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Hyperconnected Net Work Computer-Mediated Community in a High-Tech Organization

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Computer networks and work networks

The turn to networked collaborative work community

Computer-mediated communication (CMC) permeates organizations. The internet and internal intranets link managers, professionals, and even many line workers. These communication media provide speed, flexibility, and the ability to append germane documents, pictures, and audio.

Yet there is more assertion than evidence about how CMC actually affects work relations and organizations. Have applications such as listserves, email, and instant messaging (IM) fostered new forms of organization that are less bounded than traditional bureaucratic hierarchies? Analysts have asserted that CMC aids rapid communication and information access among employees, making easier inexpensive and convenient communication with far-flung communities of work. They argue that CMC provides the means for leaping over workgroup and organizational boundaries, communicating rapidly: locally or long distance; one to one, one to many, many to many. Coupled with a low operating cost and the ability to communicate while the other person is not immediately available, CMC can create an enhanced ability to maintain spatially dispersed, sparsely knit, and interest-based relationships.¹

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One consequence may be the rise of a new form of network organization, in which traditional hierarchical bureaucracies are short-circuited by employees who have direct access to all. Traditional solidary workgroups (and non-work communities) have featured densely interconnected relationships in physically compact spaces. By contrast, interactions in networked social systems occur with multiple others and relationships are specialized. As Manuel Castells argues:

Cooperation and networking offer the only possibility to share costs and risks, as well as to keep up with constantly renewed information. . . . Inside the networks, new possibilities are relentlessly created. Outside the networks, survival is increasingly difficult.²

Although social networks have always pervaded organizations, it is only recently that some analysts have proclaimed the proliferation of organizations structured around such networks. In Chapter 4, Jay Galbraith argues that organizational structures can be understood in terms of networks differentiated on the basis of the amount of power and authority vested in them. For Galbraith, companies today are faced with high levels of complexity and can only adapt successfully to the changes in their environments if they can create networks with differing characteristics that are appropriate for each component of a business reflecting its importance. Paul Adler and Charles Heckscher in their Introduction to this book usefully apply community theory to the nature of community at work:

The need for complex interdependence of specialists has led to the exploration of norms and processes for a goal-oriented type of cooperation which we call a collaborative community. . . . It is distinctive in three key dimensions: in its values, which emphasize contribution to a collective purpose; in its organization, which supports horizontal interdependence; and in the social character of its members which integrates multiple social identities and is tolerant of ambiguity and conflict. (p. 000)

This shift to networks affects the structure of work relations. For example, Adler and Heckscher suggest that collaborative community, based on social networks, is one of three ways of organizing work, along with hierarchies and markets. Their argument links with three contrasting models of community prevalent in analyses of non-work communities.

In the earliest model, analysts feared that community was withering away under the nineteenth—twentieth-century impact of urbanization and bureaucratization since the Industrial Revolution. More recently, Robert Putnam has argued that dual-career families and privatized

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television-based leisure have fostered a turn away from the voluntary organizations that are the putative Tocquevillian (1835) key to American democracy and community. Such 'mass society' arguments contend that the state or hyper-individualism takes the place of attenuated community ties of sociability, support, and social control.

The second model has responded to the alleged withering of community by repeatedly showing the persistence of contemporary neighborhood communities. Driven by data, ethnographers and survey analysts have documented the persistence of supportive relations.

The third model has developed since the 1970s, and has been built on social network analysis. Like Adler and Heckscher, it looks at community as consisting of social networks, rather than local solidarities. Researchers have shown that networked communities have developed—even before the coming of the internet. Like the second model, analysts have documented the persistence of community ties of sociability and support. However, unlike the local group orientation of the second model, they have shown that networked communities rarely are local or solidarities. This work suggests that while densely knit neighborhood and organizational groups may be diminishing, informal networks are flourishing under the group-focused radar. These networked communities consist of interdependent specialized relationships that are sparsely knit and often spatially dispersed. Under such circumstances, each person operates a personal community. Each person must maneuver through discrete ties to obtain social capital (rather than depending on communal support) and must construct identities out of often-fragmented sets of relationships. Wellman has recently called this 'networked individualism.'³

There are straightforward analogies to work relationships. Analogous to the first community model: are workers in organizations atomized, so that they respond individually to hierarchical direction and rewards? Although 'mass society' contentions abounded in early studies of industrialization, abundant research has been done to show the persistence of the second community model: village-like support, sociability, and control among white- and blue-collar workers. Yet, Adler and Heckscher contend in their introduction that the third 'networked' model is more appropriate for understanding work relations among the growing population of knowledge workers, especially those who work individually but interdependently within organizations. For example, organizations assign managers, software programmers, or lawyers problems to be solved, but largely leave it to them to work out their own solutions and find appropriate colleagues with whom to consult.⁴ They argue that

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in the last few decades cooperative norms have begun to crystallize in the corporate sphere in a goal-oriented form that we call collaborative community. . . . The large corporation combining bureaucracy and loyalty-based community meets its limits in organizing the production of knowledge. Bureaucracy, as has been frequently documented, is very effective at organizing routinized production, but it does very poorly at these complex interactive tasks involving responsiveness and innovation. (pp. 000,000)

Adler and Heckscher calls this 'process management' that requires 'the deliberate and formal organization of cooperation' (p. 000). They comment:

The problem of process management . . . is to coordinate interactions that span wide range of competencies and knowledge bases, and that shift constantly to accommodate the evolving nature of knowledge projects. Unlike the images usually associated with 'teamwork,' process management is not primarily about small, homogeneous, informal groups: it involves large, diverse communities and high levels of complexity. (p. 000)

Computer-mediated communication and networked work

That is the theory; what is the practice? Although there has been much optimism about the value of network organizations for information flow, collaboration, and innovation, few studies have actually observed the extent to which relationships actually span workgroup and organizational boundaries. Yet, many managers are aware of the relevance of networking and, as Galbraith shows in Chapter 4, use boundary-spanning teams to stimulate interdepartmental networks. Managers see such boundary-spanning networks as important sources of information and innovation. They have seized upon CMC networks as key media for organizing work in loosely coupled ties across departmental, organizational, and physical boundaries. However, analysts are just now coming to grips with how people in CMC-intensive organizations actually network—online and off-line.

Although there is general agreement as to the value of boundary-spanning communication, the actual functional ecology of groups and cross-cutting ties is unclear. Nor has there been much information about how the networking of communities—in both the organizational and the communication sense—affects trust and collaboration. As Galbraith points out, it is not desirable that everyone talks to everyone else in an organization. What matters is identifying communication gaps and establishing linkages to achieve desirable network structures. Where both trust

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and social control in traditional workgroups and communities have been both hierarchical and collective, networked communities rely more on dyadic, interpersonal relationships and negotiations. These take time and effort to build. Moreover, organizational power structures can be robust, so that an alternative consequence may be the use of CMC to increase connectivity while maintaining hierarchical bureaucratic structures.⁵

In this chapter, we use a case study of relations in a medium-size, high-tech firm to see how CMC actually affects communication, community, and trust in organizations. We analyze a high-tech firm of knowledge workers because its technologically savvy employees routinely and frequently use CMC. Hence, the case illustrates a leading edge of organizational form and behavior. We use social network analysis as a means to make visible the actual lines of communication within departments, between departments, and outside of the organization. We focus especially on three phenomena associated with CMC:

1. *Hyperconnectivity*: The availability of people for communication anywhere and anytime.
2. *Local virtuality*: The pervasive use of CMC for interaction with physical proximate people, even if located at the next desk at work or next door at home.
3. *Glocalization*: Constraint-free communication combining global and local connectivity. In addition to local virtualities, there often are virtual localities, in which spatially dispersed people use CMC to work and commune together on a common task or shared interest.

Debating the impact of cmc on community

A decade ago, the use of CMC was seen as neither routine nor normal, neither at work nor at leisure. Part of the early excitement over the internet was the debate over what CMC was doing to relationships.

The *dystopian* view argues that CMC hinders community—at work or elsewhere—because it disconnects people from ‘authentic’ face-to-face (FTF) relationships. It warns that CMC’s limited capability for transmitting social cues—such as voice tone, facial expressions, body gestures, and smell—diminishes people’s sense of connectivity.⁶ This view sees only traditional community as valid, ignoring abundant evidence that people carry on copious and important communications online. It echoes the now-discredited fears since the early 1800s that industrialization and technological change would destroy solidary community. In two influential

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books, Sherry Turkle argued that people created different personas, 'second selves,' online, as they lost themselves in cyberspace and forgot the real world. Voicing a then-common fear, Texas commentator Jim Hightower warned over the ABC radio network: 'While all this razzle-dazzle connects us electronically, it disconnects us from each other, having us 'interfacing' more with computers and TV screens than looking in the face of our fellow human beings.'

The *utopian* view argues that CMC fosters an enormous increase in cooperation by allowing far-flung people to interact. Rather than dystopian atomization, there would be unlimited communing and community. As John Perry Barlow, co-founder of the Electronic Frontier Foundation, dreamed early in the internet age:

[T]o feel the greatest sense of communication, to realize the most experience . . . I want to be able to completely interact with the consciousness that's trying to communicate with mine. Rapidly . . . We are now creating a space in which the people of the planet can have that kind of communication relationship.⁷

Both the utopian and dystopian views have privileged CMC, assuming that its very existence would radically affect community—at work and at leisure. Their prognostications have not taken into account the social patterning of community and trust: It is not solely a matter of easier communication. The Manichean fervor of both critics and enthusiasts has not been encumbered by evidence. Their fixation on the internet has ignored a century of research in community studies that has shown that technological change before CMC—planes, trains, telephones, and cars—neither destroyed community nor left it alone as remnant urban villages.

Well before the internet, community had become non-local—metropolitan and even transnational in scope—and partial, with people maneuvering among several networks of friends, relatives, neighbors, and workmates. Studies of non-work communities have shown that industrialization has not destroyed community, but has transformed its composition, practices, attitudes, and communication patterns away from local solidarities to far-flung, sparsely knit networks. Considering that socializing occurs beyond the boundaries of the local neighborhood, such analyses do not define community in terms of locality (or workgroup), but as social networks of interpersonal ties that provide sociability, support, information, a sense of belonging, and social identity.

Drawing upon this body of research, our own argument is neither dystopian nor utopian. Consistent with the theses developed by Wellman in previous writing and by Adler and Heckscher in the Introduction to this

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book, we argue that CMC has facilitated a mutation in the form of community. We argue that CMC facilitates collaboration that is both hyperconnected and glocal. Our findings are consistent with the findings of research in non-work communities: CMC—email, IM, chat, virtual communities, etc.—*adds on to* FTF communication with friends and relatives rather than destroying it or replacing it. Moreover, despite the globe-spanning ability of CMC, ties with neighbors seem to increase as online and offline communications reinforce each other symbiotically. Although CMC was originally envisioned as long-distance communication media, in reality it also supports *local virtualities*: physically proximate people extensively connected by CMC as well as by FTF (and the telephone) contact.⁸

Yet while people communicate online via electronic bits, they still consist of atoms embodied in flesh and blood. Hence, *glocalization* matters, with both physically proximate and long-distance communication. CMC is used to communicate between FTF visits, to share pictures and music, and to broadcast to large numbers. But it rarely replaces FTF contact where people smile, snarl, and sniff at each other, and exchange physical objects not reducible to email attachments.

