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The Media Toolbox:
Combining Media In Organizational Communication

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ABSTRACT

Much of the research on media use in organizations has tended to focus on the use of one medium in isolation from the other media in the organization. Yet the proliferation of communication technologies, especially Internet-based technologies, combined with work configurations such as hybrids of virtual and co-located work, has made it more likely that organizational members will use multiple media, at least some of the time, to communicate. In addition, physical work—work involving bodily skill and manual effort—is also being affected by the adoption and use of new media technologies. This study of a regional facilities group in a Fortune 500 company explores how the use of both single and multiple media in a hybrid work configuration can facilitate a variety of rich and complex interactions. We found that organizational members used single and multiple media to support individual as well as concurrent interactions. We conclude by proposing the notion of an organizational "media toolbox" on which organizational members can draw to use different media alone or in combination, to accomplish both individual and concurrent conversations.

> *To me, working is – the computer's going, cell phone's going, pager's going and you're responding and you're chatting with people. … I'm very comfortable reading email, working on something, picking up the phone, getting a couple things done.*
>
> [FacilityEast member]

Changes in technology, especially the adoption of Internet-based technologies and the proliferation of telecommunication technologies, have increased and changed the ways that people in organizations communicate and work with one another. People are using new (and existing) communication media solo and in combination to do more work with people who are both co-located and distributed across distant sites. In many cases, their work is becoming more mobile (even within a co-located site), and less tied to a particular place.

Boczkowski and Orlikowski (forthcoming) have noted that most researchers have tended to study a medium in isolation from other media in the organization. Yet, media use in organizations is not an either/or practice. While people in organizations may use a single medium to communicate and work with each other, they often choose to communicate and work using multiple media. Virtual, or distributed, work may be increasing this tendency to use multiple media. In large organizations, many groups who work together are not entirely co-located or entirely distributed but instead are a hybrid, with some members who are able to communicate and work face-to-face, and others who use one or more voice and computer-mediated technologies to communicate and work with geographically-dispersed colleagues. Work groups that include both co-located and distant members use multiple media (e.g. face-to-face and phone in the simplest case) rather than a single medium as a matter of course to communicate and work. To the extent that the literature has looked at the use of multiple media, it is in the arena of virtual or distributed work. Left unexplored, thus, is the study of multiple media in hybrid work configurations (i.e., work that involves communication with individuals who are both co-located and distributed). That is the focus of this paper.

LITERATURE ON MULTIPLE MEDIA CHOICE AND USE

Distributed work, by definition, cannot take place without the use of various non-face-to-face media. Face-to-face communication is valuable but costly, especially in organizations that rely extensively on distributed work, and many organizations (and their members) may balk at the costs—monetary, temporal, and personal—that engaging in face-to-face communication entails. Face-to-face communication has been hypothesized as the most information-rich medium (Daft and Lengel, 1984), valuable not only for its capacity to convey many kinds of subtle information but also for its role in creating a social environment. Media richness theory (Daft and Lengel, 1986) proposes that each communication medium has properties that make it better for certain kinds of communication; different communication media are described as being more or less rich in terms of conveying information, with face-to-face communication as the most information-rich medium (Daft and Lengel, 1986). Social influence theories introduced the notion that people can have different perceptions of the richness of a medium. For example, situational factors can influence perceptions (Fulk and Steinfield, 1990), and these individual perceptions as well as contextual factors affect media choices more so than the properties of the media (Carlson and Zmud, 1999; Carlson and Davis, 1998; Lee, 1994). Most of this research, however, has focused on the choice to use a single medium like email (e.g., Markus, 1994) or video-conferencing (Kraut, Steinfeld, Chan, Butler, and Hoag, 1999), or on the choice between two media such as email versus face-to-face (Daft, Lengel, and Trevino, 1987; Zack, 1993). In distributed and hybrid work configurations, the choices are not so simple.

Although face-to-face activities such as social bonding, touching, sharing meals, sharing experiences, showing up (as a signal of commitment), and managing attention are crucial for sustaining the social relationships that make collaborative work possible, face-to-face communication can also be disruptive to work and costly to arrange (Nardi and Whittaker, 2002). Nardi and Whittaker (2002) propose that an organization (or group) doing distributed work design its “media ecology” to support and promote the appropriate amount of face-to-face communication as part of its media use. A media ecology is a type of ‘information ecology,” the

local mix of habits, practices, technologies, and values of the group or organization (Nardi and O'Day, 1999) and depends upon "the work tasks, the quality of the relationships among participants, and the temporal flow of the work" (Nardi and Whittaker, 2002).

The concept of a media ecology is helpful because it acknowledges that multiple media are used as part of communication within an organizational environment. In addition, it recognizes that how media are used in an organization is a function of more than just the physical aspects of a medium or technology. While the metaphor of ecology is valuable because it suggests adaptation and variation of media use for similar circumstances, Nardi and Whittaker's formulation of it also poses some difficulties. In particular, they speak of *designing* an ecology so that people in different situations are able to use different technologies or the same technologies in different ways. The concept of "design," however, seems at odds with that of an ecology. Biological ecologies are not designed or planned. Instead, environmental, situational, and genetic influences shape the adaptation and evolution of organisms over time (Lewontin, 1995).

In an effort to understand how individuals actually use multiple communication media to accomplish their work in a distributed setting, Belanger and Manheim-Watson (2003) examined communication practices within the sales divisions of two large information technology companies, both of which regularly relied on remote work. Ongoing communication processes in the two organizations that were identified included work coordination, knowledge sharing, information gathering, relationship development, and conflict resolution. Both divisions had access to a wide variety of communication technologies but use of those technologies, while similar in some cases, differed greatly in others. In both cases, individuals made communication choices based on established local practices, but modified their use depending on the situation.

Drawing on the concept of a genre repertoire (Orlikowski and Yates, 1994; Yates, Orlikowski and Okamura, 1999), Belanger and Manheim-Watson develop the notion of a "communication mode repertoire," a set of routines developed around the use of communication media that are used by members of a community. They identify a number of structuring

mechanisms that shape these routines: substitution, innovation, variation, and combination. *Substitution* occurs as people use media to replace face-to-face communication, while *innovation* occurs when the use of a new medium allows a different form of communication. The use of different communication media for similar types of communication reflects *variation*, driven by both situational constraints and individual preferences. Different media can be used in *combination*, with the assumption that the combination allows more effective communication than any one of the constituent media does.

