SOCIAL INFORMATION, MEDIA RICHNESS, AND MEDIA CHOICE: THE PERCEPTION AND SELECTION OF ELECTRONIC MEDIA

by

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ABSTRACT

The present research evaluated Media Richness Theory and Social Influence Theory. The study examined effects of social influences on perceptions and uses of electronic mail in a research organization. Antecedents and consequents of media richness were examined to see if richness varied across individuals and if such variation influenced attitudes toward and usage of electronic mail. Both quantitative and qualitative methods were employed.

A survey identified close interpersonal ties. Social influences were modeled by an ego-centered relational network, composed of the five most frequent communication partners using all media; the network also included ego's supervisor. Data for the communication partners (obtained directly from the individuals in the network) were used to predict ego's perceptions and uses of electronic mail. Because the network data were not same-source, results were less prone to inflation by common-subject variance.

Self-reported media use, attitudes toward media usefulness, media richness for all organizational media, and assessments of electronic mail effectiveness for many communication tasks were obtained for a sample of 511 organization members (92 percent response rate). The study included 50 semi-structured interviews accomplished before, during, and after questionnaire administration.

Differences in media skills and experience influenced an individual's perceptions of media richness as did the media perceptions of co-workers. Richness influenced an individual's attitudes toward and use of electronic mail. The data suggested that the original formulation of media richness as an intrinsic characteristic of communication media needs modification.

The present research found modest but pervasive social influences of colleagues on others' media attitudes and usage. Variables representing the social influences of organizational colleagues almost doubled the "explained" variance of individuals' media attitudes and usage in the structural equation models used to test the hypotheses.

Quantitative findings were supported and amplified by interviews and observation. Qualitative data provided additional evidence of social influences, e.g., direct social pressures, organizational norms, and the use of stories to emphasize beliefs and actions that were considered appropriate in this organization. The present research suggests that the uses and perceptions of communication technology can be better understood if the social environment is explicitly considered.

PREFACE

The present research has been guided by the efforts and contributions of many persons. Just as I propose that media perception and use stem from social processes and must be examined within a social context, it is essential to emphasize the contributions of those persons who guided and shaped this dissertation.

Almost twenty years ago when I attended Michigan State University, my high regard for Ev Rogers began a process that lead to my decision to enroll in a doctoral program. I am greatly pleased to have been trained at the Annenberg School and with my continued association with Ev Rogers.

I had little idea of the intellectual (and more mundane) debts that I would accrue along the way. I should first like to thank Janet Fulk. She has served admirably (too often without thanks) as my advisor. She has been a mentor, a friend, and has helped me to engage in the sense-making that Meryl Reis Louis so accurately characterizes as essential for newcomers.

I had the pleasure and great fortune to study under both Tom Cummings and Eric Eisenberg. Much of my knowledge of organizational theory comes directly or indirectly from Tom. Equally important, Tom has shown me the role of passion and stagecraft in teaching. Tom is also responsible for the single greatest improvement in my

personal library although I should acknowledge funding from my wife, Julie. I am particularly indebted to Eric for sharing his knowledge of communication in organizations and also for providing a superb model for one who would teach others. I found Eric's seminar a grand and exciting forum to share ideas and have tried to incorporate that style in my own teaching.

I owe much to Peter Monge. He trained me in research methods, supervised my first research project, and introduced me to structural equation models. If I have any claim to expertise as a LISRELITE, Peter should be held accountable. Ron Rice has played a similar role in my acquisition of social network methodology. My network class with Ron Rice and Augie Grant was one of the most rewarding educational experiences in my life. Ron and Augie typify the excitement of discovery.

The early theoretical work that guided the premise of this dissertation was a collaborative effort of Janet Fulk, Gerry Power, and myself. My thoughts and efforts throughout this study have been aided immeasurably by discussions with Augie Grant, Gerry Power, Carolyn Aydin, and Brian Boyd. Brian also developed a SAS program to calculate ego network scores with great reductions of time and (my) stress. Also instrumental in reducing stress and improving my level of scholarship was the CommCenter under

the guidance of Carolyn Martin Spicer. The people there always gave extra help in ways that mattered.

This research is part of a larger project that was directed by Janet Fulk and funded by the Center for Innovation Management Studies. I thank CIMS for the generous assistance that made the present study possible. The Center for Innovation Management Studies also helped us locate a suitable research site and facilitated our initial contact with the host organization. My thanks also are due to Chip Steinfield who played an important role on our research team.

This study could not have taken place without the enthusiastic and valuable support of Michael Waller and Rosemary Nash at PRC. They gave the research team all the help we needed. Not the least of their gifts was thoughtful insight into what people at PRC did and how organization members employed communication media to do their work. Equally important, we were given free reign to follow our research interests and "hunches". I am especially indebted for access to PROFS and the associated database. Such access is usually reserved to PRC members at this research facility. The granting of this knowledge was particularly helpful to gain added perspective about how persons at PRC communicated with electronic mail.

Many of the knowledge claims embodied in the present research are based on the views and actions of our

respondents. These persons deserve the utmost credit for giving their time and for sharing their knowledge. I am entirely responsible for distortions that may exist in this dissertation.

The change from military pilot to scholar has been wrenching at times. Joan Van Tassel gave me sound advice and a sympathetic hearing, commodities typically in rare supply. My most important resource has been my family. My wife and sons have been understanding, often when they had just cause to feel slighted. They have my deep gratitude as do my parents and brother. Much of whatever I may accomplish has origins in their faith and support.

Joseph Schmitz Santa Monica

Chapter 1

INTRODUCTION

The goal of the present research is to identify the effects of relational interaction upon communication media selection within organizations. The present research reflects my long-standing interest in the effects of acquaintances and co-workers on the behavior of their colleagues in the work-place. During my last assignment in the U.S. Air Force, an assignment during which I remained in the unit for the remarkably long period (by Air Force standards) of six years, I was struck by systematic and dramatic changes that occurred as a consequence of cyclical personnel rotations. Unit mission and technology were constant but unit operation and unit character varied markedly.

My interest in the effects of new communication technologies has determined the present arena of inquiry. My belief in the importance of others in shaping the course of events has guided the selection of research questions for the present study. The words of W. I. Thomas (Thomas & Thomas, 1928), "If men perceive situations as real, they are real in their consequences," nicely captures my belief in the importance of the

subjective character of the social world. I endorse the view of Lippmann (1922), who wrote of a "world outside" and noted that we act based on the "pictures in our heads." Those pictures are at best an indirect representation of an external environment. It seems to me that the pictures in our heads are drawn largely from interaction with others. This position, not an original one, postulates a major role for social influences with respect to how new communication technologies are used in organizations.

The present study examines the effects of social interaction upon organizational behavior. While the present research focuses on the perceptions and uses of a new communication technology within an organization, it is grounded in the core assumption that social interaction in the work-place shapes the creation of shared meanings. These shared definitions provide a basis for the patterns of organizational behavior.

My interest in linking the effects of social influence and the use of a new communication technology is spurred by two factors. First, while many investigators of new communication media discuss the importance of the social context, research strategies have more often focused on the interaction of technical advantages and task requirements to "explain" the adoption and use of new

media. The importance of the social context has commonly been presumed but it has seldom been explicated.

A second reason lies in the model of human learning that guides the present research. Humans are seen to have multiple goals and alternative means to obtain these goals. Both goals and goal-directed behaviors are viewed as malleable. Individuals come to value and select both ends and means through a process of interaction with others.

One variant of this process, proposed by Bandura (1978), is characterized as observational learning. Theorists that stress the importance of others in acquiring and selecting behavior include Mead (1934), Simmel (1946), Rose (1962) and Bandura (1978, 1986). These scholars have provided a theoretical basis for the present research.

Salancik and Pfeffer's (1978) articulation of the role of social information in the organizational arena provided a second foundation for the present research. My associates and I, drawing substantially from Salancik and Pfeffer, developed a theoretical model of media behavior that integrated social influences and more traditional elements of media use. This social information processing (SIP) model and the accompanying propositions were presented in Fulk et al. (1987) and guide the present dissertation. The SIP model generated the present

research questions, influenced the selection of the research site, and required the adaptation of social network methodology in order to operationalize patterns of social influence.

This theoretical emphasis on social influence requires compatible empirical methods that have a potential to capture relational ties. An important feature of the present research is the use of network methodology and relational social interaction patterns to predict perceptions of communication media and media usage patterns. The selection of this network methodology stems from, and is consistent with the theoretical perspective presented earlier. As such it represents a departure from the dominant approach most often used to study new organizational media. The dominant approach, one that aggregates individuals, seeks to identify differences across individuals and matches between communication tasks and media characteristics that "explain" media use. Such an approach lacks sensitivity to important social processes that influence communication media behavior.

Underlying Perspectives

Louise (1983) noted that Burrell and Morgan (1979) described alternative paradigms in terms of their extremes, in effect, as ideal types. This emphasis on differences is useful for heuristic purposes but the risk

of ignoring similarities is introduced. The paradigmatic descriptions that follow are intended to demonstrate basic differences in approach. Clearly, overlap occurs and individual authors exhibit subtle differences and take less extreme positions than this broad overview can characterize.

The assumptions of researchers investigating new communication technology are usefully represented within the framework developed by Burrell and Morgan (1979). The social world of the organization has been viewed ontologicaly as relatively tangible and immutable. Epistemology has been highly positivistic (Weick, 1984). Media use has been an important dependent variable, one that has been viewed as subject to empirical discovery based on associations across individuals, communication task requirements, communication media characteristics, and organizational structures. In their review, Culnan and Markus (1987) noted the prevalence of these themes in the recent research literature. Daft et al. (1987) provides a representative exemplar of this tradition.

Methodology has been generally consistent with this positivistic tradition and has been particularly dependent on survey methods and statistical techniques. These methods have often employed a reductionist strategy, one that takes an isolated individual as the unit of analysis and predicts individual media behavior without

consideration of relationships among such individuals (Rogers & Kincaid, 1981; Shook, 1988). This focus on aggregations of individuals facilitates the use of powerful techniques of statistical inference. The cost of this strategy frequently includes ignoring the relational interaction that provides many of the incentives for the communication that we study. Such a reductionist strategy is usually ill-suited to capture the relational history and patterns of interaction among individuals within comprise an organization.

It seems accurate to characterize much of the research that has investigated a new communication technology as having adopted an objectively rational model of media use, a model based largely on the fit between the media characteristics and the task requirements of the communication situation (Fulk et al., 1987). The organization has been viewed by the researcher to use new media in order to accomplish communication tasks with greater efficiency or effectiveness. See Huber and Daft (1987) for an example of this kind of organizational model. Within the organization, individuals are envisioned to use objectively rational processes of media selection and to employ those media that provide the most effective match of communication media and communication task. Trevino et al. (1987) and Allen and Hauptman (1987) provide examples of research that is based on this

perspective.

An alternative view of the new communication media may have merit. The "new" perspective is one which considers social reality as malleable through the interaction of participants. This view has been articulated in social science disciplines ranging from psychology to sociology. Burrell and Morgan (1979) provided an authoritative description of the basic assumptions of the paradigm. In its strongest form, the subjective experience of the individual (experience very much based on social interaction in the view of Mead, 1934; Rose, 1962) becomes the ontological focus of inquiry.

The subjectivist approach regards knowledge as less universal and unconditional; knowledge is believed to be more personal and individual. A privileged view is accorded to the participants of interaction rather than to an outside observer. Research methodology therefore tends to be ideographic and focuses on detailed accounts of individuals in an attempt to understand rather than to predict.

The present dissertation takes a position that accords subjective social phenomena a substantial importance in organizational behavior. It, however, takes a positivistic approach toward the acquisition of knowledge and employs empirical quantitative methods consistent with that positivism. It departs from traditional survey

methodology with regard to gathering relational data and the use of social network methods to model communication media perceptions and use. The media attitudes and behaviors of organizational associates are deemed essential to understand how individuals select and use media within organizations.

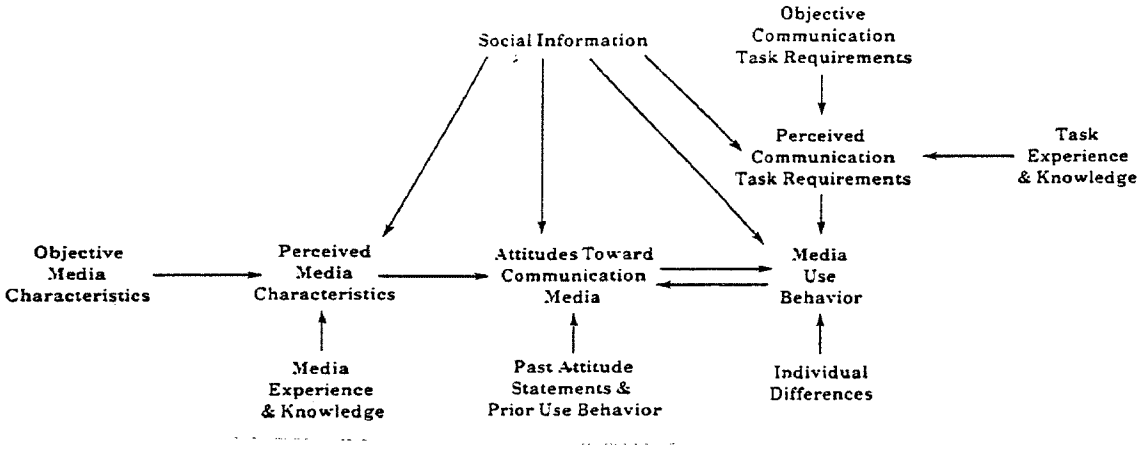
The Social Information Processing Model: An Overview

The SIP model developed by my associates and myself (Schmitz, 1987; Fulk et al., 1987; Schmitz, 1988; Fulk et al., 1988; and Fulk et al., 1990) postulated that the media perceptions and media uses of individuals are in part determined by social influences at the work-place. This model asserted that a substantial component of media attitudes and characteristics is socially constructed. We proposed that media properties are "subjective--influenced by attitudes, statements and behaviors of others" (Fulk et al. 1987, p. 537). The media uses of individuals are thus influenced by statements, norms, and media uses of organizational associates. Figure 1.1 depicts the model.

The model has two important implications for the present dissertation. First, are media characteristics malleable and subject to social influences? We drew from scholars in organizational theory and social psychology to suggest that the social context has been often ignored with respect to newer communication media.

Figure 1.1

A Social Information Processing Model of Media Use



Source: Fulk et al. (1987).

The literature review that follows in Chapter 2 provides evidence that the information richness of a medium is a characteristic that makes a difference. Information richness, the medium's capacity to change understanding or to reduce ambiguity, is accorded a central role in media selection by Daft and Lengel (1984, 1986).

Although the scholars that developed the concept of information richness envision richness as a characteristic largely inherent in a medium, a social information processing model of media use implies that richness is a subjective characteristic, one that varies across individuals as well as across media.

The first research question has two parts:

1. Do individuals vary systematically in their perceptions of information richness? If so, does that systematic variation predict media use?

A second implication of the social information processing model is that media attitudes and media behaviors of organization members influence the attitudes and behaviors of their communication partners. The assessment and use of media is not envisioned as a strict, objectively rational process. Rather, media assessment and use are in part, subjectively determined and based on many criteria including those that emphasize subjectively

preferred outcomes. Further, important sources of subjective criteria stem from relational interaction among work associates.

The social information processing model implies the second general research question:

2. Can media behavior (both attitudes and usage) be predicted using the media behavior of organizational co-workers?

Implications

The theoretical substance of the present dissertation stems from the research questions. Does the social context structure the manner in which communication media are evaluated and used? To the extent that it does, and given that relational influences have largely been ignored in many previous studies of new communication media, then existing theoretical models have been incorrectly specified. Such theoretical deficiencies are potentially very important because existing models of new communication technology emphasize technical problems, constraints, and solutions when interpersonal processes and social solutions may be the important issues.

The methodological importance of the present research lies in the research strategy to gather and integrate relational data from a large organization into a database obtained through more traditional survey and interview

techniques. In addition, the adaptation of current social network methodology to operationalize relational social influence provides an elegant way to model common aspects of organizational behavior.

The practical implications of the present research should not be overlooked. To the extent the theoretical arguments have merit, organizations should assess their patterns of social interaction and social influence just as carefully as they evaluate the technical capabilities of the new communication media they expect to employ.

Dissertation Overview

Chapter 2 presents a review of literature and the hypotheses that guide the present research. It opens with a review of more traditional models of organizational information processing. Next, a review of theory outlining the role of social interaction and social influence in shaping behavior is presented. Three units of analysis are considered: the individual, the group, and the organization. Chapter 2 also presents the research hypotheses. Chapter 3 describes the research site, data collection, research methods, and data analysis. Chapter 4 presents the results of both quantitative and qualitative analyses. Chapter 5 provides a discussion of findings and concluding assessments.

Chapter 2

REVIEW OF LITERATURE AND HYPOTHESES

A Traditional Model

Organizations as information processing systems

A common view of organizations likens them to information processing systems. This perspective stresses that information is the link between an organization and the external environment, an environment that affects important organizational outcomes, perhaps even survival. The notion of the organization as an information processing system also emphasizes that regardless of whatever bounds are drawn to define the organization, information, in the broad sense, is the currency for the internal conduct of both task and social relations within an organization. Information in the present research is broadly defined as patterns of matter-energy that influence the level of perceived uncertainty by individuals; see Rogers (1981) for amplification.

Information is deemed essential to deal with environmental uncertainty (e.g., Tushman & Nadler, 1978; Huber & Daft, 1987). It follows that one basic function of any organizational structure is to create appropriately linked sub-units that can process, evaluate and exchange

information. The organizational paradigm that undergirds this perspective stresses the importance of gathering and processing information about the environment. This information is ultimately intended to be used by decision makers to facilitate strategic organizational coping with environmental change (Huber and McDaniel, 1986).

The notion of information as a cornerstone of organizations is not new. Barnard (1938) characterized formal organizations as cooperative systems in which individuals are induced to participate in enterprises with shared purposes under conditions of mutual communication. Barnard considered communication as essential to induce individuals to share goals and be willing to cooperate, to organize, and to accomplish tasks necessary to achieve those shared goals.

Technology and information processing

The view of an organization as a collectivity of individuals with shared goals, rationally pursued, was echoed by Thompson (1967). For Thompson, the environment and the organization's interdependence with the environment as an open system became critical to understanding the relations among organizational sub-units. According to Thompson, organizations sought to buffer their technical core processes from environmental uncertainty. As open systems, organizations must process

information in order to preserve organizational prerogatives and indeed, to survive.

The work of Thompson (1967) and, to a lesser degree, that of Burns and Stalker (1961), accorded technology a central role in dictating the intensity and character of communication. Different communication requirements were based on differing coordination requirements which, in turn, were driven by differences in the core technology of organizations. Within an organization, the core technology influenced both the nature of the communication requirements and the identity of the technically interdependent sub-units. External to the organization, increased technological change and diversity led to greater environmental uncertainty and thus, greater information processing requirements.

Although the emphasis upon strict "rationality" proposed by Thompson has been questioned by later scholars (e.g., March & Simon, 1958; Cohen et al., 1972; Meyer & Rowan, 1977; Zucker, 1977; Salancik & Pfeffer, 1978; Morgan, 1986 and others), contemporary organizational scholars have remained impressed by the extent an organization's technology influences and is, in turn, influenced by that organization's communication patterns.

This intellectual heritage stresses two themes that now interest many organizational scholars. The first theme emphasizes the centrality of information processing

requirements to determine efficient structures and strategies in modern organizations. Galbraith (1973, 1977) provided both a model and alternative (contingent) strategies to reduce uncertainty by creating efficient information processing systems. The work of Tushman and Nadler (1978), Tushman (1979), and Huber (1982, 1984) exemplified the stress placed on the design of effective information processing systems to maximize an organization's capability to cope with environmental vagaries and to best exploit environmental resources. Kling (1980) characterized this perspective as a systems rationalist approach and noted that this approach stresses the role of information systems and interlocking communication bridges to coordinate the activities of differentiated organizational sub-units.

Media characteristics and information processing

A second theme converges with information processing theory and is increasingly important because of greatly increased diversity of mediated communication options within organizations. This theme notes that differences in communication media may lead to important differences in communication effects. In the strong form, scholars adopting this approach, emphasize that communication media have inherent differences with respect to their capabilities to accomplish selected goals.

One example of this approach ranks different media based on their relative ability to convey social presence (Short et al., 1976). Social presence, explicitly defined as a quality of the communication medium, is the "degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships" (Short et al., 1976, p. 65). Different communication tasks are held to be best accomplished through the use of communication media with the optimal level of social presence. For example, tasks such as getting to know someone would require media of greater social presence compared to a simple exchange of information that may be accomplished through media with little social presence. Note the implicit criteria of efficiency and effectiveness as the basis for media selection and the assumption that media with greater social presence are more costly. These assumptions also underlie the media richness theories of Daft and associates which are addressed next.

The work of Daft and colleagues (e.g. Daft & Lengel, 1984; Daft & Lengel, 1986; and Trevino et al., 1987) represents a parallel approach to the problem of media selection and use. These authors stress that communication media are employed to both effectively and <u>efficiently</u> accomplish important organizational objectives. Organization members are envisioned to have shared goals. One important organizational goal is to

reduce ambiguity. Just as specific tasks vary in their level of ambiguity, specific communication media also vary in their capability to reduce ambiguity.

