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8

Adoption, Diffusion, and Use of New Media

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This chapter reviews the forms of, and influences on, the diffusion, adoption, and uses of computer-mediated communication (CMC) in organizational settings, from e-mail to desktop videoconferencing to collaborative systems. It does not explicitly consider outcomes or consequences of such usage, but, rather, considers adoption and uses of new media as important "dependent variables" in and of themselves (Rogers, 1995).

Research and models of the adoption, diffusion, and use of new communication media have arisen from several research streams—*diffusion of innovations* (e.g., Rogers, 1995), *media choice* (e.g., Daft & Lengel, 1986), and *implementation of information systems* (e.g., Saga & Zmud, 1994). The diffusion of innovations literature suggests that characteristics of an innovation (such as relative advantage and complexity) and communication networks (such as opinion leaders and informal interactions) influence media diffusion. The media choice literature posits that interactions between characteristics of the message and the task, and peer

attitudes and use, will affect media choice and performance. The implementation literature proposes that management policies, technology design, ease of use, and user participation in design will affect media use, satisfaction, and effects.

"The" dependent variable has varied across research streams and individual studies. For example, in the diffusion of innovations literature, media adoption, usage or reinvention are generally the dependent variables (Agarwal & Prasad, 1997). In the media choice literature, choice or evaluation may be the dependent variables (Trevino, Webster, & Stein, 2000). And in the information systems literature, acceptance (measured as attitude toward use, intentions to use, or frequency of use), routinization (i.e., normal, standardized, or administrative use), user satisfaction (with respect to information, the system, and support staff) and infusion (extended, integrative, or emergent use) may be the primary dependent variables (DeLone & McLean, 1992; Saga & Zmud, 1994).

BACKGROUND

Adopters, Adoption, Use

Type and Level of Adopters. Simple dichotomizations of adoption type such as adopters or rejecters, adoption or nonadoption, usage or nonusage, are by now inadequate and misleading. For instance, Lin (1998) introduced the middle category of *likely adopters,* between nonadopters and adopters. O'Callaghan (1998) noted the distinction between *innovators*—those who make their decision to adopt independently of others' decisions or social influence—and *imitators*—those influenced by the nature and timing of others' decisions.

There may be a variety of *levels of adopters.* Often an "organization" decides to purchase or design, and implement, a new media system, which can be considered the "adoption." But that says little about the decision processes or adoption and usage levels within different units, much less by different groups or individuals. Influences on adoption by organizations and individuals may be quite different (Tornatzky & Klein, 1982). Even "organizational" adoption may be a product of prior actors' decisions, and user feedback, concerning technical and regulatory standards, designs, infrastructure, political factors, vendor and supplier strategies, and cultural constraints or national policies, as considered by the "social shaping of technology" perspective (Williams & Edge, 1996).

Adoption, Reinvention, and Infusion. A crucial distinction in kinds of adoption, especially for organizational communication media, is

the extent of *voluntariness* of the innovation (Agarwal & Prasad, 1997), or how much individual (or unit, organizational) choice is involved in the adoption and usage of the system. For example, large-scale integrated systems typically require specific technical features and well-defined kinds of usage (perhaps even limited to entering data and responses to online forms). These necessary system boundaries reduce the variety of uses and applications by potential adopters. In addition, managerial policies may limit certain kinds of usage, such as barring unjustified use of internal phone in favor of e-mail (Markus, 1994a). The kinds, amount, and forms of usage may not be very "voluntary" in these conditions. It is also the case that adoption, however defined, at one time does not necessarily imply continued usage or acceptance; an innovation not rejected initially may later be *discontinued,* such as after the primary technology champion of organizational e-mail usage leaves (Markus, 1994a), or when one desktop video system attracts another system's potential user base (Kraut, Rice, Cool, & Fish, 1998).

Another distinction is between *adoption* (allocation of resources to acquire an innovation) and *infusion* (use of the system leads to increased organizational effectiveness at a more integrated level; Cooper & Zmud, 1990). As partial evidence of the conceptual distinction between initial use and intentions for future usage, Agarwal and Prasad (1997) found that predictors of the two (concerning use of the World Wide Web) differed: for initial use, compatibility, visibility, trialability, and external pressure; for intended future use, relative advantage, result demonstrability, and current usage. In between are *adaptation* (the system is installed, maintained, and revised, people are trained and begin using the system), *acceptance* (the system is applied to work), and *routinization* (usage becomes normal and system application implications become embedded in organizational governance). A new technology may be widely acquired but only sparsely used within "adopting" firms, generating what Fichman (1995) called the *assimilation gap,* or what Hiltz and Johnson (1989) distinguish as *usage* versus *acceptance.*

Infusion may be an outcome of high levels of *reinvention* (Johnson & Rice, 1987; Rice, 1987), which is the adaptation of an innovation after its adoption. For example, Markus (1994a) noted a creative and collective reinvention of e-mail, of using the "forward" feature with the prior message included as well as an annotation, to foster group discussions, with chained annotations allowing newcomers to enter into the conversations (Rice & Shook, 1990a, found a similar use of voicemail, and Rice & Steinfield, 1994, reported similar chained annotations in e-mail messages).

Tyre and Orlikowski (1994) argued that the general implementation or adoption process actually involves a *discontinuous process* of

mutual adaptation among technology, users, and organizational contexts, where stable utilization periods are punctuated by both external and internal change triggers during "windows of technological opportunity." These changes may or may not be incorporated into work processes, leading to a new stable state, whereas stabilization in systems may cause user attitudes and usage patterns to become habituated and make it difficult to achieve higher levels of reinvention. Gasser (1986) discussed informal microlevel processes that help to integrate computing into work and sustain computing over the long term, such as *working around,* or "intentionally using computing in ways for which it was not designed or avoiding its use and relying on an alternative means of accomplishing work" (p. 216).

Levels and Types of Uses. Typically, utilization is conceptualized as amount of use, dependence on the technology, or diversity of functions used (Trice & Treacy, 1988). But adoption of a new medium involves more than just its use, and includes *acceptance, adaptation, resistance,* and *avoidance* (Hiltz & Johnson, 1989; Poole & DeSanctis, 1990), with wide variations in application and use of the innovation. Simple measures of adoption do not take into consideration advanced uses, applications, and reinvention of the technology (Majchrzak, Rice, Malhotra, King, & Ba, 2000; Rice & Shook, 1990b; Rogers, 1995; Stewart, 1992).

Usage may be distributed unequally, with "hard core users" as well as those reluctant to use or experiment with applications (Bowers, 1995). Webster (1998) distinguished among *complete, wary* and *nonusers* of desktop videoconferencing. Panko (1985) termed limited e-mail usage as *stunted use* and recommended choices in interfaces for different kinds of users. Unequal usage may be most apparent at a structural level. For example, McKenney, Zack, and Doherty (1992) revealed that density of communication among e-mail users was greater than for FtF communicators, but that there were more subsets of isolates among the e-mail users than among face-to-face interactants. Similarly, Rice's (1994a) analysis of summer interns' usage of e-mail found that those who received the lowest evaluation after their internships also participated less in the research group's wider socialization and task network via e-mail. Rice, Grant, Schmitz, and Torobin (1990) showed that membership in various communication groups strongly predicted those who used e-mail and those who didn't, whereas Haythornthwaite and Wellman's (1998) study of media use among members of a university group found that communication in general between two members was highly correlated with the number of media that that pair used.

