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Communication Processes for Virtual Organizations

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Abstract

Communication is fundamental to any form of organizing but is preeminent in virtual organizations. Virtual organizations are characterized by (a) highly dynamic processes, (b) contractual relationships among entities, (c) edgeless, permeable boundaries, and (d) reconfigurable structures. Relative to more traditional settings, communication processes that occur in virtual contexts are expected to be rapid, customized, temporary, greater in volume, more formal, and more relationship-based. To glean insight into communication processes for virtual organizations, we draw on the rich body of literature on synchronous and asynchronous electronic organizational communication. The vast set of empirical findings regarding mediated communication can foreshadow how communication will change as firms "go virtual." Six areas of electronic communication research provide implications for the major aspects of virtual organization design: (1) communication volume and efficiency, (2) message understanding, (3) virtual tasks, (4) lateral communication, (5) norms of technology use, and (6) evolutionary effects.

Introduction

Few topics have received more attention in the management literature of recent years than that of virtual organizations. Articles abound on the possibilities of virtual meetings, work teams, offices, factories, firms, and alliances. Given the burgeoning interest in this emerging phenomenon, it is surprising that very little empirical research exists on virtual organizations. Especially lacking are studies of communication processes within virtual organization settings. To help remedy this situation, this Special Issue provides an early window into several important communication processes that occur in virtual contexts. We are pleased to provide readers with a compendium of six articles that, collectively, advance current knowledge of communication processes for virtual organizations. Both single and multi-firm studies are included here, with analyses covering such diverse topics as communication content, communication structure and effectiveness, tradeoffs in electronic and face-to-face relationships, and the use of communication in formation of organizational identity. All of the studies include rigorous analysis and careful measurement of communication, and all take place within naturally occurring organizational contexts, not laboratory settings. The Special Issue is based on two key premises: (1) technology, organizational structure, and communication patterns are all tightly coupled, and (2) organizational form and communication systems co-evolve, which implies that the meaningful study of one requires an accounting of the other (Koza and Lewin 1998). A wealth of literature on technology and organizations has demonstrated the plausibility of these premises.[1] Beginning with these assumptions the papers in this Issue move forward to study how communication processes and organizational design interplay in the new, "virtual" enterprise.