Belanger and Manheim-Watson (2003) found that organizational members, when they had a number of communication media available to them, often chose to use a variety of media in sequence or in parallel rather than selecting only one medium. The combination of media used appeared to change according to the local conditions and varied even under similar circumstances. Rather than using one particular medium for one particular task, individuals, instead, had a set of routines that allowed them to select and use media in response to the situation. That is, they enacted communication practices using available media and being guided by organizational norms. Belanger and Manheim-Watson's concept of an organizational repertoire of communication routines acknowledges the number and diversity of communication media that individuals in organizations must manage in order to accomplish their ongoing work.

In addition to using multiple media to accomplish work, individuals also engage in multiple interactions at the same time. Participating in multiple conversations at one time has been characterized as 'polychronic communication' (Turner and Tinsley, 2002), a term derived from the concept of polychronicity, which is defined as "the extent that people 1) prefer to engage in two or more tasks at one time and actually do so, . . . and 2) believe their preference is the best way to do things" (Bluedorn, 2002). In polychronic communication, people use downtime during interactions with one person to interact with others. The use of an asynchronous medium (e.g., email) to communicate creates more downtime during interactions, thus more easily allowing participation in parallel interactions. While there may be less downtime in communicating with synchronous media, there may be more opportunities for

several interactions when multiple media are involved in the communication (Turner and Tinsley, 2002). For example, in many meetings, participants can be seen to use a number of media: face-to-face, phone, meeting software, and instant messaging (IM). In these cases, some participants might be talking face-to-face or on the phone, all participants may be looking at the presentation on the computer screen, and some participants might be having a sidebar discussion face to face or via IM, all at the same time.

These recent findings—that people in organizations use different media for similar communications, substitute various media for face-to-face communication, and engage in polychronic communication through the use of both single and multiple media—create a picture of media use that is more complicated than one described by theories of media choice. People in organizations have access to more communication media than ever, and work settings and arrangements are becoming more varied. Teams or work groups often include some members who are co-located and others who are distributed, rather than being entirely co-located or entirely distributed, and these alternative and hybrid arrangements lead to different ways of using media and engaging in communication.

While the literature on the use of media technologies has tended to focus on "knowledge work," physical work in organizations (i.e., work involving bodily skill and manual effort) is also being affected by the adoption and use of new media technologies. In particular, such work is evolving to accommodate and exploit the capabilities of these new media technologies, creating an amalgam of traditional and new work and communication practices. This suggests that the distinction between "knowledge work" and "physical work" may be less useful, and indicates that our theories of media choice and use need to focus on how people doing *all* types of work use media to communicate and accomplish their work.

In the following study, we examine the communication practices present within one regional facilities unit of a large multi-national organization. Members of this regional unit worked in a hybrid work configuration, interacting with both co-located and distributed colleagues via a wide variety of media to accomplish their work of facilities management.

Because of the complexity and diversity of its communication and work practices, this site offers an interesting locale to study the use of multiple media within hybrid work configurations.

SITE AND METHODS

The first author observed FacilityEast, an eastern site of the Facility division of Hardware Inc.,[1] a Fortune 500 company specializing in the manufacture and sale of computer and network equipment. Hardware Inc. is headquartered on the West Coast with the majority of its product development and manufacturing also located there. Four major product development campuses, as well a number of smaller product development and manufacturing sites, are located elsewhere in North America. There are over 100 field and sales offices in North America and Hardware Inc. has a sales presence in over sixty countries. Approximately two-thirds of Hardware Inc.'s employees work in the United States.

The Hardware Inc. Facility division which we studied includes the following departments: Real Estate, which negotiates and manages the real estate investments such as site leases and purchases; Site Development, which develops and builds out the office sites; Facility Management, which manages the company facilities and the services within the facilities; and Space Planning, which evaluates the use of space within sites by employees and business units, and plans any moves into and out of the sites. Two other departments—Employee Services, a group that coordinates services such as the cafeteria and the gym for Hardware employees and contractors, and Security—are considered part of Facility Management but report to headquarters. (See Figure 1 for a Hardware Inc. Facility division organization chart.)

The Facility division is responsible for most of the company's physical assets—the property, buildings and furnishings—which are the company's second largest expenditure annually (human resources is the largest). Hardware Inc.'s Facility division manages its global operations with fewer than 200 Hardware Inc. employees plus hundreds of additional

[1] All names—organization, departments, and people—have been changed to preserve confidentiality.

contractors. Most of the Facility division is based in North America and, except for the Facility division's senior management, Facility personnel deal with no more than three time zones in most of their day-to-day work with their Facility colleagues.

FacilityEast

At the time of the study, Hardware Inc.'s Eastern Region (roughly covering the eastern half of North America) consisted of a number of small sites along with several company campuses. It was not as cohesive geographically as the Western Region. FacilityEast was part of the Hardware Inc. facility division for the Eastern Region and was located on the East Coast in a product development site in a suburban office park. FacilityEast managed four local (within a four-hour drive) and two geographically distant product development sites, a number of local and geographically distant sales sites, and two local manufacturing sales sites.

FacilityEast included members from all of the Facility departments. FacilityEast members included both Hardware Inc. employees and contractors—indeed the majority of FacilityEast members were contractors. FacilityEast's use of contractors was not an anomaly. A survey in a 2001 *Facilities Design & Management* magazine found that 98% of companies outsourced at least one facility management function. FacilityEast members worked with each other, with all the personnel who worked in and maintained the FacilityEast facilities, with their department counterparts in other regions across the globe, and with management at headquarters. Figure 2 shows the affiliations and jobs of people making up FacilityEast when observations began.[2]

Employees from six contracting companies sat in the FacilityEast workspace where observation took place. Some of the contractors reported to the head of Facility Management, others reported to Employee Services, and still others reported to managers in other Hardware Inc. locales. Additional contractors and contracting relationships were not directly observed: 1)

[2] By the end of the observation period, Space Planning was a separate department and had lost one employee and one contractor. Facility Management also lost workers during the reorganization but those workers did not work in the FacilityEast offices, and are not counted here.

other companies contracted with FacilityEast[3]—to staff and maintain the employee exercise facilities, oversee the company copier facilities, and keep the office supply closets filled—and 2) additional contractors were affiliated with the six contractor companies represented in FacilityEast. In general, the contractors who sat in the FacilityEast workspace either managed relationships between their company and Hardware Inc., or worked closely with Hardware Inc.'s FacilityEast employees.