Given a measure of adoption or usage, even "successful" adoption is an ambiguous concept. Emphasizing the distinction between organizational and individual adopters, Manross and Rice (1986) concluded

that *organizational* definitions of the success of diffusion (there, an "intelligent" telephone system) are not necessarily the same as how the *users* actually respond to the innovation. A study of the implementation of an experimental networked computer-supported cooperative work system in a "best practice" government organization concluded that it is very difficult to define adoption success; it depends on what the system is being compared with, what constitutes the full complement of applications, what level of adopter is being considered, and what is defined as a core technology by "outsiders" (Bowers, 1995).

Regardless of the level of adoption or usage, there are also variations in the kinds of usage. Kettinger and Grover (1997) found three primary uses for e-mail:

1. Task: distribute, provide or receive info, messages, files, programs, or feedback.
2. Social/Entertainment: learning about events/things that interest me, taking a break from work, and keeping in touch.
3. Broadcast: broadcast requests for information.

Rice and Steinfield (1994) reported the same three general kinds of e-mail usage, and Kaye (1998) found that greater hours using the Web was correlated with entertainment, social interaction, and escape. Note that these kinds of usage are in line with uses and gratifications theory's propositions about influences on media use (see Charney & Greenberg, chap. 15, this volume).

OVERVIEW OF CMC: CAPABILITIES AND DIFFUSION

This section summarizes a range of trade and professional surveys on the adoption and use of several new and emerging media, specifically e-mail, voicemail, desktop videoconferencing, collaborative shared tools, facsimile (fax), and intranets.

New Media: Brief Definitions and Usage Surveys

E-Mail. E-mail, a computer-based messaging system, generally is asynchronous (although it may be invoked in synchronous "chat" or "talk" mode), quick, text-based (although it is becoming multimedia), and allows written messages to be composed and edited on a computer screen and then sent either individually addressed or to a predefined list of recipients.

Forty million Americans (15% of the U.S. population) used e-mail in 1997; this is expected to rise to 135 million (50%) by 2002 (Levins,

1997). Surveys noted by Klopfenstein (chap. 14, this volume) reported that more than 25% of all U.S. adults had an e-mail address by early 1998. These adopters are not equally distributed throughout society. An August 1998, survey of more than 50,000 households by Techserver (NUA, 1999) found that although 49.2% of homes with incomes of $75,000 were online, only 13.9% of homes with incomes of under $35,000 were.

The 1995 annual *Fortune Monitor* survey (1996), based on responses from top- and mid-management subscribers, showed a jump from 54% in 1993 to 70% in 1994 of those who used computers as part of a network, implying communication, data transfer, and information retrieval. Seventy-five percent reported their companies used e-mail (with 88% using at work and 47% connecting from home, for 5.8 hours online per week). In a 1995 survey (American Society of Association Executives, 1996), CEOs reported that their companies had e-mail for internal use (70%), external connections (49%), and international connections (13%). Nearly 80% of the Society for Human Resource Management members in 1996 said they used e-mail (McCune, 1997). By mid-1998, according to a survey of 1,000 small businesses by Cyberdialogue/FINDSVP (NUA, 1999), e-mail was the most used online business application, with more than 14.7 million business users. Of the 400 executives surveyed by Ernst & Young in early 1998 (NUA, 1999), 36% reported they use e-mail more frequently than any other communication tool, 26% preferred the telephone, whereas 15% indicated they preferred communicating by FtF in a meeting. A similar survey of 400 executives by the American Management Association also found e-mail to be the primary medium of business communication.

The Electronic Messaging Association (1997) estimated the number of e-mail messages sent overall in 1997 was 2.7 trillion; by 2000 this grew to 6.9 trillion. A study of a cross-section of Fortune 500 companies (Frazee, 1996) found an average user receives approximately 15 e-mail messages per day, spending almost 50 minutes just reading them. Half of the messages are likely to require a response; in-depth responses requiring considerably more time are frequent. A U.K.-based study of British and Irish employees (Condon, 1998) reported that junk e-mail costs businesses $8 billion a year, due to the time employees spend dealing with unwanted e-mail. E-mail overload was reported by 60% of 1,000 executives in a Pitney Bowes' survey (NUA, 1999), with greater levels perceived by those higher up in the organization. Reuters' study of 1,000 senior management in 11 countries indicated, however, that 49% felt the Internet actually helps to manage information overload (NUA, 1999). Other problems reported in the Cyberdialogue/FINDSVP survey included difficulties in prioritizing mail, attaching files, and spelling e-mail addresses.

E-mail may provide an alternative to newspapers as a major commercial medium, based on interviews by Forrester Research with executives of 50 U.S. corporations that support large-scale e-mail activities (Levins, 1997). Bill paying, prescription ordering, and vendor interactions through e-mail will become routine. E-mail management software will be able to filter out unwanted junk mail and organize incoming mail, such as putting news service messages into a news folder (Levins, 1997), and allowing browsing of an interactive, multimedia format.

According to a Human Resource Management member survey, 67% of the companies warn their employees that they should not expect privacy in their e-mail communications, 39% said that they monitor e-mail content routinely, whereas 31% indicated the company sets some parameters for respecting an employee's privacy in e-mail communications. Moreover, 42% explicitly restrict e-mail use to business purposes, but most do not heavily enforce this limitation. Only 36% of the respondents have outlined proper e-mail usage to employees (McCune, 1997).

Voicemail. Voicemail, another computer-based messaging system, accessible asynchronously from touch-tone telephones, allows digitized audio messages to be transmitted to one or more persons. However, voicemail often is conceptualized as similar to a voice answering system—that is, people use the phone expecting to talk to someone but are then requested to leave a message. This severely limits the technical and organizational capabilities of voicemail (Rice & Danowski, 1993; Rice & Tyler, 1995; Stewart, 1992). Proactively or intentionally using the messaging features allows intentional asynchronous messaging among those who have accounts on the system, forwarding, annotation, distribution lists, personalized messages and mailboxes, temporal tickler files, prioritizing of messages, storing messages for transmission at a later date, and so on (Rice & Shook, 1990b).

Voice-messaging services are available from local telephone companies, service bureaus, PC-based voice messaging, a dedicated system, or a digital system that integrates with other business and intraorganizational phone systems. Several drivers have raised the awareness and adoption of voice-messaging services, including the ability to (a) manage all messages from one mailbox from any phone or workstation, (b) manage wireless and wireline messages from the same mailbox, and (c) send and hear messages over the Internet (Landes & Harrod, 1997).

In 1997, Boston Technology, Centigram, Digital Sound, Lucent Technologies, Northern Telecom, Octel and Unisys supported more than 60 million mailboxes; Bell Atlantic's Home Voice Mail had 1.6 million residential subscribers; and U.S. West's residential service had another 1.5 million messaging subscribers (Landes & Harrod, 1997). A study by the

Voice Messaging Educational Committee reported that voicemail is used in 75% of Fortune 2000 U.S. corporations (Rodewald, 1997).

