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New Media and Organizational Structuring

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Try to imagine how a person in 1850 might explain organizational communication and organizational structures of the mid-20th century. That person would have no familiarity with telephones, telegraphs, vertical files, paper clips, photocopies, elevators, electricity, and a whole host of other communication and information technologies. Now, imagine explaining to someone in 1950—before personal computers, desktop publishing, multimedia, the Internet and the World Wide Web, online databases, facsimiles, electronic mail, voice mail, videoconferencing, electronic funds transfer, data communication networks, cellular phones, and credit cards in most organizations—developments in organizational communication and structures at the beginning of this new millennium. Finally, imagine either explanation without referring to any extant communication and information systems or any extant theories of organizational communication and structure before either time period.

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There are so many assumptions built into our notions and experiences of organizational communication and structure that are based on how people interact and communicate within and across organizations with these technologies that both of these explanations would be highly flawed, if not impossible. The implication is that our understandings of organizational communication, structure, and media are all influenced by preexisting media and structures, and in turn influence the development of new structures and media. We cannot know the future, but we can attempt to better understand the iterative and reciprocal influence of existing structures, underlying processes, and new media.

Thus, four propositions motivate this chapter. First, in addition to traditional concepts (such as centralization or formal communication flow), organizational structures include meanings (such as about the appropriate uses of familiar and new media) and relations (among members and units, within and across organizations). Second, these structures can constrain or facilitate the development and use of a computer-mediated communication and information system (CIS). Third, processes of transformation in organizational and CIS structures may range from subtle evolutions of usage norms to formal metastructuring activities. Fourth, CISs can constrain or facilitate changes within and across organizational structures.

The first section briefly introduces CISs and suggests some basic conceptual dimensions of organizational media in general. It argues that common conceptualizations of new media may be highly constrained (thus structured) by idealizations of familiar media that have become structured into media artifacts. The section outlines traditional approaches to studying organizational structure, then it presents a simple structurational approach as one way of organizing this diverse literature and research. The next section surveys concepts and results from selected research within three broad structurational processes (development, transformation, institutionalization). The last section provides a brief conclusion.

COMPUTER-MEDIATED COMMUNICATION AND INFORMATION SYSTEMS

Overview of CISs

CISs combine four major components. *Computing* allows processing of content and structuring of communication participation. *Telecommunication networks* allow access and connectivity to many others and to varieties of information across space and time. *Information or communication resources* range from databases to communities of potential participants. *Digitization of content* allows the integration and exchange of multiple communication modes—such as graphics, video, sound, text—across multiple media and distribution networks (Rice, 1987). This review emphasizes computer-mediated communication systems (CMC), but also refers to some research where information systems are associated with organizational communication.

Such systems include, for example, audiotex; automatic teller machines (ATMs) that are redesigned as information services terminals; cellular phones and pagers; collaborative systems such as screen-sharing and joint document preparation; computer bulletin boards; computer conferencing; conversational and workflow processors; cyberphones; decision support systems with communication components; desktop publishing and document dis-

tribution; multimedia desktop conferencing and screen-sharing; electronic document interchange (EDI); electronic mail; facsimile; gophers/World Wide Web; group support systems and other groupware; home shopping and banking; hypertext and hypermedia; intelligent telephone systems; Internet listservers; local area networks; mobile personal communication devices; multimedia computing; online and portable databases; optical media such as CD-ROM and lasercards; optically scanned and networked documents; personal information assistants; personal locator badges; presentation devices such as computer screen projectors; telephone services such as call forwarding, redial until delivery, or automatically transferring a pager message to one's voice messaging system; teletext; video teleconferencing; videotex; virtual reality and cyberspace; voice mail; wide area networks; and word processing.

All Media Are Multidimensional and Artifactual Structures

Such lists of example CISs are not, by themselves, particularly enduring or insightful. Further, they tend to conceptually structure the particular combination of components and uses into a singular system that appears stable and coherent. This institutionalization via labeling fosters both technological determinism (the "system" represents and imposes causal necessity) and critical determinism (any negative aspects associated with this system are due to the technology).

Thus, crucial to the general argument that meanings of CISs are a part of organizational structures is the awareness that both traditional and new media embed a wide, overlapping range of technical and social capabilities and constraints. Typically, researchers and ordinary folk alike tend to lump communication media into familiar, binary, and mutually exclusive categories. Examples include mass media/interpersonal, objective/socially constructed, information rich/lean, organic/technological, traditional/new, democratizing/hegemonic, same/different times/places, content sources/users are institutions/individuals/computer systems, and so forth (see the review of such typologies by Rice, 1992; see also Culnan & Markus, 1987; Soe & Markus, 1993).

Yet media in general and CISs in particular are inherently ambiguous (because they can be interpreted in multiple and possibly conflicting ways), can rarely be fully understood, and continue to be adapted, reinvented, and redesigned (Fulk, 1993; Johnson & Rice, 1987; Rice, 1992). So taking a multidimensional perspective toward conceptualizing media seems necessary and appropriate. Table 14.1 proposes four dimensions of a wide variety of capabilities and attributes of media: constraints, bandwidth, interactivity, and network flow (Rice, 1987; Rice & Steinfield, 1994). Table 14.1 also compares two very different communication channels—face-to-face and asynchronous computer conferencing—across these attributes as an example of how limited simple oppositions of "familiar" and "new" media are (see Rice, 1987, and Rice & Steinfield, 1994, for similar comparisons involving other media). An intriguing exercise would be to use this table to analyze one's own use of a variety of media (letters, telephone, meetings, e-mail, informal conversation, voice mail) in two very different social contexts (work, home).

This and other multidimensional typologies serve to emphasize that (a) all media may be perceived, constrained, adopted, used, and evaluated in different ways within social and technological constraints; and (b) overemphasis or idealization of some characteristics of one medium can de-emphasize and limit perceived as well as actual characteristics of other media.

Three main conclusions follow from such a multidimensional perspective. First, media may be compared in many ways, so no medium is absolutely preferable or inherently "better" or "worse." A multidimensional approach generates better understandings of how both familiar and new media are structured in particular organizations (Culnan &

TABLE 14.1 Dimensions and Attributes of Media, Comparing Use of Face-to-Face to Asynchronous Computer Conferencing

Dimensions and Attributes	*Face-to-Face*	*Computer Conferencing*
Constraints		
Receiver can identify sender	y at least appearance	n listservs, anonymous, aliases
Have to know receiver's account/name/address/number	y to find	y if private message n if posting
Address where person receives message is fixed to physical location/terminal	y	n
Users have varying participation modes	y	y
Source or centrality of control	often one person	usually dispersed
Can overcome selectivity	easier	harder
Can maintain privacy	depends on trust	trust and/or features
Organizational norms for use	y institutionalized	n developing
Need temporal proximity	y	n
Need geographical proximity	y	n
Ease of access to physical location, physical device	y once in contact n if not	n improving y with wireless
Ease of access to and use of interface, commands	y for familiar n for novel	n improving
Access costs (time, money, energy, knowledge)	highly variable	variable
Diversity of content available	depends on person	extensive
Diversity of content sequencing	n	y
Can store content (short term, long term)	limited	extensive
Limits to message length	y	n
Use to transfer documents	y	y
Can indicate priority of message	y	y not as much
Can ensure levels of privacy	n usually	y
Can retrieve by indexes or browse in random or other order	n	y
Can use filtering or allocation processes	n once contacted	y developing
Message can initiate other processes directly	y depends	y developing
Receiver can reprocess, edit for further use	n not accurately	y
Users can structure flow and privileges	y if great power asymmetry	y developing
Can easily convert content to other medium	n	y developing
Bandwidth		
Analog/digital	analog	both
Color, images, sound, text, numbers, motion, other senses	most	developing
Physical distance	y	n
Gestures	y	n developing icons
Tone, emphasis	y	n paralinguistics

(continued)

TABLE 14.1 Continued

Dimensions and Attributes	*Face-to-Face*	*Computer Conferencing*
Connotation/denotation	y high level possible	n low level typically
Symbolic aspects or connotations of medium	y	y
Social presence/media richness	can be high	usually low
"Personalize" greeting	y	y
Interaction		
Synchronous or asynchronous	synchronous	both
Symmetry of initiation and response	usually asymmetric	symmetric
Type of feedback	multiple	limited
Quickness of response by intended receiver	can be simultaneous if person there but that takes time	quicker than face-to-face if count meeting scheduling time
Control receiving pace	n	y
Confirm correct receiver, receipt	y	n developing
Mutual discourse	possible	possible
Quick-reply feature	interrupting	y
Network		
Information flow (one-to-one, one-to-few, one-to-many, few-to-few, many-to-many—both of users and of content, such as multiple copies)	one-to-one, perhaps one-to-few	all flows, depending
Usage domain (human system, individual, dyadic, group, intraorganizational, community, interorganizational, transnational)	mostly dyadic group	most forms possible
Distortion through overload	y	y unless moderator
Distortion through forwarding edited message	y	y usually available record, though
Role effect (can flow be easily controlled)	y	n difficult in computer conferencing
Critical mass necessary	n	y

NOTE: y = yes; n = no. These allocations are highly subjective and contextual. Many situations might generate other evaluations. However, this shows the wide range of possible attributes within a medium as well as the wide range of comparisons across media.

Markus, 1987; Rice, 1993a). For instance, interpersonal communication may have many disadvantages with respect to constraints (everyone has to be in a particular place at a particular time) and network flow (in larger groups, a few talk and most listen, and everyone has to respond to topics immediately or not at all) for certain social contexts (such as organizational meetings) or participants (such as the physically disadvantaged or culturally discriminated).

Second, CISs have many more capabilities than just the by-now familiar "overcoming constraints of time and space." It may well be that the ability to reprocess, combine, and analyze information in many forms from multiple sources has far more profound implications for organizing than "fast" or "asynchronous" interaction. For example, the telegraph allowed people to communicate across time and space at a pace and amount never before experienced but also enabled railroad companies to collect, associate, and analyze information from stations about the dynamics of trains, shipments, and passengers. This transformed how organizations collected and processed information, and how they learned from that information to develop effective schedules, routing algorithms and billing procedures that changed the domains and design of railroads (Beniger, 1986; Yates & Benjamin, 1991).