FacilityEast's offices were in an enclosed area off the main hallway and were not shared with any other Hardware Inc. group (see Figure 3 for an office layout). The cubicles, private offices, and conference rooms had no windows, and the only source of natural light was the partially glassed outside wall. The different departmental groups within FacilityEast did not segregate themselves within the FacilityEast space, though the telecom "guys" were clustered together. Located at the end of one row of cubicles was a laser printer/fax station; another printer station with two high-speed laser printers was located at the end corner of a row of cubicles. Two specialized large plotter/printers used to print out floor plans and one floor plan copier were located in an alcove and an open cubicle. Also stored in the alcove were floor plans, upholstery and carpet sample books, and mockups of the interior design of one of the sites. Floor plans of each of the FacilityEast sites, labeled with employee names in their respective cubes, hung on one wall; maps of the Eastern region and of some of the FacilityEast sites hung on other walls in the FacilityEast space.

Methods

The first author spent several days a week for three months in the FacilityEast office, and then visited occasionally for the next six months. She was given an empty office in the FacilityEast workspace to use while she was there. She attended meetings on-site, off-site, and virtually, ate lunch with FacilityEast members, shadowed one FacilityEast member for a day,

[3] Since this study was confined to FacilityEast, it limits the description of contractors to those affiliated with FacilityEast, which understates the number of contractors used at Hardware Inc. In some cases, the contractors themselves use contractors, as one of FacilityEast's contractors noted: "We contract out the lawn service, the snow plowing, and the blacktop striping."

participated in a major facilities move, and went to an after-work get-together. She also formally interviewed seven of the FacilityEast members, both employees and contractors, and informally conversed with most members of FacilityEast during the observation period. When she began her observations, 24 people worked in the FacilityEast. As Hardware Inc. had layoffs during the time of the study, there were fewer people in the group when she finished her observations. She regularly saw the people who had cubicles in the primary site of the study, and occasionally saw others including the three local site managers (mostly at meetings)[4], and never physically met FacilityEast members based in other locations, although she sometimes heard them in phone meetings. Hardware Inc. encouraged telecommuting,[5] so there were people who were part of the FacilityEast group who rarely came in to the office, tending to work from home.

USE OF COMMUNICATION MEDIA

FacilityEast members used a variety of media to communicate with each other and to communicate with other Hardware Inc. members. Yet, while FacilityEast members often used one medium alone during an individual conversation, they also used media in several other ways: conducting several separate interactions at once using a single medium, using multiple media for an individual conversation, and using multiple media to engage in concurrent conversations. We developed a typology of media use and conversations to represent these patterns of use (see Figure 4).

In the next section, we describe the most prevalent communication media used in FacilityEast during the time of our study, and then describe the use of these media, singly and in combination, in both individual and concurrent conversations.

[4] Two of the local site managers were laid off during the observation period.
[5] Hardware Inc. had a "virtual worker" program, begun in part to lower real estate costs. A virtual worker did not have a dedicated cubicle but did have a rolling file cabinet with physical documents, kept at the office site that s/he visited most regularly. When such workers went to their "home" offices, their rolling file cabinet would be rolled into a cubicle. A particular virtual worker was not allowed to stay in any particular cubicle for more than a couple of days. Sales people were considered virtual workers (a FacilityEast rule of thumb is that two salespeople share one desk). In exchange for taking on virtual worker status, Hardware Inc. paid for much of the home IT costs that a virtual worker incurred.

Communication Media used within FacilityEast

Face-to-Face

Face-to-face interactions occurred when FacilityEast members were in their office space, at lunch, at after-work gatherings, out at a job site, or in a meeting. As described in previous studies (Festinger, Schacter, and Back 1950; Allen, 1977), propinquity influenced who was more likely to talk to whom within the FacilityEast office space. Outside of the office space, FacilityEast members' face-to-face interactions were more influenced by task demands and friendships. Lunch was the one time during the day when cubicle proximity, task demands, and individual friendships did not factor strongly in determining face-to-face interactions.

Phone

There were a variety of phones in use at FacilityEast: desk phones, Polycoms, cell phones and radiophones. Desk phones could be used on "speakerphone" or with the handset in the cubicles and were used for individual conversations and for meetings. Everyone at FacilityEast had voicemail, routed through the desk phone number, and used for messages. Specialized phones, Polycoms, were used in the conference rooms for meetings. Many FacilityEast members also had cell phones, which they used when they were away from their desks. Finally, radiophones (combination walkie-talkie/cell phones) were used most frequently on job sites for coordination: to talk to each other when taking separate cars to job sites (radiophones are cheaper than cell phones and don't drop calls like cell phones); to keep track of each when they were working individually in different places within the same job site; to ask questions and get answers without having to meet up in person; and to find each other quickly at a particular site. The radiophone conversations tended to be short and to the point, and they lacked privacy because the responses came through a speaker rather than an earphone.

Email

The use of email was ubiquitous at FacilityEast and Hardware Inc.: "It's a very prevalent form of communication within Hardware Inc.," observed Howie, a contractor at FacilityEast. Besides being the dominant form of one-to-one communication within Hardware Inc., FacilityEast members described using email to document meetings and conversations, to control their workflow, to craft a consistent message to a group, and to remind them of appointments, meetings, and agreements.

Instant Messaging

Some FacilityEast members were using IM at the beginning of this study, even though at that time there was no company-wide IM application. The initial use of IM was bottom-up, with Hardware Inc. employees installing third-party IM systems and configuring their systems themselves. Several months after our study began, Hardware Inc. adopted a corporate IM application and its use became more prevalent, though not ubiquitous. At the time of these observations, IM was considered an internal form of communication at FacilityEast. FacilityEast members used IM in meetings for sidebar communications between colleagues, both to ask questions and to conduct quick social conversations, as well as for quick conversations with friends and family members. In addition, at least one manager at headquarters used IM as a way of determining whether his subordinates in FacilityEast were at their desk working. As he was not able to physically see his employees throughout North America sitting at their desks, he would send them IM messages. Because IM messages had to be received and answered from a computer, the manager would surmise that a response from his subordinates indicated that they were at their computers.