Computer-supported social networks flourish in organizations where information represents a key asset, informal networks have supplemented traditional hierarchies, the flow of information has become critical for success, and communication often crosses workgroup and organizational boundaries. The underlying assumption is that geographical proximity, group membership, and simultaneous physical presence no longer limit communication and collaboration.

Changes in how people communicate have created a need to develop new models for conceptualizing, and hence measuring, community. While information and communication technologies have the potential to foster new forms of networked collaborative community in organizations, what is the reality? It is no longer sufficient to draw boxes representing workgroups and hierarchical tree diagrams representing intergroup relations.

Hence, this chapter investigates how CMC affects the networked nature of collaborative community at work. More specifically, it addresses the following questions: What is the nature of collaboration in such communities? Are work relations based on an interdependent, organic solidarity where people feel a sense of reciprocity toward other members of the community and make their information freely available? Are relations principally peer to peer or hierarchical? Are employees using CMC to

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bridge group and physical boundaries, as the champions of network organizations contend? Is communication across boundaries occurring at the expense of local, within-group communication?

Rather than isolating CMC as a separate social/communication system, we study it in the real-world context. CMC itself does not create hyperconnectivity, glocalization, and local virtuality in organizations and communities. Technologies themselves—including CMC—do not *determine* work relations. Rather, CMC provides possibilities, opportunities, and constraints for the formation and maintenance of work relations: what Erin Bradner has called *social affordances*.⁹

The social affordance perspective recognizes that CMC is embedded in a variety of ways in which workers actually communicate, including FTF and telephone communication. We show how CMC has become routinized and integrated in an organization, creating hyperconnected, glocalized, local virtualities of ubiquitous, multiple communication. We analyze how the different characteristics of specific CMCs afford somewhat different communication possibilities. For example, the store and forward nature of email supports asynchronous exchanges where sender and receiver do not have to be online simultaneously. By contrast, IM demands simultaneous presence for successful communication.¹⁰

Our principal research questions are:

1. How does a local virtuality use the internet?
2. Is hyperconnectivity associated with the lack of face-to-face contact?
3. Is hyperconnectivity associated with the weak departmental structure that characterizes a networked organization?
4. What form of work community is present in a hyperconnected organization? Do the market, hierarchical, or networked models hold?

To illuminate the situation, we use a case study of a high-tech, CMC-pervaded organization. Interactions in this organization are based on loosely coupled relationships of trust, where employees feel comfortable to ask others for help and values of reciprocity guide the exchange of knowledge. It is neither a bureaucratic hierarchy nor an individualistic marketplace. We discuss the consequences of this organization's hyperconnectivity for the negotiation of norms and rules. We show that hierarchy continues to exist, even in an organization pervaded with CMC. But we also show that the notion of hierarchy needs to be reconsidered in the context of knowledge-based settings.

KME: a case study

The organization

Knowledge Media Enterprises ('KME', a pseudonym) is an eighty-employee high-tech corporation located in a major North American city. KME was founded in 1997 and expanded during the technology boom. Its involvement in knowledge-intensive activity and its high reliance on CMC make it a good place to study collaborative community in a network organization.

KME is a post-industrial firm that offers knowledge-based services and software to clients. A principal business is the hosting and facilitation of online communities, in which employees of other organizations can exchange information and work together. Besides hosting and facilitating business-to-business online communities, KME also supports business-to-consumer online communities, where a community is created around a specific product or service. For example, online communities that form to discuss soap operas or artists are considered business-to-community.

Within KME, the exchange of information and the creation of new knowledge are essential, as the firm is under constant competitive pressure to develop and improve its services and products. Moreover, KME operates in a rapidly changing environment, recalling the adage that 'an internet year is a dog year': change occurs much faster than in many traditional industries. Its work is heavily event driven: requests came from clients or from within the firm both to develop new features for the software and new ways to host online communities of practice. To remain innovative, KME relies heavily on collaboration among employees. The firm employs skilled workers who have diverse backgrounds ranging from computer science to sales to the arts.¹¹

KME has received much media coverage since its founding. This attention both reflects and creates pressure on it. The media actively monitors new software releases or virtual community innovations for quality and sales levels. Numerous articles have appeared in newspapers, business and technology magazines, and Gartner Group business reports. Internal and external websites report on the firm's software and its functionality. Venture capitalists with a stake in the firm want to know about KME's financial and business situation. KME's innovations are watched and compared to those of other companies in the industry, increasing the pressure on managers and employees to deliver high-quality, innovative products in short periods. For example, during the data collection stage of this

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study, the firm was working on a new release of its software and the time-to-market pressures are clear.

KME relies heavily on CMC. As a high-tech firm, KME has the latest communication equipment. All employees are technologically savvy. They have high-speed internet connections and use CMC routinely. This makes KME a good place to investigate how CMC might facilitate collaborative community. With our interest in an organization already comfortable with CMCs, we deliberately chose a technology-intensive organization such as KME, rather than doing an 'adoption study' of how an organization has recently implemented new forms of CMC.¹²

Data collection

Survey: Data collection took place in 2002 through surveys, interviews, and observations. KME workers enthusiastically participated: 27 out of 28 departmental employees responded to the survey: 11 in the software development department (including 3 women) and 16 in the client services department (including 5 women). Survey participants had worked for KME an average of 28 months (range: 5–48 months). Six had a high-school diploma or less, 12 had completed an undergraduate degree, and 8 had a graduate degree. Survey participants included 3 managers, 5 supervisors, and 19 other department members.

The lengthy self-administered survey gathered information about communication at each of three sociolocal distances: within the department, with other colleagues in the organization, and with people outside the organization. At each distance, participants were asked to report how frequently they used three types of media: face to face (FTF) or telephone, email, and IM (instant messaging). Participants also reported on their social and instrumental networks. They were asked to indicate how often they sought information from and socialize with colleagues in both the software development and client services group. By focusing on the information and socializing networks of both groups simultaneously, we obtain a better picture of collaboration within and between departments. The survey also asked about employees' use of information sources, and how often they used each type of media to communicate with others in the organization and with colleagues and clients elsewhere.¹³

Interviews: Ten survey participants were interviewed by Quan-Haase in December 2002, with each interview lasting approximately 45 minutes. Five employees were recruited from each department, coming from a range of positions and roles. Semi-structured interviews provided flexibil-

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ity to follow important leads while covering the same set of questions in all interviews. Transcribed interviews were sent to interviewees for review and approval. To guarantee the confidentiality of interviewees, pseudonyms are used throughout our research reports.

Observations: Quan-Haase also observed everyday work practices to learn about how people handled CMC and how they fit it into their relationships and communication. These one-on-one observations started at 9.00 a.m. and concluded when the employee left the office (at approximately 4.30 p.m.). Through one-on-one observations of a workday, all FTF, telephone, and online interactions can be observed and recorded, including email, IM, FTF, and telephone exchanges. The start and end time, duration, and content of interaction were recorded. Although participants were given the opportunity to have private conversations, no one did.

Comparing two KME departments

Software development and client services

We compare work roles and communication patterns in two main KME departments: *software development* and *client services*. While tasks are somewhat similar within each department, they are very different across the two departments. Each department had existed for at least one year, with stable patterns of communication and use of information sources. The twenty-eight employees in the two departments comprise 35 per cent of the total workforce at KME. Data from both departments enables comparisons of the extent to which task interdependency influences collaboration and the use of CMC.

The tasks, departmental structure, and milieus of the two departments can be found in thousands of firms, except for their great reliance on CMC. We do not describe the departments here for their uniqueness, but to set the stage in the next section to show how the structure of work in these two departments intersects with their CMC use in ways that build trust, social networks, community, and social capital.

The software development department had existed for 2.5 years and consists of twelve employees. The main task of the software development department is to create software packages that are largely used by customers in combination with services from the client services department. Some customization for special customers is also done. As it was fairly new at the time of our study, more revenues came from the client services side.

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Table 7.1. Comparing the departments

	Software development	Client services
<i>Performance measures</i>	<ul style="list-style-type: none"> • Pressures: time-to-market; feature wars • Success measures: performance-to-schedule; profit, market share 	<ul style="list-style-type: none"> • Pressures: cost; threat of insourcing by clients • Success measures: acceptance, satisfaction, profit
<i>Tasks</i>	<ul style="list-style-type: none"> • Staff assigned to specific tasks • User is distant and less involved in development • Process is immature • Software development via coordination 	<ul style="list-style-type: none"> • Staff assigned to specific projects • User is involved and provides input • Process is more mature • Task accomplishment independent
<i>Cultural milieu</i>	<ul style="list-style-type: none"> • Entrepreneurial • Individualistic • Long work hours 	<ul style="list-style-type: none"> • More bureaucratic • Less individualistic • More set working hours
<i>Groups</i>	<ul style="list-style-type: none"> • Less likely to have matrix structure • Involved in entire development cycle • Cohesive, motivated, jelled • Evolving creative work • Small, co-located • Opportunities for large financial rewards • Large dispersion in income 	<ul style="list-style-type: none"> • Matrix managed and project focused • People assigned to multiple projects • Work together as needed • Rely on formal specifications • Larger, somewhat dispersed • Salary-based • Little dispersion in income

The client services department had existed as a functional department for 4.0 years and consists of sixteen employees. The client services department provides KME customers with planning and support services for communities of practice and other online communities that exchange information. Some of their clients are units of large, world-famous organizations. The department works hard and skillfully to create 'virtual localities': online places where participants would log on, come to know their electronic neighbors, and share best practices. (By contrast, physically compact KME is the opposite: a 'local virtuality.')

Table 7.1 summarizes the characteristics of the two departments.¹⁴

Tasks and performance pressures

KME, like other high-tech firms, often has intense time-to-market pressure, competing on services and the functionality of its software. The

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competition exists in both the national and international market. KME serves clients in Europe, Asia, and North America.

The primary task of the software development department is to write code. The department is expected to develop and implement new functionalities quickly. As the industry is under intensive scrutiny, software must be innovative and high quality. While all department members know how to program, each person is responsible for specific components of the software that require specialized expertise. As Linda, a programmer, reports:

We are all programmers. We all know Java; we all know database Access stuff. I probably know a bit more the Access database program than other people. I know XML and database Access. I end up doing a lot of programming.

By contrast, the client services department is expected to work closely with clients and provide them with high-quality services. The client services department consists of experts in facilitating online communities. The tasks of a community facilitator include organizing relevant information for the site, keeping the site up to date, and monitoring exchanges between community members. These exchanges can occur asynchronously (i.e. on bulletin boards) or synchronously (i.e. in real-time chat rooms). If inappropriate material is posted to the site, the community facilitator is responsible for removing it. When people behave inappropriately (flaming, swearing, etc.), the offending individuals are banned from the community. While the tasks of online facilitators are similar across online communities, the nature of the online communities can vary considerably. Some online communities are focused around a product (e.g. car, computer, or food brand), while others revolve around common interests (e.g. soap operas or movies).