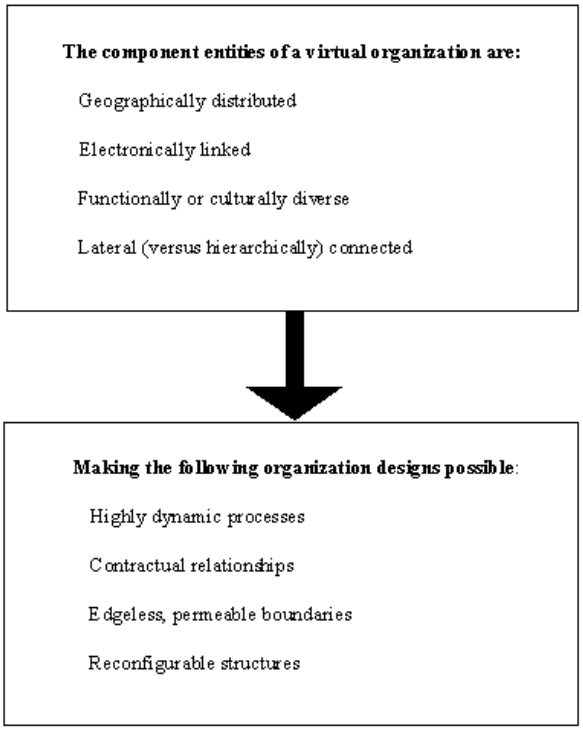
Virtual Organizing

A virtual organization is a collection of geographically distributed, functionally and/or culturally diverse entities that are linked by electronic forms of communication and rely on lateral, dynamic relationships for coordination. Despite its diffuse nature, a common identity holds the organization together in the minds of members, customers, or other constituents. The virtual organization is often described as one that is replete with external ties (Coyle and Schnarr 1995), managed via teams that are assembled and disassembled according to need (Grenier and Metes 1995, Lipnack and Stamps 1997), and consisting of employees who are physically dispersed from one another (Clancy 1994, Barner 1996). The result is a "company without walls" (Galbraith 1995) that acts as a "collaborative network of people" working together, regardless of location or who "owns" them (Bleeker 1994, Grenier and Metes 1995, Hedberg, Dahlgren, Hansson and Olve, 1997). As an example, Lockett and Holland (1996) describe Barclay's virtual global bank. This entity is a new global network created by linking together extant networks of smaller, regional banks. Customers of the regional banks now have the feel of being a part of a large global bank because electronic media bring them the worldwide services of Barclay, though they remain members of the smaller, regional banking entity. In this way, tensions between global and local are reconciled, and smaller groups or firms can exist within larger entities and realize their advantages (Monge and Fulk, 1999).

Relationships within the virtual form are tenuous. In fact, a key implication of virtual organizing is that these forms are more reconfigurable, their boundaries are considerably more blurred, and their relationships are more likely to be contractual than traditional forms (Jarillo 1993). Greater switching of tasks, roles, or work assignments is also typical in virtual organizations. This allows what Mowshowitz (1994) calls "combinatorial freedom," or the ability to dynamically allocate work across people or subgroups depending on workload demands. In some cases, the entities composing the organization may participate in several virtual organizations simultaneously and the virtual organization may not have legal existence (Cooper and Muench 1997). Davidow and Malone (1992, p. 7) describe the implications of the virtual form: "unlike its contemporary predecessors, the virtual corporation will appear less a discrete enterprise and more an ever-varying cluster of common activities in the midst of a vast fabric of relationships."

To summarize, the components (individual workers, teams, departments, units or firms) that make up a virtual organization are geographically distributed, functionally or culturally diverse, electronically linked, and connected via lateral relationships. These attributes enable the organization to dynamically modify business processes to meet market demands, to coordinate via formal and informal contracts, to define the boundaries of the firm differently over time or for different customers or constituencies, and to re-arrange relationships among components as needed. Figure 1 summarizes the attributes of virtual organizing and the implications for organization design. It is important to note that these attributes can be applied to employee-employer relationships, to teams, to firms, and to inter-organizational arrangements.

Figure 1. Summary of the attributes of virtual organizing



Few pure virtual forms exist today (Dutton, 1999). Instead, aspects of virtuality occur in many business enterprises. For example, although most companies still maintain a divisional structure, they increasingly are forming external relationships with other firms in the form of strategic partnerships, alliances, and outsourcing contracts (Mowshowitz 1994, Nohria and Berkley, 1994)[2]. Likewise, cross-organizational teams are still rare, but teams inside firm are becoming more geographically distributed and cross-functional (Ancona and Caldwell, 1992). In addition, rapid advancements in telecommunication technologies have enabled more telecommuting and cooperation among physically distributed employees (Barner 1996). These trends suggest that firms are acquiring more virtual characteristics than in the past. Even firms that may not look virtual at the surface are organizing selected activities and processes virtually.

Because purely virtual firms are still rare, the processes for developing virtual organizations and the eventual impacts of virtuality are still unknown. Proponents of virtual organizing extol the benefits in terms of greater adaptability, faster response time, and task specialization, while critics argue the potential downsides, including greater conflict, decreased firm loyalty, and higher probability of catastrophic effects (see Burris 1993, Chesbrough and Teece 1996, Davidow and Malone 1992). From a communication perspective, both positive and negative attributes might be envisioned. For example, greater geographical reach of the firm might be enabled via electronic communication, but the firm also may struggle with maintaining a coherent identity. Similarly, more participation in discussion by larger groups of people may be possible, but information overload may be a burden to participant; and more efficient communication may be possible but so might greater alienation. Realistically, what will virtual organizing bring? Specifically, how will changes in communication processes support virtual organizations and, in turn, be changed by virtual processes? While exploring these issues, it is important to keep in mind that the virtual organization concept is bound up in our social

fascination with the future – the coming of a new century and our collective imagination for new ways of doing business (Barner, 1996). The virtual organization provides a metaphor for considering an organization design that is held together, literally, by communication.

