The diffusion and the characteristics of new communication media provide evaluation research with opportunities and challenges.

Evaluating New Media Systems

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This sourcebook is neither the first nor the most visible sign that new information technologies (*new media* hereafter) are rapidly diffusing throughout our society to homes, organizations, communities, and institutions. However, it is indicative of a growing awareness that evaluation research needs to consider new media both as valuable and appropriate contexts for analysis and as an opportunity to apply expertise and insights to an increasingly significant component of social activity. This chapter has two parts. The first reviews the process by which new media are diffused. The second describes some characteristics of new media that have implications for evaluation research.

New Media: Increasingly Pervasive but Underevaluated

The term *new media* includes a wide variety of communication technologies, such as interactive cable, videodisc, electronic mail and computer conferencing, videotex and teletext, personal computers, communication satellites, cellular radio, information retrieval systems, office information systems like word processing, and knowledge worker support tools connected by local area networks. As with other communication media, these systems include capabilities for the creation, transmission, storage, and reception of communication content—

J. Johnston (Ed.). *Evaluating the New Information Technologies*. New Directions for Program Evaluation, no. 23. San Francisco: Jossey-Bass, September 1984.

whether it be textual (words or numbers), graphic, or audio. However, the new media have some characteristics in which they differ substantially from radio, newspapers, books, television, and telephone. These differences are due to the fact that the new media are facilitated by computers, sometimes by microprocessors embedded in the medium itself, sometimes by direct use of a mainframe, sometimes by a computer-managed network. As a result, the new media add processing of content to media functions and increase the interactivity that users or communicators can experience. In the next section of this chapter, these and other characteristics of the new media are considered in detail.

Some figures show that the new media are becoming increasingly pervasive. Knowledge Industry Publications (1983) reports that the percent of total consumer media spending on home computers, video games, cable and pay TV, and videocassette recorders rose from 7.5 percent in 1978 to 30.8 percent in 1982. By 1987, this increase is expected to grow by 411 percent for home computers, 104 percent for videocassette recorders, and 85 percent for cable and pay TV. Between one and three million microcomputers were sold in 1982; this figure is expected to rise to between seven and ten million by 1990. Already, five percent of U.S. homes have a microcomputer, and around 20 percent of its companies do (Blundell, 1983; "Personal Computers in the Eighties," 1983; "The Computer Moves In," 1983). Using a probability sample of 2,209 elementary schools, Becker (1983) reports that 42 percent of schools had one or more microcomputers that were used for instruction purposes, while fewer than 10 percent had five or more; the figures for high school were 77 percent and 40 percent, respectively. Videogames in arcades generated $7 billion in 1982, greater than the revenues of the movie and record industries combined. Besides the almost 8,000 public arcades, there were 14,000,000 home videogames, representing around 10 percent penetration ("National Family Opinion," 1983; Nielsen, 1982; "Video Games Go Crunch," 1983).

There are at least eighty pilot or commercial public videotex systems operating around the world. This figure does not include teletext systems or in-house closed-user groups. The Dow Jones News Retrieval system boasts more than 70,000 subscribers, while the more residentially oriented services, such as CompuServe and The Source, each have around 40,000 subscribers (Rice and Associates, 1984). Public data base providers experienced a 30 percent increase in customers in 1982; six of the largest providers served more than 20,000 users each. More than 700 providers offer more than 1,500 data bases (Russell, 1983).

More than seventy commercial electronic messaging systems were available in 1983. These systems comprised nearly 400,000 formal accounts (mailboxes), while corporate systems involved around 225,000 mailboxes, and The Source, CompuServe, and microcomputer networks supported 77,000 mailboxes (Burstyn, 1983; Panko, 1984; Sandler, 1983). In the office, about 35,000,000 workstations are expected to be in place by 1990. More than 40,000 word processing units will be delivered in 1984 (International Data Corporation, 1983). The *Wall Street Journal* has reported that nearly 85 percent of the Fortune 500 companies planned to install teleconferencing facilities; the number of installed teleconferencing rooms is expected to rise from 575 in 1981 to nearly 4,000 in 1986 as part of a 61 percent growth rate in teleconferencing use (Quantum Science Corporation, 1981).