Daft and colleagues define media that: (1) facilitate feedback, (2) use multiple cues, (3) present individually tailored messages, and (4) use natural language to convey subtleties as "rich" media. While rich media (face-to-face communication sets the standard of richness) may effectively reduce high levels of ambiguity, these media are presumed to be more costly to use than "lean" media and are therefore deemed inefficient in situations that do not entail high ambiguity. For Daft and colleagues, media choice is (or should be) based on the efficient reduction of ambiguity. Further, Daft and associates consider the characteristic of media richness to stem from the nature of the medium and to be relatively invariant across users of the same medium (Fulk et al., 1987).

Daft and associates consider the environment to be the locus of uncertainty. For example, Daft and Lengel (1984), Daft and Huber (1986), and Huber and Daft (1987) stressed that a primary goal of individuals within a sub-unit is to reduce the level of ambiguity, ambiguity that is presumed to stem largely from sources external to that sub-unit. The environment, broadly defined, thus determines in large measure the level of ambiguity (and

thence communication media requirements) for the organizational actors.

Differences in unit communication requirements are also considered to be a function of the complexity, scope and interdependence of organizational tasks. In this respect, Daft and associates drew directly from Thompson. Both Thompson and Daft have adopted a contingency approach in organization and information system design. This contingency approach favors (for Daft and associates) the selection of specific communication media based on the compatibility of media characteristics with the characteristics of communication tasks. These communication tasks are seen to vary, in part, based on technical and structural differences of organizational sub-units.

This match of organizational coordination requirements, information tasks, and communication media characteristics has become more important with the dramatic increase in media choices now available to organizations. New communication technologies, particularly computer-mediated communication technologies, provide organizations with media options that did not previously exist several years ago. Then the range of communication options was largely limited to face-to-face communication or to the mediated communication options of

telephone or print. Clearly, the range of communication options is not so constrained now.

New Media, New Potential

Now, in addition to increased use of fax, video and voice media, organizations routinely digitize, manipulate, transmit and store text with computers. This dramatic increase in computer-mediated communication, notably in electronic mail, is important for three reasons:

(1) It provides potential gains in both communication effectiveness and efficiency. Investigators of these media point to enhanced capabilities such as the ability to contact many additional individuals, to efficiently send multiple messages that are tailored to specific individuals, to avoid telephone tag, and to easily span geographic distances (Rice, 1984; Williams, 1982).

(2) It increases potential for changes in those organizations that adopt the new media. For example, Rogers (1986) pointed to the ability of computer-mediated communication to demassify communication and to facilitate shared control of the communication process.

(3) It may alter the way people interact. Rice (1984) suggested that computer-mediated communication may both increase the number of contacts available to individuals and independently increase the diversity of the available information. Changes may not just involve

more sources of information or greater information content of communication, but also reflect changes in the basic patterns of interaction.

Sproull and Kiesler (1986) provided evidence to suggest that the "leanness" in electronic media disinhibit communication behavior when compared to the more personal face-to-face medium. They proposed that resultant electronic "flaming" reflects technologically induced change in the nature of interaction, a finding disputed by others, e.g., Markus (1988).

Electronic Mail: The Medium of Study

The social information processing model of media use was asserted to be a general one that is applicable to all media (Fulk et al., 1987). This research tests the SIP model with respect to a single medium in order to provide a first assessment of the model's utility. The hypotheses are framed within the context of electronic mail. Electronic mail was selected for three reasons:

First, the increasingly widespread adoption of electronic mail indicates that it has potential to enhance important organizational outcomes.

Second, as a medium predicted to be moderately lean (Trevino et al., 1987; Steinfield & Fulk, 1987), it provides a good test of hypotheses regarding information richness and media use. Because electronic mail was

expected to be rated at the midpoint of an information richness scale, individual variation in perceived richness may be expected to lead to differences in media usage if information richness is a powerful construct for predicting individual patterns of media selection.

Lastly, an important advantage of electronic mail stems from the medium's capability to provide archival traces of individual use through the unobtrusive collection of computer-monitored data. This permits the collection of usage data independent of any survey instrument used to obtain measures of many independent variables. The computer-monitored measure of usage data, an important dependent variable, is not likely to exhibit inflated relationships with survey-measured variables as a result of common method variation.

Richness, Individual Differences, and Electronic Mail

This section develops hypotheses that relate individual variation in information richness to differences in communication media perception and use. The first research question asks if variation in information richness across individuals is associated with individual differences in media use. A related question seeks to identify the sources of variance in information richness. This group of hypotheses draws upon the work of Daft and associates but extends the concept of media

richness to include consideration of systematic differences among individuals.

Daft and colleagues conceptualized media richness as an inherent medium characteristic. Richness was used as an independent variable to predict media behavior, contingent on the ambiguity of the communication task requirements. Rich media were favored to perform tasks with high degrees of ambiguity. A related argument was that senior managers used richer media than less senior individuals. Daft et al. (1987) and Trevino et al. (1988) provided some empirical support for this position. In both studies respondents rated media with regard to richness. Respondents then reported more intensive use of rich media for ambiguous tasks as predicted by the investigators. In addition, those managers that used the "correct" match (Daft et al., 1987) were more likely to be considered as high performers by their organization.

A study by Markus (1988) provided conflicting evidence. The electronic mail use of managers, particularly senior managers, was evaluated using both qualitative and quantitative methods. Markus found that, contrary to predictions of information richness theory, electronic mail was used more intensively by senior managers, used for communication tasks that involved high degrees of ambiguity and sometimes used as a part of a communication strategy to evade richer face-to-face

interaction. The Markus study closely matches findings by Schmitz (1987) that electronic mail use was directly related to higher job levels in a local city government.

The theoretical framework presented in the present study considers richness as a perceived characteristic which may vary across individuals rather than as an invariant quality of the medium. Figure 2.1 presents the portion of the SIP model that includes media richness. The SIP model is compatible with the formulation of Daft and associates to the extent that media richness is regarded as an extremely important objective media characteristic.

In contrast to Daft and colleagues, my associates and I propose that media richness varies systematically across individuals and in part, represents the perceived capability of a medium to reduce ambiguity. Variation in media richness across individuals is proposed to be associated with differences in the individuals' communication media patterns. The existence of individual variation in perceived media richness and covariation with differences in communication media patterns is an empirical question which may be informed by data. Perhaps the best way to begin is to discover if individual differences in media richness are differences that matter.

Drawing from Fulk et al. (1987) information richness, a perceived media characteristic, is proposed to be

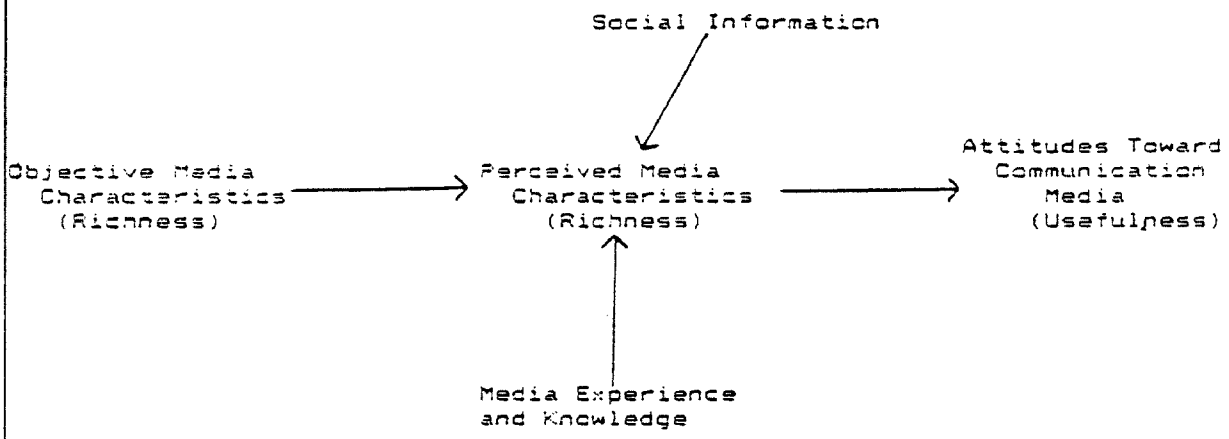
directly related to objective media characteristics. Richness should also be determined by the social information of work associates and by individual differences in media experience and knowledge. At the individual level of analysis, the perceived information richness of a medium should influence that individual's attitude toward that medium. See Figure 2.1.

Attitudes in the context of this research refer to evaluative beliefs with respect to situations, objects, persons or identifiable aspects of our environment (Bem, 1970) or as defined by Rokeach (1980, p. 119) as "a set of beliefs that are focused on a particular object or a particular situation." The present research investigates individuals' evaluations (e.g. attitudes in the context of either of the preceding definitions of the term) toward the utility or usefulness of the medium. Individuals that perceive electronic mail to be a relatively rich medium should evaluate it as more useful. Considering media use across individuals, media perceived as rich by individuals should also be used more often by those individuals.

Consistent with the earlier discussion of media richness, media perceived as rich should be considered to be effective for a wider range of applications. For this reason, individuals that perceive a particular medium to be rich should also consider the medium useful and effective across a greater range (greater electronic mail

Figure 2.1

Perceived Media Characteristics



Source: Adapted from Fulk et al. (1988)

task diversity) of potential uses. The characteristic of media richness should give rise to beliefs that a rich medium can accomplish a wider array of media tasks than a lean medium.

This hypothesized difference in perceived electronic mail task diversity (defined as the range or spectrum of communication tasks for which individuals consider electronic mail to be effective or useful) is implied by arguments presented by Daft and associates: To the extent that the efficient reduction of ambiguity is sought by individuals, rich media are more likely to be viewed as effective under any circumstances and are thus potential options accomplish a wide variety of organizational tasks.

If we consider the selection of a single medium from several media options, media richness theory implies a rational/economic model of media decision-making in which the "costs" (the user's time or other opportunity costs) of using electronic mail are relatively constant whether the individual perceives electronic mail as a rich or lean medium. In contrast, anticipated benefits are partly dependent upon the perceived richness of the medium (if media richness matters) so that rich media are expected to be effective across a diverse spectrum of communication tasks while lean media are envisioned to have a more limited range of applications. Individuals that perceive electronic mail to be rich would therefor select it for a

wider array of communication tasks than those that perceive electronic mail to be a lean medium.

The following hypotheses address the first research question: Does variation in information richness make a difference?

H1a: Perceived information richness is positively associated with the degree of use of electronic mail.

H1b: Perceived information richness is positively associated with the perceived usefulness of electronic mail.

H1c: Perceived information richness is positively associated with greater perceived task diversity of electronic mail.

Individual differences and information richness.

The previous hypotheses link individual variation in perceived information richness to media attitudes and media behavior. In essence, the hypotheses propose that variation at the individual level in media characteristics is important to variance in individual media behaviors. The next step is to identify the sources of systematic variation in information richness. Note the contrast of this approach with that of Daft and colleagues who

considered information richness to be a characteristic largely dependent on the attributes of a communication medium. The stance of Daft and associates implied that within an organization using one electronic mail system, individual variation should be minimal, largely reflecting measurement errors or random deviations from the norms by individuals.

In contrast, Fulk et al. (1987) proposed that perceived media characteristics were a function of objective media characteristics and also of social information and media expertise. The effects of social information will be discussed later. Following Fulk et al., the present section proposes that systematic variation in perceived information richness covaries with individual differences in media experience, skills and knowledge.

Individual differences with respect to the length of time using electronic media, experience with computing, and keyboard skills have the potential to facilitate electronic mail use by virtue of increasing individual mastery of medium techniques. Empirical research (Kerr & Hiltz, 1982; Johansen, 1988; Schmitz, 1988) provides confirmation of positive relationships between electronic mail use and medium expertise that may reflect increased familiarity with electronic mail.

Although Schmitz (1987) found electronic mail use to vary inversely with computing experience, system use was positively related to the other variables that reflected greater media familiarity and skills, e.g., electronic mail experience and keyboard skills. Greater media experience and keyboard skills may have enhanced the perceived richness of electronic mail by increasing media familiarity and by facilitating use of more varied language. This enhancement of perceived electronic mail richness seems particularly likely if poor keyboard skills inhibit both message length and complexity.

Increased electronic mail expertise may also permit the exchange of richer media cues because of the ease of sending more extensive messages. Increased experience may also facilitate greater awareness of electronic conventions to convey feelings and emotion--see Shapiro and Anderson, 1985 for a helpful, :-), and complete compilation of electronic etiquette.

The hypotheses which follow propose sources of systematic variation in individual perceptions of media richness. Hypothesis 2b proposes a positive relationship between computer experience and perceived information richness of electronic mail, even though Schmitz (1988) found a negative relationship between computer experience and use. This hypothesis is derived from the theoretical rationale and included because previous studies, e.g.,

Lippitt, 1980; Panko & Panko, 1981; and Schmitz, 1988, found conflicting relationships between computer experience and electronic mail use. The relationship between computer experience and perceived richness has not yet been tested. In the case investigated by Schmitz (1988), operating characteristics of the specific electronic office system rendered using the electronic mail function more difficult when the user was engaged "in" a computing job.

H2a: Electronic mail experience is positively associated with the perceived richness of electronic mail.

H2b: Computer experience is positively associated with the perceived richness of electronic mail.

H2c: Keyboard skills are positively associated with the perceived richness of electronic mail.

Social Influence and Media Behavior

The first part of the present section links the social context to information richness. Earlier, media richness was asserted to depend on specific qualities of the medium and on the personal characteristics of individuals. Here, richness is linked to socially constructed evaluations by organizational colleagues. Theories of social influence

will be presented and assessed at the individual, group, and organizational levels of analysis. This section goes beyond considerations of information richness and provides a theoretical rationale that indicates how social interaction exerts pervasive influence on communication media perception and selection. It develops propositions connecting social influences to both the individual's media perceptions and media usage.

Observational learning: The individual level of analysis

At the individual level of analysis, the observational learning theory of Bandura provides a basis for examining social influences on human action. Theories of observational (or vicarious or social) learning have been proposed in response to inadequacies in stimulus-response models of behavior (see Woodward, 1982 for a comprehensive historical review of social learning theory). As an example, the fullblown appearance of complex behavior without trial and error episodes seems to require both cognitive processes and modeling opportunities. Bandura (1977, 1978, and 1986) posited that explanations for behavior that are rooted in traits of individuals and explanations of behavior that are rooted in characteristics of situations are, either individually or

in concert, unable to account for the complexity and seemingly spontaneous nature of much human behavior.

Bandura (1977) proposed that the anticipation of reinforcement focuses attention on modeling stimuli. The modelled activities are retained through cognitive processes that include symbolic coding, cognitive organization and cognitive rehearsal (Bandura, 1986). The individual subsequently re-enacts modeled behavior that matches self conceptions; this re-enacted behavior is then reinforced with positive social feedback. Behavior modeling is subject to motivational processes that may involve external incentives, vicarious incentives, and/or self-evaluations that play a role in selecting which behaviors are evoked. Perhaps the most important element of what Bandura (1986, p. 52) terms "subprocesses governing observational learning" is the pervasive and ongoing interaction of social cues and cognitive processes that takes place after the stimulus and shapes subsequent behavioral responses.

Bandura (1978, 1986) proposed a model of reciprocal determinism in which the person's preferences, the environment and the individual's behavior(s) interact reciprocally to determine causation. He used television viewing as an example to illustrate these reciprocal interactions. Personal preferences provide one basis for selection among available programs just as the individual

history of viewing is one basis of viewer preferences. Although the potential television environment is highly similar for all viewers in a location, individual viewing is relatively idiosyncratic. Viewer preferences and viewer behaviors, in aggregate, partly shape the future television environment just as the television environment partly shapes and limits viewer preferences.

According to Bandura, the role of cognitions in determining behavior has historically been slighted. He considered cognitions as critical determinants of human action and based on individuals' conceptions of themselves and the nature of things. These individual conceptions and validations are:

> developed and verified through four different processes: direct experience of the effects produced by their actions, vicarious experience of the effects produced by somebody else's actions, judgements voiced by others, and derivation of further knowledge from what they already know by using rules of inference. (Bandura, 1986, p. 27)

Note the similarity of these processes proposed by Bandura as determinants of human behavior and very similar processes proposed by Salancik and Pfeffer at the organizational level that are outlined in a subsequent section.

Bandura stressed two points. First, that the act of cognition plays a critical role in determining human

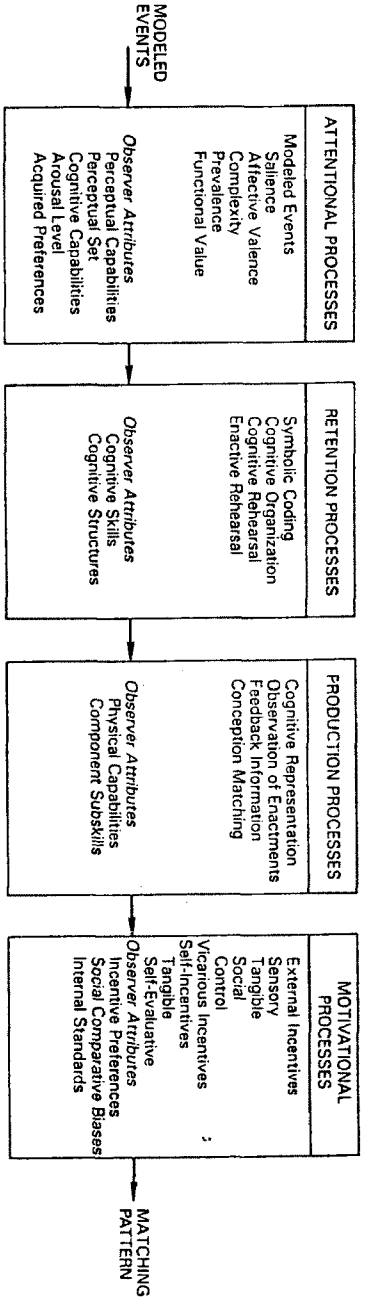
behavior. Second, that cognitions are a result of the prior history of social interaction. These cognitions (according to Bandura) play a central role for individuals with respect to attentional processes, retention processes, behavior production processes, and motivational processes. See Figure 2.2, based on Bandura (1986 p. 52) for a display of these phenomena.

Symbolic interaction: The dyadic and group level of analysis

The preceding section described processes of social interaction by focusing on the individual level of analysis. The present section shifts the level of theoretical interest to the dyad and group level; it presents a brief review of symbolic interaction theory. This section considers social influences but excludes the domain of the organization. The work of the symbolic interactionists both predates that of organizational theorists in emphasizing social processes and provides a historical foundation not widely cited in the more recent organizational literature (e.g. Salancik & Pfeffer, 1978; Blau & Katerberg, 1982; Pfeffer, 1982; and Thomas & Griffin, 1983). It is intended to provide a broader perspective of social interaction upon which to base the review of social influences within organizations that follows in the next section.

Figure 2.2

Subprocesses Governing Observational Learning



Source: Bandura, A. (1986).

Although experimental social psychologists provided empirical evidence that confirmed pervasive influences of group norms on behavior (e.g., Asch, 1952; Deutsch & Girard, 1955; and Sherif & Hovland, 1961), this work was preceded by the theoretical work of the symbolic interactionists. The teachings of George Herbert Mead (1934) were instrumental in emphasizing the potential of social interaction to shape behavior; Mead inspired an influential cadre of scholars who adopted his perspective. Rose (1962) provided a fine review of this school, one representative of the viewpoint of most symbolic interactionists.

Rose emphasized that humans use symbols not just to create and maintain relationships but also to reciprocally shape other persons' perceptions, and thence, actions toward animate and inanimate objects. This socially constructed reality is not idiosyncratic or random. Rather, the perception of external physical events and objects is systematically grounded in references to objective reality. While systematic distortion may occur, individuals' perceptions are held to be largely representative of the external referents. The social construction of meaning is envisioned as an ongoing and somewhat self-correcting process.

Through processes of symbolic interaction, a convergence of shared meaning is engendered, a convergence

somewhat similar to the process of communication convergence proposed by Rogers and Kincaid (1981). This shared meaning may entail a limited agreement on the nature of past events and on appropriate future behavior, understandings which are developed over time by the interacting individuals. Persons may therefore come to share similar interpretations and parallel realities that vary as a function of their group membership and their personal interaction history. It is important to note that the process is a dynamic one, and, according to Rogers and Kincaid, it is a process in which convergence among those who interact implies divergence from others. This patterning of shared meanings based upon interaction patterns suggests a structural semantic differentiation that may be examined by viewing the interaction networks of a social system.

Social information processing: The organizational level of analysis

Salancik and Pfeffer (1978) developed their social information processing theory partly as a consequence of an empirical review of the effects of task characteristics (Salancik & Pfeffer, 1977). In this review, they concluded that objective task characteristics were not very powerful or consistent influences on how individuals perceive the task environment within organizations.

Salancik and Pfeffer proposed that meaning and significance are socially interpreted. While they acknowledged that objective characteristics and constraints within a task environment influence perception and behavior, they asserted that information provided within the social environment is of equal importance.