Pager

A number of FacilityEast members had pagers, so that they could receive messages even when they weren't near a computer or phone. Some used the pager only when they were at work while others kept their pagers on all the time; whether they kept the pager on all the time seemed

to be a function of their perception of how important a missed message could be (the FacilityEast manager was available all the time while other FacilityEast members only wore a pager during work). People in FacilityEast treated a page as a message that needed immediate attention, more so than an email message or phone call.

Internet-based Conferencing

Internet-based conferencing applications were used to facilitate the real-time sharing of new computer applications. Newer versions of this technology also had audio, video, and chat capabilities. In FacilityEast, Internet-based conferencing was used in meetings, in training sessions, and in one-on-one phone calls, typically to illustrate or explain the new applications.

Videoconferencing

Videoconferencing was used infrequently at Hardware Inc. As one of the Facility managers from headquarters explained:

> I think people tend not to use videoconferencing so much because most of the meetings that we have . . . people have usually met and are very familiar with [each other] and … [the meetings are] ongoing. … It's not like you're trying to necessarily see people for the first time.

When videoconferencing was used it was scheduled ahead of time. During this study, FacilityEast members used videoconferencing only to participate in "all-hands company meetings" (there were few of these at Hardware Inc.). One drawback to its use was that videoconferencing was more prone to break down than the other communication media used at Hardware Inc.

Shared Folders and Internal Web Sites

FacilityEast members collaborated with each other using email attachments, web-based programs and databases, and shared folders. Sometimes the collaboration work was done by round-robin, with one person beginning a document or spreadsheet and handing it off, via email attachment, to the next person. At other times, a group used a shared folder so that a group

member was able to work on a document when he or she had time. Internal web sites were also used throughout Hardware Inc. to locate and distribute information.

Paper

FacilityEast members frequently used paper-based blueprints and space layout diagrams to assist them in their work of facilities management. They rarely wrote paper-based reports, memos, or notes to each other or to their managers; most of these types of communications were done online, via email, PowerPoint slide decks, or web sites. However, they did use paper to write memos, instructions, and reminders to the people in the business units who were being moved from one site to another, physically distributing the paper memos, instructions, and reminders to the cubicles. The planners had found that online communications (mainly email) did not command as much attention as a paper notice placed on a desk or chair.

Use of Communication Media in Conversations at FacilityEast

Figure 5 lays out the typical combinations of media used in FacilityEast conversations. Some media, like face-to-face, paper, IM or phone, were used both as a single medium and in combination with other media, and were used in both individual and concurrent conversations. Other media, such as the Internet-conferencing software, NetMeeting, were always used in conjunction with some form of voice communication, and used in both individual and concurrent conversations. We discuss these various uses of media in different conversations below.

Use of Single Medium in Individual Conversations

Most of the communication media at FacilityEast could be, and were, used as a single medium in an individual conversation. Some media, such as voicemail, were almost always used singly. Other media, like radiophones or pagers, were often used singly but could be combined with another medium like face-to-face or phone. For instance, FacilityEast members kept their pagers on while they were at work. When they received a page, they would take their pagers off their belts, look at them, and either put them back on their belts or leave to make phone calls.

These three media—voicemail, radiophone, and pager— were generally used only in individual conversations.

An example of the use of face-to-face in individual conversations involving more than two people was the weekly FacilityEast staff meeting, which usually began at 8 am on Fridays in the company cafeteria. Each member got coffee, sat at the "FacilityEast table," and gave a status report on current projects, including moves, site development, mail services, phone systems, evacuation plans, and updates on vacated sites. In addition, people asked questions, made jokes, and traded information.

The desk phone and Polycom could accommodate many people in an individual conversation, especially as there were rules (either tacit or explicit) about who talked at any given time. For example, the region-wide Site Development weekly phone meeting, with approximately 30 participants, kept people up to date on the build-out of sales offices. Only people who had work to report talked. Participants discussed the sites beginning with the site closest to completion, "[a] nd what we do is run through all the projects by name and ask if there are any issues." Although the main purpose of the meeting was to report on the progress of individual sites, Marty, the leader of meeting, also attempted to help the attendees get to know one another:

> I try to develop a little personal rapport with everybody on my call, so every week I sort of pick out somebody. You know, "hey, how've you been, what's going on, how'd you do on this project." … I try to keep it rotating. … I'm chatting with everybody a little bit, so they're learning something about all the other people. … And every now and then, we'll have a light moment.

This strategy of using a single medium for an individual conversation involving a lot of people worked when the person running the meeting was able to establish a set of protocols (either in the form of unspoken norms or explicit rules) about how the conversation should proceed. Marty observed: "Now because it's just one person handling the whole country, I can pretty much steer it so everybody knows what I'm looking for."

IM was often used within FacilityEast for quick individual conversations, sometimes personal but often work-related. These were usually brief conversations rather than the intense collaborative work noted by others (e.g., Isaacs, Walendowski, Whittaker, Schiano, and Kamm, 2002). The following quote describes how a FacilityEast member typically used IM in his work:

> A lot of times, say if I'm working on a project and I'm updating something and I have a question that I need to fill in that space with, it is something that I need to know right now, I'll look and see if someone is logged in. … And if I see that they're logged in at the same time I'll Instant Message them. … Because if I can get that answer right then than I can keep going on my work and complete that portion.

Though the descriptions of single medium use above focus on synchronous media, individual conversations were not always synchronous. Mary described her group's use of shared folders:

> […] my group [finds it] is key to use network-shared folders. So I do my piece of the work and put my information up and then they add theirs. … My main group of folks are in two different areas, in California and Texas, and then me, so we all have to try not to send each other the emails over and over. We put it out in a file. … I put in my piece. And then Sarah puts her piece in. … It makes it a lot easier.

Using a single asynchronous medium this way to conduct an individual conversation could sometimes be difficult, as Linda noted: "It is hard when two people [or more] work on something because people have different work habits."