A third, more subtle, conclusion is that much of what we feel is "natural" about traditional media is largely an "artifact" resulting from the confounding of particular characteristics (such as material production, forms of access, social conventions, etc.) with a particular communication medium (such as interpersonal "voice") (Rice, 1993a; Shudson, 1978). As a consequence, new media are often critiqued from the position of a privileged, artifactual, idealized notion of interpersonal communication and traditional media (Carey, 1990). This interpretative structuring of both familiar and new media leads to assessments of new media as a source of utopian benefits as well as a destroyer of traditional values and ideals (Jensen, 1990). Some historical analyses of how prior artifacts and interpretations constrained the development of new media have considered (a) how the memo evolved through intraorganizational battles from personal diaries and reports of branch managers or colonial administrators (Yates & Benjamin, 1991); (b) how the telephone and electricity were first embedded in prior social conventions and fears (Marvin, 1988); and how the typewriter, its supporting institutions, and even its technological design were developed, critiqued, and restructured through social practices (David, 1985; Walker, 1984).

Thus, we can conceptualize media artifacts as a particular kind of organizational "structure." Artifacts are the structuring of communication media through use and interpretation, until they become perceived as "familiar" or "natural" and thus "idealized" in ways that constrain possible interpretations of both those current as well as new media. A later section will identify some of the factors that generate as well as restructure such media artifacts.

Organizational Structure and Structuring

Organizational structure is generally conceived of as "constraints that organization members face in the communication process" (Jablin, 1987, p. 390). Stevenson (1993) provides a parsimonious review of major approaches to conceptualizing organizational structure, while Monge and Contractor (Chapter 12, this volume) look specifically at network aspects of structure. Johnson (1993) reviews five approaches toward organizational structure. Communication *relationships* (interactions, exchanges, and flow) are typically the surface manifestations of deeper relational structures, such as work dependencies, power, commitments, and obstructed or absent relations. *Entities* are the units or actors involved, such as dyads, groups, work units, and higher-order systems such as organizations; these represent different kinds and levels of structure. *Context* is the local and global environment of norms, tasks, rules, and prior relations that structure ongoing actions and interpretations. *Configuration* concerns recurrent and recognizable patterns. Formal approaches to structure often portray configuration in an organizational chart or through indexes such as formalization, centralization, size, complexity, and span of control. Finally, *temporal stability* is the extent of enduring or consistent organizational patterning, ranging from an enduring headquarter-branch organization to changing project groups. Johnson integrates

these five forms of structure into a single definition (intentionally emphasizing intraorganizational and communication structures): "Organizational communication structure refers to the relatively stable configuration of communication relationships between entities within an organizational context" (p. 11).

Such reviews of prior approaches to organizational structure generate several implications relevant to our argument. First, structure is best conceptualized as a process. This process involves meaning (as reflected in norms, interpretations, and artifacts from individual interpretations to international regulatory environments) and relations (as reflected in formal and informal communication networks, within and across physical and regulated boundaries). Second, structure both constrains and facilitates human action in organizational contexts. Third, new structures can arise or be suppressed. Fourth, most approaches to structure reject strict determinism, whether of an optimistic or a critical sort (i.e., technological utopias or technophobias). So relations between structure and technology are contextual and dynamic, but (theoretically at least) understandably so, and involve both "positive" and "negative" aspects. Given these assumptions, a structuration perspective provides a general theoretical framework for organizing a review of relationships among organizational structures and CISs.

A structuration perspective allows us to generalize the domain of organizational structure well beyond limited concepts such as "formalization" or "complexity." It focuses on the ongoing reciprocal association among structures and technologies (Giddens, 1976, 1984). In this view, structure is manifested in properties of actual social systems. These properties include rules and resources that both mediate action and are institutionalized by human action. Social interaction involves meaning (structures of signification), power (structures of domination via authority and allocation), and norms (structures of legitimation). Interaction patterns (human agency) become institutionalized (as structural properties) through repeated, habitual action, which are then referred to or applied through subsequent agency. Structural properties are therefore abstract properties of, and exhibited by, social systems. They are sustained only through contextualized human action and interpretation that are enabled by structural rules and resources in the form of objective conditions (Giddens, 1976; Orlikowski, 1992).

Systems have structures because they are conditioned by rules and resources. But these systems depend on routines being reproduced by (more or less) knowledgeable actors applying structural properties (intentionally and unintentionally) (Haines, 1988). However, actors are embedded in ongoing social and technical structures, which may both constrain and facilitate their knowledgeability and intentionality, as well as influence their access to those rules and resources. Thus, structure involves subjective and objective components, is manifested in social relations, and requires multiple levels of analysis.

We can see, then, that organizational media artifacts are a specific source as well as consequence of structuration. Attitudes toward and uses of current organizational media become institutionalized in the form of media artifacts. These structures of acceptable norms, evaluations, and resources of familiar media then constrain and facilitate the adoption and implementation of new media. Social actions, organizational policies, user attitudes, technology developments, and so on may interact in transformational processes that may or may not institutionalize new structures that themselves may well become artifacts over time.

Orlikowski refers to this as the *duality of technology* (1992; Orlikowski & Robey, 1991; see also Contractor & Eisenberg, 1990; Dutton & Danzinger, 1982; Kling & Jewett, 1994; Markus & Robey, 1988). Orlikowski's summary of this duality of technology involves four major propositions:

1. Technology is the product of human action.
2. Technology is the medium of human action (both constraining and facilitating action through interpretations, capabilities, norms, use).
3. Institutional conditions provide the context for interaction with technology (such as professional standards, resources, implementation policies).
4. There are institutional consequences of interaction with technology (through structures of signification, domination, and legitimation).

Her model thus proposes two kinds of conditions for use (institutional and technological) and two kinds of consequences of use (technological and institutional), mediated through individuals' actions, specifically the use of technology (Orlikowski, Yates, Okamura, & Fujimoto, 1995).

Orlikowski et al. (1995) extend this model by identifying a metastructuring or transformational process: technology-use mediation. This explicit and ongoing adaptation of CISs in their changing use contexts, not just at formal implementation or maintenance periods, can facilitate ongoing changes in technology designs, social norms, and organizational forms. Technology-use mediation occurs through deliberate reinforcement and adjustment between institutional properties, with occasional periods of episodic change. Thus, metastructuration adds conditions for mediation and consequences for mediation to the model proposed by Orlikowski and colleagues. So institutions, technologies, and mediation present conditions as well as undergo consequences through the structuration process.

Thus, CISs—and the meanings and relations associated with them—are particular instances of some rules and resources representing organizational structure. The interpretations of new systems are constrained by earlier interpretations, perhaps by exaggeration or misunderstanding of its potential characteristics, comparisons to media artifacts, even by rationales for design choices that are now lost to the new users (such as reduced labor costs, a visionary supervisor, or strategic initiatives; see Johnson & Rice, 1987). Particular manifestations of CISs may be rejected or c
tinually restructured through agency, or n
remain stable through continued unreflect
use, institutionalized procedures, or even c
sidered choice. CISs may in turn be a catal
or occasion for organizational restructuri
Thus, the structuring of CISs is manifested
widely diverse interpretations, uses, and o
comes (Dubinskas, 1993; Ehrlich, 19
Johnson & Rice, 1987; Mackay, 19
Markus, 1992).

Structuration of a CIS involves ongoi
microprocesses, as individuals working
gether appropriate the technology in vari
ways, both consciously and unconsciously,
tentionally and unintentionally, within orga
zational, social, and technological structu
(Lea, O'Shea, & Fung, 1995; Poole & D
Sanctis, 1990) such as preferences and ab
ties of users, design choices, and implemen
tion and management strategies (Perio
Prieto, 1994). Lea et al. (1995) argue that "
tors" may include both humans and other en
ties (such as technological infrastructure
industry regulations) that are co-construct
through interactions to constantly renegoti
both content and context. Taking a m
macro view, Gattiker (1990) proposed that t
forms and implications of technology in or
nizations are based on the mutual interacti
among (a) internal labor markets (rules a
regulations pertaining to human resource
(b) strategic choices by the firm (or how mu
planning may take advantage of environm
tal opportunities and constraints), and (c) t
socially construed work environment.

We now turn to summarizing, within t
structuration framework, some prior resear
on CISs and organizations.

REVIEWS WITHIN GENERAL STRUCTURATIONAL PHASES

The following sections generalize t
structuration process somewhat by identif
ing three processes of CIS structuratio
adoption/implementation, transformatio

and institutionalization (Orlikowski, 1992; Rice, 1987). There is debate as to the temporal location of structuration processes. Lea et al. (1995), for instance, say that unpacking context and action into "temporal cycles of alternating cause and effect" somewhat weakens the power of structuration theory. Nonetheless, we agree with Haines's (1988) characterization of Giddens's position that actors are primarily motivated to integrate habitual practices across place and time, and thus do not perceive structuration as a constantly simultaneous process. So organizing our review by three general structurational processes is both parsimonious as well as general. Across these three processes, the following illustrative research identifies ways in which organizational structures (both meaning and relations) and CISs may constrain or facilitate each other. Of course, almost none of the CIS research traditions grouped within each of these three processes was developed and studied with structuration theory in mind. And many of them may well be implicated in one or more of the three processes. However, we propose that the various research traditions may be thought of as ways of framing different aspects and microprocesses of a general structuration process, and we summarize them within the process that best characterizes their underlying argument.

Structural Influences on Adoption/Implementation of CISs

The following subsections summarize several prominent research traditions that consider how organizational structures constrain or facilitate the adoption/implementation of CISs. To the extent that each of these processes reflects differential control over and access to material resources, influence, and forms of discourse, these also represent sites of organizational power. However, we defer discussion of power to the institutionalization section. The subsections are ordered, somewhat arbitrarily, from a greater emphasis on structuring through structures of meaning (genres and norms, culture, and perceptions of CISs) to a greater emphasis on structuring through structures of relations (social influence through networks, critical mass, and physical location). More macrostructural relations such as environmental factors, unions, and regulatory policies—both domestic and international—also influence CIS use and related changes in organizations (Gattiker, 1990; Gattiker & Paulson, 1999). And new CISs generate occasions for restructuring such policies and organizational environments. But these topics are beyond the scope of this chapter.

Media Genres and Usage Norms

As one way of understanding the adoption and evolution of familiar and new media forms and uses, Yates and Orlikowski (1992) introduced the concept of *organizational communication genres.* Genres are specific variants of a general form of a medium, associated with identifiable formats, circumscribed content, established practices, and a specific community of users. One example is the moderated online listserv (with a boilerplate masthead, brief summary of entries, edited contributions by listserv members) as a genre from the general CIS medium of e-mail messages. These genres are invoked in response to commonly recognized recurrent situations, involving the "history and nature of established practices, social relations, and communication policies within organizations," as well as accepted rights and responsibilities of participants.