Salancik and Pfeffer emphasized cognitive processes that are both subjective and retrospective (Bem, 1972). These processes are very much influenced by information provided by others. Individuals also develop retrospective interpretations of their own behavior based on their observation of their present and past actions. These interpretations include attributions of past behavior that may serve as sources of attitudes. Salancik and Pfeffer (1978, p. 230) characterized the process as one which is influenced by the individual's "commitment to the behavior and the information about past behavior that is salient at the time."

Social contexts provide individuals with "norms and expectations that constrain the rationalization and justification of activities." This is a process that serves to "bind people to behavior through a process of commitment" (Salancik and Pfeffer, 1978, p. 232). The individual's social environment both imposes the need for sense-making while it constrains the range of sense-making that is compatible with the social environment. In

addition, the social environment influences the individual's job-related attitudes and behaviors through at least four kinds of communication with co-workers:

(1) Co-workers make overt statements about tasks, statements that individuals may often assimilate.

(2) Co-workers also call attention to and increase the salience of selected aspects of the work environment while discussing them.

(3) Co-workers often provide interpretations of otherwise ambiguous events and in so doing, provide social definitions of these events for others.

(4) Lastly, co-workers influence other individuals' needs by making salient selected deprivations or fulfillments in the work environment. These deprivations or fulfillments may then be perceived as important.

Although Salancik and Pfeffer proposed social information processing within the context of task attributes, it was asserted to be a "general one with respect to any environmental elements" (Pfeffer, 1982). On this basis, we adapted the rationale proposed by Salancik and Pfeffer to the study of new communication technologies within organizations. We developed a model of media perception and usage that incorporates social information from other organizational co-workers as variables which are proposed to influence individuals' media behavior.

The social information processing model asserts that social influences affect individual perceptions of media by establishing criteria for media attributes and by directing attention to salient media characteristics. For example, the use of a certain communication medium by co-workers presents the opportunity for the observational learning considered so important by Bandura. Such use also makes salient one particular solution for this particular type of communication task. Figure 1.1 reviews the model developed by Fulk et al. (1987).

Social information and electronic mail

The present section presents hypotheses relating social information to:

(1) Electronic mail use and total medium usage.

(2) Electronic mail use and perceived electronic mail task diversity.

(3) Attitudes toward electronic mail and medium usefulness.

(4) Perceived electronic mail characteristics and medium richness.

Social information from organizational colleagues about communication media can take several forms. It can stem from the media behavior of others, from others' statements reflecting underlying attitudes toward specific communication media, and from the cognitive assessments

about other co-workers by each (focal) individual. The effect of different kinds of social influences may differ because of differences in the construct domain and because of differences in construct measurement.

To the extent that: (1) the behavior of others is modeled, (2) the statements of co-workers influence the salience of media attributes, and (3) the assessments of co-workers influence the norms of focal individuals, each of the measures should predict the media perceptions and behaviors of focal individuals.

Media use of others

The first series of hypotheses deal with one aspect of social information: the media usage of co-workers. The media behavior of co-workers provides one indication of the value and the utility of electronic media to organizational associates. Co-worker use of electronic mail is therefore predicted to have a positive influence on the media usage patterns of focal individuals. If work associates use electronic mail then focal individuals are more likely to use it. Limited empirical evidence exists. Schmitz (1987) found direct influences of the supervisor's electronic mail use on the usage of subordinates. Shook (1988) reported similar voice mail usage patterns among co-workers.

In addition to similarities in medium usage patterns, individuals with close work associates who are high users of electronic mail should also be more likely to consider electronic mail more useful. The co-workers who model electronic mail use facilitate the acquisition of positive evaluative beliefs (attitudes) by their colleagues. Clearly, individuals may form negative assessments of behavior modeled by co-workers, but processes elaborated by Bandura (1986), Rose (1962), and Salancik and Pfeffer (1978) suggest that the predominant effect should be more positive evaluations.

Co-worker use of electronic mail should also have a positive relationship with the perceived diversity of electronic mail uses that are considered effective by focal individuals. Not only are the associates of high users more likely to have seen electronic mail used for a greater number of purposes, they are more likely to have been exposed to positive evaluations of this medium by their co-workers. However, this relationship may be moderated because high levels of co-worker use can model intensive use for a few communication tasks rather than extensive use for many tasks. Hypothesis 3c presents this proposition.

High co-worker electronic mail usage is also predicted to have a positive relationship with the perceived media richness of electronic mail by the focal individual

(Hypothesis 3d). The over-arching theme of Salancik and Pfeffer (1978) is that the task environment must include the social context. High co-worker media use enhances the salience of electronic mail utility just as it implies that the media has the requisite information richness necessary to reduce ambiguity.

The hypotheses that follow stem from the second research question. Can media behavior (both attitudes and usage) be predicted using the media behavior of co-workers? Are media patterns a result of social information? Hypothesis 3d also incorporates the first research question which asks if variation in perceived information richness is related to differences at the individual level.

H3a: Co-worker electronic mail use (social information) is positively associated with electronic mail use by focal individuals.

H3b: Co-worker electronic mail use (social information) is positively associated with perceived electronic mail usefulness by focal individuals.

H3c: Co-worker electronic mail use (social information) is positively associated with perceived electronic mail task diversity by focal individuals.

H3d: Co-worker electronic mail use (social information) is positively associated with perceived electronic mail information richness by focal individuals.

Media attitudes of others (as reported by these others)

The next hypotheses relate the attitudes of co-workers to the attitudes and perceived media characteristics of focal individuals. Co-worker attitudes toward the overall usefulness of electronic mail are proposed to influence the attitudes of close associates (see Figure 1.1).

The present study examines the direct links between interacting work associates because of the increased potential for close associates to influence each other. Given the presence of direct interaction, Salancik and Pfeffer (1978) suggested that the attitudes of individuals are influenced by their specific social context. The social context guides their assessments of what attitudes are appropriate. Erickson (1988) made a similar argument: that common (but unspecified) processes of social comparison are facilitated by increased frequency of interaction and that interaction favors a convergence of attitudes among those persons in close contact.

The assumption that closely associated individuals will communicate beliefs about the characteristics of communication media and about media usefulness, underlies

the hypotheses that follow. To the extent that media attitudes converge, shared norms should be created. Thus, Hypothesis 4a proposes that the attitudes of co-workers will converge with respect to electronic mail usefulness.

Social interaction that facilitates shared evaluations of media usefulness is also likely to influence the perceived information richness of electronic mail. Media that are evaluated as useful should be seen to embody the media characteristics considered by Daft et al. to be elements of information richness: e.g., facilitation of feedback, multiple cues, personally tailored messages, and natural language. Hypothesis 4b proposes that an individual's social information about the usefulness of a medium also influences the individual's perceived information richness of that medium.

H4a: Co-worker perceptions of electronic mail usefulness (social information) are positively associated with the perceived usefulness of electronic mail by focal individuals.

H4b: Co-worker perceptions of electronic mail usefulness (social information) are positively associated with the perceived richness of electronic mail by focal individuals.

Perceived media characteristics of others

Co-worker perceptions of information richness are proposed to influence work associates in two respects. First, co-workers are expected to develop convergent perceptions of the information richness of media as a consequence of social interaction. Hypothesis 5a is based on arguments posed by Salancik and Pfeffer (1978) and Fulk et al. (1987): that co-workers views are assimilated over time by means of multiple and reinforcing processes which involve guiding cue interpretation, attentional structuring, and both direct and indirect persuasion by co-workers. Hypothesis 5 is grounded in processes of symbolic interaction described by Rose (1962) and is compatible with processes characterized by Rogers and Kincaid (1981) as communication convergence.

Similar phenomena are hypothesized with respect to individuals' assessments of the perceived task diversity of electronic mail. Drawing from Daft et al. (1984), media rated high in information richness are likely to be deemed effective for a more diverse array of communication tasks. The information richness perceptions of co-workers are therefore expected to influence the attitudes of their close associates. Individuals who have close associates that view electronic mail as a richer medium are more likely to view the medium as effective across a broad array of uses.

H5a: Co-worker perceptions of electronic mail richness (social information) are positively associated with the perceived richness of electronic mail by close associates.

H5b: Co-worker perceptions of electronic mail richness (social information) are positively associated with the perceived task diversity of electronic mail by close associates.

Summary

The construct of information richness was used to predict electronic mail attitudes and uses by individuals in organizations. Individuals that perceive electronic mail as more rich will send and receive more electronic messages, regard electronic mail as more useful, and regard it as more effective for a more diverse array of communication tasks.

The characteristics of communication media are viewed as malleable by social influences. Co-workers' media behaviors and attitudes are believed to shape the media behaviors and attitudes of their close associates. Social information, in the form of (1) the electronic media use of others, and (2) the media assessments of others, are proposed as shaping electronic mail perceptions and use by individuals within organizations.

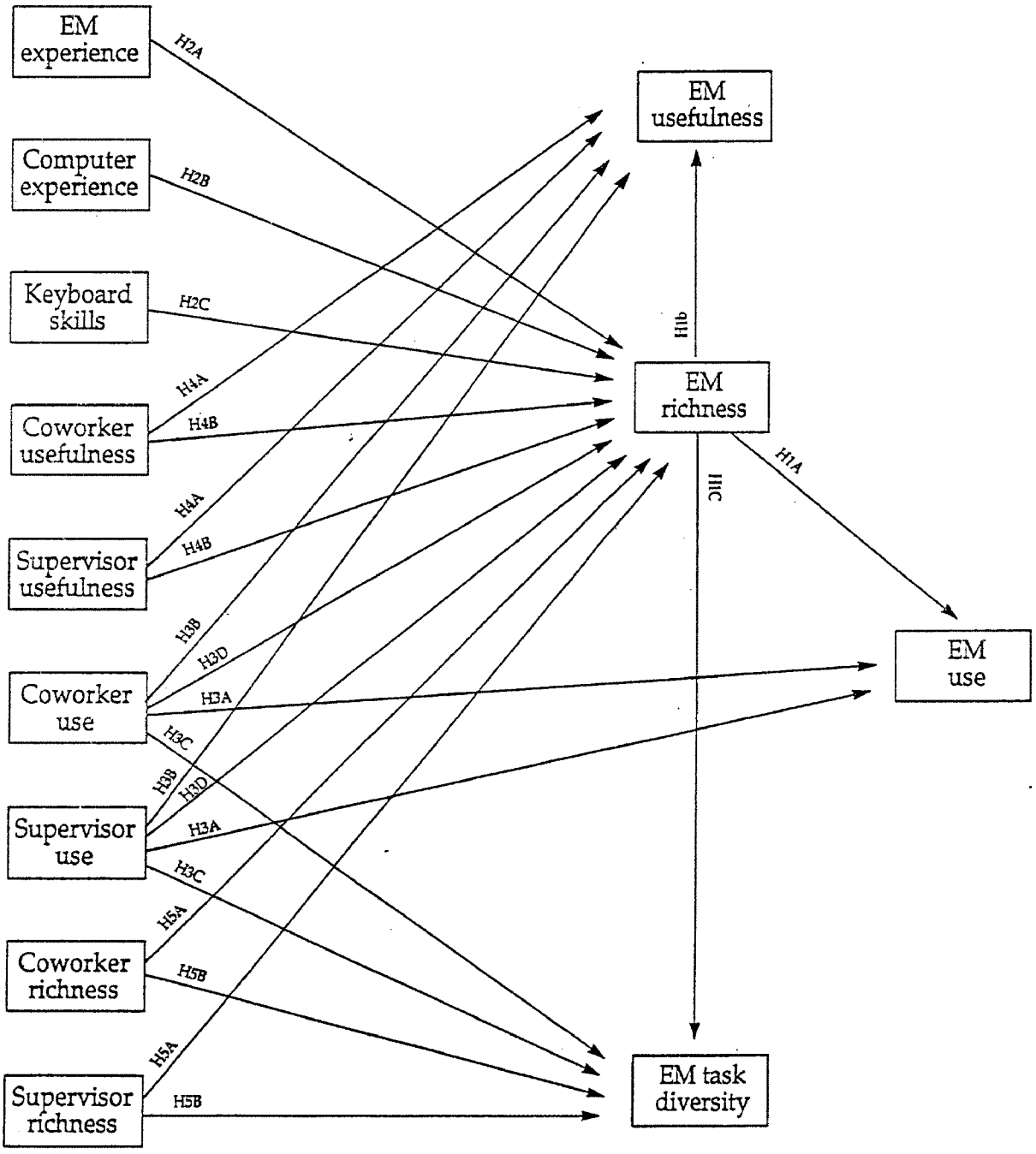
The preceding sections present hypotheses that reflect two general propositions. The first is that perceived information richness is a media characteristic that varies systematically across individuals. An individual's variation in the perceived information richness of media influences the character of media use for that individual. The second proposition is that the social environment of the workplace guides the uses, perceptions, and consequences of communication media just as surely as do the technical characteristics of communication media. Figure 2.3 presents a summary of the hypotheses in model form.

To the extent that these propositions are valid, existing theories of media selection and use have been seriously mis-specified. Such theories must be revised to explicitly address social interaction processes and patterns within organizations if they are to accurately represent media behavior.

The implications for practitioners are equally important. The potential payoffs from introducing a new communication technology are likely to be best realized through adept and accurate consideration of existing social norms and the explicit consideration of innovation strategies selected to enhance visible and public consequences of using new communication media.

Figure 2.3

Theoretical Model of Social Influence and Media Use



Chapter 3

METHODS

Introduction

The present research seeks to understand the effects of social interaction on media selection in the workplace. The research envisions the organization as an entity in which complex social phenomena interweave to form a reality that is both difficult to capture and to make unequivocally clear. Able (1981) characterizes the social order as essentially disorderly and incongruous,:

> created by human beings through myriad processes of interaction to make it possible for them to live together and to maximize the values they cherish. All arrangements between human beings....relations, organizations, structures, institutions, are instigated by us, are enacted, directed, and changed by us.
> (Able, 1981, p. 219)

Because the present study investigates the relationships among co-workers and how social interaction influences organizational sense-making, it must employ methods to gather relational data, data that reflects the interaction patterns within a social group. This study must also garner both media usage and perceptions of media at the individual level. A strategy of triangulation (Campbell and Fiske, 1959; and Jick, 1979) has been

employed to minimize weakness and to capitalize on strengths of differing methodological designs. Both quantitative and qualitative methods (Jick, 1979 p., 603) were used to reduce risks of not identifying important relationships and to permit the organization members to "provide a more complete, holistic, and contextual portrayal of" the ways that individuals perceive, select, and employ communication media.

External Validity

A major threat to the external validity of this, and much other, organizational research (see McKelvey, 1982 for a forceful and well-considered critique centering on this point) is the degree to which "all organizations are different". Those differences that concern us when we compare across organizations are differences that change the relationships among the underlying constructs, constructs that determine the measurement of the variables that we chose to investigate. The issue is straightforward. To what degree do research findings apply to other organizations? What are the boundary conditions?

The methodological strategy of the present study embodies three elements articulated by Pondy and Mitroff (1979): It shares a concern with the social construction of reality by organizational participants, a focus on

underlying models that produce behavior in a single case, and an interest in the processes within a single organization to find out "how things work."

This chapter specifies the methodology for the present study. It begins with a description of the organization and its members. Next, it describes the electronic mail system and how that system is employed by the organization. The chapter then outlines the design of the present study and describes both quantitative and qualitative data collection. The sample, measures and analytical procedures are described; the analysis of social networks with regard to media use is specified in detail. It concludes with a review of the structural equation analytic methods used to assess the theoretical model of media behavior.

The Setting

This study investigated media choice in a technically advanced, petrochemical research center (PRC) that is part of a very large corporation. At the time of the present study, the company was one of the ten largest U.S. industrial corporations. It is a fully integrated firm that produces both domestic and international oil and gas, operates refinery and petrochemical manufacturing plants, and markets gasoline and petroleum products.

The PRC research center is a part of the exploration and production arm of the parent corporation. The PRC's corporate mission is to "provide technology to operations for the exploration, production, and exploitation of petroleum and allied substances in a timely and efficient manner." The center is located in the oil producing region of the southwestern United States on a research facility comprising 60 acres. PRC employs about 650 persons, most of whom work in 5 large, interconnected buildings and 10 smaller buildings on the research campus. About 60 individuals work in 7 locations that are geographically separate from the main research facility. The dispersed locations support legal staff operations, drilling core records, and other training and support operations.

The research center is made up of five divisions. Figure 3.1 provides an abbreviated organizational chart. Figure 3.2 provides a summary of organizational job classifications. At PRC jobs are classified as professional (either scientist or engineer), technical specialist, or as administrative support. Three of the divisions; Production Research, Geophysical Research, and Geological Research, are organized in order to group related research projects and tasks together. These divisions conduct applied research in such diverse areas as advanced (oil and gas) recovery methods, offshore

technology, geophysical instrumentation, geochemistry and exploratory drilling data analysis. The center has played a leading role in the development of advanced secondary and tertiary crude oil recovery processes. For example, one early PRC innovation was the use of superheated steam to increase the level of secondary crude oil recovery.

A fourth division, Computing Research, provides database support, programming support, and conducts advanced research in data base management, graphics, and artificial intelligence. This division, in concert with IBM, developed, tested, and refined the prototype version of the Professional Office System (PROFS). The PRC facility has pioneered advanced computing techniques for modeling geophysical petroleum recovery processes, creating electronic database archives, exchanging electronic information, and other applied research applications.

The remaining division of PRC is the Research Services Division. This division provides administrative services and word-processing support for all other divisions. It maintains technical information systems and offers drafting and graphics support. Research Services is also responsible for PROFS user support and training; it provides the primary interface between all electronic mail (PROFS) users and the Computing Research Division PROFS system operators. In addition, Research Services is

responsible for purchasing, accounting, and physical plant services. The Research Services Division provided extensive direct and indirect support for the present research project.

PRC was selected as a site suitable for tests of the research questions because it meet important criteria related to the conduct of the research and to the investigation of the research hypotheses. We were particularly interesting in examining propositions that suggested organizational colleagues would influence the communication media behavior of co-workers. PRC was known to the Center for Innovation Management Studies (the funding agency) and was proposed as a candidate for the research site. PRC provided universal access for all organizational members to the electronic mail system and had a system that was fully operational for several years. In addition, corporate officials agreed to our request for relational data from all organization members and to permit researcher access to the census of members. The ability to gather relational data from all members about the perceptions and usage of a mature electronic communication system coupled with the level of support for the research demonstrated by the top managers of PRC weighted heavily in our selection of PRC as the research site.

Figure 3.1

Organizational Chart of PRC

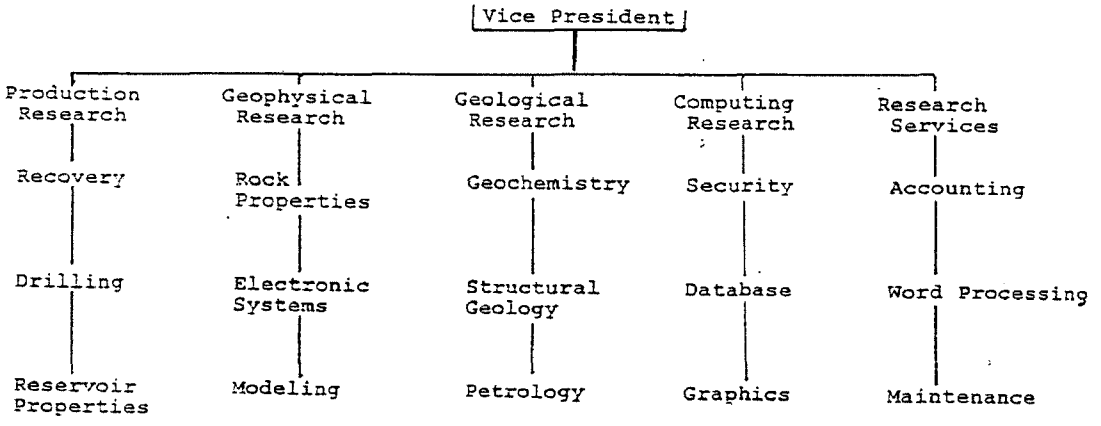


Figure 3.2

Personnel Summary of PRC

	Professional	Technical	Administrative	Total
Vice President	0	0	2	2
Human Resources	0	0	5	5
Production	180	49	10	239
Geophysical	74	33	3	110
Geology	65	34	3	102
Computing	55	21	2	78
Services	8	57	54	119
Totals	382	184	79	655

The CEO played a leading role in sponsoring the initial development of PROFS within the center and has subsequently championed this innovation in the larger corporation. During the year prior to the present research project, corporate headquarters decided to support the corporate-wide adoption of PROFS using PRC as a model. This triggered an explosive growth of external corporate PROFS users (outside of the PRC) from more than 3,000 users to almost 12,000 users during the following year. One effect of the corporate decision to more fully adopt PROFS was that it ratified the earlier decisions of top PRC management to develop the PROFS system and it legitimated system use even during the current austere corporate environment. A second effect of the corporate-wide adoption has been greatly increased PRC electronic access to an extensive network of field research projects and to colleagues at other corporate locations.

The investment in interactive computing at PRC has been substantial and sustained. Currently, PRC has more than 1,200 interactive terminals; direct and indirect computing costs exceed $30 million per year or about one-third of the annual PRC budget. Of that amount, direct computing costs (excluding salaries) approximate $3 million per year. The operating costs of PROFS are estimated to exceed $300,000 each year.