Although a substantial portion of FacilityEast's work was done online, the nature of this work (the management of physical facilities) means that such traditional media as face-to-face and paper, including CAD drawing printouts and blueprints, are sometimes the best media for conveying information, especially when using a single medium in an individual conversation. Lisa said, "We're talking about space. You need blueprints. This can't be done virtually." Kate described the problems that can arise when organizations try to accomplish physical work using a virtual medium:

> My last project was remotely managed. Nobody took the old phones out, never even unplugged them because there was nobody there. Nobody unboxed the new phones, so the technician, the technical person and the engineer completed

> their work but never thought of the client. So, the client comes in on the first day of service, and the phones are in a room never unboxed, never even plugged in.

In all of the cases discussed above, a single medium supported an entire individual conversation. However, most of these media could and were also used to conduct multiple concurrent conversations.

Use of Single Medium in Concurrent Conversations

FacilityEast members would sometimes use a single medium to conduct concurrent conversations. The most prevalent medium used to do so was face-to-face. Lunchtime was the main time during the day for this sort of interaction to occur (the cubicles in the FacilityEast office space inhibited face-to-face interactions). During lunch, FacilityEast members wandered into the cafeteria, sat together at the "FacilityEast table," typically for thirty to forty-five minutes, and had multiple, concurrent discussions that move fluidly between personal and work topics, creating a weave of social and work talk.

Email was also used frequently to conduct concurrent conversations. FacilityEast members each received at least fifty emails a day, many of them overlapping conversations about projects and work. One FacilityEast members described his email inbox this way: "The emails are popping up, my screen's on, if I've got some meeting I need to go to or some information, I'm looking for it coming across on the email."

IM was also used to conduct concurrent conversations but these conversations were usually quick and about topics that could be covered with short questions and responses. For instance, Joan said:

> "I use it [IM] a lot with Amanda when she is working at home. It's good for things that are quick like 'I'm expecting a fax, did it come yet?' … [and] that quick personal call like 'Are we still on for tonight?' … Multi-tasking has whole new meanings."

If a single medium could be used for individual or concurrent conversations, multiple media could also be used in these ways.

Use of Multiple Media in Individual Conversations

FacilityEast members regularly used multiple media to communicate and work with each other, one-to-one, in small groups, and in large meetings. The use of two media was quite common in individual conversations, either between two people or in small meetings. Meetings that had a simple purpose, like updating project managers and participants on the status of a project, often used a combination of two media, face-to-face and Polycom phone conferencing. For example a regular FacilityEast meeting delivered weekly updates on a large project site that FacilityEast had under construction. Members from FacilityEast attended either by dialing in separately from their desk or home office, or by meeting together in a conference room and dialing in. All of their management counterparts on the West Coast attended by phone. Everyone directly involved with the project gave an update. When the updates were completed and questions were answered, the meeting ended. These meetings could take over an hour if there were questions or they could be completed in as few as fifteen minutes.

Using multiple media in an individual conversation was also common when FacilityEast members were trying to accomplish physical work using virtual tools. FacilityEast space planners oversaw the relocation of Hardware Inc. groups into new or different places within FacilityEast buildings. Coordinating a move was a complicated process that required coordination among a number of different Facility groups such as the Phone Network group, the Computer Services and Information Technology group, and the Facility Management building manager. Space Planning coordinated all aspects of the move and was the interface between the FacilityEast groups, the contractors hired to do the actual move, and the Hardware Inc. group being moved. For example, during the study, FacilityEast was involved in moving employees from a company recently acquired by Hardware Inc. into a Hardware Inc. site. For one of the planning meetings, the FacilityEast planners drove out to the location of the Hardware Inc. acquisition whose people were to be moved. People sat around the perimeter of a meeting room, and referred to a printed schedule and checked their written notes from previous meetings. The phone participants (Computer Services and Phone Network) dialed in. Everyone in the meeting

checked in and listed what they had done and what they had left to complete before the move. As soon as everyone had given an update, the meeting was over. In this case, three media were used to coordinate and disseminate information: face-to-face, phone, and paper. For this complex conversation, a single medium was not enough to accomplish all of the necessary tasks: to keep records and schedules, to keep people on track, and to solicit needed information. All of the media were needed together.

In another example, individual conversations that began with a phone call often added in NetMeeting when the work or topic was difficult to describe, and then dropped it once both parties understood each other. For example, the Facility Department, which planned, built, and maintained Hardware Inc.'s physical space, used schematics, samples, and pictures as a way of representing information about space. NetMeeting allowed FacilityEast members to share a drawing or picture of the physical space and collectively point to places on it rather than trying to describe the space in words. One FacilityEast member described the value of sharing visual images in communication as follows:

> I can't tell you how many times [my colleague in] Chicago would pull up . . . drawings and talk about different issues. At one point, she had some planning issues. She felt like she could maximize the space a little bit better and rearrange the workstations, so we'd look at that together. Or out of the product we have, can we build this type of workstation or this kind of table? We'd look at plans and talk about that sort of thing together.

Another FacilityEast member concurred:

> A lot of times I would use NetMeeting [when] calling someone up [with] a question. … [I'll say] "Can you just open up NetMeeting? I just want to show you something." And we'll log onto NetMeeting … [for] five minutes of the conversation, we'll be in and then we'll get out and continue on with the conversation.

Uses of multiple media in an individual conversation were thus common. But multiple media were also used to carry on concurrent conversations.

Use of Multiple Media in Concurrent Conversations

Use of multiple media in concurrent conversations occurred frequently in meetings in FacilityEast, especially meetings that included people from other locations. Some meetings were more formal, with an agenda and a scheduled meeting place. For instance, the Space Planning department scheduled an all-day meeting for all of Hardware Inc.'s Planners to discuss new and ongoing initiatives and emailed an agenda to all the participants. On the day of the meeting, FacilityEast planners gathered in a large conference room, dialed into a phone conference "room," and had a laptop hooked up to an overhead projector with NetMeeting running. Speakers used PowerPoint presentations to present information and guide the discussion. In the formal meeting, three media, phone, NetMeeting, and face-to-face, were used simultaneously to disseminate information and get work done. At the same time, however, several of the FacilityEast members had their own laptops open and held informal sidebar conversations with each other and other colleagues.