Examples of how meaning in the form of social conventions structures media genres include rules about appropriate communication behavior (when is a voice mail response "too late"?), taboos (you can't send an e-mail directly to the CEO), expectations (how much detail is required in e-mail responses?), and roles (how much message communication filtering should listserv moderators perform?) (Ehrlich, 1987). McKenney, Zack, and Doherty's (1992) study of a programming team's use of various media found that as people develop routines for solving initially new problems and organizational challenges, they also develop shared understandings and expectations for future interactions that include issues such as topics, timing, participants, and medium. Thus, they argue that face-to-face "effectively serves as a context-creating medium, while [e-mail] is a context-reliant medium" (p. 285). As CISs become more familiar and institutionalized, they too will be appropriated into new genres, and become context-creating media.

Orlikowski and Yates (1993) studied nearly 1,500 messages from an e-mail system used by 17 members of a distributed group in a three-year computer language design project, and followed up with personal interviews. The use of traditional genres (memo, proposal, and ballot) declined, while the use of a new genre ("dialogues"—chained conversations, identified by associated content in the subject line, and including portions of the message being referred to) increased. Influences on the development of the new genre included the group's social history, the project life cycle, and the capabilities of the system.

One implication of the genre approach is that how CISs are conceptualized strongly influences their adoption, application, and success/failure. For example, conceptualizing, implementing, and using voice mail as a single, fixed genre similar to a telephone with recording capabilities stifles the emergence of the possibly new organizational genre of voice messaging (Adams, Todd, & Nelson, 1993; Rice & Danowski, 1993; Rice & Tyler, 1995; Stewart, 1992). Bikson and Law (1993) described how technical constraints in the World Bank's e-mail system strongly limited its conceptualization and application (such as integrating several documents, preparing letters and envelopes, sharing of structured files, storing messages in different electronic file categories). Learning, experimentation, awareness of initial adoption rationales, expanded or new system capabilities, and sharing new ways of using systems with others all facilitate the development of new media gen (Johnson & Rice, 1987; Orlikowski, 1992).

Culture

Johnson (1993) argues that meanings a cultural elements are consequential organiz tional structures: "Communication ritu themselves, in addition to being reflections culture, are also elements of communicati structure, since they represent relatively stal configurations of communication relatio ships between entities within an organizatio (p. 79). Configurational and cultural stru tures may well overlap, such as when a chari matic leader manages through bureaucrat forms. So both formal configuration and cu tural meanings facilitate and constrain ea other, promoting both temporal stability a change through different forms of structure.

The more traditional and formal aspects organizational structures may initially lo similar across national borders. However, di ferent cultural myths, attitudes, and opinio will generate different interpretations, app cations, social networks, and communicati patterns within these structures (Gattiker Willoughby, 1993). The enhanced ability individuals using group support systems to o fer comments that are anonymous and n necessarily embedded in ongoing group co versational threads are presumed by much the CIS literature to be a positive capabilit However, this interpretation is usual grounded in the context of "individualist" cu tures. Such implementations may be not on counterproductive, but inherently distastefu to more "collectivist" and "high power di tance" cultures (Hofstede, 1993). Maurice Sorge, and Warner (1980) showed that organ zation processes develop within an instit tional logic that is unique to a society. For e ample, French manufacturing firms have more hierarchical structure, whereby dec sions are often made by technicians or eng neers. Britain seems to be in the middle, whil in Germany the decision about work-relate matters is made whenever possible by th journeyperson at the bottom of the organiz

tional hierarchy. So the range of adoption and implementation decisions about CISs is likely to be differentially constrained and interpreted in different organizational and national cultures (Gattiker & Kelley, 1999; Gattiker, Kelley, Paulson, & Bhatnagar, 1996; Gattiker & Nelligan, 1988).

As Acker (1990) argues, the typical implementation of CISs leaves technology in men's control because skilled work is defined as men's work, creating more negative outcomes for women (Gutek, 1994). Such relations may vary cross-nationally. Whereas women from the United States differed from men in how they assessed quality of work life, Canadian women differed from men in how they perceived communication and control by working with computers (Gattiker & Nelligan, 1988; Pazy, 1994). While more and more CISs are used by managers regardless of gender, male managers in today's Russia still refuse to take advantage of CISs since using a keyboard has the typing stigma attached to it; consequently, assistants (primarily female) use the manager's workstation. Firms and managers are less likely to support additional training required for skill upgrading for women than for men in Israel (Pazy, 1994) and New Zealand (Murray, 1994).

Media Richness and Social Presence

These two theoretical perspectives can be construed as identifying structures of meaning in which CIS adoption and implementation processes are embedded. Social presence (Short, Williams, & Christie, 1976) and media richness (Daft & Lengel, 1986) theories both emphasize how communication media differ in the extent to which (a) they can overcome various communication constraints of time, location, permanence, distribution, and distance; (b) transmit the social, symbolic, and nonverbal cues of human communication; and (c) convey equivocal information. The essential underlying principle in both theoretic traditions is contingency theory. A good match (generally, but not necessarily, implying consciousness and intention) between the characteristics of a new medium (such as relatively high social presence in multimedia conferencing) and one's communication activities (such as equivocal tasks like strategic decision making) will lead to "better" (more effective, less time-consuming, satisfying, etc.) communication performance. The primary argument of media richness theory is that the relation between CIS use and performance is likely to be mediated by task equivocality and by users' "media awareness" of the suitability of new media to these tasks. Theoretically, CISs may not only be "too lean" for particular tasks, but also may be "too rich" (McGrath & Hollingshead, 1992). Proposed rankings of media on richness or social presence scales, and proposed associations of those perceptions with evaluations of new organizational media, are generally but weakly supported by study results (Rice, 1993b; Rice, with Hart et al., 1992; Rice, Hughes, & Love, 1989).

Critiques of this approach include: (a) the strength of the empirical support for media richness has usually been greatly exaggerated or nonexistent (especially concerning CISs), (b) media richness concepts have been well developed theoretically but poorly operationalized, (c) CISs can foster equivocal organizational innovations, (d) some higher-level managers seem to use e-mail contrary to media richness predictions, (e) CMC can support considerable socioemotional content, and (f) media use does not have to be nor is necessarily intentional (Lea, 1991; Rice, 1987, 1993b; Rice, Chang, & Torobin, 1992; Rice, with Hart et al., 1992; Rice & Love, 1987; Trevino, Lengel, & Daft, 1987). The negative effects associated with media low in information richness or social presence may be limited to a narrow set of situations including laboratory experiments, zero-history groups, and short initial usage periods (Walther, 1992).

The initial theories have spawned a variety of extensions. These include emphases on usage contexts (Moore & Jovanis, 1988), social influences (Fulk, 1993; Rice & Aydin, 1991; Rice, Grant, Schmitz, & Torobin, 1990; Rice, Kraut, Cool, & Fish, 1994), symbolic aspects (Bozeman, 1993; Sitkin, Sutcliffe, & Barrios-Choplin, 1992; Trevino et al., 1987), time and knowledge specificity (Choudhury & Sampler, 1997), timeliness and sequential relations among different media (Valacich, Paranka, George, & Nunamaker, 1993), status differences across lines of authority and organizational boundaries (D'Ambra & Rice, 1995), expansion of perceptions of media richness with experience (Carlson & Zmud, 1994), distinctions between initiator and responder (Zmud, Lind, & Young, 1990), and the extent to which problem solving becomes routinized over time (Dawson, 1995; McKenney et al., 1992).

Both the original theoretical formulations and these extensions represent some ways in which the meanings (such as social presence or media richness) of CISs are structured in light of past meanings and uses of familiar media, potentially influencing if and how CISs are adopted and evaluated. For example, due to processes of "idealization" discussed in the beginning of this chapter, face-to-face interactions become social artifacts that seem necessarily and universally "rich." Conversely, due to the role of technology, especially the computer, voice mail becomes implicated as necessarily "lean." These two structurings of meaning are based on emphasizing one or two characteristics of each medium instead of the wide variety of capabilities and constraints of both. Thus, native theories of "media richness," forming preexisting interpretive structures, often stifle innovative and personal uses of voice mail (as Rice & Shook, 1990, and Rice & Danowski, 1993, found).

Communication Networks

Potential adopters of CISs are embedded in various formal and informal organizational networks (see Monge & Contractor, Chapter 12, this volume). These relational structures both limit and enable people's access to resources (such as potential communication partners on a new system, or expertise as to how to use the system) and to rules (such as attitudes toward, and usage norms for, a new medium). These structures may indeed be aspects of the media artifacts themselves, such as a well-established voice mail distribution list that fosters a self-supporting decision-making elite.

For example, Papa and Papa (1992) reported that greater network diversity and size but not sheer frequency of communication, influenced how and the rate at which employees learned to increase their performance using an insurance information query system. Pavitt (1983) described how informal communication coalitions dynamically develop around topics of contention such as new CIS development and influence subsequent decisions and support for different solutions. Adoption of e-mail by lower-level users is often stimulated by higher-level employees (who are sources of greater initial resources) adopting e-mail first (Kaye & Byrne, 1986; Rice & Case, 1983). Asynchronous media such as electronic mail compared to, say, the telephone may not be as useful for weak relations, because of the preexisting social as well as substantive content of these infrequent but important ties (Hinds & Kiesler, 1995). At the interorganizational level, Newell and Clark (1990) suggested that one of the reasons why British inventory and control system manufacturers were less innovative than comparable U.S. manufacturers was that they had less communication with external organizations, conferences, and associations.

Social Influence Networks

Social influence models are one conceptualization of the microprocesses whereby organizational communication networks play a role in the structuration of CIS interpretation, adoption, use, and evaluation. One's perceptions of ambiguous phenomena such as a new CIS are likely to be influenced by the opinions, information, uncertainty reduction, behaviors, and rewards or sanctions of others accessible through one's communication structures, such as work groups, supervisors, and

informal relations (Albrecht & Hall, 1991; Fulk, 1993; Fulk, Steinfield, & Schmitz, 1990; Howell & Higgins, 1990; Rice, 1993c; Rice & Aydin, 1991; Salancik & Pfeffer, 1978).