The client services department does not operate under as much time and innovation pressure as the software development department. Customer satisfaction is the most important measure of success for client services, while profit and market share are more important measures of success for software development. The department's focus on client satisfaction is reflected in management's work practices, as enunciated by Bridget, a supervisor: 'I talk the most with my community facilitators since everything revolves around client satisfaction. My source of information is people that interact with our clients most.'

Thus, time-to-market pressures have a stronger effect on the software development component of the business, while cost pressures have a stronger effect on the client services. Another key difference between the

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two departments is their relationship with users and customers. The software development department has no direct contact with users or customers. They rely on intermediaries—the marketing and sales units—to obtain information about users and their requirements. By contrast, the client services department needs to be in close contact with users and customers. Employees engage in frequent discussions with clients about content development, tracking and monitoring, and the evaluation of websites.¹⁵ Community facilitators need to be attuned to the needs of their clients and develop the necessary expertise to keep clients satisfied, as Ben, one of the supervisors in the client services department, explains:

Trying to make sure that I know what the clients need from us and that is ever changing. Given the services we provide—we are kind of different and new in the business world—it is not a standard kind of service that we offer; it could be considered consulting services in a way. But, it is specific to something that still grows—a new phenomenon—and that is online marketing. It is using online communities as a marketing tool. So, constantly trying to figure out how we can make that work for the client. How are the client's needs or interests changing? How do we keep up with that, how do we stay ahead of the client on some respects, because our clients are very forward looking and always want to know the newest thing.

Cultural milieus

The work culture of the two departments is very different. The KME software development department consists of a highly qualified team of programmers that were formerly employed by companies such as Microsoft and SPSS. The work culture of the software development department is characterized by the highly individualistic work habits of programmers. Often, there is no predetermined work schedule. In the lead up to a release date, employees often work 50 hours or more per week. Two of the programmers have above-average incomes and excel in writing code and solving programming problems. One programmer described another ('Alex') as one of the best programmers in the country who is respected, and perhaps even revered, by his peers. This fits well with the description of *software cowboys* made by Constantine: brilliant geniuses who single-handedly create and develop clever new code in sleepless weekends of non-stop programming.

The presence of star software cowboys does not preclude the software development department from showing high levels of cooperation and cohesion. Employees at KME respect and value expertise, and they actively offer assistance to one other. The software development department also

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frequently socializes by going out for lunch or coffee. Many of the meetings are impromptu, taking place in a small meeting room in the middle of the office. A high level of communication and exchange between members of the software development department is necessary because of the interdependence of all components of the project. Moreover, consultation on design issues is also required because they affect the operability of the code.¹⁶

By contrast, the client services department works more independently. Community facilitators are not required to coordinate their activities because their work consists of interacting with individual clients. As such, community facilitators communicate primarily with clients and their respective facilitators. Thus, the work culture of the client services department is highly individualistic.

Departmental structure

The departments are structured differently in response to their work needs. The software development department functions as a cohesive, horizontal team.¹⁷ Although one departmental manager and two supervisors oversee the development cycle and ensure compatibility of the software components, individual department members work independently. Furthermore, all members of the department are involved in decision making for the development cycle. This is essential because individual components must be successfully integrated.

The client services department has a different structure. There are two departmental managers who are responsible each for a cluster of clients and their corresponding online communities. In addition, there are three supervisors who help oversee the two clusters and are responsible for one or two clients and their respective communities. Each online community has a dedicated community facilitator (these are the department members) assigned to oversee the needs of the client and the users. This reporting structure means it is less necessary for community facilitators to collaborate or communicate frequently with other community facilitators. In some rare instances, two community facilitators are assigned to the same online community if the workload or demand is sufficient to warrant the added personnel. Andy, a community facilitator assigned to the same client as another facilitator, explains how he and his colleague collaborate: 'Even though we have different sites, we have the same client and we are dealing with many of the same kinds of issues. We work together essentially. We support each other on things.'

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Physical spaces

The software development and client services departments are located on different floors of an office building. The floors are approximately three minutes from each other—either by elevator or staircase—creating a barrier for communication between departments.¹⁸ Each employee in the two departments has a computer, desk, and telephone.

The key places for informal FTF interaction in each department are the kitchens, the printers, the photocopiers, and the washrooms. The common areas on both floors were very similar: they had a coffee machine, a water boiler for tea, and a microwave.

The software development department is isolated from the rest of the company, a separation that programmers regard as advantageously allowing them to concentrate on their work without being distracted by noise and interruptions from other departments. The programmers also feel that their work is different from that of the rest of the company and does not require much interaction with people from other departments.

The programmers work in a large open space, with a washroom and a small kitchen next to the meeting room. The open concept was adopted to help programmers to collaborate and engage in joint problem solving. The only person who had a closed office separate from the common working space was the departmental manager. However, most of the time, the manager keeps the office door open so that people can just walk in.

The client services department has more people and occupies a much larger space that is adjacent to the organization's marketing, sales, and head office departments. Community facilitators are in cubicles, with supervisors having a large common area, and the two departmental managers sharing a private office. There is a kitchen, with a large table where employees gather for breakfast or lunch, and free breakfasts encourage collegial mingling.

Social networks

Work networks. Connectivity within the two departments has quite distinct patterns.¹⁹ The software development department is a densely knit network that resembles a core team. By contrast, the client services department is sparsely connected. Pairs of people in the software development department communicate more often on a daily and weekly basis. Moreover, people in the software development department communicate

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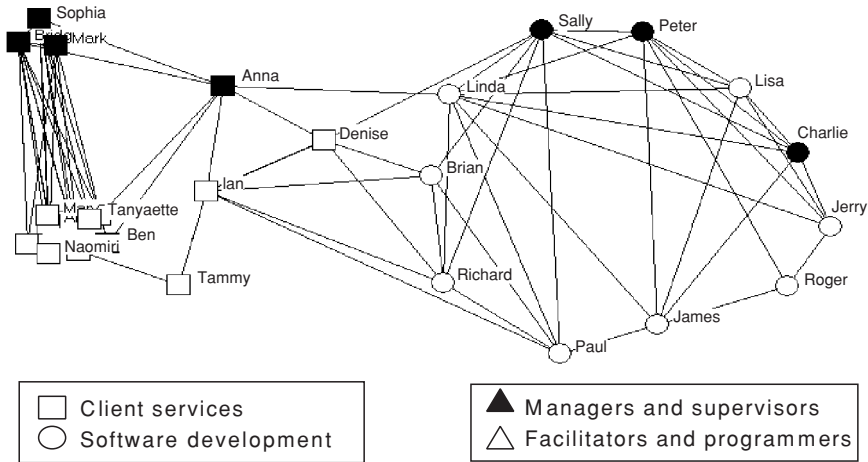


Fig 7.1 Information network—weekly exchanges

with a higher percentage of fellow department members than do those in the client services department.

The software development department is relatively egalitarian, with managers and programmers having similar communication patterns. All department members are sought for information regardless of their hierarchical position. By contrast, most information exchanges in the client services department occur between facilitators and supervisors, or between supervisors and managers. There is little communication among department members. Fig. 7.1 shows supervisors and departmental managers are clearly the most central persons in this department. Thus, managers in the client services department are more likely to be the harbingers of information in comparison to the software development department, where programmers are as likely to control the flow of information as managers.

Socializing networks. We asked KME employees how often they meet colleagues from their own department or from the client services department for lunch, coffee, dinner, and/or a drink. Like the work network, Fig. 7.2 shows that the socializing network of the software development department is more densely knit than the network of the client services department. In the software development department, there is no difference between hierarchical positions in terms of socializing.

By contrast, while department managers in the client services department are linked to each other, in the socializing network, they are not

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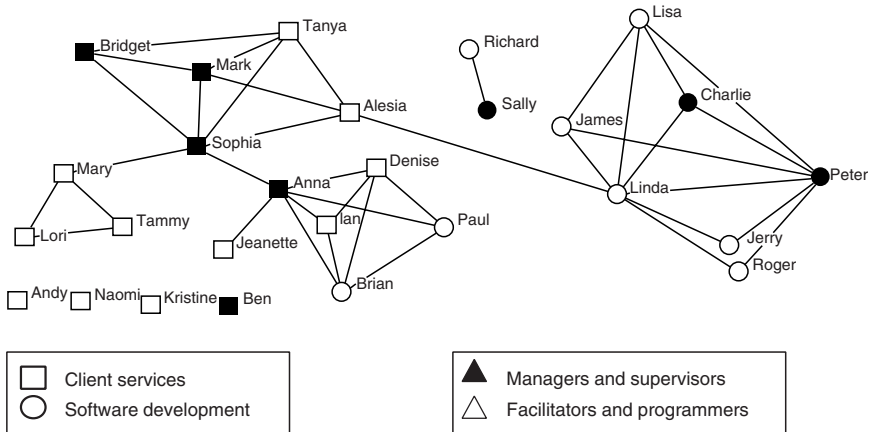


Fig 7.2 Social network—annual interactions

linked to other department members. Thus, there is a disparity between the client services’ socializing network and work network.

In the software development department, two department members are isolated from the rest of the department and only socialized with each other. Two other members do not socialize with members from the software development department at all, but instead socialize with members from the client services department. In the client services department, there are more isolates—a total of four department members. In addition, the department is divided into three clusters linked by a single person: Sophia.

In short, work exchanges on a weekly basis occur primarily within the boundaries of the departments, with few bridging ties. Information exchanges follow the hierarchical structure of communication of the organization in the client services department, but not in the software development department, where department members exchange information among themselves. In the client services department, managers and supervisors are central for the flow of information. Overall, socializing occurs less frequently than information exchange in both departments. Again, the software development department has denser socializing networks than the client services department. While socializing also primarily occurs within the boundaries of the departments, two members of the software development department are part of the socializing network of the client services department. Thus, important work and social linkages exist between the two departments.

Media ecologies in a high-tech organization

Face-to-face and computer-mediated communication

KME people communicate a great deal: informing, coordinating, and collaborating. Employees use CMC regularly as a convenient means of collaborative communication, creating a dense virtual network of exchange. Their frequent communications online have taught them whom they can trust—to respond, produce and provide reliable and valid information, and to keep confidences and commitments. Yet CMC does not function as an independent communication system at KME. CMC, FTF contact, and the telephone serve different communication purposes, often working in synergy and not in competition with one another. Although there are no formal rules at KME for which media to use for communication, employees have tacitly adopted conventions about which media to use for what purposes. FTF and the telephone are used for dealing with complex problems that require extensive discussion. Employees often use the telephone or walk to their colleagues' desks to ask questions. They see such encounters as good occasions to chat and connect on a more personal level. They often arrange via IM to meet at a nearby coffee shop for a break or go out for lunch.

