower communication requirements and interdependence, members of traditional work teams found them to work fairly efficiently. Task forces used email for coordination, and meetings for discussion and decision making. Scheduling of meetings was handled primarily through email for Firm A and calendaring for Firm B. In both firms task force members did not report communication problems, but there was a wide variety of opinions on the overall effectiveness of task forces. Projects teams and virtual teams seemed to have more problems with most communication-based work processes. At the same time they tended to rely more on communication technologies for these tasks. This is not surprising for virtual project teams, since many members were spread across wide geographic regions, sometimes globally. Similarly, while short-term project teams from within the division might have some common reporting relationship at some level, they were not typically co-located, even if they had a traditional workspace.

A priori, it seems that the type of team impacts the perceived effectiveness of the team, but that this relationship is often due to the lack of co-presence and the reliance on communication technologies for accomplishing team objectives. These relationships need to be investigated further.

5.2 Work processes, communication modes, and effectiveness

The previous discussion of the relationship between teams, communication modes and effectiveness was generic to all communication-based work processes. Yet, the data reveals clearly that some types of work processes had varying degrees of influence on the effectiveness of the team. Furthermore, depending on which communication modes were used for the different processes, impacts on team and communication effectiveness differed.

Numerous individuals in Firm A mentioned the importance of relationship development in the organization. They clearly stated that being effective in their team meant knowing who to call for what information. They stressed the fact that it was difficult to come into the company because until you knew the right people you lost a lot of time getting information, working inefficiently. Relationship development was clearly linked to successful information gathering and knowledge sharing, which in turn impacted their effectiveness. The relationships they developed also influenced who they would include in project teams when they had such choices to make.

Not surprisingly, different communication-based work processes required different communication modes. For example knowledge sharing typically
occurred in formal and informal meetings, and through the use of intranets, groupware and listservs. Yet, some choices were surprising to us. In Firm A, individuals would use email for sending almost any kind of information, even for handling conflicts and for salary negotiations. Conversely, in Firm B, conflict resolution would be handled by face-to-face meetings or phone conversations. In this firm individuals were more careful of what kind of information they sent by email. For example, they would not send sensitive non-business-related issues over email, or might send sensitive business-related material with “confidential” marked on it.

"...a lot of times, I think people don't think about what they send in an e-mail and all of a sudden, it gets routed around and, you know...so you have to be careful with sensitive information, just depending on the nature of it” [Female, Firm B]

5.3 Media choice and organizational factors, communication mode, and effectiveness

A number of factors influenced the choice of communication mode to handle the work processes in the two divisions. Some factors that emerged repeatedly include urgency of communication, organizational culture, lack of training on technologies, individual preferences, and the physical work environment.

The urgency of the communication influenced the choice of medium. Urgent communications in both firms were handled by cellular phones or pagers. Less urgent communications were handled first by voice mail in Firm B and email in Firm A. Organizational culture also had a major influence. In Firm A email is the preferred mode of communication for almost anything. Recall our previous discussion of salary negotiation and conflict resolution performed through email. The use of email, however, was considered abusive by a number of team members.

"...its culture based. Our culture is email. If you talk to me on the phone...after you tell me something, I’ll say: great! can you send that to me as email?" [Female, Firm A]

It became clear also from the interviews that several individuals did not make use of all of the technologies available to them because they do not have time to learn them.

"...the people do not go the extra mile to learn it. Not that it’s very complicated, but it’s one more thing to learn and no one has time." [Male, Firm A, discussing desktop video conferencing]

Others had technical difficulties because of the physical work environment. For example, employees in Firm B found that cellular phones were not working well within their building, leading to several important messages being lost. As a result, they relied more heavily on their pagers, using the cellular phones to return calls if they worked. However, the same dead zones within the building that made the cellular phones inoperative prevented the use of text messaging in the pagers. The employees had to be creative with the way they could be contacted.

In the project teams, additional communication issues were revealed. In an already complex communication environment, more complications arose due to the preferences of individuals in the use of the multiple communication modes available. Within different project teams, the individual preferences had to be taken into account and strategies negotiated. How and when to use different media required considerable attention from individuals and within groups. Individuals recounted various strategies during interviews.

"Typically if I haven't contacted someone before it's e-mail. And then I'll see how they are on E-mail. If I get any results. If it's easier just to phone them I'll phone them but that's my personal thing. I mean I work with people that just, you know, cell phone is the first thing. I always try to save that for more important things or more time critical things. If I just, if I'm just asking a question and I need an answer within a few hours or a day or something I'll use E-mail." [Male, Firm A]

5.4 Incentive structures, communication-based work processes, and effectiveness

We asked subjects about their individual and team incentives. All individuals suggested that they had some clearly defined incentives, and some indicated that they had team incentives. Some communication-based work processes were accomplished partly because of the incentive structure. For example, individuals in Firm A had rewards for sharing knowledge with individuals in other divisions. They engaged in presentations or loading of best practices on the firm’s intranet, in order to receive such rewards. Team incentives seemed to be non-existent for some individuals, or at least misunderstood. However, other subjects noted that everyone had team incentives. Not surprisingly, there were no clear links between effectiveness of the team and the existence of team incentives. Either these were not substantial enough to have individuals pay more attention to them, or they were believed unachievable. The effects of multi-level incentives for individuals working in multiple overlapping distributed teams need to be investigated.