Communication in Virtual Organizations

Communication is fundamental to any form of organizing, but it is preeminent in virtual organizations. Without communication, the boundary-spanning among virtual entities would not be possible. Electronic communication enables parties to link across distance, time, culture, departments, and organizations, thereby creating "anyone/anytime/anyplace" alternatives to the traditional same-time, same-place, functionally-centered, in-house forms of organizational experience (O'Hara-Devereaux and Johansen, 1994). Electronic communication loosens constraints of proximity and structure on communication, making it possible for spatially or organizationally distant parties to exchange messages with one another (Feldman 1987). Further, electronic communication provides an opportunity to signal interest in forming connections that otherwise would be difficult or impossible to maintain (Fulk et al. 1996). In this way, communication is not only the *trigger* for virtual relationships but also can be the *outgrowth* of them (DeSanctis, Staudenmayer and Wong in press). New exchanges between parties, or new relationships, can occur as a result of established connections among distributed entities (Monge et al. 1998). Indeed, one of the hopes for virtual organizations is that new connections among entities will result from lateral boundary spanning and blending of expertise (Davidow and Malone 1992). According to this view, the real power of the virtual form is realized when relationships among electronically connected people or firms produce new and/or qualitatively different communication that yields product or process innovation (Ring and Van de Ven 1994).

Communication in the virtual form is expected to be *rapid* and *customized* in response to customer demands (Davidow and Malone 1992). This implies that communication content and direction are likely to be more *temporary*, as links between organizational entities are formed and dissolved over time (Monge and Contractor in press). To the extent that lateral relationships in the virtual form substitute for hierarchical channels, *greater volume* of communication should occur, as two-way exchanges among a greater number of people are more likely. To the extent that communication volume is greater, there may be pressure to make some communication more *formal* or programmed in order to gain efficiencies and bring routine to otherwise customized work. Simultaneously, some communication is likely to become more *relationship-based*. Parties may seek a relational basis for transactions so that intimacy can be created in the face of distance, and trust can be established and maintained. Personal relationships and informal contacts are known to be more powerful than formal structures or reward systems in lateral organization designs (Joyce, McGee and Slocum 1997). Consequently, a likely tension in the virtual form will be simultaneous needs for more and richer communication, on the one hand, and pressures for greater transaction efficiencies, on the other.

The exact nature of communication processes in virtual forms, their antecedents and consequences are, of course, unknown as of yet. However, it is possible to glean some insight from the rich body of literature on synchronous and asynchronous electronic organizational communication.[3] Communication in the virtual organization certainly will become more *electronically mediated* than in the past, and the vast set of empirical findings regarding mediated communication can foreshadow how communication will change as firms "go virtual."

Implications of Electronic Communication Research for Virtual Organizations

Six areas of electronic communication research provide implications for the four major aspects of virtual organization design: (a) highly dynamic processes , (b) contractual relationships among entities, (c) edgeless, permeable boundaries, and (d) reconfigurable structures. Table 1 highlights some of these implications.

Table 1. Major results of research on electronic communication and some implications for virtual organizations.

Research on Electronic Communication	Implications for Virtual Organizations
1. **Communication volume and efficiency** - In electronic communication settings, volume tends to increase and efficiency tends to decrease. 2. **Message understanding** - Message bias decreases but comprehension is more difficult (relative to face-to face). Impression formation takes longer. Social context is critical.	**Highly dynamic processes** - Managing communication load and meaning will be difficult as business processes change repeatedly. Message understanding may go down (at least initially) when processes change. We can expect simultaneous pressures to routinize and personalize communication.
3. **Virtual tasks** - Some tasks are performed less effectively when done electronically; for example, consensus formation.	**Contractual relationships** - Some tasks may not lend themselves to execution across boundaries; design of contracts may have to vary by task, with some more formal (legal) and others more informal (psychological).
4. **Lateral communication** - broader, more diverse participation is likely; less domination and hierarchy in electronic communication (though these are not entirely eliminated) 5. **Norms of technology use** - styles of technology use emerge in individuals, group and organizations	**Edgeless, permeable boundaries** - More boundary spanning is likely; broader, more functionally and culturally diverse parties will communicate. Conflicts are likely if communication norms that are formed in different locations are not compatible.
6. **Evolutionary effects** - Impressions of others, impression management, and the degree and type of relational communication all change over time. Interpersonal relationships deepen. Norms develop.	**Reconfigurable structures** - Reliable communication norms may be difficult to develop if redesign occurs too rapidly; use of communication histories may help to shorten evolutionary time periods following redesign.