These sample figures demonstrate the increasing presence of these technologies. These media can be seen as so new that their validity as research topics is still in doubt. Alternatively, this newness can generate inappropriate and atheoretic research. But, both of these extreme responses disappear when the term *new* is seen as relative. It must be seen in that light because all communication media have been seen as new when they were introduced.

By taking the perspective that recent media are new relative only to the past, it becomes both possible and useful to apply theories and evaluation approaches developed and tested in studies of earlier media. For example, summative and formative evaluations of prosocial and instructional television have provided analytical tools and research results that are now being used in the early evaluations of educational computing by children at home and in school (Johnston and Ettema, 1982; Palmer, 1981; Williams and others, 1981; Rice and Associates, 1984). Or, theories and evaluations of news reading can be applied to videotex system design and use. But, in both cases, the differences created by the facilities of the new media require research to pay attention to different variables, different policies, and different potentialities: In particular, evaluators still have some opportunities to affect system design and implementation, which was not often the case with the mass media. Thus, the newness of recent communication technologies should not blind us to the context of prior communication and evaluation research, but it should also signal new challenges and new opportunities.

When we examine the published literature on new media, it becomes clear that this opportunity is still largely untapped. An analysis of four on line bibliographical data bases (Sociological Abstracts, Social Science Citation Index, Magazine Index, and Man-

agement Contents) available through the DIALOG data base service revealed considerable interest in the new media in the business, trade, and popular literature but almost no interest in the new media within the scientific community (Rice and Associates, 1984). From 1974 to 1982, 1.12 percent of all articles in the Management Contents file could be retrieved using keywords related to the new media; percentages for the Magazine Index, Social Science Citation Index, and Sociological Abstracts were 0.5 percent, 0.1 percent, and 0.09 percent, respectively. Further, a year-by-year analysis showed a nearly exponential growth in the percentage of business articles mentioning the new media, a noticeably increasing growth after 1977 in the magazine data base, and a decline in the sociological data base (the social science citation data base cannot be broken out by year). The ERIC data base, which contains education-related materials, including many unpublished conference papers and technical reports, showed a steady rise in materials on instructional television between 1966 and 1970, a plateau lasting six years, then a continuing decline. The number of materials on computer-assisted instruction showed a similar pattern through 1977, but then it began to grow, and it has continued to grow ever since. Finally, a content analysis of conference papers presented at annual International Communication Association meetings indicated increasing coverage of new media, with 3 percent coverage in 1973 and almost 10 percent in 1983.

The implication of this cursory review of the literature is that the scientific community, except for isolated pockets, such as educational computing and communication conference papers, has not considered the new media as worthy of attention, but the business, trade, and popular communities have. Evaluation researchers can take advantage of this attention gap by considering projects that have a component involving new media and by reporting their research in sympathetic journals; the business and popular community will find interest in such efforts. It may be especially productive to develop joint projects between communication researchers and program evalutators that can take advantage of their mutual skills and interest in analyzing the new media and their social contexts. However, evaluation efforts need to adapt data collection, research designs, and analytical approaches to the characteristics of the new media. Those characteristics are discussed in the next section.

Characteristics of New Media: Implications for Evaluation

Newness. Although extreme responses to the newness of recent communication technologies should be avoided, it is nonetheless true

that these media offer new communication functions, introduce new technological designs, require new human capabilities, and suggest new specifications of contemporary theories. Therefore, it is entirely appropriate and necessary for evaluations of new media to consist of or to include case studies. Critics of this approach argue that the results, which are rich in process and contingency analysis, cannot be generalized to other instances of new media use. In reply, it can be said that we have as yet little understanding of the process by which individuals and organizations adopt, use, and respond to communication systems, so that work needs to be done to establish the range of possibilities, identify problems with variable definition and data collection, develop standards for later comparison, and develop theory that can be tested in subsequent replications.