Organizational turnover at PRC has been relatively low in spite of the cyclical nature of the petrochemical industry. The CEO was proud of the low turnover rate at PRC (about 5 percent per year) and attributed it, in part, to gains in efficiency derived from PROFS that permitted PRC to weather a cycle of corporate-wide layoffs during the past few years.

PRC management has viewed PROFS as essential to the research facility for several reasons. The organization considers itself in the business of knowledge generation and information handling. A system that can maintain a shared data base, permit easy creation and transmission of text, and reduce clerical support hours is considered essential. PROFS, developed largely to fit these needs, is deemed successful by PRC management.

The Electronic Mail System

The PRC electronic mail system is part of the larger PROFS Professional Office System that was developed jointly by IBM and PRC. PRC pioneered the development of EOS (Electronic Office System), the prototype of PROFS in conjunction with IBM. The organization had been using PROFS/EOS for nine years prior to the present study.

PROFS is mainframe-based (IBM-VM) and provides (1) menu-driven electronic mail, (2) individual and group calendar scheduling, (3) document sharing and archiving,

(4) an on-line telephone directory that is integrated with an electronic mailbox directory for both PRC and other corporate locations, and (5) a "read only" bulletin board information tailored to PRC users.

PROFS is relatively easy to learn to use. I became reasonably competent using PROFS during a four day site visit that included ten hours of PROFS self-training at the PRC Word Processing Center. This training was my first exposure to PROFS or to any electronic mail system except for the regular use of Bitnet and a very brief exposure to the Hewlett-Packard (HPDESK) system.

The present study focuses on the electronic mail aspects of PROFS. It should be noted that the PROFS system comprises much more than just electronic mail and that other elements of PROFS are also important to communication within PRC. For example, the use of the calendar is ubiquitous within the organization. While the calender may be used to schedule private events known only to the user, the PRC norm is to make meeting schedules public.

This pattern of public information exchange through PROFS is set by the CEO. During one site visit, I noted that his calendar contained a complete and public daily schedule that included both business meetings and business-related social events. It was sufficiently comprehensive that I confirmed the date for a recently

scheduled meeting of corporate sponsors (which included PRC) of the agency funding the present research, a meeting that would occur three months hence.

Both interviews, corporate archival records (Nash et al., 1981; Clark et al., 1982; and Waller, 1985) and an earlier study (Markus, 1981) confirm that the CEO was the driving force behind the development and implementation of PROFS within the organization of study. The CEO's influence on PROFS adoption has been pervasive over the last ten years. This influence includes elements of social modeling processes; it also incorporates coercive demands on subordinates.

A favorite story concerning the PROFS implementation was told to the research team during several interviews of respondents. The CEO scheduled an impromptu 8 A.M. meeting for all division heads. This meeting had been scheduled solely through PROFS on the previous afternoon. Those senior managers that did not check their electronic mail before leaving work that evening were absent from the meeting the next morning. Clearly, the need to regularly check one's electronic mail became evident to individuals who wished to maintain their aura of general competence.

One strategy for successful system implementation involves insuring universal access and the formation of a critical mass of users (Markus, 1987). Through the use of his stratagem, the PRC CEO insured that PROFS would be

used by a large subset of very important PRC managers. All individuals (except for a few semi-skilled workers) were provided with terminals, PROFS accounts, access to system training, and they were urged to use PROFS. In order to fully understand the use of PROFS at PRC, the CEO's intensive and personal support of the system must be taken into account.

PROFS provides electronic communication in the form of permanent electronic notes. These notes may be addressed to specific individuals, sent to many individuals by use of distribution lists, or forwarded to "secondary" recipients. PROFS also provides messages that may be sent to a terminal if the other person is currently logged on. Messages are transitory; they are not saved nor may they be forwarded (IBM, 1986). PROFS, particularly as used at PRC, supports an extensive document capability that permits the creation and exchange of documents in both draft and final form. Documents are located by use of a sophisticated and expensive (with respect to core storage requirements) electronic archiving system at PRC. This effort to interact electronically and maintain an on-line electronic database reflects the CEO's vision of the PRC corporate research mission and the consequent PRC knowledge generation, storage, and transmission requirements.

The present study investigates the use of both electronic note and message communication at PRC. These features were accessible and applicable to all employees in contrast to document functions that were more specialized in nature. The usage level of the document function was much lower and, most important, restricted to a relatively smaller subset of PRC employees. At PRC documents were used to preserve and represent "final form" products that were created by the Word Processing Center and archived as part of the on-line PRC database.

Research Design

The present section describes the methods employed to gather the data. First, an overview of the design will be provided; then the data-collection will be more fully described. Both quantitative and qualitative methods were used to collect information about the PRC. Three main data-collection strategies were used.

The primary source of data was a questionnaire that was sent to the population of PRC organization members that had access to electronic communication. Three percent of the organization's employees (22 individuals) were not provided with PROFS accounts. Most of these persons were unskilled or semi-skilled workers. They are excluded from the present research.

A second important source of data came from a series of three interviews. The first interviews assessed: (1) the characteristics of the organization, (2) the communication task environment, (3) the uses of PROFS, (4) the respondents' perceptions of the PROFS system and of the effects of PROFS use, and (5) the influences of co-workers on PROFS use. These interviews were also used to modify the survey instrument which was pre-tested at PRC after the first interviews. A second series of interviews was conducted during survey administration. These interviews focused on the PROFS staff and particularly upon persons from the Word Processing Center. A third series of interviews was conducted to help interpret survey findings and collect additional information. These interviews will be described more completely in a later section.

Lastly, PRC provided extensive archival information about the organizational structure, the corporate mission and PRC policies. The research team also obtained corporate documents detailing the historical development and employment of PROFS. The organization also collected and provided computer-monitored records of PROFS system use for a one-week period after questionnaire administration.

The organizational entry process was greatly facilitated by the sponsor of the research (CIMS); it also

involved a lengthy series of interactions between the research team, the organization's top management, and the PROFS staff. The CEO was personally involved in this process at each step and it is likely that his interest in obtaining an outside evaluation of PROFS use at PRC lead to the high level of PRC support for the present research. Table 3.1 illustrates the data-collection schedule.

Quantitative Methods

A self-administered questionnaire was mailed to all 636 PRC members with PROFS accounts. The survey instrument had first been pre-tested extensively by researchers (not at PRC) who were familiar with electronic communication technologies. The second group of pre-tests were done by selected members of the Administrative Services Section at PRC. The second pre-tests indicated the need for minor changes in wording of some survey items. The final questionnaire was substantially unchanged from the version given to the Administrative Services Section.

The questionnaires were preceded by a memo from the CEO requesting participation in the survey and assuring confidentiality to respondents. Questionnaires were individually addressed and sent through the corporate mail system. Three individuals did not receive the questionnaire because they had just left the PRC. Survey

Table 3.1

Time-Line for the Present Research

1. First interviews (N=20)	July, 1987
2. Survey pre-test	November, 1987
3. Survey & archival data collection	March, 1988
4. Second interviews (N=7)	March, 1988
5. Survey administration	March, 1988
6. Follow-up for non-respondents	April, 1988
7. Final interviews (N=27)	June, 1988
8. Computer-monitored usage data (for a one-week period of all PRC users)	July, 1988

recipients were asked to mail the completed questionnaire, using a stamped pre-addressed envelope, directly to the research team at the University of Southern California. Confidentiality for individual responses was guaranteed and maintained.

Follow-up questionnaires were sent directly to the 128 individuals that did not respond to the first questionnaire. The overall response rate (including follow-up responses) was 92 percent. Of the 581 individuals that returned their questionnaires, 14 respondents stated that they did not use PROFS and answered no further survey questions. These persons were not included in the sample for subsequent analysis.

An additional 56 questionnaires were not considered usable for the present study because they lacked information about electronic mail usage, perceived richness, or perceived usefulness. The number of usable questionnaires was 511 or 83 percent of the number sent to PROFS users. Testing social influence hypotheses required relational network data. Questionnaires missing frequent communication partner information could not be used for these tests of social information. 438 respondents (71 percent) provided the names of co-workers needed for relational data. Table 3.2 presents the itemized survey response information in tabular form. The questionnaire

Table 3.2

PRC Survey Responses

	Number	Percent
Number sent (first wave)	633	100%
Number returned (first wave)	505	80%
Number sent (second wave)	128	100%
Number returned (second wave)	76	59%
Total returned (both waves)	581	92%
PROFS non-users	- 14	2%
Unusable questionnaires	- 56	9%
Total usable	511	83%

cover letter is included as Appendix A. The questionnaire constitutes Appendix B.

Computer-monitored data

The computer-based nature of PROFS provided the opportunity to obtain added measures of electronic mail usage. The organization was, initially, reluctant to provide any computer records of system activity, just as the researchers were reluctant to infringe on individual privacy. After extensive discussion, PRC collected data for PROFS notes during a seven-day period from July 11, 1988 through July 17, 1988. These data included the type of note, the size of the message, the identity of the recipient, and the time at which the note was sent. The data did not include the content of any notes.

The computer-monitored data provided a measure of both aggregate and individual system usage. It revealed the proportion of intra-organizational and extra-organizational electronic communication. The computer-collected measure also provided an index of the volume and type of individual messages and the total number of broadcast messages within the system. It also provided an independent measure of electronic mail system use at PRC that is unrelated to the survey data, but one that can be linked to survey responses at the individual level. This information was used to assist interpretation

of quantitative findings from the survey measures of subjective system usage.

The computer-monitored and self-reported (survey) measures of system usage are indications of closely related but different phenomena (Rice and Borgman, 1983). They differ, in part, based on the subjective versus the objective nature of data measurement. The "counting" techniques are also very different. The subjective data may reflect how much importance an individual attaches to his or her specific historical occurrences of electronic communication whereas the computer-monitored data may reflect trivial or habituated communication.

The objective measures permit a partial but tentative assessment of respondent accuracy (see Bernard et al., 1982 and Richards, 1985 for opposing viewpoints on this issue). The computer records also provide a unique indication of electronic mail volume. Given the research questions emphasis on the subjective effects of social influences, the subjective measures were considered as the primary measure of electronic mail.

Since the collection period lasted only one week, substantial differences between self-reported electronic mail use and the computer-monitored measures were expected. This was because two different time periods were involved and because any short period is likely to

exhibit variations in media usage not representative of longer term patterns.

For example, Schmitz (1988) reported correlations for self-reported electronic mail usage and two-week samples of computer-monitored usage to be .4, considerably lower than the correlation of .7 that he reported for a year-long sample of computer-gathered electronic mail usage data in that same study. That 1988 study compared self-reported use and computer-monitored electronic mail usage for both the two-week and the year-long computer-gathered data with the self-reported data. The time-lag between collection dates for the self-reported and computer-gathered data in the Schmitz study was three months, similar to the present research.

Qualitative Measures

Qualitative research methods provided important information for the present study. The prescription, "You observe a lot watching." (Yogi Berra, cited in Van Maanen, 1988) reflects beliefs of the researchers and their commitment to an extensive series of site visits in the presents research project. A relatively small number of participants can provide a measure of depth and breadth of understanding that can not be designed into a survey instrument. For this reason, the researchers interviewed

PRC employees prior to, during, and after questionnaire administration.

Personal Interviews

The first series of interviews was conducted to familiarize the research team with the organization, PROFS, and with how the organization members used PROFS in their work. The researchers met with the CEO, the heads of computer operations and administrative services, and a purposeful sample of users that was selected to span the range of PRC electronic mail users. The researchers interviewed 20 individuals, each for about 30 minutes.

The respondents ranged from Word Processing Staff secretaries to several Research Division Directors. The interview objectives included learning about: (1) PRC operations, (2) the individual's job environment and how this influenced his or her communication requirements, (3) the individual's overall communication patterns, (4) how the individual assessed the features of the PROFS system, (5) the nature of the person's communication partners and (6) if individuals influenced the media use of others or, conversely, if they were influenced or aided by others in the use of PROFS.

The second series of interviews was conducted by the author in conjunction with the administration of the survey questionnaire. Most interviews were with

individuals in the Word Processing Center and with the PROFS staff. The interview topics with the PROFS staff focused on PROFS training practices within PRC, PROFS trainer's perceptions of user needs (particularly unmet needs), and any recent changes in system capabilities and usage patterns.

I spent substantial time in the Word Processing Center (WPC) becoming familiar with PROFS and conducting both formal and informal interviews with the secretaries and administrative assistants at the WPC. The basic function of the WPC is to transcribe dictation, longhand, or draft PROFS notes into PROFS working documents or final PROFS documents that may then be "permanently" archived on-line. In essence, it is an electronic typing pool.

During the first site visit, the research team noted that the production of lines of type was a computer-monitored measured criterion of productivity. Monitoring individual performance in this manner is consistent with de-skilling hypotheses advanced by Braverman (1974) and Zuboff (1988) that indicate relatively high levels of control or coercion exerted by elites upon those less powerful. I was particularly interested in determining how the individuals at the WPC, with relatively low status in the organization, perceived PROFS.

Although relatively powerless, the WPC constituted an important group in the organization's communication network. WPC members were largely responsible for the physical creation and archiving of the entire PROFS database. Should the level and character of this group's PROFS use be determined by coercion and controlled and monitored by computer, the theories posing a more subtile social influence and vicarious learning that guide the present research would be largely inappropriate for the members at the WPC and perhaps for other work groups.

My contact with the WPC was intensive for the five day period of this visit. The WPC staff expressed unqualified support for PROFS. This positive regard for PROFS seemed sincere. By the time the visit ended, individuals had expressed criticism of several PRC professionals and occasionally, of corporate policy. I detected no computer-monitored, imposed pacing of work flow. Individuals in the WPC unequivocally said that PROFS gave them more control over their work, in addition to developing skills that served to increase their value in the labor market. Ironically, most said they would not change organizations if the change entailed working in an office without PROFS.

This second visit to the research site also provided me with the opportunity to become personally familiar with the PROFS system. In addition to electronic mail,

calendar scheduling, document searching, document retrieval and transmission capabilities, PROFS presented an impressive array of corporate information in the form of an electronic database that was very easy to access. This information included extensive PRC policy information, not the least of which was specific guidance that PROFS (and all other PRC computing facilities) were to be used only for corporate purposes.

The policy of very strict "corporate business only" usage was confirmed and illuminated in later interviews that revealed that while infractions for personal (particularly financial enhancement) uses were uncommon, they had occurred and were considered very serious. One likely consequence of this explicit and uncompromising policy was to limit the amount of social electronic communication that had been noted by Steinfield (1983, 1986) in another system. This organizational policy of strictly task related electronic communication makes the PRC site a rather stringent test of theories of social influence in the work-place to the extent that electronic interaction about social topics otherwise might have facilitated similar media usage patterns by close acquaintances at PRC.

The third series of 27 interviews incorporated the critical incident technique (Flanagan, 1954) and were designed to elicit examples of important events that might

aid the interpretation of data garnered through the survey instrument. Respondents were selected by the researchers using criteria that included: (1) "interesting" survey responses (particularly with respect to the open-ended comments), (2) very high or low use of PROFS, (3) new PROFS users, and (4) individuals having many PROFS contacts outside PRC. These interviews were conducted using a semi-structured interview protocol. See Attachment C for the interview guide.

The interviewers asked respondents to recall specific times when electronic mail was particularly useful or effective and then to describe that situation and the consequent communication outcomes. Times when electronic mail was not useful or effective were then discussed. The interviews also probed for information about media gatekeeping and for information with respect to social influences. Respondents were asked how they came to try new PROFS features for the first time. They were also asked to describe departmental norms with respect to PROFS or other communication media options. The interviewers also probed respondents about their supervisor's influences their personal media use.

The interviews were also intended to elicit stories about PROFS. For example, the story of the CEO calling the early morning meeting was frequently mentioned. A second, commonly-cited story told of an individual that

violated system norms by referring to certain co-workers as "peckerheads," presumably in jest. This terminology caused sufficient ire among some employees that quasi-formal censure occurred. At PRC, organizational norms called for a "straight" vernacular and flaming was not fashionable.

Sample

PRC classified its 655 employees as Professionals (382), Technicians (194), or Administrative Specialists (79). Professionals were either scientists or engineers; some professionals held first-line supervisory responsibility over other individuals. Technicians were a diverse group of technical specialists that included such persons as laboratory assistants, machinists, and gardeners. Administrative staff included a variety of clerical, secretarial, administrative, and PROFS support personnel. Archival records indicated that 94 individuals had been designated by PRC as supervisors.

The sample consisted of the 511 respondents (83 percent of the PROFS users on site) that returned usable questionnaires to the researchers. The typical respondent was male, 41 years old, and had been employed by PRC for 10 years. Respondents were highly educated; more respondents held doctorates than any other degree. Table 3.3 provides demographic information for the sample.

Table 3.3

PRC Respondents' Demographics (N = 511)

Variable	Value	Percentage
Age	40.8 years	
Gender	Male	81%
	Female	19%
Education	High school	7%
(highest level attained)	Some college	20%
	College	25%
	Masters	18%
	Doctorate	31%
Tenure	10.3 years	

Measurement

All variables specified in the hypotheses were measured in the survey. The questionnaire obtained self-reported electronic mail usage, media richness assessments for all organizational media, the electronic media experience of respondents, their subjective reports of electronic mail effectiveness for a comprehensive listing of diverse communication tasks, and the respondent's overall assessments of electronic mail usefulness.

In addition to demographic data and PROFS user characteristics, the survey asked each respondent to name his or her current supervisor and five most frequent communication partners with respect to all media. The communication partners were used to identify the relational linkages needed to operationalize the four measures of social information. The paragraphs that follow describe in more detail the specific operational definitions of each variable.

Electronic mail usage

The measure of individual usage for the note component of PROFS included the number of original notes authored by each individual, the number of notes forwarded, and the number of notes received. For the message component, the measure included only the number of original messages sent

and those received since PROFS does not permit messages to be forwarded. Duplicate notes and duplicate messages are not included in the present analysis.

Although the questionnaire obtained the number of documents sent and received by each individual, documents are not included in this analysis. First, the creation and sending of documents depended very much on a specific individual's job. For example, secretaries in the Word Processing Center and the section administrative assistants were largely occupied with creating, modifying and sending documents. Second, many documents are an end product of the organization and while their exchange may be considered communication, it is communication somewhat like the manipulation of files in government archives (with the proviso that the documents at PRC are far more likely to be read at a later time than those in most government files).

The average daily total use for each of the PRC respondents consisted of the aggregate number of original notes and messages that were sent and received and also the number of notes that were forwarded. The variable of "total use" was constructed using these five discrete, measured variables that were summed to create an index of the daily electronic transactions for each individual. Table 3.4 presents descriptive statistics for electronic mail use.

Table 3.4

Electronic Mail Usage at PRC

Variable	Mean	Median	Std. Dev.
Notes sent	3.4	2	3.8
Notes received	6.4	5	5.4
Notes forwarded	1.6	1	2.2
Messages sent	1.7	0	3.5
Messages received	2.9	1	3.8
Total usage	16.0	11	14.6

(Five item standardized coefficient alpha=.84)

The measure of total usage, constructed by adding the five individual measures of electronic communication, indicated an extremely high daily usage for the PRC system. Respondents reported an average of 16 electronic transactions per day, a usage considerably higher than reported in other studies (see Rice, 1983; Steinfield, 1983; and Schmitz, 1988 for representative comparisons). These five discrete usage variables, summed to form the total use measure, have a standardized coefficient alpha of .84.

Computer-monitored usage

System usage is presented first for the entire population of PRC users and then for the sample of individuals in the present study. The data-set consisted of 13,146 notes sent by 740 userids (both individual and group) that were received by 1,379 userids. Users were located both within and external to PRC in such locations as London (England), Calgary (Canada), Denver, New Orleans, Houston, and Naperville (Illinois). About 94 percent of the notes were internal to PRC.

More than 65 percent of the notes were "original." Over 15 percent of the notes were replies to other notes and about 12 percent consisted of forwarded notes. Here the use of the term "original" is somewhat deceptive since users can create an "original" note for each individual on

a group addressee list. Thus a single original note can be sent to many persons using the group addressee function. Replies and forwarded notes within the PRC system connote a communication intended directly for another specific individual.

A better indication of the level of "one-on-one" interaction is obtained through examination of the sequencing codes in the computer-monitored data set. These codes specify if the note is the first, second, or, nth copy of a specific electronic communication. About 61 percent (or 7,934 notes) carried the "01" code and were thus the first and only version of a message. Slightly less than 10 percent of the individual notes were "second editions." About 30 percent of the notes carried sequencing codes of "03" or higher.

The individual-level data that follow are reported for the sample of 511 PRC users. Of these 511 individuals, 393 sent one or more notes during the week under their specific individual, personal userid (personal user identification number). For these persons the average number of notes sent during the week was 19.7; the standard deviation was 34.8. It is important to observe that about 30 percent of the system notes were sent and received within PRC by specialized and group userids other than the 511 userids designated specifically for the individuals in the sample. Computer-monitored use thus

somewhat under-represents actual system sending for these individuals when we look only at the communication behavior attributed to the individual's personal userid. This is the case because much of the electronic communication that takes place using the group userid is excluded from consideration when we examine notes sent with the individual's personal userid.