There is some empirical evidence of a network-based social influence on CIS adoption and evaluation. Rice and Aydin (1991) found a weak positive influence on one's attitude toward a hospital information system only from those with whom one communicated directly, and a weak negative influence from those who shared one's organizational position. This second result implies that social influence from others with whom one occupies an organizational position but with whom one may have no communication may lead to discrepant, rather than converging, attitudes. Anderson, Jay, Schweer, and Anderson (1987) found a more pervasive effect of social influence, as measured by the "normative values" of other physicians with whom one communicated frequently. These values of salient others predicted adoption time of, use of, attitude toward, and time between when the organization adopted and the physician started using a hospital information system. Schmitz and Fulk (1991) showed that the attitudes of a respondent's supervisor and the five closest communication partners positively influenced the respondent's attitude toward an e-mail system. Self-reported usage of the system by these significant others predicted the respondent's self-reported usage.

Social influences on CIS use and evaluation may be heightened by how those very influences themselves are structured. Factors moderating structural influence include greater attraction to one's group (Fulk, 1993), lower self-monitoring (Burkhardt, 1994), negative word-of-mouth (Galletta, Ahuja, Hartman, Teo, & Peace, 1995), subordinates' task-related skills, and lower innovativeness (Leonard-Barton & Deschamps, 1988). In a longitudinal study of voice mail use (Rice & Shook, 1990), for those with more analyzable tasks, the number of voice mail messages sent by one's supervisor predicted the number of voice mail messages one received. However, for those with less analyzable tasks, the number of voice mail messages sent by one's coworkers reciprocally predicted the number of voice messages one sent and received. These results implied a more iterative and collaborative use of voice mail for more ambiguous tasks, providing some support for media richness theory, but not in its treatment of voice mail as a necessarily lean medium.

However, Rice and Aydin (1991) did not find any influence of group integration on one's susceptibility to social influence on attitudes about a medical information system, and reviewed other studies that failed to find any evidence of direct or moderated social influence on attitudes toward, or use of, CISs. Finally, analyzing a variety of media in four organizations, Rice (1993b) found a small social information processing effect only for the newest medium (desktop videoconferencing), and then only for organizational newcomers who communicated with each other through the new medium itself.

Theoretically, then, social influence in general is one microprocess of organizational structuring of the adoption and implementation of CISs. However, such influence does not seem to be a strong factor, and seems highly contingent on other structural contexts. Research might do well to better specify which contingent conditions structure how, why, and whether social influence affects the adoption and implementation of CISs, rather than make sweeping assertions about the pervasive role of social influence.

Critical Mass

The value of a CIS rises, and the relative cost of each person's potential adoption of the CIS decreases, as a critical mass develops. A *critical mass* is enough initial users to stimulate rapid later adoption by others (Markus, 1990; Rice, 1982, 1990). The greater the structural heterogeneity of interests and resources (such as task interdependence, centralization of resources, group size, and geographic dispersion) among potential users, the more likely it is that there will be initial users

for whom the system initially has sufficient worth, or who can afford the start-up costs. These initial adopters then decrease the costs and increase the value of adoption for later users (Markus, 1990). Local critical masses of other users are especially crucial to the successful diffusion of group CISs precisely because they are more likely to share similar benefits and costs (Rice, 1990). We distinguish critical mass from social influence as structural processes for two reasons, though some do not (Fulk et al., 1990). One is that critical mass theory does not usually posit a role for others' perceptions. The second is that it operates at a fundamentally different level of analysis: the network as a whole rather than individuals.

Rice et al. (1990) found that the best predictor of an individual's adoption of an e-mail system nine months after implementation was the extent to which that individual communicated with others in the office network before implementation. The best predictor of some communication-related outcomes after adoption was the extent to which individuals communicated with others who had also adopted the system. Comparing usage of two email systems in a multinational high-tech firm, Kaye and Byrne (1986) found that the benefits of an e-mail system were not realizable until almost all members within each user's local critical mass (about 15-30 others) used it as a normal mode of communication. Several studies of voice mail have emphasized the importance of implementation policies that foster a general overall critical mass of users or several local critical masses within relevant groupings (Ehrlich, 1987; Finn, 1986; Rice, 1990; Rice & Danowski, 1993; Trevino & Webster, 1992).

E-mail use at the World Bank was more strongly influenced by critical mass measures than by social pressure measures of e-mail use (Bikson & Law, 1993). Soe and Markus's (1993) study of the use of several new media in two organizations found that social utilities (especially critical mass) were better predictors of use of voice mail and facsimile, though not of e-mail, than were technological utilities (functionality, convenience, and appropriate ness for one's tasks, barriers to use such a technological and physical accessibility, an substitutability with other media). These tw analyses (and that by Rice et al., 1990) con trolled for social influence, providing empiri cal grounds for distinguishing between thes two processes, and for proposing that critica mass is a more influential structural facto than social influence in CIS adoption.

In a study of desktop videoconferencin among R&D workers, critical mass and tasl factors were initially strong influences o one's later usage, but habituation of one's ow usage patterns over time removed those influ ences as predictors (Rice et al., 1994). Thi implies that some structurational micropro cesses play a role primarily during the earl stages of adoption, eventually becoming sub sumed by and embedded in individuals' insti tutionalized behaviors and attitudes. Th study also identified four forms of critica mass factors that do overlap with social influ ences: (a) local critical masses must involv relevant others, (b) a critical mass of others experiences is necessary to institutionaliz new norms and behaviors and leads to the de velopment and subsequent awareness of nev ways to use a CIS, (c) widespread usage ma critically reduce system resources, and (d widespread usage may also decrease trus among users because of lower personal famil iarity among all the newer participants (Fish Kraut, Root, & Rice, 1993; Johnson & Rice 1987).

Macrolevel studies of large computer net works have also found support for critica mass propositions (Gurbaxani, 1990; Schae fermeyer & Sewell, 1988). New group medi such as computer bulletin boards are classi public goods that represent problems fo achieving critical mass and ongoing adoption Rafaeli and LaRose (1993) reported that criti cal mass characteristics (such as diversity o content and symmetry of participation in 12 computer bulletin boards) of collaborativ mass media were more important than man agement policies (such as access fees, tim limits, etc.) in predicting patterns of use

Interorganizational aspects of critical mass affecting CIS adoption include symmetric and asymmetric relations between and among vendors, users, and innovations. These forms of critical mass contribute to the development of media artifacts, such as the persistence of the originally intentionally inefficient typewriter keyboard layout known as the QWERTY system (David, 1985). National and cross-national programming and transmission compatibilities, and general communication infrastructure, are other forms of critical mass in telecommunications (Gattiker, in press; Gattiker, Kelley, & Janz, 1996).

Thus, critical mass seems a conceptually general, and empirically robust, aspect of CIS structuring. It embeds both social and technological factors, and it is both an influence on as well as an outcome of adoption and implementation processes.

Physical Location

Few researchers other than Allen (1977) have seriously considered the ways in which physical structures constrain or facilitate organizational communication. Physical environments within organizations represent material, though subtle, constraints on behavior, interaction, and possible interpretations. Influential aspects of physical environments include social density, proximity, access, exposure, privacy, mobility, time-space paths, physical structure (architectural and construction choices), physical stimuli (artwork, noise), and symbolic artifacts (office size and windows) (Archea, 1977; Davis, 1984; Johnson, 1993). Physical elements not only facilitate and constrain activities and relations but often represent particular resources and contexts (consider the familiar concept of the influence of "the water cooler" on emergent relations and communication climate). Physical and temporal distances constrain network relations, increasing the costs of signaling one's interests and of finding other people with similar interests (Feldman, 1987). Indeed, some researchers "view space as equivalent to context in providing the medium within which social interaction is embedded" (Johnson, 1993, p. 93).

Visual access to a terminal reduces some uncertainty associated with the costs of checking for e-mail messages and thus influences CISs' later use and evaluation (Rice & Shook, 1988). The fact that nearly half of the e-mail messages sent by employees of one R&D organization were exchanged among close coworkers was explained by factors such as cost, access, and task interdependencies (Eveland & Bikson, 1987; Markus, 1990). Thus, physical locations clearly structure access to, adoption of, use of, and outcomes associated with CISs. But as we shall see, CISs in turn have major consequences for those physical and temporal aspects of organizational structures. So adoption and use (as well as nonuse) of new media such as electronic mail may well be heavily constrained/facilitated by prior physical structures (old buildings that cannot be easily networked, or small project groups who work together closely), and in turn, pervasively restructure access to others, potential interactions, and shared meanings.

Summary

This section has summarized some of the more frequent and influential microprocesses that structure how CISs are interpreted, adopted, and implemented. Previously institutionalized conceptions of media usage, such as traditional media genres or initial adoption rationales, can prevent CISs from fostering new ways of doing work. Organizational communication research should consider these preexisting yet difficult-to-identify factors in studies of CIS adoption and use. Organizational and cultural norms represent boundaries around acceptable ways of implementing CISs and communicating through CISs. They may well be deeply embedded in media artifacts, heavily structuring how CISs are conceptualized and implemented. Alternatively, many implementations of CISs are so decoupled from an understanding of cultural structures that they foster limited adoption and negative outcomes. Social presence, media richness, and social influence theories, while not strongly supported by the data, do emphasize how interpretations of old and new media are structured, and how social influence itself operates through communication structures in shaping attitudes about new media. Their strength may be largely as manifestations of media artifacts, where "richness" or "influence" derive mainly from what's "familiar" and "natural." Various forms of critical mass influence the adoption and diffusion of CISs. For example, national telecommunications regulatory policies affect and structure not only domestic but also cross-national uses, perhaps stifling the emergence of a critical mass of international users. While CISs can overcome physical constraints, sometimes these boundaries of time and space are characteristics of real task interdependencies that cannot be ignored. However, those task interdependencies may themselves be restructured to take advantage of the other positive characteristics of CISs.

Transformations of Structures and CISs

The following subsections review studies that discuss processes whereby CISs and organizational structures are used, converted, reinvented, or integrated through their interaction. These may involve more or less emphasis on CISs or organizational structure. Again, the subsections are ordered from more emphasis on structuring through meaning (changes in the nature, form, and temporal aspects of content, and group communication), and through relations (group communication and metastructuring).