When reviewing these six literatures, it is important to keep in mind that most findings are based on the study of electronic mail and computer conferencing systems rather than other forms of electronic communication, such as group voting, decision modeling systems, document management systems, or electronic data interchange. Further, most of the research compares electronic communication to spoken language, especially face-to-face communication, despite the fact that electronic communication has many properties similar to written language (Ferrara, Brunner and Whittemore 1990). Like face-to-face conversation, electronic communication is interactive, but like document preparation electronic communication is typically edited. As a result, behavior in electronic communication settings takes on characteristics of both document writing and informal speech (Wilkins 1991).

1. Communication volume and efficiency

Compared to face-to-face communication, most studies find that implementation of electronic communication increases the overall amount of communication (Hiltz, Johnson, and Turoff 1986). Where research has shown that communication has decreased, the result has been explained in terms of reduction of back-channel information such as speech acknowledgements (e.g., "hum?" "Uh-hmm. " See O&#65533;Conaill O&#65533;Conaill, Whittaker and Wilbur 1993) and social greetings (Sarbaugh-Thompson and Feldman 1998). There is no doubt that people perceive significant differences in communication channels (Zmud, Lind and Young 1990), but the hierarchy of preference is not clear. For example, some authors report a general preference for face-to-face and telephone over computer-based conversations (e.g., Murray 1991), while others find that people choose media based on convenience (Straub and Karahana 1998). Assuming communication volume goes up in virtual organizations, intense pressures for communication efficiency should also occur. But the research suggests that gains in communication efficiency for a given task, especially problem solving tasks, may be difficult to

achieve electronically. The literature strongly suggests that problem solving and task completion are not faster when electronically mediated. Further, face-to-face meetings are faster (Gallupe and McKeen 1990, George, Easton, Nunamaker and Northcraft 1990, Siegel et al. 1986, Weeks and Chapanis 1976, Weisband, Schneider and Connolly 1995, Williams 1977) even where tasks are low in complexity (e.g., Dennis and Kinney 1998, Straus 1996). Voice-based modes of electronic communication, in particular, are efficient for task completion even though people use twice the number of words to communicate than in pure text (Chapanis et al., 1972). It may be that the addition of high-speed voice capability to electronic mail will yield efficiency gains for organizations in the future, but for the time being the research is not encouraging in terms of the ability of electronic communication to reduce communication volume or improve task efficiencies such as reducing product development cycles. Achieving the kinds of efficiencies that are needed in the dynamic process design of virtual organizations is going to be a challenge, indeed.

2. Message understanding

Successful communication requires the establishment of mutual knowledge, and parties use physical and linguist co-presence to make inferences about one another's knowledge (Hollingshead 1998). This implies that lack of face-to-face contact in electronic communication may negatively impact message understanding, but the literature is confusing on this point. Electronically mediated groups have been found to have more difficulty establishing meaning of information and managing feedback in discussion. But it has also been shown that removing visual channels from conversation does not significantly disrupt conversational control and understanding (Marshall and Novick 1995). In fact, there may be some value in reducing the visual channel in interaction. For example, Straus and Miles (1998) demonstrated that evaluations of others (e.g., interviewers evaluating job applicants) are less stereotyped and more valid when visual observation is removed from communication. The implication is that removal of visual cues may actually improve the quality of message understanding, at least in some cases, by removing the distraction of irrelevant stimuli.