The descriptive statistics are quite similar for the note-receiving behaviors of the sample. The average number of notes received was 16.6; the standard deviation was 17.0. The high ratio of notes sent, almost 20, to notes received, almost 17, reflects two factors. First, for the computer-monitored data, copies are included in the "notes sent" measure and the common pattern of communications received exceeding communications sent does not hold. Second, it appears that the sample 511 userids send more electronic communications to other PRC system userids than they receive from userids outside this sample. As with the measure of notes sent, the computer gathered number of notes received does not include notes received by these individuals at collective userids and therefore under-represents both sample individuals and total PRC system receiving behavior. Table 3.6 displays these data in tabular form.

Media richness

The perceived information richness (defined by Daft and colleagues as the capability to facilitate shared meaning) of all organizational media was measured by the survey. The questionnaire used the four criteria specified by Daft and Lengel (1984 & 1986) and Daft et al. (1987) namely: (1) timely feedback, (2) a variety of cues, (3) personally tailored messages, and (4) rich and varied language. These elements of richness were expressly specified for respondents. Respondents were then asked to rate each medium on a five-point scale that ranged from "1 = Not at all rich" to "5 = Extremely rich".

Note the means and standard deviations of information richness for PRC organizational media (Table 3.5). The respondents' perceptions of richness for each medium on the richness continuum generally follow the predictions of Daft and associates. Face-to-face and computer output define the continuum high and low end-points, respectively. While there are large differences between these end-points, all other media are clustered in the middle.

For those media of moderate richness--documents, electronic mail, memos, and telephone, respondents report relatively small differences in perceived richness. Standard deviations for the information richness of these media are large (almost 1.0) in comparison to relatively

Table 3.5

Perceived Information Richness of PRC Media (N=511)

	Mean	Std. Dev.
Formal numeric text (computer output)	2.5	1.3
Formal written text (documents)	3.3	1.1
Electronic mail	3.5	0.9
Personal written text (letters, memos)	3.6	0.9
Telephone	3.8	0.8
Face-to-face	4.4	0.9

small differences across the means (about 0.5 spans all four) of these media. The overlap of these information richness distributions suggests that individual variation in media richness across alternative media options has potential to influence media selection.

Perceived task diversity of electronic mail

Hypotheses 1c, 3c, and 5b proposed that the perceived task diversity of electronic mail (the extent an individual considers electronic mail to be effective across a broad range of communication tasks) is related to the perceived media richness and the social influences of close co-workers. Hypothesis 1c proposed that richness positively influenced perceived electronic mail task diversity as did the richness perceived by co-workers (Hypothesis 5b). The medium usage of co-workers was also proposed to positively influence perceived task diversity (Hypothesis 3c).

Respondents were asked to rate a series of 27 electronic mail applications on a five-point scale ranging from "1 = Not at all effective" to "5 = Extremely effective". The potential uses of electronic mail were selected largely from items used by Steinfield (1983) and Daft et al. (1986). The items also included several electronic mail uses mentioned by respondents during the

first series of interviews at PRC as well as several others added by the researchers on an ad hoc basis.

These "use" items were grouped into four categories: (1) exchanging information, (2) highly-involving communication, (3) personalized interactions, and (4) diverse communication contacts. Two items on the questionnaire were deleted from subsequent analysis. These two items asked for assessments of PROFS for communicating positive and negative performance feedback. The actual use of PROFS for such communication was limited to the 94 supervisors in the organization. Further, the responses of these supervisors (identified through PRC archival data) differed significantly from the responses of non-supervisors for "communicating negative feedback." Supervisors rated PROFS much lower for this use (2.1 vs. 2.7; $p.<.01$) than did non-supervisors.

The remaining 25 items comprised the perceived task diversity scale. An individual's score on this variable was based on the sum of his or her effectiveness ratings for all 25 items. Approximately 20 individuals had missing values on one or more of the usage items. In order to avoid propagating missing values, missing values were replaced by the mean score of all respondents for that particular item. High overall scores on the scale indicate that the respondent considered electronic mail to be effective for a diverse array of uses rather than

effective for a narrow range of communication tasks. Respondents averaged 79.3 (s.d.=14.2) on the scale indicating moderate effectiveness (3.2 average) reported for all communication tasks. See Table 3.6 for descriptive statistics for this and all subsequent variables.

Electronic mail usefulness

One purpose of the present study was to identify the relationships between individual attitudes toward a medium, media use and social information influences upon such attitudes. One attitude of particular interest was the usefulness of electronic mail. This attitude was measured by an item asking respondents to rate perceived electronic mail usefulness on a five-point scale that ranged from "1 = Not useful" to "5 = Extremely useful. The values on this item were extremely high (mean = 4.3; standard deviation = 0.8) and reflected the favorable views that most respondents had toward PROFS.

Media experience and keyboard skills

Hypotheses 2a through 2c stated that individual differences in media experience and knowledge are positively associated with individuals' perceptions of media richness. Respondents reported their PROFS electronic mail experience at PRC in years of experience.

Table 3.6

Descriptive Statistics (N=511)

Variable	Mean	Std. Dev.
Total usage (transactions/day) (self reported)	16.0	14.6
Notes sent	3.4	3.8
Notes received	6.4	5.4
Notes forwarded	1.6	2.2
Messages sent	1.7	3.5
Messages received	2.9	3.8
Computer-monitored usage (transactions/week)		
Computer-monitored notes	19.7	34.8
Computer-monitored notes	16.6	17.0
Information richness		
Formal numeric text (computer output)	2.5	1.3
Formal written text (documents)	3.3	1.1
Electronic mail	3.5	0.9
Personal written text (letters)	3.6	0.9
Telephone	3.8	0.8
Face-to-face	4.4	0.9
Electronic mail usefulness	4.3	0.8
Electronic mail experience	5.9	2.7
Computer experience	3.0	1.3
Keyboard skills	3.6	0.9
Perceived task diversity	79.3	14.2

Respondents used PROFS for an average of almost six years. This long experience with PROFS reflects both the low organizational turnover and the early, rapid, and nearly complete diffusion of PROFS within the organization.

Computer experience prior to working at PRC was obtained by the use of a five-point scale ranging from "1 = None" to "5 = An enormous amount." The computer experience of respondents was quite evenly distributed across all categories of experience levels. The average value was 3.0, or "a moderate amount"; the standard deviation was 1.3.

Respondents were also asked to characterize their keyboard skills by indicating their proficiency on a five-point scale ranging from "1 = Very poor" to "5 = Very good." Most respondents considered these skills to be adequate or better. The average was 3.6; the standard deviation was 0.9.

Measurement of Social Influence

Social influence is modeled by the use of a network strategy in which the relational patterns among individuals are explicitly considered. Rogers and Kincaid (1981), Burt and Minor (1983), and Wellman (1988) provided compelling rationale and convincing evidence that the consideration of relational ties is essential to understand how individuals affect one another. Rogers and

Kincaid liken the use of aggregated individual data to investigate social processes to using a "sociological meatgrinder" which tears the respondent from his or her social context.

Erickson (1988) noted that explanations of attitudes have traditionally been rooted in attributes and have typically explained only a small portion of the variance. She suggested that one reason for this lack of power lies not in the choice of predictor variables but because the "natural units of analysis for attitudes are not isolated individuals but social networks."

The present study collected relational data to construct the ego-centered communication network needed to test hypotheses of social influence. Since it was not practical to obtain the communication frequency or intensity for all possible communication partners in this very large organization, individuals were requested to identify their direct supervisor and their five most frequent communication partners using all media, e.g., the five preferred communication alters for each ego.

The decision to select five alters was a compromise intended to identify those closest associates who were most likely to influence each ego in the relational network at PRC. Bernard et al. (1982) presented a pessimistic assessment of respondent accuracy and of the "optimum" number of communication alters that can be

accurately identified: with about six being the least damaging. Burt (1984) provided a more optimistic assessment: That between three or more and eight or less alters are likely to provide reliable relational information. Five co-workers and the supervisor seemed a pragmatic choice given the level of uncertainty in this domain.

The network approach was considered necessary for this study of socially mediated influence because the fundamental characteristic of the hypothesized process is that of its relational nature. While the level of validity for self-reported relational data has been disputed (see Barnard et al., 1982; Burt, 1983; and Richards, 1985 for alternative positions in an ongoing debate), the communication links that were obtained in the present study consisted of those linkages that were the most salient and intense to respondents at the time of the survey.

Each measure of social information was constructed in a similar manner. The social information value was based on the communication alters' reports of their own behaviors and/or perceptions. The analysis section that follows this section provides a more explicit description of the network methods used to model social influences. The present section describes the specific measuring instruments for each variable.

Social information as reported by alters

All measures of social information (based on the relational links reported by each respondent and that identifies the unique set of alters for that individual) obtained the value for each ego by averaging those values provided directly to the researchers by each ego's communication alters. The three measures of social information (total use, electronic mail usefulness, and electronic mail information richness) were obtained by summing the scores of each ego's alters for that variable and then dividing the sum of the alters' scores by the number of communication alters. This procedure provided the average social information value for each separate (ego) for each of the three social information variables.

The first variable, the **total EM use of communication alters**, is the exogenous variable in hypotheses 3a, 3b, 3c, and 3d. The total use for each close co-worker had been computed previously for each individual. The average total use by communication alters was hypothesized to be positively associated with the respective focal individual's (ego's) electronic mail total use, electronic mail task diversity, electronic mail information richness, and electronic mail usefulness.

The second measure of social information is the attitude of co-workers toward the usefulness of electronic

mail. The usefulness of electronic mail for alters had been measured in the questionnaire for each respondent. The **alters' evaluation of electronic mail usefulness** (summed over the communication alters for each ego and divided by the number of alters) was used to predict the electronic mail usefulness and electronic mail information richness perceived by ego.

Similarly, the perceived information richness of electronic mail was obtained for each communication alter; the value for the social information of each ego was computed in the same manner as above. The **information richness of alters** was expected to be positively associated with both information richness perceived by ego and also the electronic mail task diversity of ego.

Network analytic techniques

The social information values for each respondent were based on the values for the variable provided by that particular respondent's alters. This network technique (Marsden 1988; Rice et al. 1990) entails creating a scalar value for each individual (ego) that sums the scores of those specific alters named by each ego. The sum of the alters (divided by the number of alters) represents the average value of social information available to that particular ego. For example, if Peter's closest communication partners are Eric and Jane and if Eric rates

electronic mail richness as 4 while Jane rates it at 3, Peter's co-worker electronic mail richness value is 3.5.

A scalar (social information) value may be constructed for any variable that was reported by those respondents nominated as communication alters. For example, the social information variable representing electronic mail richness for individual i consisted of the sum of the information richness values for alters j divided by the sum of the j (alters) used to compute that score, given that j represents those alters nominated by ego, i.

Or in equation form:

$$SIP\ i = \frac{\Sigma [\ (cij)\ (vj)\ ]}{\Sigma j}$$

When:

(1) cij represents the communication frequency between i and each alter j and is set equal to 1 if i nominates j as a communication partner,

(2) and vj represents the value of j for the variable of interest.

It should be noted that Rice et al., (1990) and Marsden, (1988) used a scalar value to represent c that is equal to the communication frequency between i and j; these studies of smaller groups obtained values for all communication partners, including those with low levels of

interaction. In the present research the frequency values were for each of the five most frequent communication partners and were all set equal to 1.

Social information values were computed as described above for each respondent's co-workers. The communication alters and the supervisor's values for each of the three social influence variables was appended to the data-set for each individual in the present sample. In this manner, the unique values for each respondent's co-workers and supervisor were available for calculations of the social influence variables. These values were the ones reported by the specific individuals in the ego network. Table 3.7 present descriptive statistics for the social information variables.

Analysis

Data-analysis for the present study was accomplished in several stages. Descriptive statistics, t-tests, analysis of variance (ANOVA), and regression analysis was used for preliminary tests of separate individual hypotheses. All preliminary analyses were done with Statistical Analysis System (SAS) PC, Version 6.03. Analyses that tested propositions of social influence required variables constructed to conform with the network analytic techniques reported in the previous section.

Table 3.7

Descriptive Statistics for Social Information Variables

N = 457

	Mean	Std. Dev.
Co-worker usage value	20.1	11.7
Co-worker usefulness value	4.4	0.5
Co-worker richness value	3.6	0.6
Supervisor usage value	26.5	13.7
Supervisor usefulness value	4.6	0.5
Supervisor richness value	3.5	0.8

SAS, Version 5 was used to calculate these social influence measures for each individual's communication alters.

The basic decision rule used for all statistical tests of the hypotheses required a significance level of $p < .05$.

Structural equation analysis

The full theoretical model was tested using the Linear Structural Relations Analysis Program, PCLISREL 7 (Joreskog and Sorbom, 1988). PCLISREL is a statistical program that is designed to test models with latent variables, measurement errors, and reciprocal causation. LISREL (or an alternative causal modeling program) requires a specific set of a priori theoretical propositions (James et al., 1982; Saris & Stronkhorst, 1984). One advantage of LISREL is that it provides efficient (and simultaneous) estimates of the causal structure underlying a system of direct and indirect relationships (Saris & Stronkhorst, 1984).

The logic and plausibility of a causal model are integral components in the evaluation of any theoretical model. Saris and Stronkhorst (1984) note that for a fully recursive model with seven variables in which any ordering of the variables is permissible, 5,040 fully recursive models would fit the same data. Clearly, LISREL models must be "theory driven" and such models (particularly when

tested with data from a single sample and only one point in time) must be assessed with caution.

Analysis of the theoretical model

The hypotheses were first integrated to form the theoretical model of social influence and then were tested simultaneously. The next step involved model modification and evaluation. A final model, one that fit the data and was deemed logically coherent and theoretically sound, was then proposed and evaluated.

The adequacy of the model and subsequent revisions were evaluated using the chi-square/degrees of freedom ratio (Wheaton, Muthen, Alwin & Summers, 1977), goodness-of-fit tests, and an examination of the model's residuals. Since the chi-square/df ratio is greatly influenced by sample size, the large sample size of the present study increased the power of this test to detect relatively minute departures of the data from the model (James et al, 1982).

The goodness-of-fit tests and examinations of residuals provided assessments of model fit that were not as greatly influenced by sample size. The original theoretical model and modifications of that model were also evaluated using the model's overall coefficient of determination and the individual R squared values (squared

multiple correlations for structural equations) for each of the endogenous variables.

The theoretical model was revised with reference to the modification indices if (and only if) they suggested an underlying causal relationship among variables that was considered theoretically sound. In addition, existent path coefficients were evaluated with respect to their t-values (James et al, 1982). Individual paths were deleted from the final revised model if the one-tailed t-value for the path indicated that the particular path was not significantly different from zero at the $p<.05$ level (Hayduk, 1987).

Variance-based analysis

A supplemental analysis was performed to examine the effect of agreement among communication alters. It is possible that the social information of some individuals' alters may "cancel others out." Consider for example an individual with two close and particularly influential co-workers. Co-worker A is an enthusiastic electronic mail user; co-worker B detests all mediated communication except the telephone. The social information model (as operationalized by the forgoing construction of scalar social information values) would predict an effect that approximates the average of co-workers A and B when an equally likely outcome might be one of no effect on ego.

Alternatively, ego might decide that either A or B was "correct" in this particular matter and ignore the other alter's influence.

In order to explore the effects of alter agreement, SAS was used to calculate median splits based on the standard deviation of the alter scores for total use. The total use variable was the social influence variable with greatest direct and indirect effects in the preceding LISREL analyses. Those individuals with high alter agreement in total use (less that the median variance among alters) were used in a sub-sample to assess the effect of communication alter agreement on the potency of social influences in the proposed model.

Analysis Summary

The analysis strategy employed SAS Release 6.03 to "clean" the data and construct the social information and other composite variables. Next, the overall model was estimated and tested by use of PCLISREL 7. The model was assessed with respect to the fit with the data and a more parsimonious, revised model was proposed. The effects of variance among the close co-workers of an individual was then explored by creating a sub-sample of individuals with greater uniformity among their communication alters. Chapter 4 presents the results of these analyses.

Chapter 4

RESULTS

Introduction

This chapter presents the results of analyses described in Chapter 3. The overall theoretical model was evaluated using structural equation modeling (PCLISREL 7). The theoretical model was assessed and later revised given that potential model revisions were judged conceptually sound and were theoretically indicated. Lastly, results of post hoc analysis follow.

The correlation matrix for all variables specified in hypotheses 1a through 5b is provided in Table 4.1. Table 4.7 provides the correlation matrix of computer-monitored usage with each of the exogenous and endogenous variables that were specified in the theoretical model.

The theoretical model employed the self-reported usage information as the endogenous measure of electronic mail use following the rationale provided in Chapter 3. The associations exhibited by the computer-collected usage measures and the variables specified in the theoretical model were also examined. They will be presented after we consider the structural equation modeling of the data as represented by the correlation matrix on Table 4.1.

Table 4.1

Zero-Order Correlation Matrix of Variables (N = 511)

		1	2	3	4	5	6	7	8	9	10	11	12	13
1	EM diver	1.00												
2	Total use	.32	1.00											
3	EM rich	.56	.25	1.00										
4	EM useful	.56	.31	.48	1.00									
5	Keyskill	.28	.24	.27	.29	1.00								
6	Comp exp	-.01	-.06	-.05	.01	.25	1.00							
7	EM exper	.12	.14	-.03	.07	.18	.04	1.00						
8	Alt use	.21	.23	.18	.23	.13	-.07	.08	1.00					
9	Alt useful	.23	.12	.16	.19	.13	.07	-.09	.40	1.00				
10	Alt rich	.21	.08	.21	.19	.12	-.02	-.11	.42	.52	1.00			
11	Sup use	-.01	.09	.01	-.00	-.05	-.13	-.02	-.05	-.06	-.04	1.00		
12	Sup useful	.04	.11	.01	.12	-.01	-.05	-.01	.06	.05	-.05	.29	1.00	
13	Sup rich	.06	.01	.07	.03	-.03	-.14	-.03	.13	.11	.15	.23	.33	1.00

p of correlation greater than .10 is less than .05

p of correlation greater than .12 is less than .01

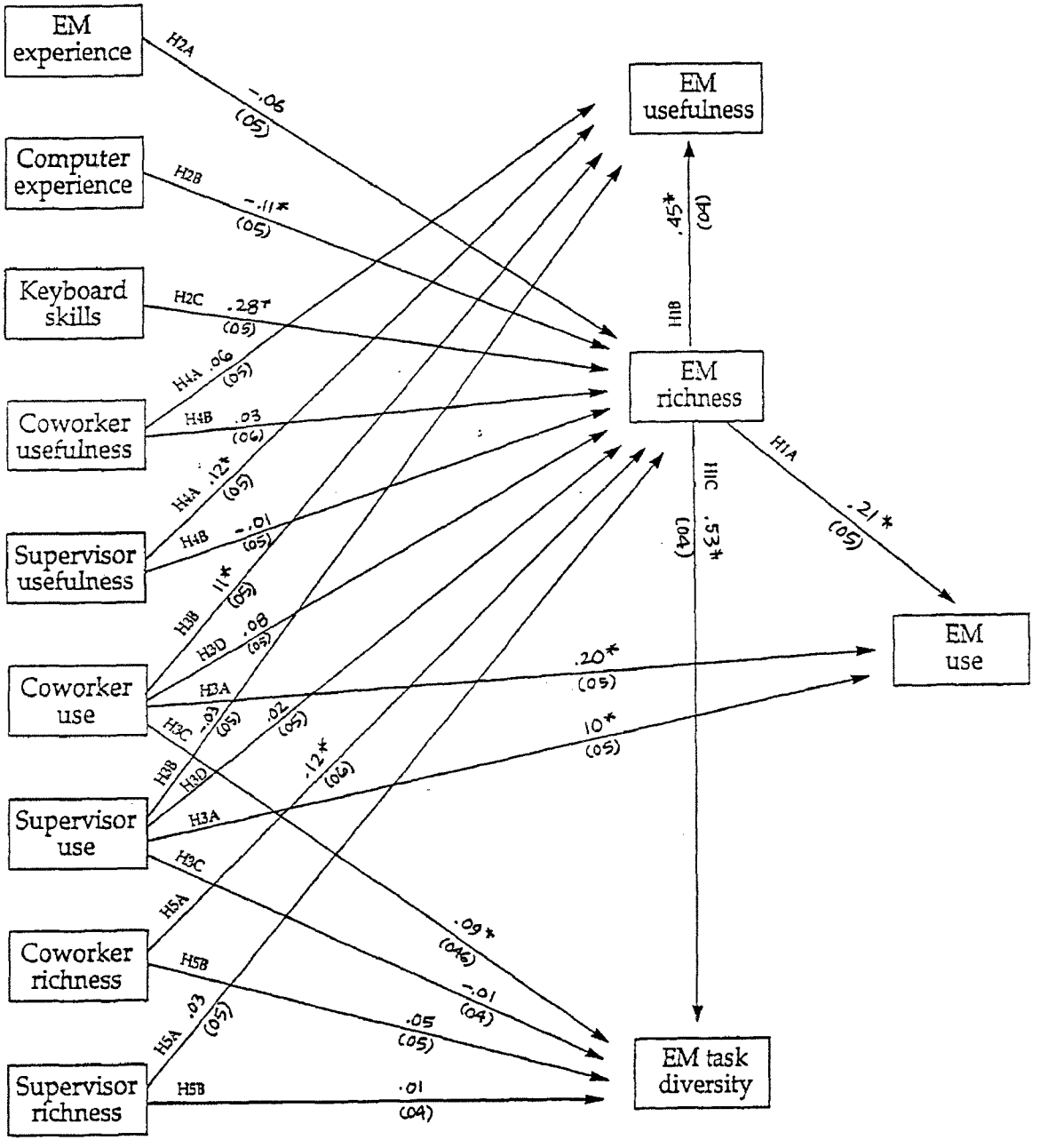
Tests of the Theoretical Model

Figure 4.1 presents the results of analysis for the theoretical model. The chi-square statistic of 141.54 (20 degrees of freedom; $p>.01$) for this large sample indicated a somewhat marginal fit of the model with the data. The chi square/df ratio of 7.08 was higher than the maximum of 5 recommended by Wheaton et al. (1977). The goodness-of-fit index was .944 but the decrease to .746 for the adjusted goodness-of-fit suggested that several paths were not very useful in their contribution to the fit of model with the data. The root mean square residual of .053 indicated that model modifications (which will be considered later) might substantially improve the model fit.