Nature of Content

Because of the potential capabilities of CISs suggested earlier in this chapter, content is processible. This allows for diverse entry, storage, massaging, retrieval, and distribution strategies (Mackay, 1988; Malone, Grant, Turbak, Brobst, & Cohen, 1987; Rice & Cas 1983). Digitization structures information CISs into a universal format (bits) so that co tent may appear in any communication mo (text, sounds, video, numbers) through a digital medium. Digitization also separat content from the traditional associations wi specific media and institutional structur (e.g., words with books, accurate images wi photography, music with records) (Bran 1987; Mulgan, 1991; Rice, 1987). This d tachment removes control of the content fro the author, producer, publisher, custodian, l brarian, and so forth. But it also creates co tradictions and problems in the tradition policies and assumptions associated wi those physical and institutional structure Typically, individuals initially enact famili genres with a new medium (such as concept alizing word processing as a fancy typewrit Johnson & Rice, 1987; or voice mail as fancy telephone answering machine, Rice Danowski, 1993). But they may develop choose an entirely new genre (virtual reality or develop new subgenres within a new m dium (electronic novels), which changes t nature, form, and temporal aspects of that m diated content.

The *nature* of message content in CISs ca differ from that of traditional organization media. For example, e-mail communicatio among seven ad hoc programming tas groups involved more discussion of schedu ing, task assignment, and socioemotional to ics, while face-to-face communication i volved more consensus building and proble solving (Finholt, Sproull, & Kiesler, 1990 CISs may allow individuals to exchange me sages, vote, or express preferences anon mously, supposedly separating content fro identity and its attendant attributions and b ases (Hayne & Rice, 1997; Hiltz, Turoff, Johnson, 1989; Jessup, Connolly, & Tansil 1990; Nunamaker, Dennis, Valacich, Vogel, George, 1991). Craipeau (1994) notes on study that found electronic mail message compared to memos, placed less or no impo tance on closing signatures. There was d creased emphasis on hierarchical status an

symbolic value, and increased emphasis on the content. While this reduces the role of organizational hierarchy in communicative content, it may also reduce the role of the social, as indicated and symbolized through closings, signatures, and position titles.

But the nature of the CIS content may be so strongly structured by the organizational context that it mirrors traditional media content, reinforced by and reinforcing the "artifact" of "familiar" organizational communication. Both Bikson and Law (1993) and Bizot, Smith, and Hill (1991) reported that over 90% of a sample of e-mail messages sent in each study's organization were clearly related to business, reflecting the strong intentional administration policies at both sites against social uses of the system, rather than technological causation. Among World Bank e-mail users, higher-level staff reported more substantive e-mail, while lower-level staff reported more administrative messages (Bikson & Law, 1993). Sherblom's (1988) study of the 157 e-mail messages to and from one middle-level manager found that messages sent upward in the hierarchy were more restricted in function (mostly involving exchange of information), functional categories were more evenly distributed among peer messages, and subordinates were more likely to "sign" their mail than were superiors. These aspects of e-mail content indicated that "an electronic paralanguage reflects, reinforces, and recontextualizes the organizational structural hierarchy" (p. 50).

Form of Content

The form of CIS content and message flow may also be different. "Multiple threads of conversation" occur in bulletin boards, computer conferencing, and listservs. These occur when e-mail postings are responses to an item added several entries ago by one user but just recently read by another user, a response to multiple previous topics, or conditional comments embedded in a message that reduce the likelihood of another person having to wait for a response from the original sender to a particular question before being able to provide some information or make a decision (Black, Levin, Mehan, & Quinn, 1983; Kolb, 1996). One consequence of such multiple threads is that online discussions can suffer from tangential comments and loss of coherence (Bump, 1990). Even regular private and synchronous e-mail messages may arrive at different users' screens in different order, due to different log-on schedules and different routings of the messages' packets through packet-switched computer networks.

On the other hand, the multiple threads identified in transcripts of online discussions can provide a visual structure of portions of an emerging virtual organization (Dubinskas, 1993). As an example of such analysis, Berthold, Sudweeks, Newton, and Coyne (1996) coded 3,000 messages from 30 newsgroups on three information services (Bitnet, Compuserve, Internet) over one month. They used neural network analysis to group 51 coded categories (such as emotion, gender, message was referenced later on) that highly co-occurred across the messages. Among other results, they found that messages that were part of conversational threads tended to have medium length, include an appropriate subject line, contain statements of fact, and not introduce a new topic. Organizational members interested in fostering enduring communication relations across otherwise diverse and distant teams or virtual firms might intentionally develop message genres with these thread attributes (see the discussion on metastructuring, below).

Hypertext links will relax our familiar notions of a sequential textual structuring even more. Users may now move from any content node (such as a word, picture, or reference) in a (possibly multimedia) document directly to associated content nodes in other documents, both within and across documents. They may also restructure hypertext documents by adding their own associations for other users to explore. Thus, an annual report posted as part of an organization's World Wide Web home page could allow stockholders to click on summary figures to inspect or reanalyze the full auditor's report, follow links to an industry association's home page for market comparisons of the organization's products and services, or discuss upcoming policy decisions with watchdog agencies. The structure of an organization's identity could be transformed repeatedly through mediated forms created by internal and external publics, many unknown to the organization. Note that hypertext structures are currently being conceptualized as novel or unique because the linear structuring of traditional printed documents has become institutionalized into media artifacts. Actually, hypertext and online relational/keyword searches share some characteristics of preprint oral culture (Grande, 1980) and the ongoing commentaries and annotations of early religious texts such as the Bible.

Temporal Aspects of Content

Time is another intrinsic aspect of the structure of communication that may be transformed within CISs. As well, changes in the use and meaning of time in CISs are transforming how people conceptualize media in general: consider evaluations of the interactivity or social presence of the traditional telephone in light of voice mail, cellular telephones, and videophones. Hesse, Werner, and Altman (1988) discuss a range of temporal aspects in CISs. These include how much communication can occur in a given synchronous period, how to sequence asynchronous contributions by multiple users, mismatches between communication pace of different participants, and the ability to recall prior contributions by participants. Kolb (1996) suggests that the limited length but rapid feedback inherent in CMC likely will foster discourse that builds up arguments over "point-for-point statements and rebuttals" (p. 16) rather than by lengthy linear arguments, and allows clarification and inquiries rather than unchallengeable pronouncements. However, the prevalence of conversational threads may make it difficult to keep the focus on a specific line of discourse and even suppress discourse that arises out of thoughts long incubating. Temporal aspects that may be explicitly structured into group communication system capabilities, according to Johnson-Lenz and Johnson-Lenz (1991), might include identifiable stages, orientations, transitions, beginnings and endings, and rhythms such as patterns of periodic contact and participation. Conscious understanding of and attention to social aspects of how systems are used—open space, timing, rhythms, boundaries, containers, and procedures—can lead to "purpose-centered groupware." They propose that emphasis on these social aspects would allow users and designers to iteratively and continuously use the current state of groupware to design and implement the next state. Highlighting the duality of structure and technology, they argue for "the emergence of background processes that inform the next generation of foreground forms" (p. 402). Thus, even traditional artifacts of a temporally sequential design-build-implement-use system process may be transformed.

Group Communication

Considerable research has looked at how groupware may be used to structure group communication, processes, and outcomes (such as decision quality or consensus) (Kraemer & Pinsonneault, 1990; Rice, 1984; Valacich, Paranka, George, & Nunamaker, 1993) and how, in turn, groupware is structured through use and interpretation. Poole and DeSanctis (1990; DeSanctis & Poole, 1994) have developed a theoretical framework called adaptive structuration theory, and refined it through empirical coding schemes. The use and outcomes associated with groupware are influenced by (a) social structures of group processes, tasks, and organization, (b) how groups produce and reproduce their structures through their use and adaptation of technologies, and (c) technical features, limitations, and spirit of CISs (such as interface design). Teleconferencing, and group communication, are discussed elsewhere in this volume (Chapter 16).

Metastructuring

We have seen that transformation involving CISs and organizational structuring may involve the adaptation of an innovation during and after its initial adoption, sometimes called *reinvention.* An early application of the concept to CISs was a cross-organizational study showing how different management and user practices (sometimes intentional, sometimes not) involving word processing fostered or constrained different levels of reinvention (Johnson & Rice, 1987). For example, some units were managed by the supervisor into organization-wide consulting groups that restructured word processing as a foundation for document and transaction processing. Other units were administered strictly as industrial typing pools without proactive management, and eventually were disbanded.

Orlikowski et al. (1995) generalize this concept, labeled *metastructuring,* as part of their model of the duality of technology. They studied how a newsgroup and e-mail system were initiated, used, and iteratively redesigned by a team of software engineers. A few individuals influenced others' use of the medium, changed the system's features, and changed the context of system use. This mediation helped to establish norms and expectations for subsequent use, sometimes through major changes in either the system or the organization of project teams. There were four types of mediating activities: (a) establishment (such as shifting official announcements from a traditional lunchtime meeting to a new newsgroup), (b) reinforcement (such as promoting effective use), (c) adjustment (such as providing online feedback to clarify rules and resources), and (d) episodic change (such as adding a moderator). Indeed, without such ongoing metastructuring and reinvention, a CIS is likely to be irrelevant, damaging, unsatisfying, or rejected. Sure enough, when the engineers' organization was restructured, there was no formal provision for technology-use mediation, and the newsgroups and other services fell into disuse.

Summary

There are many dimensions of transformations involving CISs and organizations. CISs may be used in ways that transform the nature, form, and temporal aspects of content. To the extent that these microprocesses of communication influence the structuring of meaning and relations in organizational settings, they may be one of the primary ways in which new media genres emerge. These may possibly transform our ways of conceptualizing what has been considered "natural" conversational relations and meanings. Group CIS systems have been adapted to facilitate better group interaction, idea generation, and decision making—but also may be used to reinforce familiar group communication processes and structures. They may also seriously challenge traditional notions of organizational structure that presume most interaction is within the functional work group, rather than across organizational units or even across organizations themselves. Metastructuring may be designed into the implementation process as an ongoing, intentional transformation of social and technical aspects of CISs.

Institutionalization: CIS Influences on Organizational Structures

CISs may expand or reduce characteristics associated with traditional media, and alter the mix of available media. Associated patterns of communication and transactional processes are likely to change as well. New communication systems shorten the time between events and their consequences, reduce internal and external organizational buffers, and increase but also allow the management of interdependence (Rockart & Short, 1991). These processes may generate new behavioral and conceptual spaces, changing both actions in, and thinking about, organizations (Taylor & Van Every, 1993). That is, CISs provide occasions for institutionalization of changes in power, participation in communication networks, and meanings and relations within and across organizations.