Most regularly scheduled meetings attended by FacilityEast members were less formal than the one described above. The meeting described next was typical of most of FacilityEast's meetings in that it involved the use of four media (phone, face-to-face, NetMeeting, and IM) to support concurrent conversations. In this case, Dick and Mary met in the conference room to attend a meeting about the recent division reorganization. Dick plugged in his computer and logged into the company intranet. He then dialed into the conference call and announced that he and Mary were attending the meeting. He and Mary activated the mute button at the beginning of the meeting, allowing them to make comments to each other during the meeting; they turned the mute off when they wanted to participate in the meeting. This face-to-face conversation was concurrent with that of the meeting itself. Dick also opened NetMeeting and accessed the presentation describing the reorganization. After that, he immediately opened an Instant Messaging window on his laptop (a subset of the meeting attendees were part of Dick's IM "buddy list"). As the Facility vice-president began the meeting, methodically going through PowerPoint slides about the reorganization, Dick and Tim, another Facility Manager at a

different site, started a concurrent conversation via IM, griping about the reorganization, discussing the sites that each had gotten assigned in the reorganization, and exploring opportunities for swapping some of them. The meeting ran for 45 minutes, during which multiple concurrent conversations took place via phone discussions, NetMeeting presentation, IM exchanges, and face-to-face interactions.

FacilityEast members were conscious of their juggling of concurrent conversations across multiple media. For instance, a Facility manager at headquarters described media use during meetings this way:

> [We do] Instant Messaging when we're on these conference calls [at the] same time. So there's a lot of ways that we communicate with each other while we're having the conference calls, not just telephonically. And we can all be sharing information through NetMeeting, and you're seeing it as if we're face-to-face with the individuals.

Another FacilityEast member said:

> I didn't think about my conference calls because … I'm multi-tasking. And a lot of times conference calls aren't through NetMeeting, so you could be on the computer and in a meeting at the same time.

Using multiple media to engage in concurrent conversations was perceived by some to be problematic. As Marty noted:

> There are so many methods to communicate right now. If you spent all your time trying to be effective on every one of them, you'd never get anything done because you'd be calling your voice mail, checking your email, looking at your pager and checking the voice mail on your cell phone.

Other FacilityEast members believed that advances in communication media contributed to the proliferation of meetings and the tendency to include more peripheral people in the meetings. Denise said:

> Because now it's so much easier with technology to involve people in conversations regardless of their physical location that you tend to get invited to more meetings than you probably need to. So what happens is you have more meetings and more frequent meetings, and you have larger meetings. … So the more people you involve, then there's more sidebar conversations and people talking over other people.

Still, this routine of multiple media in concurrent conversations was in widespread use within FacilityEast.

CONCLUSIONS AND IMPLICATIONS

Our study of FacilityEast suggests that the use of multiple media—in this case face-to-face, voice, various electronic tools, and paper—either in individual or concurrent conversations, creates layers of communication. In many of the examples of multiple media use above, participants deliberately and artfully combined their use of various media to share more information and create richer understandings than were possible through the use of any one medium alone.

Using Media in Layered Communication

Some of the communication interactions engaged in by FacilityEast members could stand on their own, such as asking a quick question via IM. More often, however, the additional layers of interactions that arose out of simultaneous media use allowed the participants in a meeting, for example, to move beyond just sharing information to using multiple media to strengthen relationships among at least a subset of the group members. In the example of the facility managers' meeting, IM was used by a number of participants to gripe about their shared situation and to explore how they could alter their regions, while the phone and NetMeeting were used to share information about the reorganization. At the same time, Dick and Mary, were involved in their own face-to-face discussion about the meaning and implications of the reorganization. These layers of conversational interactions facilitated by the use of multiple media added to communication complexity but provided conversational richness and supported additional communication purposes.

The media that seemed to be used together most often at FacilityEast—IM, phone, NetMeeting and face-to-face—all allowed synchronous interactions. One manager in an interview referred to all face-to-face, phone, and IM use as "face-to-face" interaction. While he made

distinctions among these when pressed, his labeling of these three synchronous media as face-to-face suggests that the differences among these media mattered less than their similarities and their ability to facilitate synchronous interactions. When used in combination, synchronous media may help create a deeper sense of participation in a conversation by allowing multiple people to communicate at the same time. The use of multiple media, especially synchronous media—with their ability to respond in real time, deal with visual representations, facilitate interactions, and convey information—may be key to the effective working of many teams, both virtual and hybrid.

Layering communication via the use of multiple media, especially asynchronous media, increases opportunities for creating innovative new ways of communicating and working with colleagues. When new potential combinations present themselves, people have to draw on their previous experiences with each of the constituent media. How people used a medium or combination of media previously contributes to the creation of a routine for future use. For instance, in FacilityEast, people used IM with their other co-located co-workers for quick questions, both work-related and social, when they were sitting at their desktops. When FacilityEast installed a wireless network and employees and contractors could wander around with their laptops, untethered from the physical network, IM became more prevalent in meetings. While IM continued to be used for quick questions in meetings, IM exchanges were also used to solidify social relationships between colleagues who were not co-located.

Using a Media Toolbox

Nardi and Whittaker (2002) note that there is unlikely to be a single technology that approximates face-to-face interaction and argue that an important issue in designing a media ecology is determining how much face-to-face interaction is needed. Focusing on face-to-face interactions as the standard when designing the mix of communication technologies within a firm, however, may cause organizations to overlook what is important in the work. For instance, FacilityEast members, and their managers at headquarters, saw a need for face-to-face interactions but they often wanted those interactions in different circumstances and with different

frequencies. FacilityEast members wanted the occasional (once every six months or so) face-to-face interaction with their managers; managers seemed to want such interactions more frequently, though budget constraints kept them from actually having more face-to-face meetings. At the same time, FacilityEast members wanted more face-to-face interactions with their clients and with their sites. While the requirement for face-to-face communication is usually discussed with regard to people, FacilityEast members worked with physical space and found the use of the face-to-face medium equally important to judging physical size and spatial distance, as it was to judging a person's reaction.

The media mix at FacilityEast was important because it represented the tools that FacilityEast members used in enacting their communication practices, with FacilityEast members picking and choosing media for many of their interactions depending on what they were attempting to do at a particular moment and what was available to them. Many of their enacted communication practices were established routines, honed over time through numerous experiences with the media, the work, and each other. For instance, FacilityEast members would often fire up NetMeeting and look at a drawing when they were unable to describe the space adequately by phone, a routine that had evolved over time was described by several of the FacilityEast members as invaluable.