A 1996 survey of 150 executives found that 62% of business managers checked on their voicemail messages first, compared to 36% preferring e-mail ("For call-backs," 1997). *INC.* (1996) reported how frequently CEOs check their voicemail when they are away from their office: 0 to 1 times per day, 32%; 2 to 4 times, 47%; 5 to 9 times, 10%; more than 10 times daily, 3%. They logged in to their e-mail much less frequently: 0 times 56%, 1 to 3 times daily, 32%.

Future enhancements include speech recognition, mailbox management via the Internet, and a greeting card message using a celebrity voice to wish someone a happy birthday or anniversary. Other developments entail linking voice messaging to other services such as pager notification, fax messaging, broadcast distribution and routing capabilities, and the emergence of groups such as The Messaging Alliance (jointly owned by Ameritech, Bell Atlantic, Nynex, and Pacific Bell Information Services), which aims to enable private branch exchange (PBX) and network-based voicemail systems in North America to perform nonreal-time messaging communications (Rodewald, 1997). Two future challenges remain: first, adding audio menus and responsiveness design, so that callers won't be automatically cutoff or fail to reach a live respondent; and second, enhancing the voicemail system by implementing auto attendant (answering calls, allowing informed users to transfer to a specific extension, coverage during busy times), audiotext (broadcast frequently requested information in audio form on request), transaction boxes (navigation through menu prompts), and fax-on-demand (requesting print information through voice or fax requests; Rice & Shook, 1990b; Rodewald, 1997).

Desktop Videoconferencing. Desktop videoconferencing allows for audio and video communication between multiple locations through users' personal computers. It is a technology that integrates several media. For instance, some desktop systems also include collaborative shared tools that allow remote individuals to jointly (and often synchronously) share applications, such as spreadsheets (Alavi, Wheeler, & Valacich, 1995), graphics, computer displays, databases, and other features and resources necessary to accomplish joint activities. A more general term for combined groupware and desktop video is *media space,* which uses "integrated video, audio, and computers to allow individuals and groups to work together despite being distributed spatially and temporally" (Mantei, Baecker, Sellan, Buxton, & Milligan, 1991, p. 803). In accord with Bly, Harrison, and Irwin (1993) and Dourish, Adler, Bellotti, and Henderson (1996), Mantei et al. argued that media spaces are more than just "poor substitutes" for FtF: they offer unique conditions of richness and complexity.

The business market for desktop video will remain small until a variety of factors converge (Dixon, 1998). Real-time, full-motion desktop videoconferencing is expected to be technically and economically feasible in the next few years, overcoming today's complex configurations and low video quality. High-speed and/or broadband technologies such as Digital Subscriber Line (a derivative of ISDN digital phone transmission), coaxial cable TV lines, wireless systems, low-orbit direct-broadcast satellite systems (with Internet uplink connections), "streaming" video (where multiple users view the same one-way transmission) and switched LANs, will help make this possible (Korostoff, 1996; Poole, 1997).

Of 853 *Fortune* top management subscribers in 1996, 24% reported their companies were currently using videoconferencing, and 13% were actively investigating its use; for desktop video, the figures were 7% and 10%. *Electronic Market Trends* (1996) noted a Yankee Group report that 28,000 desktop video units were sold in 1995, and this jumped to 3.8 million in 1999. In 1996, only $180 million was spent in the United States on dedicated desktop videoconferencing hardware, whereas in the consumer market, Intel shipped more than 5 million ProShare cards in less than a year between 1997 and 1998 (Poole, 1997). According to Telespan Publications (Hamblen, 1996), business desktop videoconferencing units reached 6 million by 2000, and home units 14 million.

Facsimile. Facsimile captures and transmits the graphic image (typically as a series of digitized symbols indicating lighter or darker areas of the original) through telephone lines between fax machines that scan the original or print out the image on paper, whether to one recipient or to a distribution list of recipients. Computer fax can take a computer document and convert it into a fax image, transmit it over computer networks, receive other faxes, and use optical character recognition to convert images of alphanumeric symbols into editable text and numbers for use in word processing or spreadsheet applications. As the hardware for copying, faxing, and printing can now be one, the new fax systems, combining with intelligent telephone systems, are turned into a single desktop appliance.

A 1996 Gallup survey of Fortune 500 and mid-sized companies found that 60% of daily users were faxing more than in 1995 ("What paperless," 1997). In a 1996 *Fortune* uppermanagement survey (*Fortune Monitor,* 1996), 18% reported their organizations were intending to purchase computer-based fax, and 13% new fax machines. A 1996 Cablevision survey of 1,000 respondents noted that fax was used 2.7 hours per week for business purposes compared to .6 for home purposes (*Cablevision,* 1996). From a 1995 survey of 1,596 association management CEOs (PPAM, 1996), 68% said their company used fax broadcast-

ing, 70% used faxes for in-house use, and 20% had fax-on-demand, mostly for in-house use; 20% offered for-fee information about associations through fax. In 1995, 5.8% of direct marketing organizations indicated that they used fax as their primary system for both consumer and business audiences; 7.1% indicated they used fax for secondary sales, and 10.3% used it for non-sales communication (DMA, 1996).

Respondents from *Fortune* and mid-sized organizations reported selecting fax over e-mail, voice mail, and overnight courier as the most reliable method of communication ("What paperless," 1997). The average time estimated to fax five pages created on a personal computer was less than required to send the pages by e-mail, and response rates from broadcast fax campaigns were quicker and higher than for mail, e-mail, and other media in almost every case, beyond the fact that many small businesses do not have e-mail addresses. A mid-1997 Gallup poll (NUA, 1999) found that although 65% of organizations had provided e-mail accounts for their employees, company staff still preferred fax to e-mail, largely because of a perceived greater reliability and simplicity of fax delivery.

Internet and Intranets. The use of the global Internet, or "the set of networks using multiple network technologies that can intercommunicate" (Leiner, 1994, p. 32), has exploded with the application of World Wide Web (WWW) technology. The WWW allows users to find and use information in a standard way across different platforms, and represents an integrated technology, as it can provide such services as e-mail, file transfer, and discussion groups (Scheepers & Damsgaard, 1997). Intranets, or "organizational Internets," are closed-user-group networks, whether limited to the physical boundaries of a single organization, or shared among members of dispersed organizational units. Some intranets may be "firewalled" off from the Internet, whereas others may provide gateways and even external access to the internal resources.

Approximately $19 billion was spent by end-users on Internet and Intranet products in 1996 (*Information Interactive Services Report* [IISR], 1997). By the end of 1997, 62 million Americans (30% of those over 16) were users of the Internet and online services (Intelliquest, 1998). Klopfenstein (chap. 14, this volume) reported that, by 1998, as many as 100 million Americans, and over half of all American and Canadians between 16 and 34, had used the Internet. LaRose and Hoag (1996) argued that use of the Internet is still primarily an organizational innovation. For instance, half of the users in 1994 were teachers and executives (Bournellis, 1995) who probably used the Internet from their institutions. Of the 853 upper level management respondents to the annual *Fortune* (1996) survey, 48% used commercial online services, 42% used the

Internet, and 21% used online financial services—at work and home—both for approximately 3 hours per week each. During April 1997, an ongoing panel of business users of the Web spent almost two thirds more time per week on the Web than did home users (5.75 hours per person vs. 3.5; NPD, 1998). Forty percent of 1,596 CEOs reported their companies had an Internet address, and 39% had a web page (PPAM, 1996).