5.5 Other factors, communication mode, and information overload

Information overload emerged as another outcome in the study. We could argue that it is an intermediary outcome, which eventually leads to lower communication and team effectiveness. Yet we believe that this relationship is important enough to warrant some further discussion. In both firms employees were overwhelmed with the amount of
communication and information they had to manage, especially e-mail - approximately 50 to 100 e-mail messages per day per employee. Many spoke of spending nights and weekends working simply to go through the enormous numbers of e-mail messages that had accumulated in just a few days.

"one thing about this company is that you get so flooded and bombarded with emails, that I am sure their filters are on -- very high. You know... after a while you have to say: ok, I am getting 150 emails a day -- you could spend a 10 hour day just to sort out emails. And you could spend another -2 sorting out voice mail...it's pretty crazy" [Male, Firm A]

Several factors that led to choices of communication modes by team members also led to the problem of information overload. Lack of trust was one of those factors. Lack of trust emerged as a particularly important issue in project teams, which were interdependent for task accomplishment. It contributed to information overload through redundant messages and increased number of meetings. The lack of commitment from some project team members led to other team members needing to consider methods for insuring that the team's work would be completed satisfactorily. For example, in Firm B, project team members often expected that task assignments would not be completed reliably. An increased number of meetings were then held, messages sent, and generally redundant communication took place as employees felt they had to continually follow-up to insure that others who had made commitments to the team would actually meet them. This created information overload for everyone. The issue appeared to be stronger and have more influence in Firm B.

"... It's starting to fail me because then I have to go and do the face-to-face. I have to make the additional phone calls which all of sudden we've got these very redundant things happening because the initial entry point is failing." [Female, Firm B]

Other factors may have also influenced the volume of e-mail in both firms. Subjects need to keep their traditional work unit manager or members up to date on their activities, even activities that occurred in the context of project team or task force roles. This is even more difficult when they work in virtual work environments, and email becomes the preferred medium for accomplishing this.

"It's not uncommon for me to get 50 to 100 emails per day. Most of it is information not really looking for response or action. I get, as you would expect when you have six or seven associates working for you, they like to copy you on lots of things. I am not sure if they want you to know what they are doing or if it is truly to keep you in the loop." [Male Manager, Firm B]

In addition to e-mail, employees received messages via conference calls, pagers, and cell phone calls. They participated in formal meetings, ad hoc interactions (e.g., meeting in the hallway), and in some cases video conferencing, to perform their jobs. Managing the volume of information generated from these different communication activities presents a significant challenge for all employees.

"All this information technology is great, but now I am like: don't let this storm happen because I will blow up! Because -- you know you've got your pager, you've got your cell phone, you've got your computer. I am just microwavable... so it is good and bad. It's just a matter of finding where you niche is as to the best way for you to manage information." [Female, Firm A]

There might be other reasons for this large volume of communications in the divisions, which need investigation. More importantly, we need to study the consequences of such information overload.

5.6 Contributions and limitations

This research provides several contributions to the study of teams in virtual work environments. It is one of the first studies, if not the only one, to look at overlapping teams and multiple concurrent memberships in distributed settings. It provides an in depth study of communication and the supporting communication modes in real organizations. The findings highlight the importance of culture in media choice, even for tasks that would otherwise not be appropriate (conflict resolution). Clearly, however, one must take into consideration other factors, such as urgency of communication (when cellular phones and voice mail become preferred communication modes). Another finding is that the lack of training affects significantly technology use because overworked individuals do not take the time to learn new tools, even when their own firm makes or sells this technology! These are only some of the complex relationships emerging from the study (see Figure 1).

Some say that findings from case studies are not generalizable because observation and deduction cannot be controlled [15]. However, it can be argued that a case study’s validity does not depend on the case being representative, but rather on the logical reasoning used in drawing conclusions from the case [26]. In addition, we used two cases, thereby reducing some concerns about generalizability of findings.

6. Conclusion

The level of effort required to facilitate good communication in working relationships has long been recognized. Strategically planning interactions so that goals are more likely to be accomplished, and taking into account the preferences of others is part of effective communication [13]. However, our initial findings point toward a more complicated communication environment for individuals in virtual work, with more attention devoted to managing the interaction between the increasing number of communication modes and communication-based work processes.
7. References