The theoretical model accounted for .23 of the total variance in endogenous variables. About 13 percent of the variance in richness and 11 percent of the variation of electronic mail use was "explained." The model accounted for about 27 percent of the variance in electronic mail usefulness and almost one third of the variance in electronic mail task diversity. The overall model statistics indicate a moderate fit of the hypotheses with the observed data but there is considerable room for improvement. Let us turn first to an examination of the individual paths that represent the hypotheses and then

Figure 4.1

Theoretical Model of Social Influence



address how the original theoretical model might be improved.

Individual hypotheses

The analysis of the theoretical model (Figure 4.1) is summarized on Table 4.2. Examination of the path coefficients (in conjunction with the standard errors of the coefficients) permits assessment of each specific hypothesis. Because the a priori hypotheses were directional in nature, the critical t-value selected was for a one-tailed test.

Electronic mail richness

The first hypothesis, H1a, proposed that the perceived richness of electronic mail would positively influence the medium's use. The path coefficient of .21 [$t=4.5$, $p<.01$] supports the positive relationship of electronic mail richness with electronic mail use.

H1b proposed that richness would influence electronic mail usefulness. Again, the large path coefficient of .45 relative to the standard error [$t=10.2$, $p<.01$], supports the hypothesis that electronic mail richness is positively related to the perception of that medium's usefulness.

Hypothesis H1c proposed that electronic mail richness would positively influence electronic mail task diversity. The LISREL analysis supports this hypothesis. The path

coefficient of .53 [t=12.6, p<.01] provides support for the relationship between increased media richness and the perception of a wider array of effective uses for electronic mail.

Media skills and experience

The next series of hypotheses specified relationships between media skills and experience and media richness. H2a proposed that electronic mail experience would positively influence richness. The path coefficient of -.06 [t=-1.3, n.s.] disconfirms that proposition. H2a is not supported.

H2b proposed that computer experience would facilitate and therefore be positively related to enhanced perceptions of media richness. The analysis indicates a significant but negative -.11 [t=-2.2, p<.01] path coefficient for the path from computer experience to electronic mail richness. H2b is not supported. This negative relationship is similar in both direction and magnitude to a previous study by Schmitz (1988) and will be considered later in the discussion section.

The last hypothesis in this series, H2c, proposed that keyboard skills influenced the perceived the richness of electronic mail. The positive relationship between keyboard skills and information richness, indicated by the path coefficient of .28 [t=5.6, p<.01] supports H2c.

Effects of colleagues' media use

The remaining hypotheses investigated the second research question--do the attitudes and behaviors of organizational colleagues influence behavior and attitudes of associates? The first hypotheses to be considered linked the electronic mail usage of colleagues to the focal individual's: 1) electronic mail usage, 2) perceived media richness, 3) perceived usefulness, and 4) electronic mail task diversity.

Hypothesis H3a proposed that the electronic mail use of colleagues influenced the media use of focal individuals. The direct effect of colleagues' use on ego's use was significant for both co-workers (path coefficient=.20, t=4.2, p<.01) and for the supervisor (coefficient=.10, t=2.1, p<.01). H3a was supported for both co-workers and supervisors.

The path between colleagues' media use and assessment of media usefulness, hypothesis 3b, was significant for co-workers (path coefficient=.11, t=2.4, p<.01) but was not significant for the supervisor (path coefficient= -.03, t=-.7, n.s.). Hypothesis 3b was therefore supported only for co-workers.

The direct effect of co-workers' use on perceived electronic mail task diversity, H3c, was significant (path coefficient=.09, t=2.0, p<.01), thus supporting hypothesis H3c for co-workers. This hypothesis, however was not

supported with respect to the supervisor (path coefficient=-.01, t=-.3, n.s.).

H3d proposed that the electronic mail use of colleagues would positively influence the perceived media richness of their associates. For both co-worker and supervisor, the relationship between the electronic mail use of colleagues and ego's electronic mail richness was not significant. The respective path coefficients of .08 [t=1.5, n.s.] for co-workers and .02 [t=.4, n.s.] for the supervisor did not support H3d.

Effects of colleagues' perceived usefulness

Hypothesis H4a posed positive relationships between the electronic mail usefulness perceived by co-workers and supervisors and the usefulness perceived by ego. The present analysis indicated a non-significant path between co-workers and the focal individual (path coefficient=.06, t=1.3, n.s.) but a significant path between supervisor usefulness and the usefulness of ego (path coefficient=.12, t=2.6, p<.01). Hypothesis 4a was supported for the supervisor but not for co-workers.

Hypothesis H4b posed a positive relationship between the communication alters' perceptions of electronic mail usefulness and the information richness reported by ego. H4b was not supported for either co-workers or supervisor

in the LISREL model. The path coefficients were .03 [t=0.5, n.s.] and -.01 [t=-0.2, n.s.] respectively.

Effects of colleagues' media richness

The final hypotheses proposed that the richness of electronic mail as perceived by colleagues would influence the perceptions of ego with respect to both media richness and electronic mail task diversity. Hypothesis H5a linked the richness perceived by communication alters' to the media richness perceptions of associates. The structural equation analysis supported H5a for co-workers (path coefficient=.12, t=2.1, p<.01) but not for the richness of the supervisor (path coefficient=.03, t=0.6, n.s.).

Hypothesis 5b proposed that the media richness of colleagues was positively related to electronic mail task diversity of ego. The direct effects of richness for both co-workers or supervisors were not significant. The path coefficients of .05 [t=1.1, n.s.] and .01 [t=.1, n.s.] do not support H5b. See Table 4.2 for the summary of the hypothesis testing of the theoretical model.

The Model Fit

The theoretical model was revised by using modification indices if they suggested an underlying causal relationship among variables that was considered theoretically sound. In addition, existent path

Table 4.2

Structural Analysis of the Theoretical Model

Hypothesis	Variable	Findings
H1a	EM Richness -> EM Use	Supported
H1b	EM Richness -> EM Usefulness	Supported
H1c	EM Richness -> EM Task Diversity	Supported
H2a	EM Experience -> EM Richness	Not Supported
H2b	Computer Exp -> EM Richness	Not Supported
H2c	Keyboard Skill -> EM Richness	Supported
H3a	Co-worker EM Use -> EM Use	Supported
H3a	Supervisor EM Use -> EM Use	Supported
H3b	Co-worker EM Use -> EM Useful	Supported
H3b	Supervisor EM Use -> EM Useful	Not Supported
H3c	Co-worker EM Use -> EM Task Div	Supported
H3c	Supervisor EM Use -> EM Task Div	Not Supported
H3d	Co-worker EM Use -> EM Richness	Not Supported
H3d	Supervisor EM Use -> EM Richness	Not Supported
H4a	Co-worker EM Useful -> EM Useful	Not Supported
H4a	Supervisor EM Useful -> EM Useful	Supported
H4b	Co-worker EM Useful -> EM Richness	Not Supported
H4b	Supervisor EM Useful -> EM Richness	Not Supported
H5a	Co-worker EM Richness -> EM Richness	Supported
H5a	Supervisor EM Richness -> EM Richness	Not Supported
H5b	Co-worker EM Richness -> EM Task Div	Not Supported
H5b	Supervisor EM Richness -> EM Task Div	Not Supported

coefficients were evaluated with respect to their t-values. Individual paths were deleted from the final revised model if the one-tailed t-value for the path indicated that the particular path was not significantly different from zero at the $p<.05$ level (Hayduk, 1987).

The theoretical model yielded a marginal fit with the data in several regards. A number of the proposed path coefficients were not significantly different from zero. Equally important, the modification indices suggested that additional paths should be added to improve the fit of the model with the observed data. The most important of these were two paths linking the endogenous variables.

The system of hypotheses included in the literature review for the present research focused on the antecedents of richness, the effects of richness on media perceptions and use, and the proposed effects of social influences of co-workers. It did not attempt to integrate the media attitudes and uses even though the literature review drew heavily from work by Fulk et al. (1987) that did pose causal relationships from media attitudes to media behaviors. The data suggest the inclusion of these paths is warranted; their omission stemmed from the initial imposition of relatively strict limits on the breadth of the theoretical model for the present study.

Model Revision

The model revision proceeded in several stages. Those paths that had coefficients not significantly different from zero were deleted. Paths were added (one at a time) if they were theoretically defensible; the revised model was then tested. The modification indices of the theoretical model illustrated the need for adding two causal paths from electronic mail usefulness, one to electronic mail task diversity and the other to electronic mail use in order to better fit the observed data.

These added paths were deemed logically sound and theoretically consistent with Fulk et al. (1987). The paths were added one at a time to improve the theoretical specification of the electronic mail task diversity and total use variables before deleting those paths that were non-significant in the original theoretical model. The addition of the links from electronic mail usefulness to task diversity and to electronic mail usage did not cause any of the initially proposed deletions in the theoretical model to become significant. Adding the link from usefulness to task diversity did render the direct link from co-worker use to task diversity not significant.

The resultant model (model 2) provided a much better fit with the observed data as evidenced by the greatly reduced chi square/df ratio of 3.28. The coefficient of determination decreased somewhat to .21. Table 4.3

summarizes statistics for the theoretical model and for subsequent revisions of that model.

The next model revision deleted those links that did not differ significantly from zero, using a one-tailed test at $p<.05$, and then added links suggested by the modification indices that were deemed theoretically sound. Twelve paths, one for each of the hypotheses not supported plus the link from co-worker use to task diversity rendered not significant by the addition of the path from usefulness to task diversity, were deleted. Five additional paths were added, one at a time. The paragraphs that follow provide the rationale for and also reflect the order of the successive changes to the model.

The largest modification indices suggested that keyboard skills had direct effects on both electronic mail usefulness and total electronic mail use. This was consistent with findings by Schmitz (1988) of pronounced effects of keyboard skills on electronic mail system usage. Two paths were added, first to electronic mail usefulness and then directly from keyboard skills to electronic mail use.

Next, modification indices suggested that electronic mail experience might influence electronic mail task diversity. Given that added experience with the medium should serve to expose users to communication tasks that

Table 4.3

Comparative Model Statistics

Model	Chi-square	df (ratio)	Goodness of-fit	Adj goodness of-fit	Root mean square residual	Coefficient of determination
1	141.5	20 (7.08)	.944	.746	.053	.226
2	59.0	18 (3.28)	.978	.889	.038	.209
3	22.7	26 (0.87)	.992	.971	.021	.263
R	77.9	32 (2.43)	.973	.923	.064	.154

1 -- The theoretical model

2 -- The theoretical model with paths from usefulness added

3 -- The final model

R -- The reduced model without social influence variables

would be seen to match electronic mail capabilities, the path from experience to electronic mail task diversity was added.

The next path to be added was the path from co-worker usefulness to electronic mail task diversity. This path was consistent with previous hypotheses of social influence. It seemed reasonable that individuals with co-workers who found the system useful would perceive electronic mail to be effective across a broader spectrum of communication tasks. The converse also seemed logical. Individuals with close associates who do not find the medium useful are not as likely to perceive it as broadly effective for as many tasks.

The last added path connected total use and electronic mail task diversity. Modification indices for previous model revisions suggested that a link should either be added <u>from</u> total use to task diversity or <u>from</u> task diversity to total use. Throughout the course of earlier model modifications, the directionality (as suggested by the modification indices) for this relationship shifted.

The final determination of directionality for the link between electronic mail task diversity and medium usage was based on theoretical preferences. I elected to avoid posing the dynamic relationship of behavior that

retrospectively influenced attitudes (as proposed by Bem, 1972) unless this was clearly and unambiguously indicated. In addition, previous model modification indices (and theoretical preferences) suggested the best fitting causal structure incorporated causal arrows from perceived media attitudes or media attributes to media use. Of two rather "good" candidates, I selected the more parsimonious model in which total electronic mail use was influenced by perceived electronic mail task diversity.

The Final Model

The resulting final model (model 3) did not include the path between electronic mail richness and total use. As paths were added from electronic mail usefulness, electronic mail task diversity, and keyboard skills, the direct effects of media richness on media usage were lessened. As Table 4.5 (in the next section) indicates, the final model suggests that electronic mail richness had indirect effects on medium usage through both usefulness and electronic mail task diversity. Table 4.4 provides the chronology of specific revisions made in the succession of model modifications. This table also displays the t-values of those paths that were deleted and the modification index value for each added path.

Table 4.4

Model Modifications

Deleted Path	(t-value)	Added Path : Modification index
Model 2		
		EMuseful -> Task div: 60.7
		EMuseful -> EMuse: 16.4
Model 3		
Co-useful -> EMrich	(.50)	Keyskill -> EMuseful: 13.6
Supuseful -> EMrich	(-.16)	Keyskill -> EMuse: 8.5
Supuse -> EMrich	(.40)	EMexp -> Task div: 8.0
Suprich -> EMrich	(.61)	Co-useful -> Task div: 9.1
Supuse -> Task div	(-.32)	
Suprich -> Task div	(.35)	
Co-use -> Task div	(.93)	
Supuse -> EMuseful	(-.73)	
Co-rich -> Task div	(.93)	
EMexp -> EMrich	(-1.3)	
Co-useful -> EMuseful	(1.3)	
Co-use -> EMrich	(1.5)	
* EMrich -> EMuse	(.6)	* Task div -> EMuse: 7.6

* Modifications performed last for Model 3.

Final Model Assessment

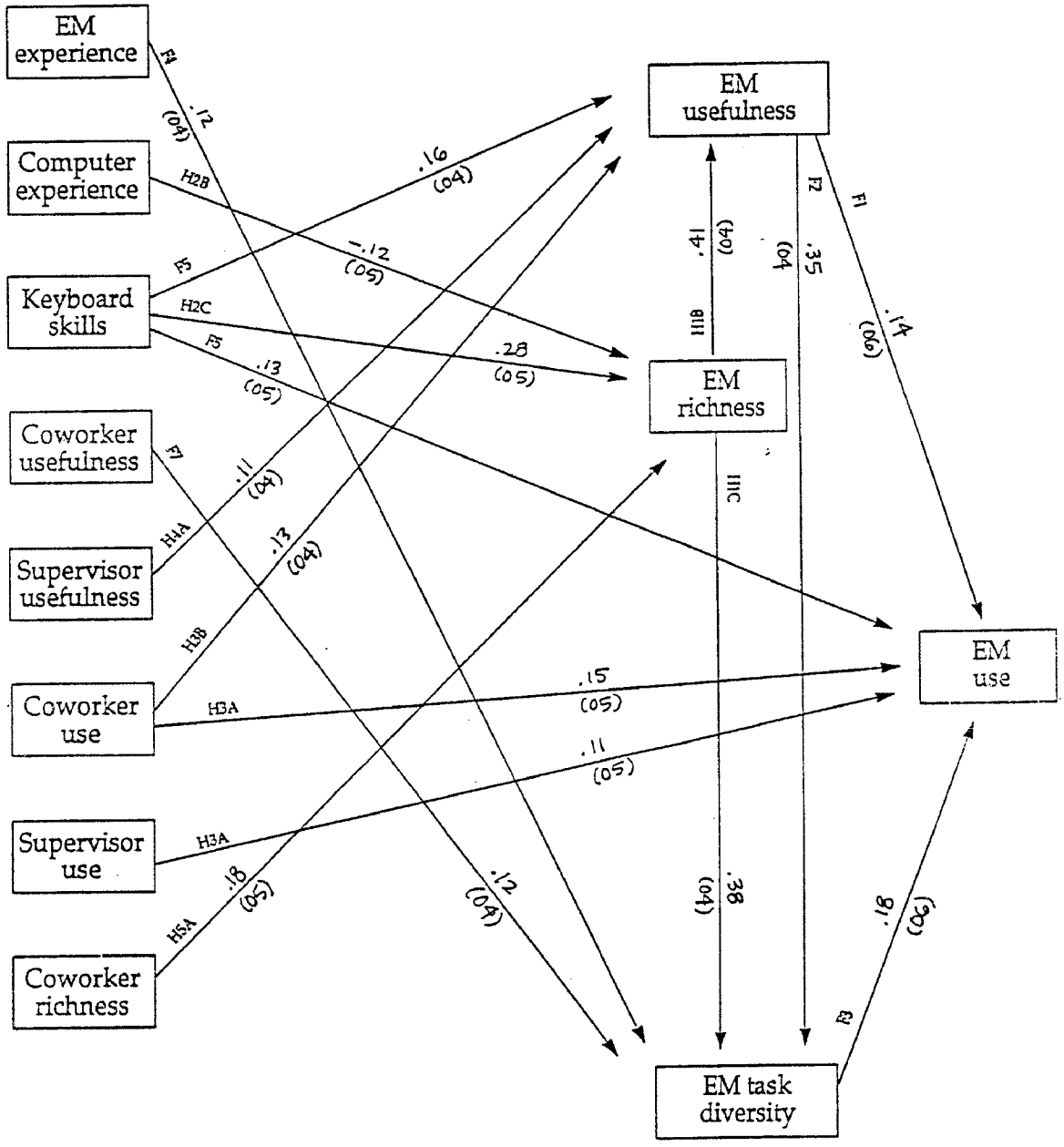
The final model provided a remarkably good fit to the data; see Table 4.3. Note the chi-square/df (22.7/26) ratio equal to .87 compared to the maximum of 5 suggested by Wheaton et al (1977). The overall goodness of fit statistic was .992 (adjusted, .971). The root mean square residual of .02 for model 3 was halved from that of model 2 and was almost a third of that in the original model. The revised final model accounted for slightly more than 26 percent of the variance of the endogenous variables. Figure 4.2 portrays this model; added paths are identified with the notation F1 through F7.

While the final model improved the overall coefficient of determination somewhat, the level of "explained variance" for each of the endogenous variables remained modest. The explained variance for electronic mail richness was rather small, .12 as was the variance for electronic mail use, .17. About 28 percent of the variance for electronic mail usefulness was accounted for by the exogenous and partly endogenous variables. In contrast, 44 percent of the task diversity may be attributed to the model variables.

The model depicts a pattern of structural relationships in which the exogenous variables (excepting keyskills and the electronic mail use of communication alters) did not directly influence electronic mail use...

Figure 4.2

Final Model of Social Influence



Similarly, the effect of media richness on media use was indirect. This pattern is one of exogenous variables that influence electronic mail richness and then indirectly influence electronic mail use through perceived usefulness and electronic mail task diversity.

Media experience and skill effects

Consider the effects of media experience and keyboard skills. First, keyboard skills had pervasive and moderately strong effects on perceptions of media richness and on perceived media usefulness. Keyboard skills therefore had both direct and indirect effects upon electronic mail use. Second, experience with electronic mail directly influenced perceived electronic mail task diversity and indirectly influenced electronic mail use. Last, the direct effect of computer experience on perceived electronic richness was negative as were the indirect effects of computer experience on the other endogenous variables.

Social network effects

The final model poses six direct social network effects on the media behavior of ego. The electronic mail use of (1) supervisors and (2) co-workers influenced the use of their close communication partners. The path between (3) co-worker richness and the perceived media

richness of ego was also significant as was the link between (4) supervisor usefulness and the perceived electronic mail usefulness of ego. Co-worker use (5) was directly related to the perceived usefulness of electronic mail by ego. The last network effect, the link between co-worker usefulness (6) and perceived task diversity of electronic mail was not originally hypothesized but that relationship is consistent with the processes of social influences that were proposed in the review of literature.

Total direct and indirect effects

The overall pattern of effects among the endogenous variables was that of media richness influencing media attitudes toward usefulness and task diversity which (in turn) influenced media use. The anticipated direct link between richness and use was not significant in the final model. Rather, the effect was an indirect one. Table 4.5 summarizes both the direct and indirect effects represented by the final causal model.