The use of Intranets in organizations also is growing: 59% of U.S. companies and 38% of European companies had an Intranet in 1997, with about 75% expected in both regions by 1998, leading to 133 million Intranet users by 2001 (NUA, 1999). E-mail is the primary application for 50% of companies with Intranets, according to a survey of 3,000 companies with Intranets (NUA, 1999). Business-to-business companies were the highest adopters (37%) with government organizations the lowest (3%).

Not all of this organizational Internet use is necessarily productive or even healthy! Half of the 1,000 respondents in a survey by Reuters Ltd. actually "crave" information, and 54% said they experience a "high" when they find the information they have been seeking (King, 1997). More than one third of respondents believe their colleagues are obsessed with gathering information, and 65% said that makes their work environment more stressful. Eighty-four percent of respondents also recommended information management classes, yet 58% said their companies did not offer them. Nearly two-thirds of human resource executives report that employees are spending more time surfing the Internet as diversion (Sunoo, 1996), whereas 85% of Association for Information Technology Professionals (1998) are somewhat or very concerned about non-productive use of the Internet by workers.

Integrated/Other Communication Media. Media are becoming integrated today, rather than consisting of a single medium. Although forecasters have predicted that collaborative technologies like videoconferencing, groupware, and integrated messaging will become widely diffused, currently the most frequently used collaborative tools continue to be voicemail, e-mail, and audio conferencing (Borthick, 1997). Groupware may actually be used largely as fancy e-mail. For example, only about 50% of the 1,500 Notes end-users in a 1996 Arthur-Anderson survey regularly use Notes discussion databases; only 14% use workflow applications at least three times a week (Cole, 1996). Orlikowski (1993) explained the limited and simple use of Lotus Notes in a consulting organization as due to (a) an implementation that did not develop users' mental models of Lotus Notes as anything more than a limited, personal application; and (b) a competitive climate that mitigated against sharing information. However, more companies are switching from simple e-mail systems to software that also provides groupware—from 60% in 1997 to an estimated 80% in 2001, based on a 1997

survey by International Data Corp (Cole-Gomolski, 1997). This is due to increased integration of programs (such as Lotus Notes, Microsoft Outlook, and Novell's Groupwise), increased interoperability, and cross-program standards among groupware systems.

Some media, although valuable in themselves, are not sufficient for integrated communication activities. For example, newsgroups, threaded discussions, chat, and e-mail are necessary for virtual workspaces but are not sufficient, as they provide little support for convergence, consensus, focus, and joint creation of an outcome (Romano, Nunamaker, Briggs, & Vogel, 1998). Trends are toward strong integrated messaging (involving computer-telephony integration [CTI]), which includes a combination of e-mail, fax, and voicemail, with support for not only retrieving any of these forms of messages, but also filing and managing the messages (Franklin, 1997).

Other new media are becoming more prevalent in organizations. A *Fortune Monitor* survey (1996) reported that companies were either currently using (8%-32%), or were actively investigating (5%-12%), use of personal digital assistants, wireless data communication, and multimedia. For instance, pager sales rose from $139 million in 1991 to $300 million in 1995 (Electronic Market Trends, 1996) and cell phones were used for business activities 7.3 hours per week compared to 6 for home activities (Cablevision, 1996). International Data Corporation's survey of 600 executives reported that 70% owned a 3Com PalmPilot hand-held computer, most frequently using it for personal information and e-mail (Investor's Business Daily, 1998).

Diffusion in the Literature

Table 8.1 shows rough trends in coverage of new organizational media in business and social science literatures. These searches were conducted for 1990, 1995, 1997, and 2000 to show recent trends, first on the full record and then on the title only, as the title is a more explicit indicator of coverage of specific media. In the business literature, e-mail coverage grew rapidly from 1990 to 1995, with the most overall coverage except the recent emphasis on Intranets. Voicemail coverage remained essentially stable at a moderate level over the time period. Groupware interest jumped in 1995, but dropped off since then (possibly because of the use of different terms as group applications become more integrated). Fax has shown a steady increase in interest until recently. Academic coverage has been much lower in terms of sheer numbers of article title word retrievals, although e-mail coverage similarly rose in 1995 and has leveled off. Interest in groupware reached a peak in 1995, as in the business literature. Intranets are just now appearing.

Table 8.1. Diffusion of New Organizational Media as Indicated by Online Database Coverage, 1990-2000.

	New Media					
Database	E-mail	Voicemail	Video	Groupware	Fax	Intranet
ABI/Inform						
1990-all	276	101	4	42	—	0
1990-title	11	23	2	13	85	0
1995-all	809	186	89	594	—	8
1995-title	26	24	18	109	121	3
1997-all	876	173	46	428	—	432
1997-title	17	18	58	57	250	34
2000-all	867	17	3	166	—	183
2000-title	121	1	0	16	7	27
Wilson Business Abstracts						
1990-all	97	67	5	21	—	0
1990-title	17	19	3	13	136	0
1995-all	173	61	28	33	—	5
1995-title	12	14	8	104	47	1
1997-all	296	101	35	96	—	368
1997-title	11	12	6	19	35	94
Dissertation Abstracts						
1990-all	15	4	0	7	—	0
1990-title	3	1	0	2	1	0
1995-all	72	4	1	38	—	0
1995-title	24	1	0	12	2	0
1997-all	69	4	5	12	—	3
1997-title	20	0	1	9	2	0
2000-all	98	1	0	0	—	2
2000-title	14	0	0	0	0	1
PsychInfo						
1990-all	19	3	0	5	—	0
1990-title	8	3	0	2	0	0
1995-all	19	6	1	5	—	0
1995-title	7	4	0	4	2	0
1997-all	27	2	2	14	—	0
1997-title	6	2	1	1	0	0
2000-all	87	0	0	9	—	5
2000-title	24	1	0	4	0	1
Wilson Social Sciences Abstracts						
1990-all	2	0	0	1	—	0
1990-title	1	0	0	1	4	0
1995-all	21	2	0	2	—	0
1995-title	3	0	0	0	2	0
1997-all	27	5	0	2	—	0
1997-title	1	0	0	1	2	0

Table 8.1. Diffusion of New Organizational Media as Indicated by Online Database Coverage, 1990-2000 (con't.).