We propose that, much like the view of culture that argues for "an image of culture as a 'tool kit' of symbols, stories, rituals, and world-view that people may use in varying configurations to solve different kinds of problems" (Swidler, 1986), it is useful to view organizations as having a media toolbox with a number of media technologies that can be used alone or combined, for individual or concurrent conversations, depending on what needs to be communicated and accomplished within a group at particular times in particular places. What shapes the composition and use of these media toolboxes in different circumstances is an interesting area for future research.

It is important to note that the availability of particular tools in the media toolbox and a particular set of communication routines did not automatically determine usage. Individuals

might not choose and/or bundle the "right" media for a conversation even when the media were available and there were known routines in wide use within the organization. For example, all North American Facility managers and their vice-president, located at Hardware Inc. headquarters, attended a regular weekly project meeting via phone. For one particular meeting, Dick and four other facility managers at different sites each dialed into the meeting on a Polycom phone. The vice-president and three other facility managers (one who was visiting headquarters rather than stationed there) participated from a conference room at headquarters. The vice-president started the meeting by saying "We don't need to use NetMeeting," and directed everyone to the project web site that he had set up. Facility managers, who were not in the headquarters conference room with the vice-president, were also able to read email and send instant messages during the meeting. The vice-president noted he would like to create a "dashboard" on the website to record project metrics and measures. He then unrolled a large sheet of paper with a preliminary layout of it, showing it to the people in the room with him and beginning to describe what was drawn on the paper (… "and in the upper right hand corner is a box"). The facility managers who weren't in the conference room couldn't see the paper, the description of the drawing was perfunctory, and the conversation quickly became difficult to follow with voices overlapping because the people who were in the headquarters conference room conversed with each other all at once, while at the same time referring to the drawing. Only the people at headquarters spoke while the others did not participate in the discussion.

Previous vignettes have shown that people working in Hardware Inc., especially those in the Facility department, often used NetMeeting so that people working at a distance could all access a common document and follow an explanation related to that document. The vice-president knew about NetMeeting as his quote "We don't need to use NetMeeting," demonstrated, and this meeting would have seemed like an appropriate venue for using that particular technology (since many similar Facility meetings had been run using the technology), yet he decided not to use it.

Thus, communication and work practices are not determined by the availability of particular technologies in the media toolbox or even by established communication routines but, instead, emerge from a situated process of choosing among media and enacting their use, often creating or modifying routines in the process, though these routines may be subtly altered with each use.