Power

Organizational power is associated with access to and control over informal and formal rules and resources, such as communication flow, interaction norms, and hierarchical position (Blair, Roberts, & McKechnie, 1985). But *any* organizational medium (from memos to meetings) structures access to resources (intentionally or not). Current organizational information is already prefiltered, but largely in ways that we do not perceive, cannot control, or generally idealize rather than recognize as artifacts of how communication is structured and constrained. Pettigrew (1972) provides a classic case study of how differential access to interaction (involving pre-CIS media of face-to-face meetings, reports, memos, telephone calls, etc.) among organizational members was used to control the flow of information and the range of interpretations during the process of deciding on a new CIS. Moreover, differential structuring of access (by any particular medium) is neither universally good nor bad for an organization (Choo & Auster, 1993). Organizational members have always had opportunities to use unmediated and mediated interaction as ways to structure power, and will continue to do so with CISs. As Markus (1984) and others show, whether and how power is reallocated cannot be easily predicted because that depends considerably on personalities, internal organizational changes, and preexisting access to resources. For example, women are more likely to experience negative changes in work structures and skills, primarily because they hold jobs that have less power and in which CISs can play a greater role, such as routine processing (Gattiker, Gutek, & Berger, 1988; Gattiker & Howg, 1990; Gutek, 1994).

To the extent that CISs can alter some constraints—say, by reducing hierarchy, providing the occasion for development of expertise, increasing one's centrality in online space and allowing greater interaction and thus visibility through the network—more organizational members may share power (Blair et al., 1985; Sproull & Kiesler, 1991). And such outcomes are quite salient to those members: Joshi (1992) concluded that inequity with regards to the allocation of resources (measured in terms of role ambiguity and role conflict) was the single strongest predictor of users' reported dissatisfaction with a CIS.

CISs have the potential for changing power through providing new sources of organizational socialization and informational resources, such as ad hoc groups, distribution lists, and informal social interest groups (Eveland & Bikson, 1988; Finholt & Sproull, 1990; Rice & Steinfield, 1994; Sproull & Kiesler, 1991). For instance, increased network density, increased ability to recognize other members of the organization, less centralization of interaction, more cross-group communication, and quicker emergence of expertise were found in a group that used e-mail, compared with a comparable group of nonusers (Bikson & Eveland, 1990; see also Sproull & Kiesler, 1991). Several studies have found that over time, users in general, but early adopters in particular, increase their power and relational network centrality as they use a new CIS (Burkhardt & Brass, 1990; Hesse, Sproull, Kiesler, & Walsh, 1993; Huff, Sproull, & Kiesler, 1989).

CISs may well contribute to the erosion of organizational and even national hierarchies (Cleveland, 1985; Taylor & Van Every, 1993). Information via CISs flows easily across boundaries (so that many instead of few can be informed and participate). A CIS does not necessarily require a small set of leaders to coordinate decision making. But it may require greater cooperation among leaders. CISs may attenuate the influence of organizational legitimization and managerial trust by increasing the social space in which organizational members participate, and by emphasizing principles of self-management and semiautonomy (Perin, 1991). Indeed, Mulgan

(1991) argues that greater use and scale of telecommunications networking increases the decentralization of usage, with a corresponding loss of control and a rise in the costs of control.

Paradoxically, CISs themselves might be particularly vulnerable to changes in policy or concerns about power loss because they are not as visible or institutionalized as more traditional media structures (Perin, 1991). Perin suggests that new CIS structures may also obscure important differences in power and interests, and are not themselves necessarily free of hierarchy or conflict. Indeed, the very nature of organizational CISs may foster "strategic information behaviors" such as manipulation or distortion (Zmud, 1990). This may happen in two primary ways (in the content of a message that a system transmits/stores/distributes, or in how a message directs operations of the system itself) at a variety of system nodes (sensor, filter, router, carrier, interpreter, learner, and modifier). Zmud describes how information overload fosters the delegation, summary, or dilution of initial e-mail messages, increasing users' reliance on symbols of expertise and authority, and creating opportunities for manipulation and susceptibility to misrepresentation.

Bloomfield and Coombs (1992) emphasize "the potential role of computer-based information systems in the renegotiation of professional knowledge, discourses, and practices within organizations" (p. 461). Thus, to the extent that organizational activities involve technological terminology and jargon, and to the extent that these terms are differentially understood and valued by different members, a CIS is necessarily discursively associated with power relations (p. 467). Bloomfield and Coombs note that this power disciplines actors via norms (such as users being judged as more or less "competent" depending on their usage of technical terms). A CIS may foster a loss of power that is based on technical expertise and a weakening of group boundaries because of changes to in-group terminology (Nelson, 1990). But it also empowers members by providing access to bodies of knowledge or discourses, enabling different kinds of action (such as technical staff members becoming internal consultants to high-level managers). Even *perceptions* of power may be influenced: In 27 CIS groups, users of "powerful" language were perceived as more attractive, credible, and persuasive relative to users of "powerless" language (Adkins & Brashers, 1995).

The potential for interconnectedness across boundaries of time and space may encourage the development of virtual communities (Rheingold, 1993) that in the long run reduce the power of geopolitical identities in politics (what Cleveland, 1985, calls the "passing of remoteness"). However, the openness of networked, participatory communication can also hinder innovation and bold initiatives, because they are then subject much earlier on to public scrutiny, defensiveness, and suspicion (Cleveland, 1985; Dutton, 1996). Cultural differences and identities may become blurred, with subsequent loss of diversity.

Communication Structures and Participation

Many studies show that CISs can overcome physical and temporal structural constraints and thereby facilitate more diverse communication (see, e.g., the early reviews by Rice & Associates, 1984). CISs may help solve some of the problems of traditional bureaucracies by reducing organizational complexity, hierarchical structures, and procedures; facilitating a better sense of members' opinions; and increasing participation and democratic interaction (Keen, 1991; Sackman & Nie, 1970; Taylor & Van Every, 1993).

In some cases, the empirical changes are considerable, such as the ability of organizational members to participate in ongoing multiple, overlapping committees because physical and temporal constraints have been

reduced (Eveland & Bikson, 1988). Bishop (1993) found nearly two thirds of 950 aerospace engineers who used a variety of network applications reported increases in the amount of information available, exchange of information across organizational boundaries, and communication with others outside their own organizations. Kaye and Byrne's (1986) study of an organizational e-mail system revealed that ideas were recorded and circulated that would otherwise have been lost, opinions and decisions were better considered, information flow between organizational levels and departments increased, and more communication could be managed in the same time.

Simple increased access ("overcoming time and space") is not the whole story behind such changes, though. Lind and Zmud (1995) studied the influence of voice mail on the communication and sales performance of a multinational truck manufacturing firm by comparing sales regions that had used voice mail for nearly a year to regions that had not. They found increased and improved communication relations between sales representatives and dealership managers, primarily through direct benefits from the store-and-forward capabilities of voice mail. But voice mail was also used to signal a need for communication episodes between dealers and sales representatives, or to asynchronously establish a context for subsequent written exchanges, both of which increased dealers' satisfaction with their interactions with sales representatives.

Participation is usually less unequal in CISs than in face-to-face groups (Hiltz & Turoff, 1993; Kraemer & Pinsonneault, 1990; Rice, 1984). But users can participate more across vertical and external boundaries, as well. Online courses can foster more equal discussion among students than do traditional classrooms (Harasim, 1990; Hartman et al., 1991; Hiltz, 1986). Users in one organizational study sent 78% of their (computer-monitored) messages to others outside of their own work group, indicating extensive crossing of traditional work boundaries (Bizot et al., 1991). Eveland and Bikson's (1987) study of 800 users in an R&D organization found that three quarters of the messages crossed departmental boundaries, while 40% of the messages crossed specific research project boundaries, indicating high cooperation on projects among research disciplines within broad organizational functions.

Such changes seem more likely in novel situations or new groups, when groups are not embedded in organizational structures, when other communication channels are not constrained, and when jobs are more technical than administrative. For example, Markus (1992) analyzed four field study groups that had access to groupware systems as well as participated in weekly face-to-face meetings. The groups' social contexts helped explain system usage—including one group using the system primarily so that two antagonistic members would not have to meet face-to-face! Rice (1994) found that initially the network of e-mail communication among new interns and their mentors in an R&D organization was strongly correlated with work and social networks. Over time, though, it diverged from those traditional structures as well as from formal mentor-intern relations. Eveland and Bikson (1988; Bikson & Eveland, 1990) provided strong evidence that CISs can influence the development and maintenance of both task and social networks among groups that had not interacted before, including fluctuating leadership patterns over three time periods, greater communication in all channels, greater connectedness, less centralization over time, more multiplex subcommittee relations, continued online communication after the report was completed, and considerable messaging across the task subgroups. Feldman's (1987) study of messages exchanged among 96 users indicated that 60% of the messages would not have been sent without the system, but this was even higher for people who did not know one another, who did not communicate other than by the CIS, who were spatially

or organizationally distant, and who used distribution lists. Other reviews (Hiltz & Turoff, 1993; Rice, 1980, 1987, 1992; Rice & Associates, 1984; Sproull & Kiesler, 1991) summarize similar results from many studies.

Increases in horizontal and collaborative communication also seem more likely among certain types of users. An analysis of dyadic communications among administrators and technical workers found increased horizontal relations among technical workers who used e-mail. This was partially explained by the flatter internal structures of their project teams, more frequent boundary crossing to avoid extreme specialization, less analyzable tasks, and their professional socialization to work on projects in teams, and of course, e-mail use (Hinds & Kiesler, 1995). Such changes are even more likely among members of professional, dispersed occupational communities, such as academic researchers, whose values and perspectives transcend the norms of their employing organizations (Pickering & King, 1995). So organizations may have good reasons to be cautious about personnel using the Internet. These increased external network relations may weaken managerial control, provide access to unmonitored values and norms, increase external job opportunities, and allow leakage of organizational information (Gattiker, Janz, Kelley, & Schollmeyer, 1996).