The key to effectiveness in interaction is strong maintenance of mutuality of the conversational model (Marshall and Novick 1995). Some studies show individuals take longer to form impressions of one another when conversing electronically because it takes longer to decode social cues (Sproull and Kiesler 1986, Walther 1993). Nevertheless, mutual understanding via electronic media is certainly possible. In addition to physical and linguist co-presence, participants in communication also use their community membership to make inferences about one another's knowledge. Parties apply the norms of social context to interpret messages and respond accordingly (Ferrara et al. 1990, Spears and Lea 1994). This means that, compared with face-to-face interaction, the social and normative context may be of even greater importance in computer-mediated communication. Given sufficient contextual information, mutual understanding can be very high in electronic communication. Parties can become highly cohesive across distances (Abel 1990), and electronic conversation can evolve to take on the attributes of a social community (Wilkins 1991). The implication of this line of research is that, despite pitfalls, electronic communication can support effective relationships among parties. The key is to identify the specific contextual conditions that facilitate effective relationship maintenance. To the extent that mutual understanding can be achieved via electronic communication, the implications for virtual organizations are positive. As virtual organizations form and re-form their business processes, they would do well to provide rich contextual information to communicating parties; this could heighten message understanding and shorten the time that might otherwise be required to establish mutuality of the conversational model.

3. Virtual tasks

Researchers have invested considerable effort in isolating the conditions under which electronic communication is most effective. A number of years ago Daft and Lengel (1986) proposed that as channel capacity decreases from face-to-face to telephone to computer-based systems and memos, the medium becomes less rich. They proposed that for equivocal tasks, face-to-face meetings should be used, and for unequivocal messages lean media such as written memos should be used. Their theory has not been supported by the research data, however. For example, a number of studies report no superiority of video communication (greater channel capacity), over audio or text-based media (less channel capacity) (e.g., Kasper and Morris 1988, Marshall and Novick 1995); and matching channel capacity to task equivocality has not been found to improve performance (Dennis and Kinney 1998, El-Shinnawy and Markus 1997). Nonetheless, the belief that face-to-face interaction is more powerful than mediated interaction continues to exist in popular writing on virtual organizations.

Zack (1993) concluded from a case study that the face-to-face mode of communication was

appropriate for building a shared interpretive context among parties; conversely, computer-mediated communication was more appropriate for communicating within an established context. But in many other studies the "task-medium fit" hypothesis has not been supported (e.g., Chapanis et al. 1972, Krueger and Chapanis 1980, Weeks and Chapanis 1976.). Marshall and Novick (1995) point out that modality can influence task more than the other way around. In their study, people were more task-oriented on the telephone than face-to-face, and modality influenced the weighting of task goals. If task complexity is, in parallel fashion, influenced by medium, then the core rationale underlying the task-media fit hypothesis is seriously undermined.

About the only consistent finding in the empirical literature with regard to task and media is that groups are more effective in divergent thinking tasks when communicating electronically rather than face-to-face, especially (but not only) if the communication is done anonymously. Thinking convergently, resolving conflict, or reaching consensus, however, is better done face-to-face than electronically (Barefoot and Strickland 1982, Gallupe, DeSanctis and Dickson 1988, Hiltz et al. 1986, Watson, DeSanctis and Poole, 1988, Valacich and Schwenk 1995, Weisband 1995). In other words, electronic communication facilitates information sharing but can make consensus formation more difficult in time limited contexts. George et al. (1990) and Weisband (1995) explain that face-to-face groups can more readily reach understanding and sense-making of information than electronic groups. The implication is that certain organizational tasks, or types of work, may be more effective when performed in virtual mode than others; in particular, exchanges involving knowledge elicitation or sharing may more readily lend themselves to the virtual mode than those involving consensus formation or conflict resolution. This puts limits on the kinds of work that might be managed via external, contractual relationships among entities in the virtual network. Further, it suggests that some tasks may require more structured or formal relationships when managed across boundaries whereas others might be effective with less structured or formal relationships. There is a great need for research that isolates the task conditions that are most effective in virtual settings as well as the kinds of contractual arrangements that work best with a given type of task.