	New Media					
Database	E-mail	Voicemail	Video	Groupware	Fax	Intranet
2000-all	51	1	0	5	—	5
2000-title	9	0	0	0	2	0
Sociology Abstracts						
1990-all	4	0	0	1	—	0
1990-title	1	0	0	0	1	0
1995-all	21	1	3	1	—	0
1995-title	7	0	0	0	1	0
1997-all	11	4	1	2	—	0
1997-title	3	0	0	1	0	0
2000-all	24	0	0	1	—	3
2000-title	6	0	0	0	0	0

Notes. Term sets used in the searches were: (a) e-mail, electronic mail, electronic messaging, computer-mediated communication; (b) vmail, voicemail, voice messaging; (c) desktop video, desktop videoconferencing, computer videoconferencing; (d) groupware, collaborative technology, computer -supported collaboration, GDSS, group support system, group decision support system; (e) fax, facsimile; and (f) intranet.
Only feature articles in periodicals.
All = search on title, abstract, descriptor; Title = title only.
Fax: "All" not used because word "Fax" listed in abstracts for ordering.
ABI/Inform: 1,000 business, management, trade journals.
Wilson Business Abstracts: 345 business periodicals.
Dissertation Abstracts: PhD and master's theses; for 2000, *Digital Dissertations*.
PsychInfo: 1,300 journals in psychology, physiology, linguistics, medicine, nursing, sociology, education, pharmacology, psychiatry.
Wilson Social Sciences Abstracts: 350 social science journals (no mention of communication or information systems); for 2000, *ProQuest Social Sciences Abstracts*.
SocioFile: 2,000 journals; w/dissertations, conference abstracts.

INFLUENCES ON ADOPTION AND USE

As described earlier, influences on media adoption and use have arisen from multiple theoretical perspectives, relating to individual, rational, organizational, technology, and social factors (see Fjermestad & Hiltz, 1998; Kettinger & Grover, 1997, for recent reviews of influences on CMC system adoption and use). Individual factors often reflect persons' technology-related skills, such as their computer skills. Rational factors relate to the situation and reflect objective characteristics of the specific incident, such as message equivocality or access to the medium, that may constrain

or guide behavior. Organizational influences relate to such factors as management support and organizational structures. Objective technology influences relate to such factors as transmission quality, while perceived technology influences relate to more subjective characteristics of the technology such as ease of use. Social factors relate to the social environment and reflect such forces as others' attitudes and symbolic cues.

Each of these factors may only explain a small amount of variance in adoption and use (e.g., critical mass, Rice, 1990; Sanderson, 1996; Steinfield, 1992; social influence, Rice et al., 1990; Rice, 1994b). For instance, Donabedian, McKinnon, and Bruns' (1998) analysis of responses from managers explained 15% of the variance in media choice by variables related to task and medium. One explanation is that certain factors may be more important for different media (Webster & Trevino, 1995) or at different times. For instance, Astebro (1995) found that peer communication helped explain diffusion and adoption for more innovative people (earlier), whereas social and political influences by management provided better explanations for less innovative people (later). Rice (1993b) analyzed social influences across time for a variety of media in several organizations, and found a significant effect only for the new medium (desktop videoconferencing) and only for users communicating through that medium.

A more fruitful approach is to examine influences of multiple factors drawn from a variety of perspectives (Webster & Trevino, 1995), as the following sections do. This complementary approach integrates influences on adoption, diffusion, and use, rather than examining them as competing explanations (Bozeman, 1993; Sitkin, Sutcliff, & Barrios-Chopin, 1992; Webster & Trevino, 1995).

Individual Influences

Most research has focused on individual characteristics of the sender (although Kraut & Attewell, 1997, and Zmud, Lind, & Young, 1990, noted the separate roles of sender and receiver). For instance, Schmitz and Fulk (1991) proposed that those with lower medium experience, computer experience, and keyboard skills would be inhibited from using a technology-based medium. Fulk (1993) posited that those who are younger and more educated would be more receptive to a newer medium. Older members may find it harder to learn new technologies, have more invested in the current status and environment, and have more equivocal tasks because of their higher organizational level (Rice & Shook, 1990a). For example, a study of more than 1,000 voicemail users in 75 different agencies and departments of state government agencies (Caldwell & Uang, 1995) found differences in preferences for voicemail across various situational constraints by gender, age, and experience.

Leonard-Barton and Deschamps (1988) suggested that several individual characteristics would influence usage of a system; for example, those who perceive themselves as higher performers would have stronger intrinsic motivation to adopt an innovation and those higher in personal innovativeness would be more likely to use an innovation without management urging. More innovative individuals are not only more likely to adopt a new medium earlier and use it more, but also to use it in more varied ways with more benefits. For example, voicemail users who were more innovative reported a greater ability to obtain information (Rice & Shook, 1990b). However, perceived organizational innovativeness was a stronger influence than individual innovativeness in a study of voicemail adoption in two organizations (Rice & Tyler, 1995).

Compeau and Higgins (1995) suggested that those with higher computer self-efficacy beliefs would exert greater efforts to master a system than those with lower self-efficacy beliefs. Webster (1998) proposed that those higher in introversion would have a greater need to maintain their privacy, and thus would use desktop videoconferencing systems less than those lower in introversion. Other individual characteristics studied for their influences on new media adoption and use have included communicator style (Rice, Chang, & Torobin, 1992), cognitive style (Trevino, Lengel, Gerloff, & Muir, 1990), and self-monitoring (Alexander, Penley, & Jernigan, 1991).

In addition to demographic and personality factors, researchers have suggested that user participation in the development process will positively affect user knowledge, and thus beliefs about usefulness and intentions to use (Saga & Zmud, 1994). Involvement or participation in implementation or the diffusion process increases users' perceptions of control, thus reducing perceived threats (Baronas & Louis, 1988), as well as fostering a variety of other intervening processes such as commitment and satisfaction (Johnson & Rice, 1987).

Task Influences

In explaining organizational use of new media, researchers argue that technologies must fit well with job tasks in order for positive impacts on individual performance to occur (Cooper & Zmud, 1990; Goodhue & Thompson, 1995). Based on organizational information-processing and contingency theory, this approach posits that the task demands of information-processing and communication content interpretation interact with technical capabilities of media to influence outcomes such as communication effectiveness and work (as well as organizational) performance.

The primary task-medium characteristics theories are social presence (Short, Williams, & Christie, 1976) and media richness (Daft & Lengel, 1986). These explain how communication media differ in the extent to which (a) they can overcome various constraints over time, location, permanence, distribution, and distance; (b) transmit the social, symbolic, and nonverbal cues of human communication; and (c) convey equivocal information. A better fit between the medium's characteristics (such as higher social presence or richness in desktop videoconferencing compared to text-based e-mail) and the task demands (such as equivocality, as in negotiating) will foster greater communication performance. For instance, Rice and Shook's (1990a) meta-analysis demonstrated that managers at different levels would prefer or need to use different media, due to different task environments. Many studies show positive relationships between task analyzability and new media use (such as e-mail, Rice et al., 1990; or voice mail, Rice & Tyler, 1995).

Rankings of perceived media richness or social presence scales are usually quite consistent. However, correlations of those perceptions with levels of new media usage (generally e-mail) at the individual level are typically weak (Rice, 1993a; Rice et al., 1992; Rice, D'Ambra & More, 1998; Rice, Hughes, & Love, 1989). Furthermore, nonverbal cues and socioemotional content are possible in CMC (Rice & Love, 1987) and e-mail and voicemail are sometimes used by managers for equivocal situations (Markus, 1994a; Rice & Shook, 1990b).