Potential changes in communication associated with CISs may institutionalize new traditional organizational structures of meaning and relations, but may reinforce old ones. In one traditionally hierarchical R&D organization, 83% of all messages collected from 188 users over a three-day period were sent within a division, and 93% of messages were sent to a recipient either one job type above or below the sender, indicating little circumventing of the traditional organizational structure (Bizot et al., 1991). Eveland and Bikson (1987) found little evidence of changes in departmental or project communication clusters during 18 months of e-mail use in an R&D firm, indicating that the electronic mail system supported the intraorganizational structure of the R&D organization.

Mantovani (1994) underscores the strong organizational structurings of culture, social actors' goals, and local situations on the extent to which any democratization of participation through CISs may actually occur. He argues that access (physical, cultural, technical, and economic) to CISs is inherently unequally distributed. Equal participation does not necessarily mean equal attention from others (especially in noncooperative social contexts) because it is far easier to be selectively attentive in CISs than in face-to-face communication. Symbolic group norms may be stronger in CISs than in face-to-face contexts, and certain phases of group decision making such as negotiation and means-ends debates tend to be minimized in online discussions (Mantovani, 1994; McGrath, 1990; Rice, 1987, 1990; Spears & Lea, 1992).

Dutton (1996) suggests the possibility that the absence of formal as well as social norms that otherwise regulate online discussions may actually "undermine the very existence of such forums by chasing key individuals, such as opinion leaders and public officials, off the system" (p. 284). However, Ess (1996) applied Habermas's theory of communicative action to show that CISs have the potential to "facilitate the unconstrained discourse of communicative reasons, a discourse that leads to consensus over important norms" (p. 215), as represented by the "diverse plurality of democratic communities" of listservs and newsgroups.

Relationships among gender and participation in CISs have received considerable attention (Ebben & Mastronardi, 1993; Gattiker, 1994; Hackett, Mirvis, & Sales, 1991; Perry & Greber, 1990; Zimmerman, 1983). Because of their supposed limited bandwidth and the use of pseudonyms or anonymous accounts, CISs should reduce the influence of social and other status cues. Thus, discussion via a CIS would be expected to include more diversity of viewpoints, egalitarian participation, interpretative risk taking, and challenges to textual authority than in traditional face-to-face settings. Also, Internet connectivity can foster new organizational forms of particular interest to women, such as discussion groups centered around a specific professional interest (such as women's career development, sexual harassment awareness, or organizational mentoring).

Some studies do find evidence for empowerment and nondiscriminatory participation in CISs. Adoption of Santa Monica's Public Electronic Network (PEN) by women was encouraged by the free system and public terminals, public norms supporting community participation, system administrators' support for reinvention in design and implementation, and women's greater involvement in community politics (Collins-Jarvis, 1993).

However, some argue that the use of CISs in traditional ways may just reinforce existing gender inequities (Frissen, 1992; Sparks & van Zoonen, 1992). For example, women constitute small percentages (from 10% to 40%) of users on the major online systems (Brail, 1996). Selfe and Meyer's (1991) study of 56 teachers using a computer conference reported that men and high-profile members initiated more communications (although used fewer words per message) and disagreed more, and these differences were unaffected by options for using pseudonyms during a second 20-day usage period.

Precisely because context may be depersonalized due to anonymity and weak social feedback, online communication may be more disinhibited and critical, and lessen public awareness of social sanctions (Collins-Jarvis, 1996). This may lead to more, rather than fewer, gender-based stereotypical comments, especially when online social cues make groups' unequal and unstable power relations salient (Collins-Jarvis, 1996). Such content leads some women to drop out of, or never join, online discussions (Brail, 1996; Ebben, 1993). On the PEN system, initially, female users experienced instances of discrimination and harassment, so a few of these female users restructured some aspects of the system by forming a women's user group (Rogers, Collins-Jarvis, & Schmitz, 1994). Several of Brail's women respondents noted, however, that unpleasant disturbances occur in all communication environments (another instance of demythologizing the artifact of idealized interpersonal communication), and they would not let that discourage them from taking advantage of the Internet.

Intraorganizational Structures

Early studies of CISs and organizational structure concluded that computerization increased organizational centralization (Mowshowitz, 1976; Mumford & Banks, 1967; Whisler, 1970), increased number of job titles (Gerwin, 1981), or deskilled work by extracting local control (Braverman, 1974). Caufield's (1989) meta-analysis of technology as industrial process concluded that technology does have a direct effect on hierarchical and administrative structures. Outcomes such as increased consolidation of departments and reduced span of control occur, however, mostly within general subunits and not across broad organizational units (Perio & Prieto, 1994).

Later research included more contextual measures, such as the particular function of the system and environmental stability. These studies concluded that computerization primarily reinforced the status quo, whether there was a trend toward centralization or decentralization (Blau, Falbe, McKinley, & Tracy, 1976; Robey, 1981). Others found evidence of increased horizontal differentiation, but argued that increased differentiation does not necessarily mean a bureaucratic hierarchy: It can also support matrix and lateral relations (Bjorn-Andersen, Eason, & Robey, 1986). Along with Child (1986), they conclude that the primary influence is not technology per se but implementation and operational strategies, which are, however, typically decided by power elites.

Some familiar organizational communication roles will likely be restructured with the

diffusion of CISs. For example, top managers can handle more of their correspondence through e-mail, voice mail, and word processing. One subtle consequence of this shift is the removal of secretaries from their accustomed informal role as gatekeepers and liaisons. Note, however, that in some ways this represents a reinstitutionalization of office roles before the typewriter separated secretarial from managerial activities, creating the "idealized" artifact of the now threatened executive secretary position (Johnson & Rice, 1987).

But the opposite role transformation may also occur. The unnecessary monitoring and filtering represented by middle management is being excised from many organizational structures. This change leads to a flattening of organizations' hierarchies, and new forms such as orchestration, group management, and teamwork, involving greater trust, motivation by more than pay, a willingness to change, and collaboration (Davidow & Malone, 1992; Wigand, 1985). Using CISs to access updates or relevant service processes, "lower-level" personnel now can solve nonroutine problems and take on informal guru roles, thus altering decision roles throughout the organization (Quinn & Paquette, 1990). (However, these informal roles rarely have their authority or resources restructured; Bikson & Law, 1993; Johnson & Rice, 1987.) Thus, different authority structures are being institutionalized—from one of control to one of interpersonal boundary management and empowerment (Johnson & Rice, 1987). But Hirschhorn and Gilmore (1992) warn that the loss of familiar internal organizational boundaries must be managed through formerly transparent but now exposed boundaries of authority, task, political, and identity. Such ongoing restructuring requires iterative communication within and across organization boundaries.

The physical structures of one's work, office, and organization are also evolving into new forms through the use of CISs (Fulk & DeSanctis, 1995). The physical structures of buildings and offices create considerable constraints on communication, and thus quality of work life, performance, and innovation (Allen, 1977; Johnson, 1993). Developments such as modular offices, shared drawing displays, wireless communication, and personal locator badges may overcome some of these constraints, while also generating others ("The New Workplace," 1996; Stone & Luchetti, 1985; Want, Hopper, Falcao, & Gibbons, 1992). Bikson and Eveland (1990) found that while there was a high negative association between the spatial distance network and the self-reported communication network for respondents of one ad hoc task force without an e-mail system, for the other task force that used the system there was little association. As many organizations are finding out, "the new work styles don't work in buildings designed for the old top-down corporation" ("The New Workplace," 1996, p. 108). Thus, traditional communication relations may, to some extent, be an artifact of "natural" physical structures, institutionalized into an "ideal" organizational communication context, which is being "threatened" by CISs. Consider, for example, how being in an elevator essentially silences all but the most ritualized interaction; compare that to anonymous brainstorming through group support systems. Integration of facsimile, mobile phone, voice messaging, rerouting of phone calls, and "smart buildings" may well foster changes in the familiar association of high organizational status with a large, remote office. Truly influential members may well become the most "virtual."

It is true, though, that the removal of these traditional aural and visual constraints can lead to a loss of sense of work privacy and an associated decline in job satisfaction (Sundstrom, Burt, & Kamp, 1980). But organizational norms of access and privacy have usually already been institutionalized for familiar media such as telephone, the office doorway, elevator interactions, and so on, creating "artifacts" that confound technological possibilities and limitations with social structuring. A case in point is a study of a networked desktop video conference system that showed that while it facilitated R&D workers' ability to make contacts and collaborate with others across offices, it still raised issues concerning norms of privacy, interruption, and access (Fish et al., 1993).

Certainly, telecommuting and telework are one form of restructuring organizations (Dürrenberger, Jaeger, Bieri, & Dahinden, 1995; Kraut, 1989; Nilles, Carlson, Gray, & Hanneman, 1976). New structures for telework range from prosaically working from home with visits to employer or client; to distance working enterprises, where enterprise workers provide information-based services to distant customers; to distributed business systems that are physically separated units (either part of same, or different enterprises) that are networked together to produce a final good or service (Dürrenberger et al., 1995; Holti, 1994, p. 263). Lower-level, female, and clerical workers, who might become even more disenfranchised through remote work (Calabrese, 1994; Soares, 1992), could decrease their isolation and simultaneously develop basic computer skills, through use of CISs (Matheson, 1992).

New organizational structures might include (a) answer networks, where networks of experts and databases can refer problems to the sufficient level of resolution; (b) overnight organizations, that assemble short-term project teams through a network, via a database of skills, evaluations, and availability; (c) internal labor markets, where services are allocated on the basis of project requirements, rather than by supervisory assignment; (d) computer-mediated decision networks that connect opinions and suggestions from multiple people at different decision phases; and (e) more effective and contextual information gatekeeping services (Malone & Rockart, 1993). Federal Express uses a CIS to avoid most middle organizational levels (an "infinitely flat" structure) and keep in constant communication with its vans and airplanes, leading to increased value-added services. This is an example of Mulgan's (1991) paradox that centralized CIS networks enable decentralized and customized decisions and service.

In the "spider's web" organization, relations among consultants and clients are supported by centralized CISs (such as expertise bulletin boards), allowing any participant to request information from, or make suggestions to, any other participant (Quinn & Paquette, 1990). As an example of "critical mass of expertise," this solution also reduces some of the potential loss to corporate memory that turnover by knowledge workers represents. Additionally, this increases switching costs for consultants considering jumping to firms that do not participate in the web, in turn allowing the more networked firms to invest more in specialized training.