4. Lateral communication

Perhaps the most encouraging result from the literature is the demonstrated capability of electronic communication to support lateral communication and broad participation across social groups. Virtual organizing presumes that coordination occurs less through hierarchy and more through transactional exchange and network relationships, thereby enabling faster, more customer-responsive information flow (Joyce et al. 1997, Venkatraman and Hendersen 1998). Numerous studies report that parties communicating electronically are less prone to domination by high-status members than face-to-face groups; electronic groups also display greater equality of participation (Chidambaram, Bostrom and Wynne 1991, Dubrovsky, Kiesler and Sethna 1991, George et al 1990, Nunamaker, Applegate and Konsynski 1987, McGuire, Kiesler and Siegel 1987, Sproull and Kiesler 1986, Siegel et al 1986, Straus 1997). Of course, these patterns are not guaranteed, and some studies fail to find the expected flattening of communication hierarchies (e.g., Jarvenpaa, Rao and Huber 1988, Poole, Holmes and DeSanctis 1991, Wilkins 1991). Still, electronic mail, in particular, has been shown to complement general work networks and provide more diverse, participative and less formally aligned relations (Bikson and Eveland 1990, Rice 1994). In one study Hinds and Kiesler (1995) reported on electronic communication patterns of technical and administrative employees within and between departments of a large telecommunications firm. They discovered high levels of lateral communication and inter-departmental communication and a notable preference for synchronous technologies to support lateral communication. Consistent with prior findings on influence of social norms, they reported more boundary-crossing communication in less hierarchical work groups. Overall, the findings of this literature support the notion that electronic communication can enable boundary spanning among culturally or functionally diverse parties of virtual enterprises.

5. Norms of technology use

Early on, researchers thought that electronic communication would be stripped of social context cues and would tend to be task-focused rather than relational, and free-wheeling rather than socially controlled. (For example, see Kiesler 1986, Sproull and Kiesler 1986.) But more recent studies show that relationship-oriented communication can be high in electronic media settings (Walther 1992 1995) and that electronic communication is heavily influenced by surrounding social norms (Ferrara et al. 1990). Numerous studies show that electronic communication patterns are less a function of the medium per se than of the norms, practices, and social conditions surrounding media use (Abel 1990, Lea and Spears 1991, Spears and Lea 1994). Even low channel-capacity media, such as text-based electronic mail, can be used for complex

communication if the organization encourages and supports it (Finholt and Sproull 1990, Markus 1994). In addition, individuals, groups and organizations develop certain electronic communication styles or practices.

Individuals are known to develop rhetorical styles of communication that can transfer to the electronic medium. Some styles, for example, reflect high concern about confidentiality whereas others do not; hence, some individuals are more prone to be concerned about confidentiality in electronic mail than others (Gotcher and Kanervo 1997). Similarly, individual differences can determine who dominates electronic discussion, and these differences can overpower media effects (Straus 1996). Groups can develop stylistic communication patterns as a function of the particular parties involved (Jarvenpaa, Rao and Huber 1988, Finholt and Sproull 1990) and the emergent dynamics of their interaction (Ellis, Rein and Jarvenpaa 1990, Poole, Holmes and DeSanctis 1990). As a result, there are extensive variances in the ways that people use electronic communication media, whether individuals or groups (Mantei 1989, DeSanctis, Poole, Dickson, and Jackson 1993, Zack and McKinney 1995).

Many studies, including those by Weisband et al. (1995) and Wilkins (1991), demonstrate that parties project personal styles, previous experiences and social norms of interpersonal interaction into electronic conversations. The potential for conflict is substantial as communication in the virtual organization takes place across organizational and social boundaries and as the cultural and professional diversity of relationships increases. Further, the dynamic nature of the virtual organization may make it difficult for electronic communication styles to "gel" or develop new, standard norms for communicating. Participants in virtual relationships may do well to make communication norms explicit in advance and to establish procedures for reconciling differences in communication practices that emerge as they do business across multiple boundaries. As business processes are redesigned, organizations will have to simultaneously find ways to preserve the beneficial norms that have been established while promoting newer ones that are more appropriate to the redesign.