When they communicate, employees share practices and jointly address problems. Employees use CMC regularly as a convenient means of collaborative communication, creating a dense virtual network of exchange. Their frequent communications online have taught them whom they can trust—to respond, produce and provide reliable and valid information, and to keep confidences and commitments.

Email and IM frequently lead to FTF encounters among colleagues. As shown in Fig. 7.3, employees often use IM to arrange to meet for lunch or coffee. Exchanges with a social purpose occur frequently between coworkers, and they create a sense of belonging to the organization, provide social support, and create meaningful work relationships. People build relationships, and their exchanges provide them with friendship, humor, and advice. Even though CMC currently does not have the capacity to transmit certain voice, visual, smell, or touch cues, it enables people to remain in contact and exchange social messages.²⁰

CMC provides employees with a more convenient form of communication because it allows for cheap, fast and continuous exchanges. Communication occurs almost simultaneously over multiple media, and not just sequentially. Employees often answer an IM and glance at their email

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Mark: coffee?
Sophie: ok, give me 5 minutes
 Mark: now is better for me
Sophie: is Maureen in?
 Mark: no
Sophie: let me finish up this email first and then we'll go
 Mark: was my comment to you [about your project] not clear?
**Sophie: it was but if you want my feedback
 you'll have to wait a few minutes**
 Mark: ok, ok
Sophie: I'll ping you in a few
Sophie: almost done
Sophie: ok, ready to go
Sophie: meet at the elevator

Fig 7.3 Social exchange via CMC

while holding a FTF conversation. Thus, employees do not switch between media and FTF for communication, but rather use various media simultaneously to interact with different people. When Charlie, a programmer, needed to fix a bug, he contacted people with various expertise and background via FTF and IM:

Today they had an error in the internal community. So, I investigated the product by trying various things and to do that I sent an instant message to some people that it had an impact on—Brian and Sally they are experts. I had to ask and I had to compare it with something else to see if I can replicate it somewhere else. And I had to work with Linda when we had to do the command line stuff. So I worked with Linda face to face. And then, it happened to be in this case Paul and Denise who were emailing me and Brian. They were in this email thread that is going back and forth. It is very specific to what the problem is, though.

James, a programmer, notes the limitations of CMC for sending complex messages. When he felt that IM could not handle his problem, he immediately switched to telephone conversations:

If there is any complexity to it, I use the phone sometimes too. The phone and face to face, it is kind of similar in that if it is at all complex, I want it that way, just to have it back and forth. Last night I started communicating with Roger with IM and pretty quickly I just wanted to call him on the phone. It would just take too long to explain everything on IM. You can do a fair amount of back and forth. [Phone] is

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better than email: there is some back and forth. So I talk on the phone because it is too complex to try and sort out over IM.

CMC does not disrupt work as much as FTF and telephone calls in the crowded KME workspaces. Community facilitator Lori feels:

I don't want to be loud because there are all these people right there. So phone is OK, but I feel I am invading other people's privacy, if I am loud on the phone. So the best way for me is email. Plus, I like to keep a written record of everything that is going on.

All media are central at KME for getting work done. Employees do not use various media at random, and they are aware of differences in the suitability of various media for different types of messages, types of communication partners, and degrees of urgency and importance. Thus, understanding the appropriateness of media use is essential for KME's collaborative community. Employees trust that others will make the appropriate media choices, and they themselves are careful when selecting a medium. They have 'media etiquette.'

Instant messaging and email

Instant messaging. CMC is not a single homogeneous medium. This is clear at KME where two widely used forms of CMC—email and IM—are used differently.²¹

KME's culture and fast-paced environment emphasizes using IM. It takes priority over email, FTF, and the telephone. This is not only a matter of individual discretion, but also an important organizational norm. Employees rely on IM because of its speed and its real-time (almost synchronous) nature. Although employees can in principle ignore IM messages, in practice there is a norm of trying to reply within two minutes. This allows the senders of IMs to receive rapid feedback, at the cost of potentially interrupting their colleagues. We noticed that as soon as an IM message appeared on someone's screen, they would glance over and read the message. As part of the culture at KME, people feel compelled to reply, even if it is only to say that they are in a meeting and will respond later. Clearly, IM often comes before FTF, despite the more abundant media cues present in FTF.

Yet, sending an IM is perceived as a relatively polite way of asking a question: The IM appears on the communication partners' screens alerting them of an incoming request, but unlike a telephone call or FTF visit, the IM message does not force others to respond immediately—the norm of rapid response can be ignored at times.

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IM serves as a meta-communication medium that affords informal talk about work, email exchanges, and other current organizational developments and concerns. As Linda notes, IM serves for chatting and discussing issues while email allows for the exchange of more detailed information:

I use IM a lot. IM is great if you have one question that you just need an answer to. When you need to explain something in detail—an outline, kind of a business case for doing something, or for getting somebody to take action—email is the best.

With people at their desktops, IM provides important information about the availability of others. In physical space, employees can see each other and communications are based on visual cues. If a person is on the telephone it is not appropriate to approach them until they become disengaged. However, when most communications occur via CMC, one never knows if a person is working on an important document, exchanging urgent IMs, writing an important email, or just chatting or daydreaming.

IM partially solves this problem by providing information about who is logged on to the communication system, usually at their desks.²² People appear as present on IM when they are logged on or they are busy typing. Again, this type of information is only based on people's presence and not on their availability. IM provides the possibility to learn if people are busy, thereby postponing exchanges for a later, more convenient time. For example, Kristine, a facilitator, uses IM to time her requests for information: 'I see that they are online, I need an answer now, I need to talk to them now, I will ping them.' As Linda, a programmer, points out: 'I just know that if you call or send an IM, you will get a faster response than email.'

As IMs are not saved or archived, they represent a more transient, casual form of exchange. Often IM is used for short social exchanges providing an opportunity to greet others or to share jokes. This promotes closeness among department members and integrates them into a web of online exchanges—both work and social. Yet, such exchanges do not occur in the same manner with all employees. The type of relationship that connects two persons influences the frequency and content of their messages.²³ People with strong ties make more frequent use of IM than those with weaker ties. This difference between strong and weak ties is greater in IM than in email, telephone, or FTF contact. Thus, programmer Linda feels comfortable sending her colleague Liz an IM, even if she may be interrupting her. However, she would not send messages to other people in the office unless it was urgent or important:

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I kind of IM Liz. I don't mind interrupting her as much. I don't think she minds it. I enjoy communicating with her: I can say: 'What is going on?' and by the way I have this technical question. Whereas other people, I wouldn't want to IM because I don't have the kind of relationship with them unless it is really important. Then I would. But, I would be less likely to IM because I would not want to disturb them without a real excuse.

IM can be disruptive, because of the information it provides about who else was around. As people knew who else was around, this created expectations for how quickly a response should come. When the expectations of rapid response are not met, conflict sometimes develops. For example, Ben sent an IM to one of his clients, but did not receive a reply. Yet, Ben knew the client was online as he could see the client on the IM buddy list. He resent the IM message the next day and asked the client whether he had received the previous message. The client responded that no IM message had been received. Ben does not believe that the message had not arrived, and he thought the client had ignored him. It is not surprising that when she wants to get a solo job done, one community facilitator, Denise, does not log on to avoid interruptions by others.²⁴

Despite these tensions, at KME, IM contributes to hyperconnectivity and facilitates collaborative community. Knowing whether other department members are connected or not—and thus potentially available for communication—creates feelings of closeness and community. This is especially important in an environment where most employees spend the majority of their time sitting in front of computer screens. IM provides the basis for routine exchanges that maintain a community of work.

Email. Email is used differently than IM. Email provides a medium to state complex matters and obtain responses that can be archived and referred to later. It is less often dashed off or used socially. Email leaves a record: It can be stored, checked at a later point in time, and forwarded to other people in the department or organization.²⁵ Linda, a programmer, explains:

I use email, if it is something that I do not need immediate response to. Using email because I can develop a well thought-through message, and the other person can respond to it at a different time. Instant messaging exists for immediate things, for quick exchanges, where you don't care about archiving. To me, I think that email should not substitute for face-to-face relationships.

At KME, email represents a more serious and instrumental (as distinct from expressive) form of communication. While IM is primarily used for one-on-one exchange of messages, email goes to a wider range of employees

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within the department and elsewhere in the organization. Employees are more likely to send email to someone with whom they do not have a close, trusting relationship because it is not as intrusive. Anna, a department manager in client services, says that unlike IM, she makes an effort for her email to be clear and logical: 'I like email because it allows you to put together a well-thought-out message. With my emails, I go back and I edit and I think about them a little bit before I send them off.'

James, a programmer, says he prefers people to communicate with him via email, which is less intrusive:

If it is trivial or it is just as easily handled by an email I'd much rather somebody communicate to me that way on email. Let me answer it on my own time. So, I extend the same courtesy to them. I don't interrupt them unless it is important or really simple, and I have a good relationship with them.

Programmer Linda makes a clear distinction among CMC forms of communication:

If you are communicating with someone who sits next to you only by email, that seems kind of a problem. Like if someone is sitting over here and you are only talking to him by email, there is something artificial about that. It does not seem quite healthy. I could say: 'Hey, what do you know about this?'

CMC has also become an electronic superego. Employees routinely keep IM and email windows open, using outstanding IM messages as a to-do list of reminders of what they need to respond to within minutes (or at most, hours) and outstanding email messages as reminders of what they need to respond to within hours (or at most, days).

Together, IM and email help shape work community and trust at KME. Propelled through CMC, employees are to a large extent connected in real time, opening the opportunity for a stream of constant exchanges. CMC has not only changed the speed of communication, but also its nature. Most obviously, both email and IM allow communication with spatially or temporally distant others, with email providing the additional ability to converse while not simultaneously logged on to the communication system. At KME, each employee would have multiple IM windows open at the same time. Moving between IM windows—and thus conversations—is common practice. Just like teenagers gossiping about each other, multiple relationships can be juggled, sometimes in small groups and sometimes in simultaneous one-to-one conversations. Each IM window represents a conversation with a distinct communication partner and addresses a different topic.

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Hyperconnectivity

KME employees are hyperconnected, using CMC and FTF at high rates in their rapidly changing, technology-intensive work. In light of the text-only nature of CMC, its predominance is somewhat unexpected.²⁶ Yet it is task complexity and interdependency that are key factors in determining group structure and CMC use. Hyperconnectivity is more pronounced in the software development department, where tasks are interdependent, than it is in the client services department, where tasks are independent.