For example, in a study of the adoption of word processing by 200 organizations, case studies of a subset of the companies revealed four distinct ways of managing such installations. Each approach involves an increasing level of communication among operators, supervisors, and authors, with concomitant increases in flexibility, creativity, and integration in word processing use (Rice and Associates, 1984). The insights provided by open-ended interviews and construction of the adoption process have significant implications for improving efficiency, effectiveness, and employee satisfaction. Yet, they could not have been postulated before the research was conducted, and, indeed, they could not have been deduced from responses on the 200 organization-level questionnaires. This four-system model of word processing innovation can be tested and refined, it can inform the general diffusion of innovations model, and it can be used as a general framework for evaluations of the implementation and management of future office information systems.

Case studies also have much to contribute in the way of developing baseline data on use and impact. There are considerable archival and historical survey data about the mass media with which contemporary use of the media can be compared, but there are no such resources for the evaluation of new media. Thus, while a cross sectional survey of multiple organizations will reveal aggregate relationships, a case study conducted over time can reveal typical trends that would otherwise confound cross sectional relationships. It seems, for instance, that use of computer-mediated communication systems typically rises to an early peak, then declines to some lower plateau (Rice, 1982; Rice and Paisley, 1982). Knowledge of such trends can be used to time the data collection in other evaluations to guide subcategory analysis, and, when not supported, to generate alternative explanations for system usage. For example, an evaluation of a university electronic mail system showed

a decline in reported system usage only among the highest users; the overall equilibrium in system usage was posited as an attitudinal rather than a behavioral condition. That is, the interaction of individual media preferences, task attributes, organizational roles, and media characteristics constituted a media style that intervened between access and use, thereby effectively disassociating perceived benefits of electronic messaging from actual use of the technology. The consequence was that a straightforward evaluation showed a high correlation between system use and reported benefits. However, the media style analyses showed that perceived benefits were unevenly distributed and could not be guaranteed for each organizational member simply by making the technology available (Rice and Case, 1983).

As already mentioned, the newness of the new media does not deny—in fact, it illuminates—the utility of theory and research on more traditional media. Thus, new media research needs to seek out relevant models and theories. For example, a common initial response to text-oriented new media (personal computers, electronic messaging and computer conferencing, videotex, office information systems) is that they will depersonalize human relationships because they cannot transmit nonverbal and affective cues. This interpretation is a rather straightforward application of the combination of technological constraints in transmission band width with an understanding of the different kinds of human communication coding. However, a framework for cross-media comparisons has been developed that specifies this very broad technical analysis. Called the *social presence* model of media use, it has been described most thoroughly by Short and others (1976). These authors argue that, due in part to technical constraints, different media transmit different amounts of social presence, that is, different perceptions of the presence of users of the medium. Levels of social presence are typically indicated by respondents' evaluation of media on such scales as unsociable-sociable, insensitive-sensitive, cold-warm, and impersonal-personal. Perceptions of the sociability and appropriateness of different media do not depend strictly on technical constraints but also on preexisting attitudes, familiarity, and preferences. For example, replications of social presence analyses typically order common media by declining level of social presence in this manner: face-to-face, television, multispeaker audio, telephone audio, and business letter. However, the other component of the model described by Short and others (1976), the task context, is equally crucial. Some tasks are more technical, objective, and formal; other tasks are more social and emotional in nature. For example, consider two official organizational tasks: a routine request for updated information and a

strategic negotiation between two executives. These very different contexts affect the appropriateness of any given medium. In the electronic messaging study cited earlier, this new medium was rated as appropriate for the following tasks by the percentages of managers: exchanging information (100 percent), asking questions (95 percent), staying in touch (84 percent), exchanging opinions (81 percent), generating ideas (73 percent), decision making (47 percent), exchanging confidential information (30 percent), resolving disagreements (15 percent), and bargaining and negotiating (18 percent). Similar rankings are found for computer conferencing systems (Hiltz and Turoff, 1978; Rice and Associates, 1984). Thus, the social presence literature is a useful framework for comparing new media (Johansen, 1977).