Contextual Influences

Communication is an interdependent phenomenon. Hence, whether a critical mass of users exists or whether other relevant participants have access and will respond via the medium is a significant influence (Markus, 1994a). Markus (1987) summarized diverse literatures to show that the value of an interactive communication medium is related not just to the attributes of the system, but to the number of other users. As possible interactions escalate with additional users, later users gain more immediate value than do earlier users. Thus, she also highlighted the importance of different benefits, and different resources, of early and later adopters. Alternatively, rejection of an interactive medium by some groups may prevent an organization-wide critical mass from forming, reducing the value of the innovation for those who do choose to adopt (as found by Harper, 1996, in his study of use and rejection of "active badges" in two research labs). Kraut et al. (1998) analyzed the use of two similar desktop videoconferencing systems, showing that user migration to one system lead to the disuse and "death" of the other system. They pointed out that systems technically unprepared for critical mass may well become overloaded or too public, leading to rejection by earlier adopters. Similarly, individuals will benefit from new media such as voicemail in proportion to the degree that it is used by other members of the group (Beswick

& Reinsch, 1987; Rice & Tyler, 1995), and voicemail tends to be adopted or rejected by an entire work group (Stewart, 1992). Other studies addressing e-mail, voicemail, and fax (Bikson & Law, 1993; Ehrlich, 1987; Kaye & Byrne, 1986; Rice & Danowski, 1993; Rice et al., 1990; Soe & Markus, 1993), some controlling for a variety of other factors, have shown the impact of critical mass on influencing adoption, usage, and evaluation of new media.

Other factors, such as time pressures and geographic distances, also reflect the sociocontextual influence of the interdependent nature of communication. For instance, because of its ability to overcome situational constraints of time and space, e-mail is more likely to be used as the geographical distance between communication partners is greater (Rice, Hughes, & Love, 1989; Trevino, Daft, & Lengel, 1990). This relationship would hold more for cross-organizational communication, because within organizations task interdependencies, cost factors, and local usage norms are strong influences on use of e-mail even among physically close unit members (Eveland & Bikson, 1987; Markus, 1987; Rice, 1994a). Furthermore, according to Bly et al. (1993), work is fundamentally social, so collaborative technologies are defined by the social setting (such as group size, commonality of purpose, and degree of openness about work). Intragroup and intergroup task interdependence also have been identified as positive influences on e-mail, voicemail, and collaborative media use (Kraut & Attewell, 1997; Rice, 1994b; Rice et al., 1990; Rice & Shook, 1990b; Rice & Tyler, 1995; Steinfield, 1986).

Media/System Influences

Objective Characteristics. Characteristics of the media themselves and their availability affect adoption and use. Media richness (a perceived characteristic), reviewed earlier in connection with task characteristics, represents one key attribute. Other attributes include transmission quality of the medium, especially for those involving compressed video image transmission (e.g., video compression, half-duplex, and lack of synchronization of video and audio for desktop video; Anderson et al., 1997; Whittaker & O'Conaill, 1997). Familiar norms and habits can be disrupted by technical and design aspects in media spaces, such as audio degradation and limited dimensionality of sound, limited control of spatial orientation and how one's video image appears to others, and tradeoffs between detailed and wide views (Bly et al., 1993). Obstacles to successful use of desktop video include interaction differences between those in the same room and those in mediated spaces, misaligned eye gaze, loss of status information associated with traditional seating arrangements, minimized cues for in-meeting coordination of turn-taking, impact on discussion of participants' image sizes, misleading perceptions of personal or

impersonal proximity due to small and asymmetric video image sizes and positioning, and issues of privacy and surveillance (Mantei et al., 1991). However, some research suggests that users will choose an image of some relevant object instead of others' facial views (Whittaker & O'Conaill, 1997). Similarly, Abel (1990) found that users of a videowall and cross-site office videoconference were more oriented toward audio than to video, and Egido (1990) summarized research showing that the visual channel does not really add much in terms of either content or outcomes.

Access and reliability of a medium influence adoption and use. For instance, visual access to an e-mail terminal reduces some uncertainty associated with the costs of checking for e-mail messages and thus influences e-mail use and evaluation (Rice & Shook, 1988). The time required for access, and ease of access, can influence employees' intentions to use a technology, especially with newer technologies such as desktop videoconferencing that may not support fast-enough connections (Webster, 1998). Higher reliability, or "dependability and consistency of access and uptime" (Goodhue & Thompson, 1995, p. 235) of the system, should lead to more medium use.

In situations involving time pressures, synchronous communication becomes important. People may turn to the telephone instead of e-mail to meet this task demand (Sproull & Kiesler, 1986; Trevino, Daft, & Lengel, 1990). It also may be necessary to know if the message has been received or not, and media that provide this notification may be needed.

The characteristics of the communication technology, in terms of containing single or multiple media, will also affect adoption and use. Employees do not use media in isolation; they sometimes combine several media or use an integrated technology, such as desktop videoconferencing, to get their message across (see Reder & Schwab, 1989, and Valacich, Paranka, George, & Nunamaker, 1993, for a conceptual discussion of sequencing and interdependence among media). Use of one or more media is clearly an influence on the adoption and use of other media. For instance, Markus (1994a) found that employees might first send a message through e-mail because of its ability to transmit text, and then follow up through the telephone because of its ability for two-way discussion. Ramsay, Barabesi, and Preece (1996) studied desktop videoconferencing software for informal communication, finding that it was used to share perspectives and discuss shared objects, whereas users adopted combinations of media (here, audio, video, and typed text) in sequenced activities for informal communication. They also discovered that as half of the pairs spontaneously displayed behavior indicating a need for shared activity space, such as drawings, tools, text editors, many of the pairs used mixed media exchanges—by simultaneously engaging in typing, annotating, talking, or a combination of these methods. A shared record (here, a text-mes-

saging window process) was sometimes desired because audio and video media provided a shared reference point for nontextual abstract representations that were only transitory attention-getters. Finally, LaRose and Atkin (1992) showed that adoption of audiotext was associated with adoption of related innovations that provided information on demand, such as 800 numbers, automatic teller machines, and conference calling.

Perceived Characteristics. A communication medium's perceived characteristics may be equally or more important than their objective characteristics. For example, media richness perceptions may be based on both the objective properties of the medium and others' views in the social environment. Markus (1994a) was careful to note that social definitions of media do not discount material characteristics that constrain and foster some behaviors, but those constraints may not be permanent, and not all features will be used. Thus, differences across organizations in perception and use of e-mail are likely, due to the differences that exist in the social definitions of the medium and the technical functions of the medium derived at individual organizations. Research has demonstrated that perceived richness relates to use (Fulk, 1993), and that the more rich a medium is perceived to be, the more it is preferred and used for any communication task (Schmitz & Fulk, 1991).

Other perceptions of the communication medium's attributes (such as innovation attributes of relative advantage, compatibility, trialability, communicability, complexity, ease of use, voluntariness, result demonstrability, image, usefulness, effectiveness, and perceived accessibility—Agarwal & Prasad, 1997; Davis, Bagozzi, & Warshaw, 1989; Moore & Benbasat, 1991; Rogers, 1995; Saga & Zmud, 1994) influence technology diffusion. For example, Agarwal and Prasad (1997) concluded that more perceptual factors, such as compatibility, visibility and pressure to use, were the primary predictors of initial use of the Web, but more benefit evaluations and personal experience were the primary predictors of intentions to continue using.