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FIGURE 1

Hardware Inc. Facility Organization Chart

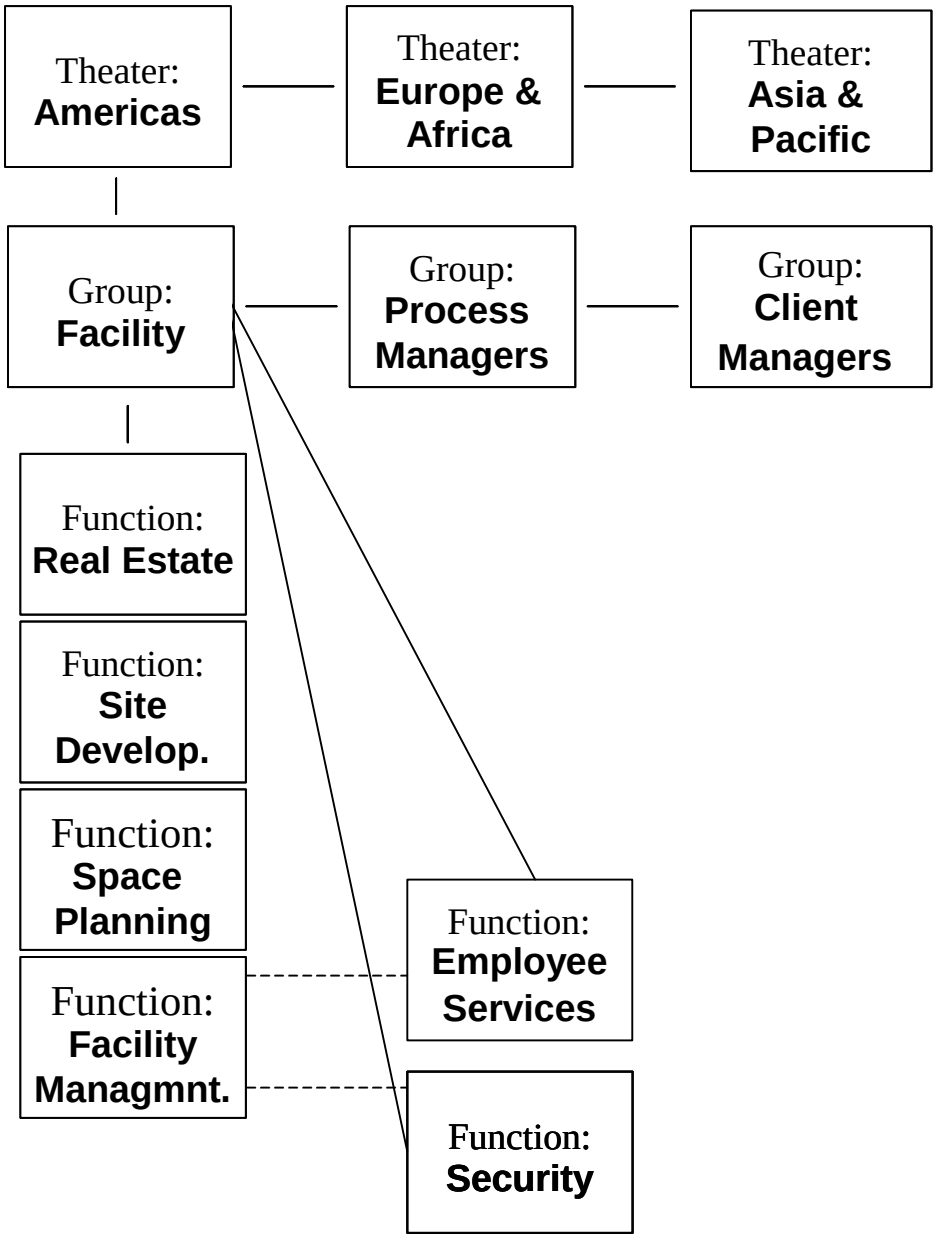


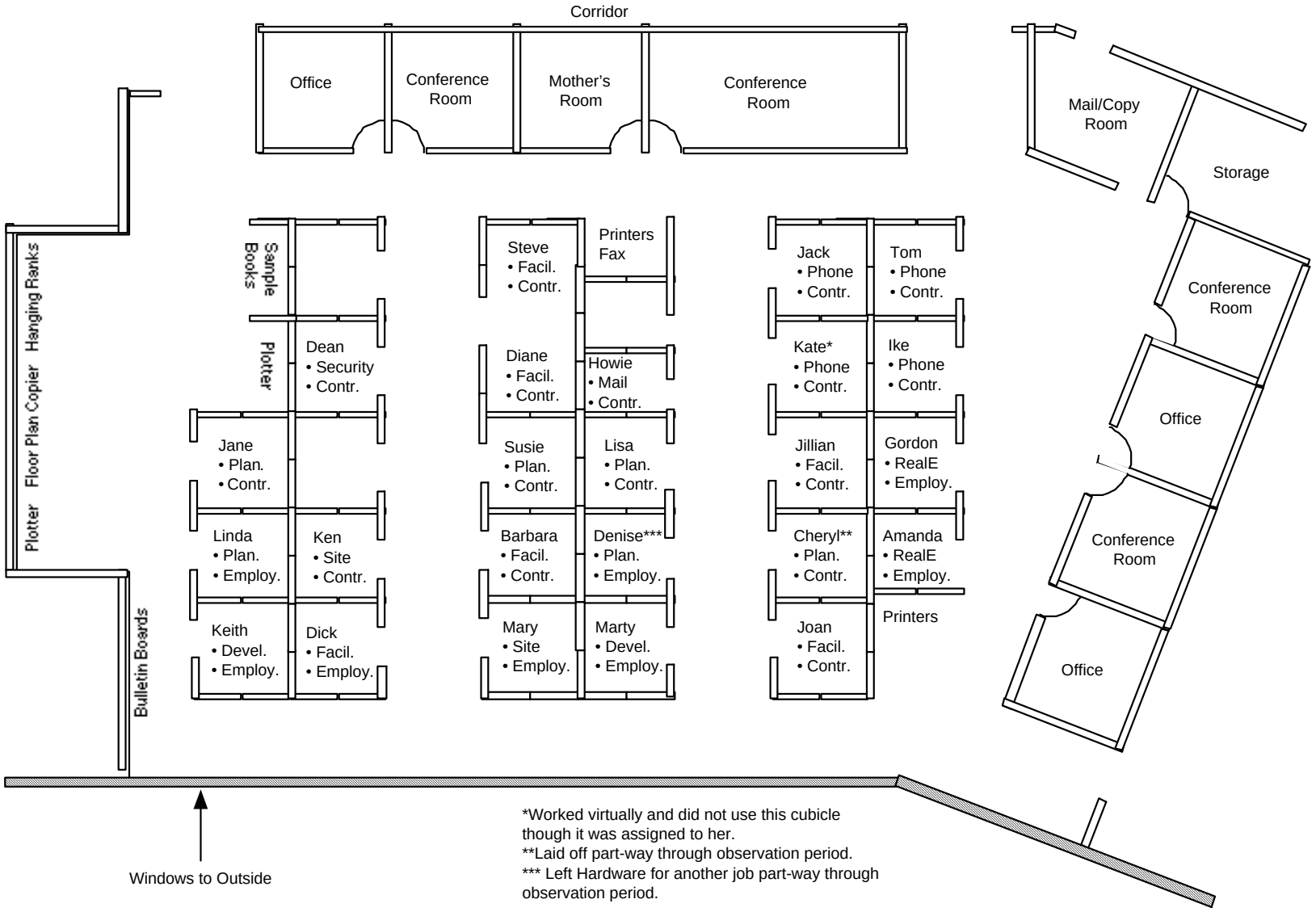
FIGURE 2

FacilityEast Employees and Contractors

Facility Department	Number of Hardware Employees	Number of Contractors	Number of Contracting Firms	Gender	Tenure > 3 Years
Real Estate	2	0	0	1 M; 1 F	1
Site Development	2	0	0	2 M	2
Facility Management	1	5	1	2 M; 4 F	1
Space Planning	2*	4	1	6 F	
Employee Services	1	1	1	1M; 1 F	1
Phone Network	0	4**	1	3 M; 1 F	
Mail and Packages	0	1	1	1 M	
Security	0	1	1	1M	
Total	8	16	6	11 M; 13 F	5

*One of the Internal Coordination employees was considered “virtual” but she was often in the office during the time of the study.
**One of these contractors was “virtual” but participated in the study.

FIGURE 3
FacilityEast Office Floor Plan



*Worked virtually and did not use this cubicle though it was assigned to her.
**Laid off part-way through observation period.
*** Left Hardware for another job part-way through observation period.

FIGURE 4

Typology of Media Use and Conversations at One Time

	Individual Conversation	**Concurrent Conversation**
Single Medium	Face-to-face Phone Pager Shared Folder	Face-to-face IM Email
Multiple Media	NetMeeting and Phone	Conference Meeting Calls using Phone, IM, NetMeeting, and Face-to-face

FIGURE 5

Use of Media in Communication and Work at FacilityEast

	Commonly used as a single medium	**Commonly used combinations of two media for individual conversations**	**Commonly used combinations of more than two media for concurrent conversations**
Face-to-face	Yes	w/Phone	w/Phone, IM, and NetMeeting
Radiophone	Yes	w/Face-to-face	
IM	Yes	w/Shared Folder	w/Phone, Face-to-face, and NetMeeting
Email	Yes		
Pager	Yes		
Phone: Desk Phone	Yes	w/IM or NetMeeting	
Phone: Polycom	Yes	w/Face-to-face	w/Face-to-face, IM, and NetMeeting
Cell Phone	Yes	w/Shared Folder or NetMeeting (at home)	
Voice Mail	Yes		
NetMeeting		w/Phone	w/Phone, Face-to-face, and IM
Video Conference (for meetings only)		w/Face-to-face	
Paper	Yes	w/Face-to-face	
Shared Folder/Web Site/Common Files	Yes	w/IM or Desk Phone	