However, because the new media are new, they have yet to achieve stable perceptions in beginning users, and they are flexible enough to be used in different ways over time. Thus, experience and context of use may well be contingent conditions for evaluating the appropriateness of new media. For example, experienced computer personnel using the same electronic messaging system were more likely to rate the system as appropriate for generating ideas, decision making, resolving disagreements, and bargaining and negotiating than managers were (Rice and Case, 1983). Experienced computer conferencing users were more likely to rate the medium as appropriate for the more socioemotional tasks (Hiltz and Turnoff, 1981; Rice and Associates, 1984). So, as the medium becomes less new, users' attitudes toward the new media are likely to change, depending on task, organizational role, and media preferences. Therefore, from an organization's perspective, the impacts, benefits, and applications will also evolve. Evaluation has a role in identifying these changes and in facilitating desirable evolution.

Communication Processing. It is essential to view new media as processors of communication. It is true that many applications of the mass media and of some of the new media consist essentially of information delivery or transmission. However, as already noted, the digital signaling and computer processing involved in new media expand the range and nature of communicative activities. Consider computer conferencing. Because the conferencing program can be designed to create specific communication structures (such as equal access and participation by all, sequential polling, centralized decision making, hierarchical access priorities, and so forth), the evaluator needs to know the goals, constraints, and philosophy of the system's communication structure before he or she can interpret the actual usage patterns and user responses. Conversely, precisely because individuals in a com-

puter conference that has been designed to equalize participation do tend to participate more equally than participants in face-to-face groups do, there is less likelihood of a leader emerging, less likelihood of consensus about the final group decision, and more likelihood that it will take some time to reach a decision (Kerr and Hiltz, 1982; Rice and Associates, 1984). Further, difficulty in reaching consensus does not seem to be related to the quality of the group's decision; indeed, the minority that holds out for its decision in a computer conference, which in a face-to-face group may have succumbed to nonverbal and interpersonal peer pressure, occasionally holds on to a superior or more creative decision. Evaluation needs to consider trade-offs that are consequences of the medium before assessing the utility of the system.

Because communication involves interactions and exchanges among individuals, the level of analysis can be seen as one of relation or interaction, not of a single individual's use or a group's aggregate usage. That is, attention to the communication process involving new media leads research to consider communication networks. A network is a pattern of relations (Rice and Richards, 1984; Rogers and Kincaid, 1981). Network analytic methods have been used by sociologists interested in social structure, anthropologists interested in community and kinship structure, health service agency evaluators interested in client and agency relationships, and managerial researchers interested in organizational structure. However, rigorous network analysis requires censuses, not samples, of users and research budgets and organizational patience impose constraints. Nevertheless, the emphasis on near-censuses may be salutary. Otherwise, system evaluators may lose sight of an important characteristic of new media: A communication system becomes more important as more people have access to and use it. There are two methodological implications for communication system evaluators. The first is that results from a study in which only a small number of the possible users in a given social system actually use the medium are likely to be misleading, because the full benefits of the system cannot have been realized; the users have been communicating only among themselves, and they still use other channels to communicate with nonusers. The second is that network analytic techniques, which reveal clusters and patterning of interactions, the most central and most isolated communicators, and where information flows in the system, seem to provide fruitful approaches for evaluations of new media (Rice, 1982). However, these techniques require more complete data and sometimes more sophisticaed statistical expertise than the techniques used to evaluate traditional mass media.

Availability of Computer-Monitored Data. Computers in

various forms are fundamental to new media, and computers can collect data about system use. Typically, such data come from studies of information retrieval systems and of computer-mediated communication systems. Data analysis can focus on the frequency, type, and context of errors; the timing and duration of use; specific commands or sequences of commands; use of categories of messages (such as private-public, single-multiple, messaging-conferencing); interaction patterns among senders and receivers; textual content for semantic, linguistic, interaction, or topical interest; and traditional system evaluation of hardware and software performance (Chandler, 1982; Danowski, 1982; Hamilton and Chervany, 1981; Hiemstra, 1982; Penniman and Dominick, 1980; Rice and Borgman, 1983).