Other new forms include "postmodern" (Bergquist, 1993) and "postbureaucratic" (Heydebrand, 1989) organizations. Such new organizational structures tend to involve fewer physical assets, customer information and communication as primary assets, increased informality, greater cross-organizational networking, and more permeable and transitory organizational boundaries. Crucial to their success is an increased dependence on strong cultures within, and trust and relationships across, organizations, implying increased interdependence. This in turn requires more mutual adjustment and cooperative mechanisms across suborganizations, such as cross-functional teams, ad hoc project teams, task rotation, overlapping electronic group memberships, and novel reward policies (Quinn & Paquette, 1990).

Interorganizational Structures

CISs can be used to restructure interorganizational boundaries, and these new structures also require and foster new forms of CISs. Such systems influence the transaction costs of acquiring knowledge, communicating, coordination, distribution, and producing and enforcing contracts, within and across organizations (Gurbaxani & Whang, 1991; Malone, Yates, & Benjamin, 1989; Monge & Contractor, Chapter 12, this volume).

The restructuring of organizations from clearly bounded, hierarchical structures to new forms has increased the possibilities for interorganizational relations. CISs can allow formerly separate and rival organizations to engage in new forms of cooperation, such as joint marketing partnerships (online services), intraindustry partnerships (electronic publishing ventures), customer-supplier partnerships (electronic document interchange), and CIS vendor-driven partnerships (using liaison CIS networks to enter new markets) as well as many other emerging structures (Cronin, 1994; Gale, 1994; Granstrand & Sjölander, 1990; Hart & Rice, 1988; Hepworth, 1989; Konsynski & McFarlan, 1990; Monge & Contractor, this volume).

Paradoxically, CISs may foster a return to small organizations, embedded in larger organizational networks involving long-term relationships with one or more suppliers (Ciborra, 1987; Davidow & Malone, 1992). These would be communication-rich environments where information flows blur traditional internal and external boundaries, perhaps leading to "boundaryless organizations" (Ashkenas, Ulrich, Jick, & Kerr, 1995; Rockart & Short, 1991). Other transformations include the creation of virtual electronic markets where customers, suppliers, and distributors interact in a largely seamless web (Dordick, Bradley, & Nanus, 1981). The Internet has ushered in the era of electronic commerce; online interactive sales are estimated to rise from the $350 million exchanged in 1995 to nearly $7 billion in 2000 (Kalakota & Whinston, 1996; Rupley, 1996). Another example is the French videotext network, where the national telephone system provides the transmission technology and the gateway software for information providers, individuals, or other businesses to exchange services and information (Steinfield, Caby, & Vialle, 1992).

Any discussion of the benefits or transcendence of the "network organization" should, however, consider the limitations and disadvantages of this new structure. These may include stifling of innovation, ambiguities in the nature of relationships, asymmetric commitment, conflict over control, personality and cultural differences, loss of autonomy and security, time lags, managing complexity, structural constraints, narrow managerial perspectives, manipulation and ulterior motives, mismatched or incomplete knowledge and competence, increased dependencies, and so on (Camagni, 1993; Nohria & Eccles, 1992).

Universities and academic professionals have always been a somewhat unique organizational form. They already incorporate various aspects of the "boundaryless organization" (conceptualized as "the invisible college"), but they, too, are undergoing transformations associated with CISs. The traditional cycle of scientific communication (conceptualization, documentation, and popularization, with some feedback loops) may change, by increased collaboration, diffusion, and feedback, through CISs, leading to an era of "telescience" (Lievrouw & Carley, 1990). CIS networks increase the intensity and diversity of communication and participants, the "stock" of ideas, and awareness of others' work (Hiltz, 1984; Hiltz & Turoff, 1993; Kerr & Hiltz, 1982).

The academic journal may evolve into new structures such as separate articles published and distributed on demand or retrieved by "intelligent agents," independently of other articles that have traditionally, but artifactually, been seen as constituting a regularly published "journal issue" (Kolb, 1996). Further, the content of the "article" may no longer be fixed, as readers and colleagues may provide ongoing feedback, evaluations, or addenda associated with the original material, through hypermedia linkages managed through World Wide Web interfaces. In the extreme, academic institutions may be restructured through direct distribution of materials from authors to readers via the Internet and personal or organizational Web pages. Readers may use on-demand publishing from optical archives, online databases, and Internet file transfer protocol (Gattiker, in press). Online courses, degrees, and educational organizations will not only challenge traditional organizational forms such as university campuses and classrooms but also redefine how learning itself is structured (Harasim, 1990; Harrison & Stephen, 1996). However, many boundaries in scholarly communication have been changing for some time, obscured by the "artifacts" of "familiar" academic media. For example, photocopying, microfilm, facsimile, and online databases have dramatically, but quietly, transformed relations among scholars, producers, publishers, vendors, libraries, and students (Schauder, 1994).

Summary

CISs can provide the occasion for the evolution of the fundamental basis of organizational power—the structuring of interaction—into new forms and locations. One way this may occur is through exposing hierarchy and authority as largely artifacts of traditional constraints on organizational structures. CISs have been associated with transformations in the communication flow within organizations when groups are less embedded in preexisting organizational structures (such as new or project-based groups, or cross-structural roles such as technical workers). A variety of social and organizational structures foster differences in men's and women's attitudes toward, and use of, CISs. To the extent that CISs, like other media, are malleable and socially adapted, they can be structured to foster positive or negative differences, or even mute differences, for good and ill.

CISs, by removing some structural constraints, will expose widely accepted communication norms as the artifacts they are, generating the need to develop and manage new norms. Unfortunately, limited conceptualizations of media will foster applying familiar norms to evaluating CISs, thus institutionalizing limited and constrained uses and interpretations of CISs. Managers may develop more integrated communication processing through CISs, and need to develop new ways of managing increasingly amorphous boundaries. At the same time, the role of "middle manager" may be largely deinstitutionalized from organizational structure. A wide diversity of organizational forms is emerging. New institutionalized structures associated with CIS networks are far more complex than the traditional opposition of "centralized or decentralized structures." This ongoing process probably best highlights the constant interactive and iterative relationships among CISs and organizational structuring. Academic institutions and communities, an early form of "virtual organization," are also undergoing structural changes associated with CISs.

CONCLUSION

This chapter has suggested both explicit and latent themes concerning theory and research on organizational structure and new communication and information systems.

Several explicit themes structured this review. Organizational structures include meanings and relations, within and across organizations. Such structures can constrain or facilitate the development and use of CISs. Transformations of structures of organizational communication and CISs may involve intentional processes of metastructuring, or nearly invisible evolutions of the form, nature, and temporal orientation of communication content. And CISs can constrain or institutionalize changes within and across organizational structures.

Table 14.2 summarizes these arenas of interaction between CISs and structure. This is not intended to portray a comprehensive, fully specified, or causal theoretical model, but rather to suggest various strands of research that seem to focus on different microprocesses of these three generalized processes involving CISs and organizational structuring of relations and meaning.

This framework may help to identify arenas for future research that would illuminate how microprocesses co-occur or moderate each other within each generalized process, and how microprocesses influence each other across generalized processes. For example,

TABLE 14.2 Summary Model of Macro- and Microprocesses of CISs and Organizational Structuring of Meaning and Relations

Structural influences on adoption and implementation of CISs
- Media genres and usage norms
- Culture
- Media richness and social presence
- Communication networks
- Critical mass
- Physical location

Transformations of organizational structures and CISs
- Nature of content
- Form of content
- Temporal aspects of content
- Group communication
- Metastructuring

CIS influences on organizational structures
- Power
- Communication networks and participation
- Intraorganizational forms
- Interorganizational forms

there has been increasing work on the contingent relations among media richness/social presence, communication networks, social influences, critical mass, and physical location in how they influence adoption, choice, and use of new media (Rice & Aydin, 1991; Rice et al., 1990). However, few of these and other prior structures have been considered in analyzing transformations of the nature, form, and temporal aspects of content, except perhaps in qualitative approaches to describing new media genres (Orlikowski et al., 1995). Only a few studies have considered how these transformations may be institutionalized into new intraorganizational forms, ranging from the role of signatures in e-mail messages (Sherblom, 1988) to forms of power embedded in participatory discourse enabled through organization-wide listservs (Sproull & Kiesler, 1991) and public computer conferences (Dutton, 1996).

This framework might be useful in developing implementation policies that emphasize metastructuring. For example, a better understanding of how new media can (though not necessarily) facilitate increased participation can be used to foster metastructuring discussion groups. These could then intentionally and consciously develop possible metastructuring procedures and roles to help shape transformations between prior structures and desired restructurings. This process itself, however, is a topic ripe for research. To what extent has the by-now familiar notion of "free agency" and "social construction of reality" become idealized into an invisible artifact of uninformed and unmanaged "social influences"? Once we have identified processes of adaptive structuration (Poole & DeSanctis, 1990), should these microprocesses be managed by participants in any conscious way? Can they be? Is the process of sociotechnical design inherently flawed because it must be intentional and conscious?

One latent theme of this chapter is that research on organizational structure and CISs—both supportive and critical—tends to be structured by past conventions about and research traditions in communication processes, new media, and organizational structure (for a review of perspectives, see Rice, 1992). In particular, organizational researchers and ordinary folk alike tend to compare the constraints and advantages of new media not to those of older media at similar stages of development, implementation, and structuring, but to idealizations and consequent artifacts of familiar media. Thus, we argue, one goal of a structurational approach toward CISs and organizational communication should be to "uncover" asymmetric assumptions about "old" and "new" media in organizational settings. It should force us to identify factors and processes that are conceptually distinguishable, but artifactually confounded, in familiar media and research practices. It seems fairly obvious that neither the determinism of technological utopianism nor the determinism of critical pessimism is free from constraining assumptions that limit our understanding of how CISs are embedded in organizational structures and in restructurings of organizational meanings and relations.

A second latent theme of this chapter is that pluralistic, multimethod approaches that involve triangulation of both method and analysis are necessary to better identify and understand the microprocesses of (re)structuring. A more subtle aspect of this theme, however, is that specific theoretical approaches that appear to be opposed may, in fact, be complementary approaches that just focus on different components of one of the three generalized processes. For example, some have tried to artificially characterize media richness theory as a "rational choice theory," which then obviously suffers in comparison to social influence models that are "social construction of reality theory." But this confounds structural facilitation with "meaning" and structural constraints with "technology." It may well be more enlightening to show how both objective and subjective influences both constrain and facilitate, so that media richness theory and social influence theory can both contribute to understanding structural influence on the adoption and implementation of CISs.

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