Communication flow represents another perception of the human-technology interaction experience, and is measured as the extent to which (a) the individual perceives a sense of control over the interaction, (b) the individual perceives that his or her attention is focused on the interaction, (c) the individual's curiosity is aroused during the interaction, and (d) the individual finds the interaction intrinsically interesting (Trevino & Webster, 1992). Trevino and Webster found that employees experienced higher flow with e-mail than with voicemail, and that flow related positively to attitudes toward the medium and to employees' perceptions of communication effectiveness and quantity. Agarwal, Sambamurthy, and Stair (1997) integrated the concepts of perceived ease of use, flow, and computer playfulness into what they call cognitive absorption. This cognitive absorption is influenced by self-efficacy (a person's belief in ability to do a certain activity, fostering learning, and actual ability) and personal innovativeness.

Social Influences

One's perceptions of ambiguous stimuli such as a new medium are likely to be influenced by the opinions, information, behaviors, and rewards or sanctions of salient others, as individuals attempt to reduce uncertainty, respond to rewarded behaviors, and become socialized (Fulk, 1993; Fulk, Schmitz, & Steinfield, 1990; Howell & Higgins, 1990; Rice, 1993b). Schmitz and Fulk (1991) found, for example, that the attitudes and usage of a respondent's supervisor and the five closest communication partners positively influenced the respondent's attitude toward and use of an e-mail system. Rice and Shook's (1990a) analyses indicated that the number of voicemail messages sent by supervisors was influenced by the number of messages received by subordinates, and the number of voicemail messages sent by a respondent's work group influenced the number of voicemail messages that the respondent sent. Peer use, consulting, and advice have been significant influences on information system adoption (Leonard-Barton & Deschamps, 1988).

Saga and Zmud (1994) found that levels and forms of system usage tend to be compatible with one's group, social, and organizational norms (a straightforward diffusion of innovations principle). Salience and strength of norms influencing the adoption and use of a new medium, and the extent of potential influence (depending in part on individuals' varying innovation thresholds) changes as a new medium diffuses (O'Callaghan, 1998). For example, Dourish et al. (1996) found that new social arrangements for "office-sharing" through desktop video emerged over time, both with respect to how users' office behaviors became new norms for nonusers, and how nonusers' norms influenced the participants' adoption and usage (see also Fish, Kraut, Root, & Rice, 1993).

Another traditional source of social influence on adoption is the technology champion. Through ownership of the idea, activation of informal networks, articulation of the innovation's organizational potential, and risk to one's prestige (Howell & Higgins, 1990), technology champions lead the effort in overcoming resistance and indifference to major innovation. For instance, Markus' (1994b) study of a multisite organization identified the chairman as the primary e-mail champion. After 4 years of usage, e-mail was the primary medium of work-related communication, with the telephone a distant second. However, when the champion left, the new CEO did not use e-mail, and overall e-mail usage declined.

Researchers have also suggested that media choices have symbolic meanings in social settings (Sitkin et al., 1992; Trevino, Lengel, & Daft, 1987). Trevino, Daft, and Lengel (1990) proposed a symbolic interaction model of media choice, involving message equivocality, context (location, time, use by sender, and use by receiver), and the symbolic meanings represented by the medium and its use in particular contexts. That is, the medium itself, independent of its content, may come to represent symbolic values and meanings in its organizational and cultural setting. For example, letters have been found to symbolize formality, whereas meetings carry meaning about desire for involvement and teamwork. There often is no commonly accepted understanding of the symbolic meanings for newer and emerging technologies. Similar to the period when the telephone was first introduced, "current and emerging technologies come with many rough edges in need of the sandpaper of manners" (Marx, 1994, p. 540; see also Kraut et al., 1998, for an analysis of the development of social norms during the diffusion of a desktop videoconferencing system). For instance, at different times, e-mail has signaled technological innovativeness and at other times, a low priority message (Markus, 1994a; Trevino et al., 1990). Webster and Trevino (1995) found that the symbolic meaning of "when you want to be casual or informal" influenced e-mail choice within one organization.

To the extent that social influence matters, it seems to be more of a factor in the early stages of diffusion, and when new media are involved, because those situations involve more uncertainty (Rice, 1993a, 1993b). For example, Kraut et al. (1998) found that influences of usage and attitudes by one's group on one's own use of a desktop video system disappeared after the first few months of the year-long trial.

Organizational Influences

Organizational characteristics can facilitate or inhibit the use of a particular communication medium. For instance, Leonard-Barton and Deschamps (1988) suggested that managerial behaviors supporting or directly urging use of a medium would positively affect use. Similarly, Trevino and Webster (1992) proposed that employees who felt supported with resources and guidance on how to use a medium would exhibit more positive attitudes and use of the medium, and Saga and Zmud (1994) posited that employee training and managerial intervention would positively affect implementation success.

Alavi and Joachimsthaler's (1992) meta-analysis reinforced the commonsense belief that training increases the likelihood of successful implementation of an information system. For instance, Okolica and Stewart's (1996) study of voicemail users in a Fortune 500 company showed that the amount of training had a significant effect on the use of voice messaging, and Webster (1998) noted that limited training and documentation was associated with low levels of users' awareness of the full range of a desktop videoconferencing system's features (such as application sharing and privacy choices).

Zack and McKenney (1995) examined the influence of the social context of two ongoing daily newspaper management groups on the patterns of FtF and CMC. Different groups used the same functional structure, engaged in the same task processes, and used the same group-authoring and communication system, but operated in different social contexts (i.e., communication climate, management-leader philosophy, cooperation norms, communication networks). The two groups appropriated "the communication technology differently and in a way that was consistent with and reinforcing to their existing social structure" (p. 394).

Organizational structures affect adoption and use (Rice, 1994a; Rice & Gattiker, 2000). For instance, Schein (1994) argued that an innovative culture is necessary for achieving the potential of information technology in organizations. Taking a sociotechnical approach, he proposed that organizational structures, underlying cultural assumptions, and organizational processes, as well as the nature of information technology, influence the extent and type of organizational innovation in the information systems domain. Furthermore, Grover and Goslar (1993) found that greater decentralization, environmental uncertainty, and dispersion of information technology support throughout the organization affected diffusion.

Obviously, political factors in organizations, such as control over implementation policies, resources, and intended beneficiaries, and strategic and manipulative uses of new media (such as copying an e-mail message to others to increase pressure on an e-mail recipient), will influence the kinds, extent, and distribution of adoption of new media (Rice & Gattiker, 2000). For instance, Harper (1996) studied the attitudes of two groups of a corporate research lab toward "active badges." These transmit the location and computer activities of all individuals who wear the badges within the sections of a building where the information is transmitted by the badges. One lab group supported and wore the badges, whereas the other group vehemently opposed the badges. Each lab group had their own sets of attitudes, views, and beliefs, even though the technology was identical. Here, issues concerning badge-wearing were really a manifestation of organizational conflict—in particular, the labs' boundaries, and associated rights to research, but, more importantly, what was sacred concerning their research, autonomy, and ownership of ideas. Harper suggested that failure to respect community or group beliefs "can lead to the rejection of systems on grounds well removed from the purported purpose of those systems" (p. 297).