There are several advantages to such data. The computer can collect them automatically, and it can administer, prompt, and manipulate controlled experiments (Hiltz and others, 1982). Data collection can remain unobtrusive, reducing such threats to validity as demand characteristics and interviewer bias (Webb and others, 1981). Further, the data are not based on remembered or perceived reports of communication behavior; instead, they represent actual communication behavior. Discrepancies between the two kinds of data are often quite considerable (Bernard and others, 1982; Rice and Associates, 1984). It is nearly as easy to capture the entire census of user behavior with the computer as it is to sample, which satisfies the need to measure the relations among all users. Systems can monitor usage over their lifetime (or at least over the lifetime of the evaluation), so longitudinal evaluations of complete populations of users are possible. Thus, the process of adoption and use as reflected in communication behavior can be described and analyzed to an extent impossible without computer-monitored data. For example, Rice (1982) used monitor data for ten research groups (each comprising about fifty people) who used a nationwide computer conferencing system for twenty-five months. There were 87,000 interactions in the data set, which revealed network patterns within and across groups and how they developed over time; at the same time, the data set tested a model of interaction posited on electronic, not face-to-face, communication. Heeter and others (1983) analyzed Nielsen meter data about cable television viewing and channel switching that involved selected portions of millions of transactions. Such uses of computer-monitored data not only can reveal processes that cross sectional and survey data cannot, but they also foster replications and reevaluations, because they avoid the measurement and reliability problems created by questionnaire wording, sampling error, and response inaccuracy.

However, the ability to capture and use such data has certain disadvantages. The massiveness of the resulting data sets creates budget problems, because the programming of the monitoring functions requires support from systems staff, and it may also require extensive preprocessing of the data tapes. Processing and management require extensive time commitments. Moreover, the expertise needed to accomplish all the necessary processing is not readily available. There are also the questions of privacy, confidentiality, and the ethics of collecting data on people's communication behavior. Usually, certain portions of the data will be available to evaluators as part of a pilot or government-funded project. Others solutions to privacy concerns include consent statements, randomized identification numbers, bypassing of content, and aggregate reporting. The allure of reliable behavioral data may obscure the fundamental question about the meaning of such behavioral data. While attitudes may be based on false perceptions, attitudes are what subjects report and what they reveal to others. The discrepancy between reported behavior and actual behavior does not necessarily imply that actual behavior at one time influences behavior and attitudes at a later time as much as it does that attitudes affect behavior the first time. Thus, evaluators must identify how the different kinds of data can be useful before they retool to analyze computer-monitored data. The fundamental hurdle, however, may lie in integrating the evaluation component early enough to request the capture of these data in efficient and usable form.

Media as Systems. The awareness that mass media are embedded in social context and that they are part of economic, political, and technological systems clearly must be extended to new media. Looking at media in terms of organizational, institutional, and environmental contexts has received constant, if not primary, attention in communication research (Hirsch, 1977; Rice and Associates, 1984). Within organizations, the introduction of automatic processing systems and information systems has spurred the development of a sociotechnical perspective, which bases the design of work and understanding of the impacts of telecommunications on a view of the work group as an interaction among attributes of the technology, social needs of the group, and characteristics of the work task (Bostrom and Heinen, 1977a, 1977b; Cummings, 1978). Further, media themselves—particularly new media, because of the integration of different telecommunication technologies, including computer facilities—necessarily involve a diverse array of designers, vendors, adopters, users, and evaluators. Thus, evaluations of new media need to consider the systemic context of the media and to identify system elements that are sufficiently relevant and consequential to

include. One framework for identifying these components is a four-dimensional matrix consisting of stakeholders, criteria, domain, and method.