To a great extent, communication with other employees is the basis of work at KME. Employees must obtain information; they must coordinate. Although hyperconnectivity creates new opportunities for exchange and collaboration leading to denser networks, it also creates challenges. At times, hyperconnectivity has negative effects on work processes. Each employee must deal with a large number of requests that add up on a day-to-day basis. Norms require that KME employees be available for CMC, yet employees frequently feel overloaded—and at times overwhelmed—by the number of incoming requests for information and coordination. Hyperconnectivity stops them from getting their ‘own work’ done. Their densely knit, hyperconnected networks lead to interruptions in completing tasks. Employees are constantly multitasking, dealing simultaneously with their own work demands and others’ requests for information. Employees say they do not mind being available to answer others’ information requests, but they often feel unable to control when these interruptions occur. Clearly, the ease of CMC adds to the volume of communication.²⁷

Local virtuality

Local virtuality—the use of CMC for local communication—is endemic in this high-tech organization,²⁸ where each employee has a computer terminal. Employees rely on CMC for the majority of their communications, even though they work in physical proximity. After all, they already are at their computers and staring at their screens. The time spent writing an email or an IM generally is shorter than the time it takes to lead a FTF or telephone conversation. As a consequence, workers can communicate with each of their communication partners more frequently and they can communicate with more partners. In this way, IM and email combine to create a hyperconnected local virtuality.

Despite the heavy use of CMC, KME is not a ‘spaceless place’: Locality as a physical place to meet and interact emerges as a key dimension for the

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formation of collaborative community.²⁹ At first sight, an observer might think that the fact that people are rarely interacting visibly—in meetings and informal FTF interactions—means that they are in isolation. However, they are going online to exchange emails and IMs with colleagues who are sitting next to them. In this local virtuality, fingers flying over keyboards are easier than walking to another desk or picking up a telephone. The physical setting is crowded, and people do not want to disturb others by moving about and talking. Moreover, people need to work with multiple others. CMC exchanges usually take less time than FTF conversations, allowing for a greater number of exchanges. Under these conditions, CMC is both more effective and less disruptive than FTF or telephone communication.³⁰ Communication has moved from the physical space to the virtual realm, where conversations consist of typed words.

Work relationships are often formed in the context of work itself. People collaborate on a project, work on the same account, or help each other solve bugs in the software. Andy, a community facilitator, thinks back to when he and fellow facilitator Lori developed a close and trusting work relationship:

I had chats at night where I needed more people and could not just handle it on my own. Lori worked with me on them. So we built a very strong working relationship that has remarkably, I think, carried over into the area. Now we work on completely different accounts from each other. There is no relationship between my account and her account, or very little. But we still find each other a helpful source of information and knowledge sharing, which is weird. But it is only because we have built personal contact. We turn around and talk to each other all day long about stuff. And say: 'Hey look at my... look what is going on.'

Glocalization

Is communication at KME spanning group boundaries? Because CMC facilitates communication at a distance overcoming barriers of space and time, it allows for easy and quick communication across group boundaries connecting colleagues in other KME departments and outside of the organization.

Most communication stays within a department. Employees report a mean of 285 days per year of within-department communication, which means that they communicate more than once per day, based on a 250-day work year (5 days × 50 weeks). Most exchanges within the department use CMC. Employees report communicating FTF with departmental colleagues an average of 240 days per year in comparison with 306 days per

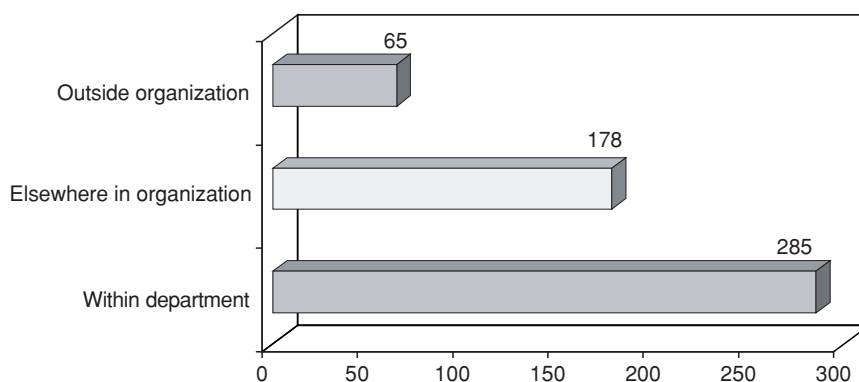
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Table 7.2. Communication at KME (days per year)

	FTF and phone	Email	IM
Within department	240	306	306
Elsewhere in organization	99	213	215
Outside organization	21	103	72

year via CMC (see Table 7.2). KME employees use both email and IM frequently and at about the same frequency. Despite the boundary-spanning 'global village' properties of CMC, KME employees use CMC more for communication within their departments than for communication outside of their department or the organization. They use email and IM more than FTF or the telephone (Fig. 7.5). Within departments, email is used 1.3 times more frequently than FTF and the telephone, and IM is used 2.1 times more frequently than FTF and the telephone. Thus, even in this high-tech organization, where employees have diverse CMC tools available to them for boundary-spanning communication, they continue to exchange information primarily with other department members.³¹

However, boundary spanning is also common at KME: a large proportion of communication is with colleagues elsewhere in the firm, with a mean of 178 communication days per year (see Table 7.2 and Fig. 7.5).³² CMC is even more the predominant means of communication to elsewhere in KME than it is within departments. Communication to elsewhere in KME follows a similar pattern as within departments: Email (213 days per year) and IM (215 days per year) are used most frequently,

**Fig 7.4** Communication within departments, elsewhere in organization, and outside organization

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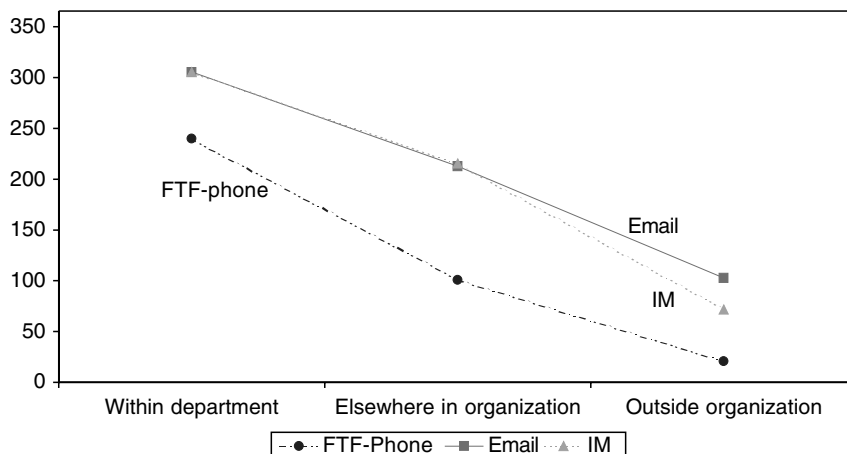


Fig 7.5 Communication by media and sociolocal distance

while FTF and the telephone are used less for communication (101 days per year each). Although less frequent than communication within departments, the frequency of email and IM contact to elsewhere in the organization is about two-thirds of within-department contact, while FTF contact drops even more to about one-half (see Table 7.2). The ratio of communication with colleagues elsewhere in KME to within-department communication is 0.62.

CMC even more greatly dominates communication patterns for contact outside of KME, with email (103 days per year) and IM (72 days per year) used more frequently than FTF and the telephone (21 days per year). The difference between CMC and traditional means of communication for outside communication is large: email is used 4.9 times more frequently than FTF and the telephone, and IM is used 3.4 times more frequently than FTF and the telephone.

As in the comparison within and between KME departments, there is a much greater drop in the frequency of using FTF contact to people outside of KME than the drop in using CMC. Email is especially used for contact outside of the organization. Thus, employees communicate primarily within their departments even in this high-tech global organization permeated with boundary-spanning CMC. However, when they do span boundaries, either to elsewhere in KME or to outside the organization, they rely heavily on CMC. KME is both a local virtuality and a glocal organization, with CMC supporting communication with customers, partners, and users who are distributed nationally and globally.

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Although the general pattern of communication is very similar in the two departments, they differ in their proportion of inward and outward communication and in their use of particular media. As is inherent in their job, the client services department is outwardly oriented. Communication with the client occurs on a regular basis as Kristine, one of the community facilitators, reports: 'I talk to someone at the client site almost every day.' Client communication relies heavily on CMC. For contact outside of KME, client services employees communicate an average of 159 days per year on email and 113 days per year on IM, but only 28 days per year by FTF and the telephone. For them, CMC supports boundary spanning and helps coordinate work with clients and partners, as facilitator Lori explains:

It is mostly just Megan that I talk to. Tuesdays I have a conference call with Megan for half an hour. . . . We communicate so often through email and IM that once the conference call comes around there is really not much else to talk about.

By contrast, the software development department communicates less frequently with people outside of KME: 22 days per year by email and 11 days per year by IM, in contrast to 10 days per year by FTF and the telephone. Although CMC makes boundary spanning possible, the type of work performed by the software development department does not call for as much boundary spanning as it does in the client services department.

Both departments rely heavily on CMC to communicate with colleagues in other departments. The client services group communicates more frequently with colleagues elsewhere in KME by email (186 days per year) and IM (232 days per year) than by FTF and the telephone (105 days per year). Similarly, in the software development group, employees communicate more frequently by email (251 days per year) and IM (191 days per year) than by FTF and the telephone (96 days per year).

The pattern of communication within departments is similar to that for communication with colleagues elsewhere in KME. Employees of both the client services and software development rely heavily on CMC for internal communication. In the client services department, the average employee emails internally 299 days per year and IMs 279 days per year, compared to 210 days per year for FTF and the telephone. In the software development department, email comprises 315 days per year and IM 344 as compared to 279 days per year for FTF and the telephone. Note that in both departments, employees are using email more than the number of workdays per year, indicating that they use email to communicate with each other even while off the premises, presumably while at home. Even

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though there is proportionally more FTF and telephone contact within departments, CMC is still used more frequently.

Five patterns are evident:

1. KME is a local virtuality, with CMC outweighing FTF and telephone conversations even though people are co-located.
2. In both departments, CMC is used more frequently than FTF and the telephone for communication. This becomes even more evident if we compare overall CMC communication—comprising email and IM—versus FTF and telephone exchanges.
3. There is a proportionally greater reliance on CMC for communicating outside of KME than for communicating with colleagues elsewhere in KME. This suggests that locality influences the choice of media as FTF and telephone interactions increase when people are co-located.
4. The practices and capabilities of people outside of KME affect the media use of KME employees. For example, KME employees use email heavily to communicate with one major client that ‘lives on email’ and never uses IM externally.
5. Differences in work function and tasks are driving the differences in communication. While CMC affords glocalized networks, it does not cause them. The types of tasks performed by the two departments also play an important role in creating different communication patterns.

Collaborative community in a high-tech organization

Formal meetings and informal exchanges

Formal meetings. Collaboration at KME operates through both formal meetings and informal exchanges. Formal meetings occur frequently in both departments. They are routinely scheduled in advance, or on an ad hoc basis to deal with emergencies. They are held in the two departments’ meeting rooms that are equipped with speakerphones and audiovisual equipment.