6. Evolutionary effects

There is little doubt that the dynamics of electronic communication in the enterprise may be different in the long run than in the short run. New communities with potentially differing perspectives and social realities from those of today are likely to emerge as more persons read and write on computer networks. Electronic classrooms, for example, have been shown to evolve their own communication patterns that are kindred to yet substantively different from traditional classrooms (Duin 1991, Hiltz 1994). Impressions of others, impression management, and the degree and type of relational communication all change over the course of electronic interactions (Chidambaram 1996, Hollingshead, McGrath and O'Conner 1993, Walther 1995). As noted earlier, longer-term interactions tend to improve message understanding and deepen interpersonal relationships. The evolution of relationships in the context of electronic communication occurs both "in the small" of individual relationships and "in the large" of entire communities. A question that arises, then, is the viability of rapidly configurable, or disposable, structures in virtual organizations to sustain these longer term interactions. Organizations may have to figure out which aspects of communication they can disrupt and re-arrange and which they should allow to evolve over longer periods.

It may be that electronic communication products, such as conversations and documents stored in knowledge repositories, can provide stability to otherwise tenuous relationships. Perhaps communication histories from one setting can be carried into the communication future of other settings via evolving databases. The issues of volume, load, task, and message understanding are significant, particularly for complex information exchanges and problem solving. Future research might consider how electronic communication products might be used to support the evolutionary aspects of communication in dynamic networks and reconfigurable organizational settings (Monge and Contractor in press). For example, it may be that transactive memory systems, the context-specific and unique communication processes that develop within a group and guide knowledge sharing (Hollingshead 1998, Wegner, Raymond and Erber 1991), can be somehow formalized and re-applied when groups are dissembled and re-arranged.

Research Directions

There is no doubt that new developments in organizational structure, practices, and communication technology can promote the construction of new organization designs. Considerable theory and evidence shows this to be true (see DeSanctis and Fulk 1999, Karsten 1995, Lucas 1996, Malone, Yates and Benjamin 1987, Orlikowski and Robey 1991, Wheeler and Valacich 1996). At the same time, the literature just reviewed reveals the complexities

involved in shaping communication processes for virtual organizations. Electronic media can do much to enable highly dynamic processes, contractual relationships, permeable boundaries, and reconfigurable structures. But the challenges are many due to the complexities of achieving communication efficiency and message understanding in electronic mode; the uncertainty surrounding design of tasks in virtual mode; and the powerful role of norms, hierarchical relationships, and evolutionary effects.

Perhaps the core issue for managers is determining the actions they might take to influence what the firms of the future will become. "Genres" of communication processes in virtual organizations may evolve on their own (Orlikowski and Yates 1994, Yates and Orlikowski 1992). But what can managers do to shape the design of the boundaryless, flexible enterprise and to encourage productive and healthy communication processes? In addition to uncovering relationships among technology, structure, and communication, researchers should direct attention to specifying and evaluating strategies for organizational members. Possibilities include embedding procedural templates for communication into electronic media (Winograd and Flores 1986), goal setting and specification of desired norms for communication (Marshall and Novick 1995), or use of mediators to facilitate users' interaction with technology and to alter contexts of use (Orlikowski, W. J., Yates, J., Okamura, K., and Fujimoto 1995). Finally, given the emphasis placed on trust, cohesion and identity in virtual forms, team building interventions may help organizations to manage communication and build mutual understanding among virtual participants.

The articles in this Special Issue address several important questions:

- How will the frequency and content of communication change in virtual organizations?
- To what extent can electronic networks substitute for personal relationships as inter-firm coordination mechanisms?
- Will formalized, programmable communication replace more informal, customized communication?
- What does it take for remote workers to be effective in their jobs?
- How will virtual organizations maintain cohesion and a sense of organizational identity?
- Can virtual teams effectively form trust? What does it take to maintain trust in virtual teams?