Stakeholders are system actors who have an interest in the system (or, more narrowly, in the outcome of a specific evaluation). Bryk (1983) examines stakeholder-based evaluation. Considering the interests and perspectives of various stakeholders increases cooperation, deepens understanding of the system or program, and raises the salience of evaluation results. Moreover, the chance of significant errors in system design and implementation increases when alternative perspectives are not considered in the evaluation (Hamilton and Chervany, 1981; Kling, 1980). This is because information systems are systems: Many actors are involved, and many people are affected, but the linkages between these groups are often not clear to participants. Evaluation has a role to play in uncovering the assumptions, effects, and relevance of various stakeholders. At least six categories of stakeholders are involved in new media systems: macrosupport—funders—of development and evaluation for governmental or policy purposes; regulators, as of telecommunications and legal matters; social and cultural activists, including critics and proponents of new media in such contexts as children's use of videogames or invasion of privacy by computerized record keeping; industry representatives and system designers, who are concerned about such matters as technical standards in videotex systems, system performance, cost-efficiency evaluations, and the proprietary nature of evaluation results; administrators—personnel managers concerned about access to use and support, support staff concerned about development priorities and user requests, or work group leaders who desire simple but flexible design; and users, whether potential (the "computer illiterate," persons in low-income communities where there are no personal computers in schools), organizations and institutions (libraries and legal firms will have very different needs for and tolerances of on line-data bases), groups (who may value group cohesion over decision-making efficiency), user networks (which may have lower tolerance for unreliable value-added networks because there is no other means for communicating with most network members), and individuals (who may be concerned about employment impacts, ergonomics, and ease of use). The stakeholder approach is not necessarily economical or easy to manage, because it requires extensive evaluator commitment and interaction with the interested parties. And, the interaction itself can bias the interpretation of analyses.

The criteria or goals of an evaluation are influenced not only by

stakeholders but also by the training, theoretical orientation, and mandate of the evaluators. Criteria for success or failure may include resource distribution, system functionality, political processes (whether related to public concerns or to organizational politics), knowledge creation and dissemination, cost (amount, relation to benefits, source of funding), social benefits (such as quality of life), demands on users' skills (with implications for training, career advancement, and system rejection), and social structure (who gains and who loses access to communication and information).

Another dimension of the evaluation matrix consists of the domain of analysis or the level of communication behavior. Specifying the domain causes different networks of communication and different uses of the media to become salient. These domains range from institutions and society to groups, dyads, and individuals. These domains then interact with stakeholders and criteria in identifying the attributes and impacts of new media that should be measured and evaluated. For example, in assessing the relationships between office automation and organizational productivity, most organizations have used very traditional and narrow criteria for productivity when calculating the benefits of systems. Word processing may be cost-justified on the basis of reduced keystrokes or increased paper throughput, but this approach ignores the multiple levels of criteria for performance that coexist (perhaps uneasily) in an organization. The mission of the organization, such as increased short-term profits for stockholders, may mandate very different measurements of benefits than organizational purpose (a strategic target for accomplishment of mission) would. Mission would emphasize the return on investment of an inventory control system, while purpose might emphasize reduced customer turnover because of improved service. Such organizational functions as planning and purchasing may emphasize customizing of system language, even though this might reduce cross-function communication. Further down the hierarchy of organizational performance, processes represent the form, not the content, of organizational behavior. For example, managerial style in one organization might emphasize face-to-face communication over telephone or memo communication; clearly, an electronic messaging system will be used less in such an organization, but it also requires a lower criteria of use to be considered successful. The activities—that is, the observable behaviors that make up each process—involve the different kinds of tasks discussed in my comments on social presence. Different activities can be assessed for their contribution to the organization's mission, purpose, and function. So, an evaluation effort might wish to consider how well meetings and computer conferences satisfy

given criteria, rather than to assess the new medium by itself. Finally, the sequential stages involved in performing the activities constitute actions. Productivity evaluations can measure the amount of time and resources used to make a successful telephone call to transform the same message content across various forms (phone message, notepad, message note, formal calendar, dictated response, official letter).