All employees in the software development department are customarily present during formal meetings. Ad hoc meetings are more common in the software development department because decisions made about the software can influence various components and it is considered important that all members are aware of these changes. Developers need to be up to date with changes, decisions, or problems occurring with the software. Their expertise is valued, and their input is considered relevant. This

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emphasis on participation is a key aspect of the way the software development department works as a collaborative community.³³

Formal meetings also occur frequently in the client services department. However, not all department members attend all meetings. The only ones who attend routinely scheduled meetings are those working on a specific account and the managers and supervisors. Ad hoc meetings typically take place between two or three employees. The client services department's large size makes it difficult to schedule meetings for the entire department. The lack of common meetings creates fragmentary understanding of other employees' tasks and accounts. This has led to lower levels of understanding among employees and to a collaborative community that is less densely knit.³⁴ Ben, a supervisor, explains how the lack of department-wide meetings has reduced understanding of others' challenges and problems:

We used to have a weekly meeting with the entire community management department, which we no longer have. . . . There are times when it feels like there may be things going on with Alesia and Tanya's accounts that would help me, and I don't know about them.

Informal encounters. Despite the importance of formal meetings, employees usually communicate informally to share knowledge, coordinate activities, and collaborate on a project. Most informal collaborations take place one on one rather than in groups, with one person contacting another. The most common communication is asking questions to obtain clarification or work lore about a specific matter. However, much communication is devoted to in-depth problem solving, where one person would help another make sense of a problem and think through various strategies to find a solution. A third type of communication occurs when the person originally contacted refers the questioner to others better equipped to help. Charlie, a supervisor in software development, often cycles through different sets of people and roles:

I probably would be communicating with Sally the majority of the day. Then Ian and Denise would be probably the number two and three because they normally are either helping me develop something or I am helping them. Then Alesia would probably be the fourth most because she is the one who deals with the client, so, designing or prioritizing the projects for me.

Commitment to collaborative community

Contrary to the early fears of dystopians, KME's heavy reliance on CMC has not weakened its employees' sense of community. Although CMC

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provides limited sensory cues, it nevertheless supports interpersonal trust, and active networks of socializing, information exchange, coordination, and collaboration. For example, James, one of the programmers, asked his colleague Jerry for help on an ill-defined programming problem and received a prompt response:

I looked at some of what we had in place, and it looked kind of promising, but I wasn't sure still what to do. So, then I emailed Jerry about an area that he is very knowledgeable about. And he responded within 20 minutes, probably. I had to go back and forth a couple of times over email, and I ended up calling him over the phone just to clarify some things. And then I implemented what he recommended and it worked.

Jerry responded quickly to James's request, using email and the telephone to give in-depth problem-solving advice. This close collaboration between employees reflects what Adler and Heckscher refer to in the introductory chapter of this volume as an ethic of contribution to the success of others. At KME, hyperconnected employees constantly help each other with their particular expertise, and they use CMC to pool their knowledge toward joint problem solving.

Commitment at KME is simultaneously interpersonal, departmental, and organizational. Frequent CMC has bred *interpersonal* awareness, understanding, and trust. FTF meetings and encounters provide a broad bandwidth of communication, enabling employees to assess voice tone, body language, and physical presentation of self. But while CMC does not allow people to smell each other, its highly frequent use provides a ubiquitous backdrop of communication. The combination of CMC, FTF, and telephone communication enables people to understand the concrete interests and identities of others in collaborative relationships, and to provide the communication auspices for creating and maintaining trust.

There are both strong and weak ties at KME. Opportunities to form strong, trusting relationships continue to exist in this hyperconnected local virtuality. Strong, trusting relationships are particularly relevant in the context of CMC because of the potential intrusiveness. When a close relationship links two people, interruptions are not seen as intrusive. Trust plays an important role because employees need to trust that others will use different media in appropriate ways, so that they do not unnecessarily interrupt others' work. Such computer-facilitated trust is a precursor for these active work networks. People interact more easily with those whom they trust and feel close with, and trust relationships are an important basis for knowledge sharing and joint problem solving—and ultimately, the success of the firm.³⁵

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As a *department*, the software development department is more committed to collective community than client services. Software development's small size and focus on a single goal fosters group cohesion. The developers feel they have ownership of the software, and they commit much time and effort to improving it. Software supervisor Charlie explains the need for sharing information under such circumstances:

The engineers need to talk to their partner about the module that they are working on, and documentation needs to know about every single module. Testing needs to know about every single module. Design needs to know about every single module.

By contrast, community facilitators in client services often work on different accounts. While most employees do similar work, their work does not contribute to a single effort: the success of one account is independent of the success of others. Thus, department members do not share a common goal and do not feel part of a team in the same way as programmers do. Andy, a facilitator, feels the absence:

We don't meet and we don't talk about stuff. So, it may not occur to the other community facilitators that anything that occurs with their clients may have any relevance to my client and vice versa. I think we need to be more aware of what each other's clients are like.

Nonetheless, frequent email and IM in the client services department support a sense of collaborative community where people advise and help each other. They readily share their expertise and best practices, and hyperconnectivity makes all easily reachable.

Employees in both departments are invested in the success of the *organization*. They have chosen to work in KME because it is a high-tech firm, and they believe that its products can lead to large revenues. Many of the employees identify with the firm and see their own personal success as closely linked to it. The ethic of contribution to the collective value is spurred by the involvement often found in start-up firms that struggle to find a niche in the marketplace and require the support of employees to be successful. Many KME employees had given up stable jobs in established companies with the hope that the start-up will be successful and they will directly benefit from earnings. They believe they have better chances for advancement than in established organizations, and often have potentially lucrative stock or options as part of their compensation packages. Their contribution to the collective value consists of high performance, long hours of work, and high commitment to the firms' goals. Thus, the ethic of contribution occurs through increasing the collective value as well

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as contributing to the success of others. For example, programmer Linda is so committed that:

Sometimes I just get up in the middle of the night and I am jotting stuff down, just so that I can get them out of my head. So I realize I don't have to think about them. But I am constantly thinking about the details of the job and what needs to get done. I constantly think of the things I need and then I write them down.

The commitment of employees to create a collaborative community has led to the development of a sense of identity that seamlessly merges a strong sense of individualism—based primarily on expertise—with feelings of obligation toward the organization as a whole—based primarily on collaboration and an ethic of contribution. As Adler and Heckscher suggest in the introductory chapter, work in the collaborative community consists not only of the uniqueness and high levels of expertise of workers, but also of workers using their expertise to contribute to the success of the organization. The KME employees' sense of individualism is linked to their seeing their jobs as unique and their expertise as having little overlap. The uniqueness of their jobs results from the independent types of tasks they need to accomplish. Employees see themselves as self-sufficient in that they can accomplish the tasks that are expected of them. Moreover, they have high levels of expertise that often have little overlap with that of others. They often feel that their expertise has reached such high levels that they can manage problems specific to their areas of expertise better than anyone else.

The employees' sense of obligation is a result of high commitment to the success of the organization as a whole. Employees are often working with various individuals at the same time and need to adapt to the demands of each of the projects in which they are involved. Although they are not involved to the same extent in each of the projects, their unique expertise may be a key to dealing with a problem at hand. James, a programmer, explains how he is involved in a number of projects, each demanding a different aspect of his expertise:

So, I did a little bit of that this week, reviewed some documentation that Kristy asked me to review, helped out Tom a little bit, she is making some changes to some other page. She needed some additions to the Java code and had some questions about that.

To be involved in various projects and with various sets of individuals, workers must be flexible in how they apply their expertise to a variety of demands. This creates a need to develop an identity that is simultaneously individual and collective.

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Hierarchy

When we began studying KME, we expected to find a networked, post-bureaucratic organization where people worked in shifting teams with multiple others, with little structured departmentalization and hierarchy. Instead, we found a hybrid organization, what Adler and Borys call an 'enabling bureaucracy,' where rules about work and vertical and horizontal divisions of labor exist along with high levels of trust and community cohesion. How does a high-tech, hyperconnected company such as KME reconcile collaborative, networked community and bureaucratic hierarchy?

KME has an explicit hierarchy that relates people and functions. The hierarchy provides a way of organizing individuals around work tasks as well as coordination and communication. The roles and statuses of people at KME are clearly formalized. People know what their role is, to whom they report, and what the adequate type of engagement is. Decision making takes place at the top and decisions are then communicated to employees.

Yet, KME is also an enabling bureaucracy. Rules about work and vertical and horizontal divisions of labor support rather than displace trust and community cohesion. On the one hand, employees enjoy sufficient freedom to perform their jobs without reporting constantly to their supervisors and asking for permission. On the other hand, their meta-awareness of the reporting structure—combined with hyperconnectivity, trust, expertise, and experience—allows employees to work largely independently while connected to a larger departmental and organizational enterprise.

For example, Lisa is responsible for designing the interface of a specialized search engine to seek and mine information from a large database. Her work does not require direct input from any of the other programmers and has little overlap with their roles and functions. Although most of her work is done alone with little supervision, she often asks others in the team to look at her design. Meanwhile, others are developing the database itself. While each worker takes ownership of his or her own part of the software, these components must work together. Hence, software development is a constant switch between individual work on subcomponents and group work on the whole product. The process at KME fits nicely with Adler and Heckscher's discussion in the introductory chapter about work that creates in employees a sense of ownership of the whole project—an ethic of contribution to the success of the department/organization

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as a whole—while employees continue to take responsibility for their particular work. For example, community facilitator Lori says:

I used to report to Mark, but I do not report to him anymore; he does something else. I report directly to Bridget. All that Bridget does: if there is a problem, a huge problem or an issue coming up, then I'll ask her about it. Otherwise, it's pretty autonomous. They trust me enough; I have been doing it long enough; I don't need to run to Bridget or Mark for every little problem.

Lori has worked for her boss for nearly three years: long enough to develop a relationship of trust. She can evaluate when the situation requires the involvement of the boss. Otherwise, she deals with the arising problems herself. While the work is done independently, this does not create a problem in the hierarchy because the status of the players remains clear. What changes is the amount of consultations occurring among various levels.

Moreover, the type of work done by these high-tech employees has reached such complexity that the boss often cannot give much input for dealing with a technical problem. Such circumstances preclude direct hierarchical-bureaucratic supervision. As department manager Anna points out, management need to trust and rely on their employees to provide them with the necessary information to make decisions because they are dependent on their expertise:

I have been on Ryan for a week to get me the help desk statistics in a way that I can look at them. And it has taken him this much time. Today I have started to see them. I get a little bit frustrated because I cannot get in and do it myself. And I really don't want to do it myself. So, I think the biggest thing for me is just getting people to get it to me in a timely enough fashion. So, it is more people management.

Although hierarchy and collaborative community exist side by side, one strain is an imbalance of expertise between management and employees. Programmers each have more specialized knowledge than their managers. As for client services, management has expertise with regards to the market, sales, and clients, but does not have a full understanding of the day-to-day tasks and problems of employees. In both departments, management cannot provide sufficient guidance in the execution of tasks. Employees must develop the expertise themselves, with management trusting that employees have the expertise to develop their own plan of action.