Grabowski and Roberts ("Risk Mitigation in Virtual Organizations") review the properties of virtual organizations and provide a series of propositions on how virtual organizations engage in risk mitigation. They argue that the content of communication in virtual organizations will include more discussion of safety issues and efforts to clarify goals, relationships and responsibilities than in traditional firms. Kraut and colleagues ("Coordination and Virtualization: The Role of Electronic Networks and Personal Relationships") report on a large sample study of managers from four different industries. They find that electronic communication complements personal relationships more than it substitutes for them; their finding suggests that increased electronic communication does not necessarily lead to efficiencies in overall organizational communication. Further, the existence of personal relationships between a firm and a potential supplier predicts use of electronic networks to coordinate production. Outsourcing contracts, it seems, are based on more than evaluation of contract terms. Ahuja and Carley ("Network Structures in Virtual Organizations") examine the communication structure and content of a virtual research and development group. They find the communication structure in the group to be more hierarchical and centralized than the virtual organization literature would suggest. They also examine the relationship among structure, task routineness and performance as they attempt to uncover the reasons for lack of anticipated lateral communication in the virtual team. Staples and colleagues ("A Self-Efficacy Theory Explanation for the Management of Remote Workers in Virtual Organizations") report on a survey of remotely managed workers from 18 organizations. They find that remote worker effectiveness depends on remote work self-efficacy, experience in working remotely, and information technology capability. The competencies required to effectively manage remote workers include good listening skills, time management, information technology skills, and maintaining ample availability to remote workers.

Wiesenfeld, Raghuram, and Garud ("Communication Patterns as Determinants of Organizational Identification in a Virtual Organization") also report on a study of virtual workers. They find that use of electronic communication significantly relates to identification regardless of the degree of one's virtual status. Their study provides empirical support for the proposition that electronic communication can aid organizational identification and act to bind together otherwise scattered members of a virtual enterprise. Jarvenpaa and Leidner ("Communication and Trust in Global Virtual Teams") conclude this Special Issue with a report on global virtual teams whose members are separated by location and culture while working on

a common collaborative project; their only economically and practically viable coordination mechanism is electronic communication. The teams experience a form of "swift" trust, but such trust is fragile and temporal. They find that communication related to the task activities of the project is crucial to maintaining trust in these teams and that, contrary to some claims, social communication complements rather than substitutes for task communication in teams with persistent trust. Their results are some of the first empirical insights into trust development in global virtual teams.

Conclusion

This Special Issue marks an important advance in the study of communication for virtual organizations. Yet considerable further development is required to achieve the kinds of scientific knowledge that will enable practical, prescriptive statements about how to manage communication for virtual organizations. This burgeoning area of scholarship needs extensive theoretical development, conceptual explication, philosophical analyses, empirical research, and substantive criticism. The articles in this Special Issue should provide significant impetus to these future endeavors.

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Footnotes

[1.] As examples, consider the theoretical work of Daft and Lengel 1986, DeSanctis and Poole (1994), Fulk (1993), Fulk, Flanagin, Kalman, Monge and Ryan (1996), Heydebrand (1989), Malone, Yates and Benjamin (1987), Orlikowski and Yates (1994), Star and Ruhdler (1996), and empirical work such as Hinds and Kiesler (1995), Karsten (1995), Kraut, Rice, Cool and Fish (1997), Lea, O'Shea and Fung (1995), Markus and Robey (1988), Rice (1994), Yates, Orlikowski, and Okamura (1999), and Zack and McKenney (1995). See also texts by DeSanctis and Fulk (1999), Fulk and Steinfield (1990), Jablin and Putnam (1998), and Rice (1980), and review articles by Fulk and Boyd (1991), Contractor and Seibold (1993), and Fulk and Collins-Jarvis (in press).

[2.] See the Special Issue of *Organization Science*, 1998, Volume 9, Number 3 on Managing Partnerships and Strategic Alliances.

[3.] For extensive reviews of this literature see Fulk and Collins-Jarvis (in press) and Rice and Gattiker (in press).

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