The methods dimension of the evaluation matrix includes the full range of analytical tools now available to evaluators. As already mentioned, it includes network analysis as well as considered use of computer-monitored data. Because of the new and evolving nature of the new media, their increasing integration with other media and with other work units and processes throughout the organization, and the complex contingent nature of media effects, it is also necessary to take advantage of new analytical perspectives that focus on change. Statistically, this involves the use of Markov analysis, pooled cross sectional time series, LISREL, overtime and multidimensional scaling, and case studies (Hannan and Young, 1977; Hewes, 1978; Monge, 1982; Woelfel and Fink, 1980).

Another approach specifically addresses the changing perceptions as nonusers become new users, then experienced users. If new media do indeed change the ways in which people work and communicate, then attitudes and perceptions should change as well. Thus, three kinds of change are possible. The first kind of change, alpha change, is change in level on a particular scale: Users do more work, or they are more satisfied. The second kind of change, beta change, involves the extension of a prior scale: After the introduction of word processing, operators have higher expectations for turnaround and text flexibility, so earlier evaluations of work done by typing may have to be adjusted downward in retrospect. The third kind of change, gamma change, involves a shift in the dimension used to evaluate work: Integrated office systems allow users to be more effective and change their work processes, criteria very different from efficiency of typing (Rice and Associates, 1984). As Tapscott (1982, p. 20) concluded from an evaluation of an office automation system, "the findings suggest that as access to information improved, so did expectations regarding what is possible and perceived requirements regarding what is necessary." The methods used for measuring and identifying these kinds of change are well introduced by Terborg and others (1980).

To summarize, evaluation approaches must match new media systems in their complexity and evolution. Such matching requires attention to different levels of and interactions among the four dimensions of the evaluation matrix proposed here.

Early Adoption Stages and Innovative Adopters. At this time, the majority of new media implementations are pilot systems, funded demonstration projects, installations in selected organizational departments, or acquisitions by innovative individuals. This set of characteristics has crucial implications for evaluation.

One implication is that the only population that users of new media represent is new users. Thus, it is difficult for consumers of evaluation (say, managers or agency funders) to know how the results should affect policy. The managers who used the electronic messaging system that Rice and Case (1983) evaluated were chosen to be social role models for other university managers, so that diffusion would be facilitated. At the same time, both perceived benefits and usage patterns are likely to be quite different for later users. The farmers selected as users in the agricultural information system demonstration sponsored by the Department of Agriculture (Rice and Paisley, 1982) were stratified by farm size (an indicator of gross revenues) to control for economic differences in explanations of videotex use. None of the demographic variables was successful in predicting reported or system-monitored use, but the farmers' innovativeness (measured by the number of other farm innovations previously adopted), coupled with a functional interest in weather information, was associated with system-monitored use. Thus, even when there are evaluation opportunities to improve inference strengths, new users still can be discriminated by their general innovativeness. Other traits associated with innovativeness are likely to be confounded with reported effects of and attitudes about new media.

Further, because the new media are complex systems, they are often tested in real organizational or social settings. Thus, it is very difficult to locate a control group with which comparisons can be made. Moreover, separating subjects into users and nonusers limits the potential positive benefits of the system, because everyone does not interact. Even if early users in a pilot system are relatively representative (or even if enough variables are measured to enable postproject statistical controls to be performed), rival hypotheses cannot easily be rejected through analyses of behavior and attitudes in similar groups of nonusers. Some approaches to this problem are possible, however: Tapscott (1982) reports an office automation study that involved a control group; users can be studied over time (both before and after implementation) to take into account within-group historical trends, and early users can be compared with more experienced users. Although cross-system evaluations are difficult to conduct, they are necessary if the rival hypothesis of system-specific results is to be rejected. Only Kerr and Hiltz (1982) have reported such multisystem analyses.