Reduced form model

One of the important propositions of the present research was that the inclusion of social influence processes in models of media behavior can aid

Table 4.5

Direct and Indirect Effects of Exogenous Variables

Exogenous Variables	Endogenous Variables: EM Usefulness Dir	Ind	Total	EM Task diversity Dir	Ind	Total	EM Use Dir	Ind	Total
EM exper	-	-	-	.12	-	.12	-	.02 (.01)	.02
Comp exp		-.05 (02)	-.05	-	-.06 (03)	-.06	-	-.02 (01)	.02
Keyskill	.16	.11 (02)	.28	-	.20 (03)	.20	.13	.07 (02)	.21
Co-useful	-	-		.12	-	.12		.02 (01)	.02
Sup useful	.11		.11		.04 (02)	.04	-	.02 (01)	.02
Co-use	.13		.13	-	.04 (02)	.04	.15	.03 (01)	.18
Sup use	-			-	-	-	.11	-.11	
Co-rich		.07 (02)	.07		.09 (03)	.09	-	.03 (01)	.03
EM rich	.41	-	.41	.38	.14 (02)	.52		.15 (03)	.15
EM useful	-			.35	-	.35	.14	.06 (02)	.20

Standard errors of indirect effects are in parentheses
All standard errors -- $p<.05$

understanding of media perception and selection. In the review of literature it was suggested that the failure to consider such processes constituted a serious mis-specification of our models of media behavior. One indication of the possible magnitude of this mis-specification may be obtained by comparing the model with the social influence variables to the reduced form model that excludes such variables.

Table 4.3 described a reduced form model in which all social influence variable paths were set to zero. By eliminating consideration of these variables, the overall coefficient of determination decreased from .26 to .15. The largest decreases in explained variance are for the variables of richness, total use, and usefulness of electronic mail use; there is almost no change in perceived electronic mail task diversity. Table 4.6 provides the comparison of reduced form model with the final revised model. In Table 4.6, the squared multiple correlations for structural equations represent "explained variance" and are labeled as "squared multiple r".

Structural Equation Model: A Summary

Results of the LISREL analysis indicate modest but pervasive social influences on both the media attitudes and behavior for electronic mail. The richness of the

Table 4.6

Comparison of Social Influence and Reduced Form Models

	Reduced form	Social influence
Coefficient of determination	.15	.26
Squared multiple r		
Electronic mail richness	.09	.12
Electronic mail total use	.14	.17
Electronic mail usefulness	.26	.28
Electronic mail task diversity	.43	.44

medium influences media attitudes directly and media use indirectly. Of the individual attributes examined, only keyboard skills positively influenced richness. Keyboard skills also directly influenced perceived media usefulness and reported media use.

Computer-monitored Electronic Mail Use

The usage measures that were gathered from the survey and the PROFS usage obtained from the computer-records for one week of PRC electronic mail system use were moderately associated. As Table 4.7 indicates, the correlation between total reported use and computer-monitored use was .44 for sending and .49 for receiving. The association with self-reported original notes was slightly higher: .48 for sending and .53 for receiving. The correlation between computer-monitored sending and computer-monitored receiving was .69. These associations are consistent with (but greater than) those found by Schmitz (1988) in a study of electronic mail in a local municipal government.

Given the short period of collection and the three-month time lag between the survey and collection of computer-monitored usage, the computer-collected measure was not the best representation of electronic mail usage at PRC. In addition, as was proposed in Chapter 3, the self-reported measures are considered more appropriate

Table 4.7

Correlation of Computer-monitored Use and Survey Variables

Computer-Monitored:	(Sent)	(Received)
Original notes sent	.48**	.53**
Total use	.44**	.49**
EM experience	.10*	.18**
Keyskill	.24**	.22**
Computer experience	-.03	.06
EM richness	.17**	.14**
EM usefulness	.22**	.27**
EM task diversity	.15**	.19**
Co-worker use	.18**	.15**
Co-worker usefulness	.09	.06
Co-worker richness	.01	-.01
Supervisor use	.02	.10*
Supervisor usefulness	.14**	.24**
Supervisor richness	.02	.05
Computer-monitored received	.69**	

* p<.05

** p<.01

measures of the theoretical usage constructs for this study. As Chapter 3 indicated, self-reported measures were more likely to reflect the salience of messages and notes to the individual. The computer measure includes some habituated communication. In addition, the counting technique was such that multiple copies (e.g., of a meeting notice) were counted as original messages for both senders and receivers.

The utility of the computer-monitored data for the present study is that they indicate a similar pattern of bivariate relationships. The relatively high correlations of usage measures and the comparable usage values reported by individuals lend confidence that the self-reported data neither wildly exaggerate nor do they grossly minimize actual system usage. The computer-monitored data also provide additional insight into the overall PRC electronic mail communication patterns.

Post Hoc Analysis

The final section of the present chapter considers the effects of communication alters who are in close agreement. A sub-sample of the 511 PRC organization members was selected by dividing the original sample on the basis of similar usage among communication alters. The split was accomplished by calculating the exact standard deviation of the total use score of communication

alters for each individual in the larger sample. Individuals with lower standard deviations for their communication alters were considered to be exposed to social information about electronic mail use from alters in close agreement.

The analysis that follows used the half of the sample (based on the median split of the standard deviation) with closer agreement of communication alters on the variable total electronic mail use. Table 4.8 provides descriptive statistics for this sample; Table 4.9 displays the correlation matrix.

The sample of individuals that communicated with alters who had reported similar electronic mail usage was then analyzed using LISREL following the same strategy as with the complete sample, first using the original theoretical model. This analysis was then repeated using the final revised model. Figure 4.3 and Figure 4.4 depict both the theoretical and revised models for this sub-sample of individuals with co-workers who reported similar electronic mail usage.

Consider the theoretical model on Figure 4.3. The direct effect of co-worker electronic mail use was considerably higher for the sample with close agreement (note close agreement reflects either consistent high or low use across alters) than for the total sample. The

Table 4.8

Descriptive Statistics:

Sub-sample With Close Alter Agreement (N=245)

Variable	Mean	S.D.
Total usage self reported transactions/day	14.3	12.3
Electronic mail richness	3.5	0.9
Electronic mail usefulness	4.2	0.8
Electronic mail experience	5.8	2.7
Computer experience	3.0	1.3
Keyboard skills	3.6	0.9
Perceived electronic mail task diversity	77.9	14.8
Co-worker usage value	14.1	7.8
Co-worker usefulness value	4.3	0.5
Co-worker richness value	3.5	0.6
Supervisor usage value	27.3	15.1
Supervisor usefulness value	4.6	0.6
Supervisor richness value	3.4	0.8

Table 4.9

Zero-Order Correlation Matrix of Variables

Sub-sample with Close Alter Agreement (N=245)

		1	2	3	4	5	6	7	8	9	10	11	12	13
1	EM diver	1.00												
2	Total use	.27	1.00											
3	EM rich	.52	.26	1.00										
4	EM useful	.54	.31	.46	1.00									
5	Keyskill	.24	.25	.21	.22	1.00								
6	Comp exp	.04	-.03	-.04	.01	.28	1.00							
7	EM exper	.16	.21	-.03	.10	.20	.05	1.00						
8	Alt use	.25	.31	.19	.23	.13	.00	.17	1.00					
9	Alt useful	.26	.07	.15	.16	.13	.10	-.06	.40	1.00				
10	Alt rich	.22	.04	.22	.14	.10	-.02	-.07	.33	.47	1.00			
11	Sup use	-.01	.05	.03	.03	-.07	-.18	-.10	-.02	-.06	-.06	1.00		
12	Sup useful	.07	.20	.09	.13	-.01	-.12	-.04	.14	.00	-.09	.34	1.00	
13	Sup rich	.12	.03	.13	-.01	-.09	-.20	-.05	.17	.11	.21	.29	.33	1.00

p of correlation greater than .13 is less than .05

p of correlation greater than .16 is less than .01

Figure 4.3
Theoretical model – Sample with co-workers in close agreement

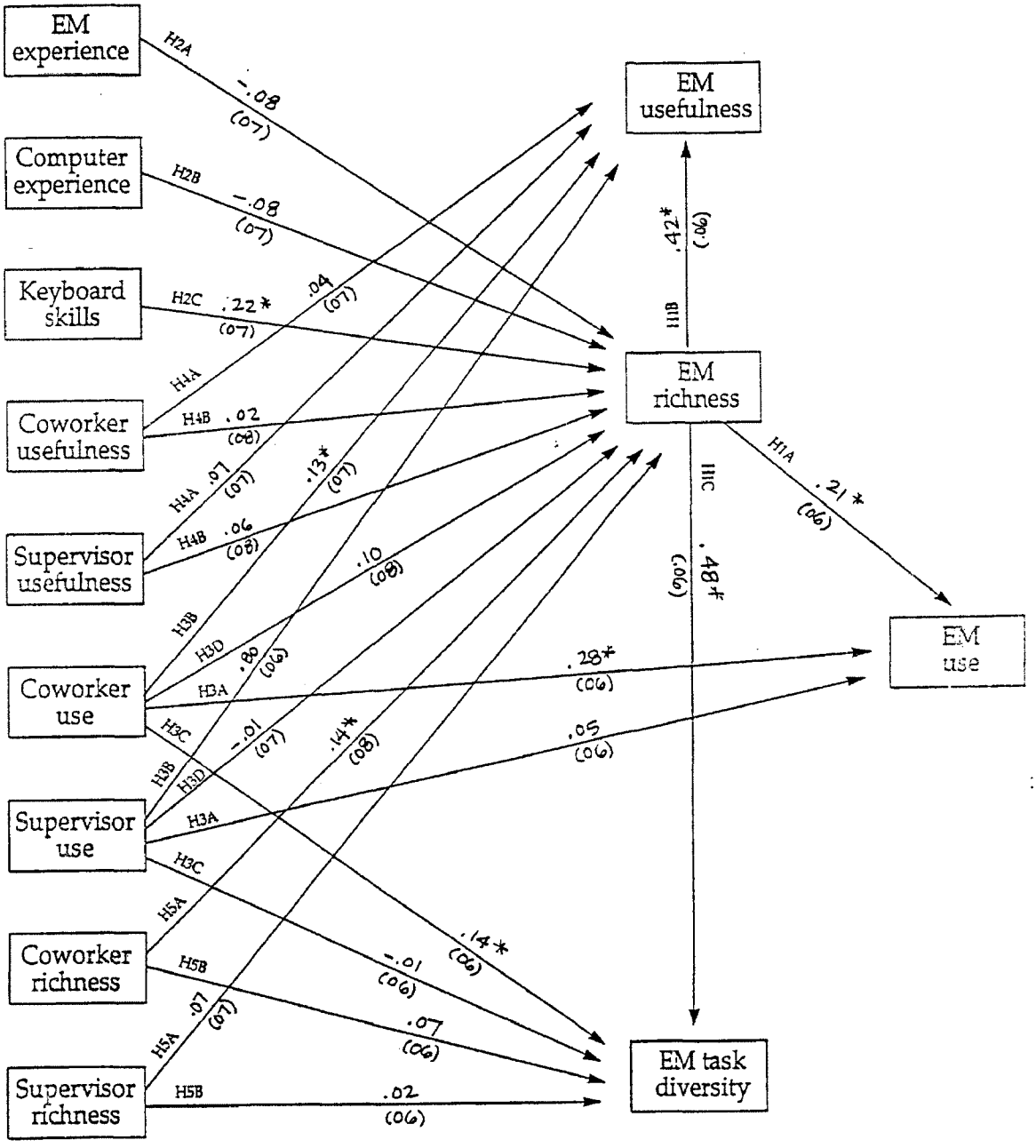
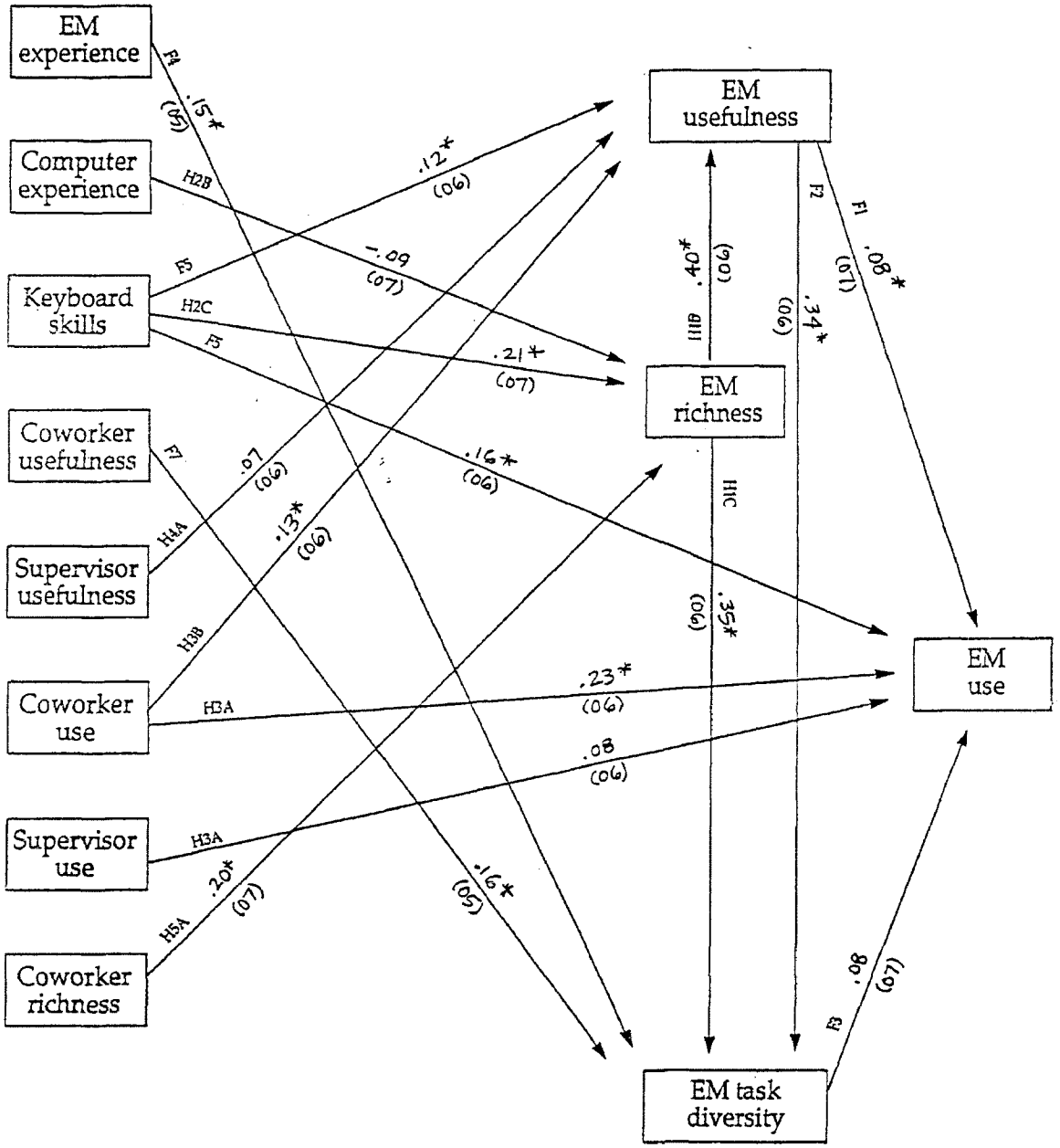


Figure 4.4
Final Model – Sample with co-workers in close agreement



overall model statistics were similar to the theoretical model for the entire sample except for the lower chi-square/df ratio of 4.3 (86.3/20) that largely reflected the reduced sample size. The coefficient of determination was somewhat greater, .244 versus .226. The goodness-of-fit, adjusted goodness-of-fit, and root mean square residual were essentially unchanged at: .941 [.944]; .733 [.746]; and .056 [.053], respectively.

The path coefficient from co-worker use to the individual's total electronic mail use for this sub-sample was .28, $t=4.3$, $p<.01$ versus .20 for the entire sample. The other three direct path coefficients from communication alters' use were:

(1) electronic mail richness (path coefficient=.10, $t=1.3$, $p>.05$);

(2) electronic mail usefulness (path coefficient=.13, $t=1.9$, $p<.05$); and

(3) electronic mail task diversity (path coefficient=.14, $t=2.2$, $p<.01$). These path coefficients increased but the standard errors also increased approximately 25 percent reflecting the reduced sample size. Table 4.10 provides a comparison of the <u>total effects</u> of co-worker use on the endogenous variables for the two samples.

Table 4.10

Total Effects of Co-worker Electronic Mail Use

	Theoretical Model	
Variable	Full sample	Close Alter Agreement
EM richness	.08	.10
EM total use	.21	.30
EM usefulness	.15	.17
EM task diversity	.13	.18

Comparison of co-worker usage total effects for the final model (see Table 4.11) yielded similar results although the magnitude of the increased effects in the sample with close alter agreement was smaller. Again, the overall model statistics for the sub-sample were quite similar to those for the original complete sample.

The chi-square/df ratio was low for both samples, 1.2 (31.4/26) although the original sample chi-square/df ratio was somewhat lower at 0.9. The coefficient of determination again (as in the earlier comparison for the theoretical model) was somewhat improved for the sample with close communication alter agreement, .275 versus .263. The goodness-of-fit, adjusted goodness-of-fit, and root mean square residual statistics indicated a slightly poorer fit than for the original sample. They were .979 [.992]; .928 [.971]; and .037 [.021], respectively.

The path coefficient from co-worker use to the individual's electronic mail use for the sub-sample was .23, ($t=3.7$, $p<.01$) versus .15 for the entire sample. The other direct path coefficient from communication alters' use to electronic mail usefulness (path coefficient=.13, $t=2.2$, $p<.01$) was essentially the same as for the entire sample. Table 4.11 compares total direct and indirect effects of co-worker use on the endogenous variables for the original sample and for the sample with co-worker agreement using the final revised model.

Table 4.11

Total Effects of Co-worker Electronic Mail Use

	Final Model	
Variable	Full sample	Close Alter Agreement
EM total use	.18	.26
EM usefulness	.13	.13
EM task diversity	.04	.04

The descriptive statistics for the dependent variable total use (mean=14.3; s.d.=12.3) on Table 4.8 indicate that the sample of individuals with alters that use electronic mail more similarly had slightly less use and less variance than was the case for the entire sample (mean=16.0; s.d.=14.6). It is therefore not likely that the increased total effects of communication alters' electronic mail use is a function of greater use or a greater variance in use that may be more easily "explained" in the sub-sample with the more uniform media usage by communication alters.

The results displayed in Tables 4.10 and 4.11 and Figures 4.3 and 4.4 are consistent with the notion that processes of social influence are exceedingly complex, more so than this examination of aggregated values of communication alters in ego-centered social networks can completely disentangle. To the extent that the aggregation of mean network values distorts the effects of existent social processes, the results presented in this chapter are likely to be understated rather than overstated. This theme will be integrated and amplified in the discussion that follows.

Chapter 5

DISCUSSION AND CONCLUSIONS

The present research had several important goals that followed from each of the two broad research questions. The first research question asked if the information richness construct should be conceptualized as a variable with important antecedents and consequents rather than as a constant derived from the objective characteristics of a particular medium. Is media richness partly based on the individual's perceptions rather than on objective media characteristics, and do variations in richness perceptions influence media attitudes and behaviors?

The second research question asked if processes of social influence operate within the realm of media perception and selection. This question asked if the media behavior of organizational colleagues influenced the media use and attitudes of their co-workers. In the section that follows the consequents and antecedents of information richness will be discussed. The discussion will next turn to the social influences of co-workers and supervisor.

Media Richness: Consequences

Does media richness, the perceived capability of a medium to reduce ambiguity, affect media attitudes and behaviors? The answer is yes. The present results show that perceived media richness influenced: (1) media use, (2) perceived media usefulness, and (3) perceived task diversity. Individuals who considered electronic mail to: 1) provide timely feedback, 2) provide a variety of cues, 3) tailor personal messages, and 4) use rich and varied language were likely to use electronic mail more than individuals that perceived electronic mail as a relatively lean medium. Individuals who perceived electronic mail as rich were also more likely to consider the medium more useful and more suitable for a diverse array of communication tasks.

The direct relationship between media richness and media use was less pronounced than were the relationships between media richness and media usefulness or task diversity. The lessened direct influence on media use may indicate that for the actual use of a particular medium, the direct influences of media richness perceptions may be outweighed by situational factors, relational influences, and communication task requirements.

However, when we consider the revised LISREL model, pervasive but indirect influences of media richness on media use become evident. These indirect media richness

influences are modeled as indirect paths through both usefulness and task diversity. This revised model is consistent with the (theoretical) generalized model of media characteristics and media use that was originally proposed by Fulk et al. 1987 (p. 533). The variance in perceptions of media richness can be seen (Figure 4.2) to influence the ways in which media are perceived, and thence used. We turn now to the antecedents of richness.

Media Richness: Antecedents

The first research question also asked if individuals varied in their perceptions of richness. Differences across the means for the moderately rich media (print, telephone, and electronic mail) were small when compared to the variation across respondents in evaluating the richness of a single medium. This indicates that individual variance in richness not only exists, but that it has potential to influence media behavior.

To the extent that print, telephone, and electronic mail may be substituted for each other, as Rice and Bair (1984) have suggested, individual differences in the perceptions of media richness for these media have increased importance. Because individual differences in electronic mail richness predicted attitudes toward usefulness and task diversity for electronic mail, the antecedents of media richness variation are important.

This is particularly the case because the perceived richness by individuals both directly and indirectly influenced their electronic mail usage.