External Influences

A wide variety of external factors, such as economic, industry, and regulatory criteria, influence how people interpret, and organizations adopt, new media (Rice, 1987). Diffusion of a technology throughout an industry—another aspect of critical mass—can also change perceptions through increased knowledge of the technology, applications, and benefits, and reduced risk, influencing later adaptations and likelihood of adoption by others (O'Callaghan, 1998).

Two other significant external influences are standards (e.g., a stable and well-understood, but proprietary and slow-changing one versus a currently incomplete but rapidly improving one) and interoperability (such as the tradeoff of internal security versus the ability to interconnect with Internet resources and future business partners; Ginsburg & Duliba, 1997).

National culture also can affect the relationship between influences and usage. For example, Kwon and Chidambaram (1998) found that South Koreans were more likely to use cellular phones because of their perceived usefulness, whereas Americans were more likely to use them due to reasons of security, enjoyment, and social pressure. However, Rice et al. (1998) found only a few slight associations between high-context/collective and low-context/individualist cultural membership and perceptions of traditional or new media.

CONCLUSION

Based on the preceding review, Fig. 8.1 presents a comprehensive framework of factors influencing the adoption, diffusion, and use of new media in organizational settings. Two key attributes of this model should be noted.

First, perceived media characteristics and beliefs act as mediators between other influences (including objective aspects of the technology) and adoption, diffusion, and use. Consistent with previous models, for example, those of Agarwal and Prasad (1997), Bozeman (1993), Fjermestad and Hiltz (1998), Fulk (1993), Leonard-Barton and Deschamps (1988), Saga and Zmud (1994), Sitkin et al. (1992), Trevino and Webster (1992), and Webster and Trevino (1995), we include a complex array of influences, including these mediating variables. For example, Fulk (1993) proposed that perceived medium richness mediates between medium expertise and medium use, Trevino and Webster (1992) suggested that flow mediates between technology characteristics and use, and Saga and Zmud (1994) indicated that beliefs about the medium mediate between user knowledge and acceptance.

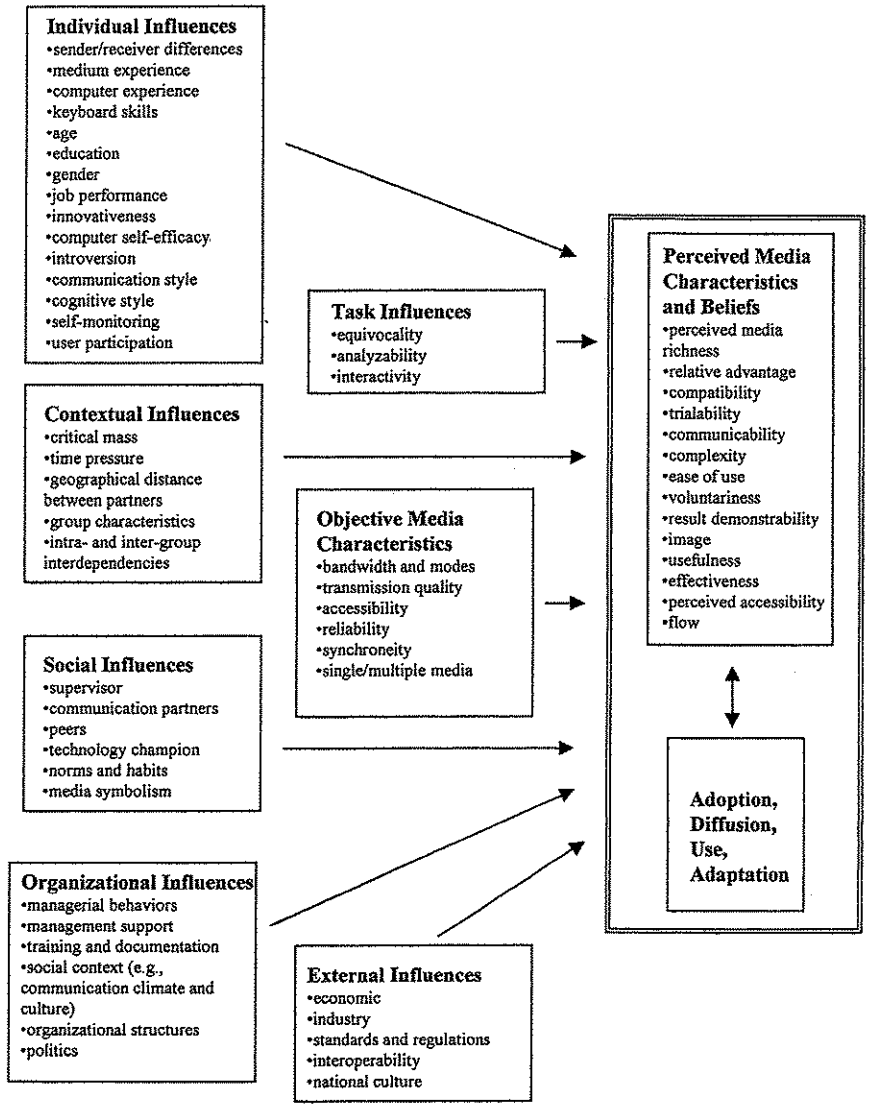

Figure 8.1. A general framework of influences on adoption, diffusion, and use of new media

Second, the figure includes recursive relationships between the mediating variables and adoption, diffusion, and use. For example, although higher perceived richness may result in more use of a medium, more use (especially more successful use, as usage norms develop) of a new medium over time may also result in higher perceptions of its richness. This reasoning is congruent with other researchers, such as O'Callaghan (1998), who emphasized that there is no predetermined causal order between organizations and technology—so that, for instance, choices about organizational redesign could influence technology adoption choices. Indeed, newer theoretical approaches such as "adaptive structuration theory" (DeSanctis & Poole, 1994; Poole & DeSanctis, 1990) and "technology/structure duality" (Orlikowski, 1992, 1993; Orlikowski & Robey, 1991) have proposed that CMC uses and outcomes are part of the recursive relationships among technological features, institutional structures, and users' actions (Rice & Gattiker, 2000). The framework diagrammed in Fig. 8.1 highlights the main categories of variables. We hope it will help guide future empirical research. However, we see three major areas for future theoretical development of this framework, in particular. First, testing any portion of our framework would benefit from further elaboration concerning the specific constructs within these main categories of variables, as well as specifying any interrelationships between the constructs. Second, our framework does not present the nature of the relationships between adoption, diffusion and use; future researchers will want to build on past research to continue this development (e.g., see Andriessen, 1994; O'Callaghan, 1998; Saga & Zmud, 1994). Third, our framework does not distinguish those influences that are differently and dynamically important to the stages of adoption, diffusion, and use. However, some research has addressed this important issue (e.g., see Andriessen, 1994; O'Callaghan, 1998; Saga & Zmud, 1994) and should be continued. In conclusion, there is significant practical and theoretical rationale for, prior empirical results about, and potential of future research on, the adoption, diffusion, and use of new media in organizational settings.

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