Because both the new media and their diffusion through social and organization contexts are in early stages, formative evaluation has a greater role to play than it does in traditional media evaluations; early or interim results can be used in later system refinements and management actions, particularly because the integration of the computer with the medium makes continuing development of applications possible. Thus, some portion of evaluation efforts can be directed at identifying ways of managing and applying technology to improve the likelihood of desired benefits later in the implementation process. For example, in the word processing study mentioned earlier, a summative evaluation of the organizations at the less creative sites might have concluded that they had implemented the innovation successfully although they were mired in a narrow and limiting form of adoption. Rather, a model of innovation that posits reinvention (the adaptation of an innovation after its initial adoption) will look not at whether organizations adopt or do not adopt but at systematic conditions in the organization that foster reinvention (Rice and Rogers, 1981). In this case, precisely because information about information systems is needed if we are to understand the technology and the potential for wide-ranging applications, organizations that supported operator-supervisor-author communication experienced greater benefits from the technology.

Simultaneity of Influence. One consequence of many of the characteristics of new media just described is that evaluation efforts must reject simple notions of one-way causality. Because media systems exist in social systems, because they are complex, because they are new, because they involve communication and networks of users, it is difficult to posit first causes. Indeed, consequences reverberate throughout such systems. An organization that fosters reinvention in simpler media will experience changes in work design that will motivate the adoption of more sophisticated office information systems (Giuliano, 1982; Strassman, 1980). Individuals may report attitudes toward and perceived benefits from new media, but those perceptions may have been the motivations for system use in the first place (Kerr and Hiltz, 1982; Lippitt and others, 1980; Rice and Case, 1983).

Thus, we need to consider the role and the acceptance of new media in a complex information environment. For example, the longitudinal analysis of computer conferencing users mentioned earlier explicitly avoided a deterministic analytical approach; rather, it assumed a probablistic communication process and tested not impacts but different models of how social systems would develop over time and what attributes of information flow would be significant components of the networks' patterns over time (Rice, 1982). Theoreticians of computing impacts argue persuasively that computing is a web or package

that changes, develops, constrains, and is constrained (Kling, 1980). One implication for analysis is that the effects of media on other media become valid foci of evaluation. For example, what are the consequences for local newspapers when electronic publishing (such as videotex) becomes an economic reality? Will access to computing at home and at school improve literacy in general and book reading in particular? Electronic messaging in organizations tends to reduce the use of memos and telephones but not of face-to-face communication, yet managerial time is the most expensive and apparently most oriented to face-to-face interaction. What trade-offs among media are possible and beneficial? Low-power television, and direct broadcast satellites will all compete for some of the same advertising and consumer spending resources that once was the sole preserve of television, which in turn had encroached on radio and newspapers resources. What design and marketing strategies will facilitate success of these new transmission media?

Summary

Several authors have been credited with the indictment that, on the train to progress, we all have seats facing backward. Researchers still have an opportunity to turn around and see where we may be going. If we cannot see far ahead, we may at least be able to describe what is just ahead or what we are passing by so that we can assist those who are deciding which tickets to purchase. In this chapter, I have indicated some of the ways in which evaluation research can take note of characteristics of new media that will inform analysis, enrich interpretation, and enliven implications.

The growing use of new media evidenced by market penetration figures and industry projections is as yet unmatched by scholarly attention, references retrievable from major on line data bases indicate. The attention gap that such comparisons reveal is not necessary, as there is considerable precedent in past evaluations of mass and educational media. Indeed, existing research approaches and theoretical foundations can be applied to the study of new media. However, new media exhibit characteristics that require alterations in traditional evaluation efforts. These characteristics include, but are not limited to, newness; processing of communication content and flows; availability of computer-monitored data; the systemic nature of media, which requires a multidimensional evaluation effort; early adoption stages and innovative adopters; and simultaneity of influences. The resultant systemic interaction of new media within and with their environments

requires new evaluation perspectives and methodological approaches. But, it also presents evaluation with opportunities to cross disciplinary and stakeholder boundaries, to inform and unite what may otherwise be disjointed and opposed actors and components of new media systems.

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