CMC supports both hierarchy and collaborative community. While CMC allows managers and employees to communicate, it is especially

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useful for communication among employees within and between departments. This is especially the case in the software development department where programmers need to be in close contact and frequently share expertise. Although the hierarchy is explicit in this department, employees communicate via email and IM with those who have the expertise they need, regardless of status in the hierarchy. Yet, employees remain aware of status differences. While this is not reflected in their interactions within the department—where people socialize and trust each other—it clearly affects their interactions with the organization's management. In this case, CMC supports communication with all employees within the department, but does not remove hierarchical structuring outside the department.

In the client services department, hierarchical position influences to a greater extent who talks to whom (see Fig. 7.1). A person's status within the hierarchy of the organization plays a key role in how messages are replied to. Employees of lower status feel compelled to reply to messages of employees of higher status because receivers of messages knew that senders are aware that they have received the message. Thus, the awareness of others' availability leads to expectations in the sender about how long it should take the recipient to reply. For example, Brian, a department manager in the client services department, received two IMs during our interview. Each time, when the message popped up on the screen, Brian glanced at his screen and quickly scanned it. Both times he excused himself and initiated an exchange that lasted for two or three minutes.

When asked what had happened, Brian replied, 'I usually do not answer messages while I am engaged in a face-to-face meeting unless they are short questions or are urgent.' Yet he answered these messages, because they were from his superior. With IM, the status of the communicator and the urgency of the message can be more compelling than the physical presence of someone FTF.

Conclusions

Social affordances of CMC

KME is *hyperconnected*. The adding on of CMC to FTF and telephone contact has created hyperconnectivity where community members—at work or elsewhere—are always connected to CMC and always available for communication. Employees can easily send an email or instant message (IM) to any other member of the organization, regardless of status or

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role. Hyperconnectivity affords new forms of collaboration, such as instant availability of contact and constant monitoring of IMs. Hyperconnectivity combines the traditional availability (and surveillance) of all-to-all characteristic of pre-industrial villages and workplaces with the flexible connectivity to socially and physically dispersed others characteristic of the networked internet age.

In this hyperconnected organization, and perhaps in many others, pervasive CMC has become the routine and practical means for contacting people within and outside workgroups, departments, and organizations. We may be observing a change in the use of CMC and traditional media unique to firms where work consists of sitting at desks. Organizations that have multiple and the latest technology available for communication may prefer to rely on CMC for communication. CMC is simply the *modus operandi* of the organization, with organizational norms outweighing social presence and message-media fit limitations.

CMC-fostered hyperconnectivity means that KME is a *local virtuality*. Most communication is via CMC, both email and IM, despite the physical proximity of fellow employees. People go online to exchange email and IM with colleagues who are sitting next to them. The high volume of CMC use, within a department and beyond it, strongly suggests that CMC does not weaken trust in this organization. It is the social structure and ethic of contribution of the organization that is important to the formation of collaborative community, and not the communication media alone.

KME is *glocalized*. Its members not only communicate by CMC with fellow department members on the same floor, but email is their predominant means of communication with people outside the organization. Rather than the utopian dream of CMC making community independent of distance, CMC has become the way to communicate, both locally and globally.

Task complexity and interdependency are key factors in determining the extent to which employees communicate with one another both via traditional media and CMC. Programmers have independent jobs, but they recognize and use each other's expertise, forming dense networks of collaboration. The KME way of working collaboratively involves the simultaneous independence of jobs combined with interdependencies. Although KME is not a thoroughly networked organization, people are often enmeshed in multiple work networks. They work simultaneously and sequentially with different members of their department.

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For example, in the client services department, people work on different accounts that function independently of one another and thus have little incentive to share best practices. This leads to more sparsely knit networks than in the densely knit software development department. The differences in collaboration between the two departments show that while CMC affords the creation of collaborative community, task characteristics also have an influence on its formation.

In a nice illustration of the Adler–Heckscher model of collaborative community, the KME way of working collaboratively involves the simultaneous independence of jobs combined with interdependencies. There is a dynamic tension between shared and individual problem solving. Workers are given clear roles to deal with assigned tasks, and they are expected to fulfill these tasks independently. Yet, frequent meetings and discussions of product development accompany these independent tasks. Shared understandings develop during these meetings, with other department members providing input into the various components of the software development task. As Sabel argues in Chapter 2, when problems reach levels of urgency, volatility, and complexity where no single person can know the whole answer to a particular question, people will use their social network to locate someone who is already solving the problem or at least has worked on a similar problem. In this way, individuals have access through their social networks to experts that can help them identify potential solutions and compare various problem-solving strategies.

What makes KME particularly effective in locating experts who can help solve a problem is that hyperconnectivity in this local virtuality creates a dense network of exchange. Frequent communication helps employees create the shared understandings that are key for effective joint problem solving. Moreover, the availability of multiple CMC and the always-connected nature of KME provide flexibility and access for employees to solve problems quickly.

Contrary to the arguments of dystopians, CMC at KME attracts the attention of employees but does not *immerse* them in their computer screens. When Quan-Haase sat with KME employees at their workstations, she noticed how they were always glancing at their screens to check for incoming messages. They frequently interrupted their conversations with her to respond to an urgent message. Yet, they were not totally immersed, as they always turned back to Quan-Haase (and others) to resume chatting FTF, picking up the continuing conversational threads.

Nor *does CMC fragment identity*, another fear of dystopians. Although KME employees vary in how they use CMC, each employee has the same

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persona online and offline. They are integrated personas, having nothing resembling Sherry Turkle's 'second self' online. Employees use CMC pragmatically as a tool and a social facilitator. They do not use CMC as therapeutic devices to get lost in cyberspace, away from the real world.

CMC at KME affords *trust*. Colleagues do not need to be in FTF contact to trust one another. There are frequent shorthand IM conversations, so much so that we marveled at their apparent intrusiveness. More structured emails are equally as frequent, with email leaving more time for thought, allowing attaching documents, and providing archives and paper trails. Emails are supplemented by FTF encounters, both formal meetings and casual conversations. It is clear that FTF contact is not the only trustworthy form of communication. In a milieu with much individual networking and little direct supervision, it is hyperactive CMC that fosters collaborative community and trust within and between departments.

Technology does *not determine* communication behavior at KME. Rather, technology creates possibilities for behavior. Norms and social structures of interdependency affect media use. For example, programmers use IM more than email, while client service employees use email. The needs of the two departments differ: there is close collaboration among the programmers and a culture that favors rapid IM exchanges. By contrast, client service people, oriented more to external relations, use the more formal email. It is the type of relationship—not the type of technology—that influences how employees interact.

Despite the fears of early pundits, the supposed limitations of CMC—low *social presence* and *media richness*—do not significantly affect communication. While people cannot physically hug online, they can maintain close social relations and offer social support. As people become technologically savvy and become routinely used to communicating over CMC, the range of their computer-mediated use expands. KME employees frequently use CMC for sociability and social support, with communication ranging from simple information messages to complex discussions.

There is *conservation of media choice* in this hyperconnected organization. People who are contacted by one medium routinely respond by that medium: IM will be answered by IM, email by email, voice-mail by return phone call, and real-time phone calls and FTF chats inherently use the same medium. Although media conservation is a strong norm, we hesitate to call it a media law, as there are enough situations where people switch from one medium to another out of complexity or convenience. It is to this limited extent that differences in media richness come into play. For example, in several instances employees switched from IM to phone to

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deal with complex situations and there were other situations where a phone call led to a request: 'Could you send me an email about that?' Media etiquette at KME is a complex product of local norms and more widespread understandings of when different media should be used. Thus, employees used more email—and less IM—when communicating with people outside of KME.

Organizational affordances of CMC

Overlaying the formal structuring of departments, KME is *networked*. It is a milieu of multiple work teams and multiple friendship networks. While networks have always been pervasive in organizations, they are now facilitated by the routinization and normalization of CMC that is making communication easier and quicker across departmental and organizational boundaries. People move in and out of different networks as needed. At KME, hyperconnectivity affords more fluid and active use of networked relationships within and between workgroups. Their links interconnect multiple networks, providing access to new information and possibly more creative problem solving. Employees work simultaneously and sequentially with shifting sets of others, in *networked individualism*: reflecting the shift of work and community structures away from solidary, comprehensive bounded groups to sparsely knit, partial social networks.

Ties in KME's networks are *neither randomly nor evenly distributed*. Interdependent work (in software development) and organizational efforts to build collegiality (in client services) creates clusters of densely knit relationships of work, and to a lesser extent, sociability. The two departments are quite different (see Figs. 7.1 and 7.2). The outwardly oriented client service facilitators connect less frequently with each other than do the programmers. Yet while the hyperconnectivity of the programmers creates a densely knit cluster of relationships, at any one time, relationships usually operate as dyads—two persons working on a problem—rather than operating in groups. Despite the networked basis of work at KME, its hyperconnected local virtuality fosters departmental and *organizational identity and loyalty*. Employees were always keenly aware of their colleagues, their organizational role, and their organization's mission.

Although networked in practice, communication at KME occurs within an organizational structure. Despite the widespread belief that CMC is fostering a wholesale transition to network organizations in high-tech firms, KME remains *hierarchical* in the form of an enabling

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bureaucracy.³⁶ Hierarchy and roles continue to exist even in this hyper-connected environment. Not all employees are equally connected to all other employees. Status differences continue to influence interactions in a computer-mediated work environment. The immediacy of responses to IM and email is driven by norms and power, as much as by technology. All employees are connected, but some are more connected than others.

Hierarchy continues to play a dominant role in relationships among workers. At the same time, the meaning of hierarchy requires revisiting. Supervision does not occur in the same way as happens in a traditional bureaucratic organization, where employees report on a daily basis to their bosses and where bosses closely surveil the work of their employees. This is possible in production types of work, but when it comes to knowledge work, employees have unique expertise that is difficult to evaluate and supervise from the bosses' perspective.

Trust and hyperconnectivity in the local virtuality of KME play key roles in terms of employee independence. Employees' experience and expertise lead to what Levin and Cross have referred to as competence-based trust, which allows employees to make decisions without prior consulting.³⁷ This is important in these types of industries where time is a key resource and involving one's boss is a burden.

The evidence provides a view that is more routinized and stable than a 'network organization' but more flexible and hyperconnected than a traditional bureaucratic organization. Unlike Adler and Heckscher's opposition of hierarchical and networked models of organization, KME is a mixture of both forms. Neither is an overlay of the others. Employees are organized into departments. These departments significantly structure their work practices, and most communication occurs within departments—on and off the internet. Yet, KME is also a network—functioning as a hyperconnected local virtuality. Within the stable framework of departments, its employees communicate frequently and widely. In this local virtuality, there is less need to go to meetings or to get up from desks. CMC provides employees with the flexibility and access to gain the information and coordination they need immediately—within and between departments. The ways in which CMC supports peer-to-peer communication within and between departments provide 'gangplanks' that facilitate informal coordination while maintaining formal hierarchical control.³⁸ In short, while KME is not a network organization, it is highly networked, with CMC networks providing the means for information and social networking.

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Notes

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1. The changes from hierarchical to networked organizations have been discussed in such texts as: Heydebrand (1989); Jarvenpaa and Ives (1994); Miles and Snow (1986); Miles, Snow, and Charles (1992); Nohria and Eccles (1994); Monge and

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- Contractor (2000, 2003); Davenport and Prusak (1997, 2000); Ward et al. (2000); Wellman (2002); Castells (1996). Sproull and Kiesler's *Connections* (1991) was one of the first books to discuss how organizations are changing as a consequence of CMC. See also Howard Rheingold's description of the online community The WELL (2000) and Bradner et al.'s (1998) portrayal of work groups on Babble.
2. The quotation is from Castells (1996: 171). See also Adler and Heckscher's introductory chapter; Adler and Borys (1996); Ahuja and Carley (1999); Castells (2000); Choo (1998); Davenport and Prusak (1997, 2000); Heckscher and Donnellon (1994); Heydebrand (1989); Jarvenpaa and Ives (1994); Monge and Contractor (2003); Nohria and Eccles (1994); Sproull and Kiesler (1991); Van Alstyne (1997).
 3. Withering away of community in mass society: Tönnies (1887/1955); Nisbet (1953); Putnam (2000); Tocqueville (1835). Persistence of community: For case studies, see Gans (1962; 1967) Grannis (1998); for a synthesis, see Greer (1962); Keller (1968). For networked community, see Tilly (1974); Wellman (1979, 1999a, 1999b); Wellman and Hogan (2004); Wellman and Leighton (1979); Fischer (1982). 'Networked individualism' is discussed in Wellman (2001b).
 4. Telework, where organizational employees work from home using CMC, takes this model one step further as employees are no longer under the visual control of supervisors. See Johnson (1999); Dimitrova (2002); Salaff et al. (1998).
 5. See the discussion of how the creation and maintenance of social relationships are a major investment for organizations in Nahapiet and Ghoshal (1997, 2000).
 6. See Cohen and Prusak's discussion in chapter 7 on 'The Challenge of Virtuality' (2001). The lack of social cues in CMC compared to FTF is discussed in Rice (1993) as well as in Fish et al. (1992).
 7. Turkle's work (1984, 1995) is based on observations of children and teenagers in the early days of CMC. Hightower is quoted in Fox (1995: 12). Barlow is in a *Harper's* symposium (1995: 40).
 8. Adler and Heckscher's introductory chapter summarizes the evidence adduced by Fischer (1982), Wellman (1999a, 2001a, 2001b); Wellman and Gulia (1999); and others. For how the internet adds on to existing forms of communication, see Quan-Haase and Wellman (2002); DiMaggio et al. (2001); Wellman and Haythornthwaite (2002); Katz and Rice (2002). For how the internet affects local use, see Hampton and Wellman (2003).
 9. This work is presented most thoroughly in Bradner's doctoral dissertation (2001). See also Bradner et al. (1999).
 10. Asynchronous communication is also starting to become more popular on IM as teenagers and adolescents leave each other messages when not online.
 11. See Bruce Bimber's *Information and American Democracy* (2003) for a description of the shift in American organizations and institutions towards rapid, event-driven processes. Also see the chapter in this book by Paul Adler and Charles

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- Heckscher, and the books by Davenport and Prusak (1997, 2000) and Davenport (1999).
12. A number of studies in the literature report on challenges that employees confront when adopting a new tool (see Orlikowski 1996; Kling and Gerson 1978).
 13. For an analysis of the use of information sources and working relationships in KME, see Quan-Haase and Cothrel (2003), Quan-Haase (2004), and Quan-Haase and Wellman (2004). The scale for the instrumental, social, and media networks was: 1='never'; 2='a few times a year'; 3='1/month'; 4='1/week'; 5='several times a week'; 6='1/day'; 7='several times a day.'
 14. For discussions of communities of practice and their relevance to knowledge sharing in organizations, see Wenger (1998, 2000); Wenger et al. (2002). The conceptual framework to compare the software development and client services departments is adapted from Carmel and Sawyer's typology (1998).
 15. For time to market pressures, see Carmel (1995); Carmel and Sawyer (1998); Dubé (1998); Krishnan (1998); Zachary (1998). For client relationships, see Keil and Carmel (1995) and Constantine (1995).
 16. The work of programmers reflects many attributes of the entrepreneurial legend: long hours, grit and determination, and high risk. (See Boorsook 2000; Carmel and Sawyer 1998; Taylor 1999.) The term 'software cowboys' was coined by Constantine (1995: 48). By contrast to the KME situation, Adler's chapter provides evidence of the industrialization of software programming: routinized, coordinated work with bureaucratically regulated divisions of labor. See also Kling and Scaachi (1982). Brooks (1974) in his investigation of how IBM developed the Systems 360 operating system documented how team behavior is the driver of software development. While this is also the case at KME, where employees work on a single software package that requires high levels of integration, not all software development depends on highly interrelated tasks.
 17. Carmel (1995) calls this a 'core team.'
 18. Thomas J. Allen (1977) describes in his studies that as people are physically further away from each other, the less they communicate and hence the fewer opportunities they have to build trusting relationships. Hillier (1996) describes how the design of a workspace influences the possibilities for communication.
 19. To investigate the instrumental networks of the two departments, weekly exchanges of information among department members and between departments are examined.
 20. Although not used at KME, internet phones provide voice contact that mimics traditional telephones. They may develop additional capacity at a later time. Desktop videoconferencing systems have been around since the early 1990s (see, for example, Mantei et al. 1991; Herbsleb and Olson 2004). There have even been prototypes of remote transmission of smell and touch (Strong and Gaver 1996).

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21. The fact that various media are used for different purposes suggests that a single dimension ranging from lean to rich is not sufficient to describe and predict media choice and adequacy, as message–media fit theory has attempted (Daft and Lengel 1986; Daft et al. 1987). Various media serve different purposes in different social contexts. Thus, while message–media fit theory is not refuted by the observations at KME, it needs to be expanded to include other relevant dimensions. In many organizations employees are now collaborating via IM, either as a complement to email or a replacement See Handel and Herbsleb (2002); Herbsleb et al. (2002); Poe (2001); Nardi (2004).
22. The first study to our knowledge on the use of IM in the workplace as a tool to identify other communication partners is conducted by Nardi et al. (2000).
23. This is in accord with the findings by Haythornthwaite and Wellman (1998) who showed that when more types of social relationships connect two individuals, the more types of media are used to communicate and the more frequent the communication.
24. Erickson and Kellogg (2000) describe how information about a user that is transmitted by a communication system can be used for making social inferences about the status of the communication partner, including inferences about awareness, availability, and accountability.
25. The need for a recorded trail of messages has increased in the USA with the passage of the Sarbanes-Oxley legislation in 2002, requiring archiving of all organizational correspondence. Folklore has it that some organizations use IM precisely because current software does not archive messages.
26. Although ‘hyperconnected’ is not a newly coined word, we give it a new meaning as social systems in which people are always on: available for communication anywhere and anytime. The word is rarely defined. A search on Google provided a number of hits and multiple usages for ‘hyperconnected.’ Some websites refer to a use in mathematics. In the context of technology, hyperconnected is used to refer to the connections between websites. Biz Stone (2004) uses ‘hyperconnected’ to refer to the linkages between weblogs. *Wired* magazine (2002) used the word to describe children who are born in the digital age. The pervasiveness of hyperconnectedness at KME calls into question message–media fit theory which argues that the characteristics of media lead to different media choices (Daft and Lengel 1986; Daft et al. 1987). Messages that are complex or equivocal are transmitted via rich media, such as FTF and the phone, because lean media, such as email, are not adequate.
27. These findings are similar to those of a study of interruptions and availability in managerial jobs that found that managers want to be accessible to others, yet maintain control over these interruptions (Hudson et al. 2002). See also the experiment done by Dabbish and Kraut (2004) showing that frequent monitoring of availability displays affects attention and Eppler and Mengis’s guide to overload research (2004).

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28. 'Local virtualities' is not new. We use the term here to describe local work settings where people are physically near each other and use CMC to exchange information, share best practices, and socialize. See Quan-Haase and Cothrel (2003) for a more detailed description and a more extensive discussion of the emergence of local virtualities at KME. The term 'local virtuality' also has been used in the study of rural communities, where it is defined as the use of email as a communication tool among non-anonymous parties and contrasted with global virtuality, which refers to exchanges among anonymous parties (Koskikallio 2002).
29. Manuel Castells argues that information and communication technologies create spaceless places where information is stored, shared, and exchanged in virtual space. He contends that even in a technological and networked society, place continues to be a relevant dimension for the formation and maintenance of culture.
30. CMC is usually thought of as an alternative way of communication for long-distance, boundary-spanning exchanges (see Sproull and Kiesler 1991). Among the few studies of IM at work are Nardi et al. (2000). At KME, CMC is used for local exchanges as a result of a crowded workspace and ease of use.
31. The original 7-point scale has been transformed into days per year: 'never' = 0; 'a few times a year' = 5; '1/month' = 12; '1/week' = 52; 'several times a week' = 130; '1/day and several times a day' = 365. Much social network research has shown that while specific metrics of communication frequency tend to be unreliable, comparative metrics tend to be valid. The ratios have been obtained by calculating the proportion of communication between distances. For example, the ratio 'Colleagues Inside Organization/Work Group' is $178/285=0.62$. In this example, the mean days per year communication with colleagues elsewhere in the organization is divided by the mean days per year communication within the workgroup. For more details on glocal communication in KME, see Quan-Haase and Wellman (2004).
32. Robin Teigland's (2000) investigation of a high-tech firm showed that external sources of information help programmers find creative solutions to their problems, in particular online communities of practice that span the globe. External sources are reported to be critical as key information is often not available within the department or organization. Employees at KME similarly report using external sources of information when critical knowledge is not available within the organization and relying on CMC to access these external sources.
33. The high degree of collaboration among the software development department reflects previous arguments that the most important factor in software development is the team interaction, which has been referred to as 'peopleware' (DeMarco and Lister 1987; Constantine 1995).
34. Cohen and Prusak (2001) see the creation of shared understandings among coworkers as a key organizational process. They see shared understandings as a

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prerequisite for the development of trust. Unless people can develop shared understandings, it will be difficult for them to trust each other.

35. Cohen and Prusak (2001) refer to the sum of relationships among coworkers that facilitate the flow of resources (information, knowledge, social support, etc.) in a firm as social capital. Social capital constitutes the key factor for success in a knowledge economy. See also Adler and Heckscher's introductory chapter for a discussion of trust and community in organizations.
36. In enabling bureaucracies, procedures provide organizational memory encoding best practices and providing a stable environment for innovation (Adler and Borys 1996). See Wellman (1988) for a discussion of why ties in networks are never randomly distributed.
37. Levin and Cross (2004). See also Adler and Heckscher's introductory chapter and Adler and Borys (1996).
38. The notion of cross-cutting, coordinating 'gangplanks' comes from Fayol (1949) and is developed as a social network concept by Friedkin and Johnsen (2002).