The effort to identify the antecedents of systematic variation in media richness was moderately successful. About 12 percent of the variation in richness covaried with the proposed antecedents the theoretical and the revised models. Two of the proposed predictors, keyboard skill and co-worker social influence (richness) were positively related to ego's perceptions of media richness. The influence of keyboard skill seems straightforward. For those with high levels of such skills, the medium was less "opaque" and easier to use in ways that facilitated more varied and interactive exchanges of meaning. These survey findings were consistent with interview data; several infrequent users characterized electronic mail as unwieldy and unidimensional precisely because they did not possess necessary keyboard skills. The influence of co-worker use on richness will be considered in the next section.

The effect of computer expertise was contrary to prediction. H2b proposed a positive relationship between computer experience and media richness; the data clearly indicate negative relationships between computer experience and both electronic mail richness and electronic mail use. This negative relationship confirms

and amplifies the findings of a direct (negative) relationship between computer experience and use found by Schmitz (1988) in another organization.

It may be that individuals particularly adept at computing, for example the PRC artificial intelligence experts, conceive the PROFS system as rather simple and primitive, particularly with respect to graphics deficiencies. Several of the computer experts that were interviewed noted these deficiencies in language that connoted perceptions of lean media. Individuals experienced in computing are more likely to understand that "richer" electronic systems are possible. Such persons are also more likely to be attuned to the limitations of all such electronic systems when compared to the face-to-face standard that media richness implies.

Another explanation for this inverse relationship might be that persons with high levels of computing expertise may have fewer intergroup communication needs and therefore have fewer uses for electronic mail. Our interviews and the analyses performed for the host organization (Fulk et al. 1989) indicated that managers made more extensive use of the electronic system than did either engineers or researchers. Persons high in computing skills but with low needs for communication across groups or organizational levels may not have as much occasion to use electronic mail.

With fewer intergroup communication needs, such individuals have fewer incentives to use the electronic mail system. They may therefore not obtain experience with the electronic communication (versus computing) system that can lead them to discover aspects of electronic mail that embody characteristics of moderately rich media. Given the consistency of these findings with those of Schmitz (1988) and given the non-obvious nature of the present results, further investigation into this negative relationship between computer expertise and both perceived media characteristics and electronic mail usage seems warranted.

While the present research identifies several antecedents of media richness, much of the variance in richness remains unexplained. This area seems a fruitful area for further research, because variance in perceived richness has been shown to influence media behavior. One strength of the present research is that it provides empirical evidence that challenges a dominant perspective that holds media characteristics to be unchanging if the technical features of a particular medium are held constant. Much previous research in the domain of new communication technology has objectified media characteristics and used them as explanations for consequent media behaviors. To the extent that media characteristics have antecedents and vary across

individuals with respect to how they are perceived, our models of media behavior need to be reformulated so that they reflect those processes that give rise to the perceived differences.

Social influence

The second research question asked if social interaction played an important role in guiding media behavior. The literature review raised broad questions of the nature of the social world. It was asserted that individuals model their behavior, in part, on the behavior of others (Bandura, 1986). Further, the work of symbolic interactionists (e.g., Mead, 1934) was cited as a rationale for predicting that individuals in close contact might converge in their perceptions of media attributes. Lastly, the formulations of Salancik and Pfeffer (1978) were used to explicitly locate processes of social influence in the organizational domain. Hypotheses derived from the review of literature predicted that the media attitudes and behaviors of co-workers and supervisor would influence the attitudes and behaviors of their organizational colleagues.

The hypotheses linking co-worker usage and co-worker assessments of media richness and media usefulness to their colleagues' media uses and perceptions were confirmed although the effect magnitudes were modest. The

effects of supervisors' media behaviors were less consistent, but were often significant influences on the media behaviors of subordinates.

While the effects (both direct and indirect) of social influence were modest, they were statistically significant and were not trivial. Clearly the present research could not capture the rich extent of social interaction using survey methods. Note also that variables reported by one individual were used to predict the attitudes and behavior of another individual. Measurement errors in either or both sets of responses should (and undoubtedly did) attenuate observed relationships. Not all, or perhaps most, of the direct, social influences were captured by the measurement strategy. Yet results indicated consistent relationships existed between co-worker media usage and attitudes and the media behaviors of their organizational colleagues.

The strongest relationships were those linking the electronic mail use of co-workers (and supervisor) to the media use of their close communication partners. The influence of usefulness reported by organizational colleagues on both the media richness and the media usefulness of ego was less pronounced. Only the electronic mail usefulness reported by the supervisor had a significant path coefficient (with the usefulness of ego). The revised model suggested a positive relationship

between media usefulness (of co-workers) and increased electronic mail task diversity. With respect to media richness, as predicted by the hypotheses, the data indicated that the media richness perceived by co-workers influenced the media richness perceived by ego.

One explanation for the more pronounced influence of the behaviorally measured variables is that these behaviors are largely overt and observable, whereas the attitudinal variables may be less frequently salient to close interaction partners. Although overt statements reflecting co-workers attitudes may often express media attitudes, the media use of colleagues more closely represents unambiguous commitments to behaviors (Salancik and Pfeffer, 1978). Note that both attitudes and usage of others had influences upon ego, but at PRC the actions seem "to speak louder than words."

A complementary explanation suggests that those processes of observational learning posited by Bandura are more likely to be measured in this cross-sectional design than more subtle and long-term processes of symbolic interaction that might underlie a hypothesized convergence in attitudes. Bandura (1986) considered tangible, salient, and readily enacted behavior to facilitate vicarious learning. Common variance in media usage of colleagues and that of ego was more readily apparent, given an appropriate cross-sectional design. More

difficult to detect (particularly with survey instruments) are the intensities and dimensions of media attitudes and evaluations that are posited to converge as a consequence of social interaction.

The effects (social influences) of co-workers were greater than those of the supervisor. The differential effects of co-workers and supervisor lends some credence to attributing the relationship to processes of social influence rather than to competing explanations based on the distribution of organizational power. The alternative case in which the supervisor's media behaviors are more greatly reflected in the media behaviors of subordinates might suggest that the similarities stem from directed or coerced media use exhibited by the less powerful subordinates. In my view, the finding that influences appear to stem from both co-workers and supervisors and that the more similar co-workers appear to exert greater effects on their colleagues, strengthens the potency of social influence as a basis for the underlying processes.

One possible rival explanation is that close co-workers talk to each other electronically. Recall that close co-workers were defined as individuals that frequently communicated with each other using all media. The alternative explanation seems less likely as a <u>general</u> explanation of PRC media patterning if we consider the interview data. Interviewees said they did <u>not</u> often use

electronic mail to communicate with organization members in their own work groups nor was PROFS used to communicate across organizational boundaries by interdepartmental work teams because PRC policy was to not employ such groups.

In addition, the present survey asked individuals to characterize their messages as to whether they were upward, downward, or lateral messages. The messages were evenly split among these three categories and included a high percentage of messages that were sent to individuals not directly in a supervisory chain and also many messages sent to individuals in the different departments. Both interview data and survey data suggest the electronic mail communication patterns were not established as a consequence of point-to-point communication between close co-workers. Furthermore, the single week of computer-monitored data identified almost 1,400 different electronic mail recipients, lending added support for the presence of a more diffused electronic network.

Electronic Mail Task Diversity

The present research introduced the construct of electronic mail task diversity. Much of the research regarding new communication technologies omits consideration of the content of communication but instead, focuses on the frequency of media use (notable exceptions include Aydin, 1989 and Phillips, 1989). This criticism

applies to the quantitative portion of the present research and there is a need to address the substance as well as the frequency of electronic media use.

The variable of "electronic mail task diversity" represents the range of communication tasks for which electronic mail was deemed effective. While this variable cannot represent communication content or meaning, it can indicate the potential intensity of use combined with the breadth of, or the pervasiveness of, medium use. It seems important to go beyond whether a medium is used a lot or a little; the task diversity construct was intended to add such a dimension of media range and perceived media versatility.

Because the task diversity construct is new, psychometrics are lacking. Nunnally (1978) suggested that in such cases one should first specify the construct domain, second determine whether the construct indicators measure the same thing, and third assess the construct's predictive validity using controlled experiments. Nunnally went on to say that in practice this usually occurs in reverse order and requires several repeated studies.

The case for the task diversity construct rests on two bases (Anderson, 1987; Williams et al., 1988), in addition to the assertion that it is logically useful to characterize media behavior with respect to a range of

uses as well a frequency of usage. First, the case for face validity is bolstered by having directly measured respondents' reports of electronic mail effectiveness over a range of communication tasks drawn from the literature and from preliminary interviews of PRC respondents. The measure consisted of reports by organization members of the range of communication tasks and the degree of effectiveness that electronic mail provided for accomplishing these varied organizational communication tasks. It seems probable that high scores reflected perceptions of a medium with a greater diversity of use and also a greater breadth of content. See Appendix 1 for a listing of the 25 communication tasks.

Second, the predictive validity seems to be adequate given the newness of the measure. The measure was quite highly associated with perceived media richness, consistent with the theoretical rationale that a medium perceived as rich should be potentially more versatile. By extension, more versatile media should be used more frequently. Both relationships were well supported by the data (see Figure 4.2).

Theoretical Implications

The present research was explicitly designed to evaluate two theories of media behavior--theories of media richness and theories of social influence. If we draw

from Hawking (1988) and characterize a theory as a model of a restricted part of the universe and a set of rules to relate quantities in the model to the observations that we make, the implications of the present research are quite clear. Given that the rules used to relate the model quantities to the empirical observations were fair (such questions of methodological appropriateness are often matters of contention and will be addressed in subsequent sections), then the theories of media richness and social influence, having been explicitly tested in the present study, may now be evaluated critically. Both theories appear to stand in need of some modification.

Media richness

Media richness theory proposed that media characteristics and communication requirements are often matched. Media richness theory is descriptive in that it argues how communicators behave. Daft (1988) asserted that the theory provided a best first approximation of media selection. Media richness theory is also prescriptive in that it asserts that organizations should design their information systems so that rich media are used to reduce equivocality whereas lean media can often suffice when only uncertainty is at issue (Daft & Lengel, 1986, Daft et al. 1987).

The present research suggests that such a match is problematic. First, while media richness has both direct and indirect effects upon media use, in the revised model richness has less effect on media use than does either keyboard skills or co-worker social influence. Second, the concept of matching media to communication task implies relatively fixed levels of media richness (and clear differentiation across media alternatives), conditions that are not supported by the present study.

The present research suggests three modifications of media richness theory. First, it seems fruitful to conceptualize media richness as a variable with antecedents both at the individual level of perception and attribution as well as at the relational level. Richness seems to be much more complex than originally formulated.

Second, media richness seems to be subject to processes of social construction. The data suggest that these influences are pervasive (even if somewhat modest) when relational networks are examined for effects of socially mediated influence.

Last, the low levels of explained variance may reflect the need to more closely specify the domain of operation for both media richness and social influences. With respect to richness, one implicit assumption is that communication is intended to reduce either uncertainty or ambiguity and that the potential communicators actively

exercise media choice. The presumption that these conditions predominate seems suspect upon closer examination. The notion that communication is usually intended to inform ignores the roles of conflict and power (Frost, 1987; Putnam & Poole, 1987) in organizations and has been challenged on theoretical and pragmatic grounds by Eisenberg (1984).

Respondents consistently stressed the role of the CEO as a champion of electronic mail during interviews. Often they would also identify and note the effects of others as PROFS cheerleaders. Persons in the organization also had their own personal media preferences. Many respondents indicated they liked very much, or alternatively, strongly disliked, a particular medium. Clearly, factors other than the reduction of ambiguity or uncertainty played important roles in determining the media patterns within the organization.

Interviews with infrequent users of electronic mail elicited several additional themes. Some individuals seemed "put off" by the leanness or impersonal nature of electronic mail. Other persons were daunted by the need to learn a complex system that may also require new typing skills. During interviews, several infrequent electronic mail users reported they were particularly sensitive to deficiencies in graphics capabilities and the difficulty of obtaining synchronous feedback with this medium. These

comments give credence to the importance of information richness in assessing the potential capabilities of electronic media. These comments also imply that technical improvements in electronic media have the capability to increase both inherent and perceived richness for these media and thus to facilitate adoption by other potential users.

Social influences

The present study was designed to provide a test of a social influence model of media choice. While the effect magnitudes attributed to social influences were modest, the observed pattern of media attitudes, perceptions, and usage was clearly associated with patterns of close interpersonal interaction. Knowing the media behavior of those who interact closely with an individual nearly doubled (see Table 4.4) the coefficient of determination of the endogenous variables that describe media attitudes and behavior. To the extent the quantities (as in Hawking, 1988) used in the present analysis are fair representations of the model constructs, theories of media behavior need substantially increased representation of human interaction processes and their outcomes.

The present findings suggest that relational patterns matter; that the meanings of media lie partly in patterns of interpersonal interactions that lend context to media

behavior. Yet the low total "explained" variance suggests that the model must be further examined and perhaps modified. The model as presented by Fulk et al. (1987) specifies that communication task characteristics are one likely determinant of media usage. The present study would have benefited from the inclusion of communication tasks as predictors of media behavior.

It seems necessary to identify more precisely the nature of the task characteristics (for example the degree and quality of sub-unit task interdependence) that might influence media use. Then, means of measurement must be developed for these variables. The literature does not well identify specific communication task variables that consistently influence media selection processes, although the work of Daft and associates suggest that the equivocality of a communication task plays an important role in media selection.

The evidence seems rather clear that the social influence perspective has merit. To the extent this evidence is convincing, models of media behavior should explicitly include interpersonal relational processes as determinants of media selection. Thus far, the history of research in communication technology has given a more central position to the objective characteristics of the new technology and the resultant consequences of adoption of these innovations (Williams et al., 1988). To the

extent this view unduly minimizes the social malleability of both the technology and its consequences, our understandings of these phenomena are circumscribed.

Limits of the Network Methodology in the Present Study

It is important that the measure of social influence obtained was based only on frequent interaction at the dyadic level. Only social influence relative to the direct interaction among close co-workers was modeled. Clearly the social environment consists of more numerous and more indirect influences within groups. The interview data lend insight into this group dimension of social influence. Many respondents indicated that senior managers and executive secretaries set the pace for the group's electronic mail use. Some sections had influential and very enthusiastic "boosters" or cheerleaders, for electronic mail.

One executive secretary said PROFS was the single most important aspect of her job and was directly responsible for her highly positive feelings toward her work and toward the organization. She took personal responsibility to show others the "joys" of electronic mail and took obvious pleasure in promoting the system. Groups like hers were characterized as heavier users of the medium. Other sections were more blase' about "just another" medium. The network methodology employed in the present

study captured only the direct (single point in time) relational similarities and missed much of the more subtle clique influences.

Almost all individuals who were interviewed emphasized the substantial and positive influence of the organization CEO on electronic mail use. This influence was at times subtle, but on occasion, very direct and unequivocal. Recall for example, that the PRC lore included a story of the early morning meeting "called" by the CEO using only the newly installed PROFS electronic mail for notification. This champion of electronic mail was effective in providing a model for behavior that was directly observed by all organizational members, particularly by those managers at very high organizational levels.

Even though managers at PRC may employ more face-to-face communication than persons at lower levels, these managers were also heavy users of electronic mail. Explanations for high use of electronic media at the top of this organization include the interpersonal influence of the CEO as well as his employment of organizational authority to stimulate PROFS usage. Although the observational and interview data lend support to the thesis that interpersonal influences shape media behaviors beyond the sensitivities of the present network methodology, competing explanations have merit. The

technical advantages of electronic mail to easily perform otherwise complex communication tasks, shaped the behavior of many individuals in ways that complemented, but may also have conflicted with, their social perceptions.

An additional question should be raised. What magnitude should be expected for effects of social influence? It seems that modest, but consistent effects should result from interaction with close associates. For example, it is not reasonable to expect co-workers to "persuade" other persons that electronic mail is as personal as face-to-face interaction. It does seem reasonable that co-workers can "persuade" colleagues that some media are a bit more useful or more rich than others. Given that a relational network approach can capture and model such social influences, then empirical tests of hypotheses should yield pervasive but moderate associations. The present research meets these criteria for the magnitude and consistency of associations.

The present research is noteworthy in that the quantitative measures obtained from one individual comprise many of the exogenous variables used to predict media behaviors for other individuals. As such, this strategy is not as subject to inflated associations characterized as common subject variance. In the present research, error components in either set of measures were

likely to attenuate rather than inflate observed relationships.

In addition, the tendency for respondents to exaggerate, perhaps unwittingly, a consistency among their own attitudes and their behaviors can engender spurious associations between attitudes and those actions that the subjects presume are related. To the extent the present study uses attitudes and actions of organizational colleagues to predict behaviors of ego in tests for social influence, the risk of spurious common method variance was minimized.

The Effect of Alters' Agreement

The post hoc analysis used a median split of all respondents based on the agreements of communication alters with respect to electronic mail use. The analysis sought to explore the case of high alter agreement and presumably consistent (rather than conflicting) social influences on the individual. The social influence model would predict larger path coefficients from co-worker use to the endogenous variables. Results presented previously in Tables 4.10 and 4.11 support these predictions.

Results from this sub-sample displayed enhanced social influences compared to effects for the entire sample (which included individuals with alters that both converge and diverge). These results imply that not only do social

influences play a pervasive role in media behaviors, but they are more important when members of a localized network are in agreement. This conclusion must be tempered by the understanding that the analysis employed individual networks using measures of the criterion variable on a post hoc basis. Future research might utilize strategies to identify individuals with communication partners in close agreement and then compare them with individuals having divergent social influences. Such research strategies would provide a priori tests of these relationships.

Limitations of the Present Research

Several limitations of the present research should be addressed. First, the research was performed in a single organization and uses a cross-sectional design. It is possible that findings are appropriate to the host organization but not very generalizable. The fact that the present research was "driven" by theory lends some protection to the problem of generalization (Anderson, 1987). Since the research site had used PROFS for almost ten years, media perceptions and media behaviors were likely to be more stable than sites that have just adopted electronic mail. In addition, the present study evaluated media behavior at PRC by employing a variety of data collection methods over the course of thirteen months so

that the methodological approach taken was not entirely ahistorical in nature.

The use of a single organization forces us to address (if not answer) the question posed by McKelvey (1982): Are organizations all alike or are they all different? In some organizations, the selection of media may be a decision contingent on the individual's supervisor; in others, it may be a decision undertaken by teams or clusters of workers. The criteria for making such decisions are likely to vary among organizations. Indeed, we should not presume that the decision criteria are constant nor will they have to be based on logical models. They may instead be "psycho-logical" (Bem, 1970). Yet the findings that media behavior and media attitudes are influenced by social interaction suggest causal processes that cut across organizational boundaries, processes that ought to be investigated in similar studies of media use in other organizations.

The present survey did not address the communication content dimension of media behavior, except indirectly through the task diversity measure. While the personal interviews facilitated increased understanding of the purposes and styles of media use at PRC, the relatively sparse information regarding the content of media represents a limitation to the present research. This limitation is prevalent in the domain of new communication

technology research although several notable exceptions exist. One strategy employs computer-collected text that is then subjected to computer analysis for semantic themes; see Williams et al. (1988) or Danowski (1987) for descriptions of this method.

The content of communication is an important but relatively under-investigated aspect of electronic communication even if we include the research of Phillips (1989), Aydin (1989), and Sproull & Kiesler (1986). One reason for this neglect stems from the requirement for a long-term commitment of resources needed for longitudinal designs that are more suited to investigate the content of interactions over time. The resources required to analyze the content of text sent interactively by individuals on electronic mail systems seems to be massive, particularly if making sense of this content entails awareness of the communication content in the other media that organization members use to complement and supplement electronic mail.

One solution to what appears to be a structurally intractable research problem is to employ more qualitative designs. Such designs might require longer periods of participant-observation and enlist knowledgeable organizational insiders as members of the research team. These methods provide one way to address the content of the medium and also to include rich details of the social

and organizational contexts in an effort to understand processes of media perception and employment.

Strengths of the Present Research

The present research was designed explicitly to test and integrate competing theories of media behavior. The strategy of methodological triangulation yielded both qualitative and quantitative evidence designed to facilitate the interpretation of results. Data collected from a natural setting greatly enhanced the basis for external validity, a problematical issue in much organizational research conducted using a social information perspective (see Thomas & Griffin, 1983 for a review of experimental and field studies of social information).

The present research design also employed rather conservative operational definitions of social influence within the natural setting. Because the relational data captured elegantly, if not completely, the interaction patterns necessary to test propositions of social influence, threats of common method and common subject variation were minimized when compared to studies using more conventional designs. For this reason, associations found in the present study are likely to be understated.

Future Research

The earlier discussion of limitations of the present research has identified several desirable elements of future research. Research strategies and methodologies should be constructed to better describe three dimensions of media behavior. There should be increased emphasis on: (1) the content of communication, (2) the social context, and (3) the history of interaction within the organization. Such designs would logically take a longitudinal approach and should explicitly address the communication content of different media used in several work groups. I would propose a participant-observation component and the intensive use of insiders to make sense of large volumes of text. The explicit and longitudinal modeling of social and semantic networks (Monge & Eisenberg, 1987) might also be highly appropriate.

Alternatively, future research might use quasi-experimental designs in organizations that regularly change group or team member composition. The concomitant changes in network composition, socially mediated influences relative to media behaviors, and consequent media patterns could be evaluated in such longitudinal designs. These designs should pay close attention to changes in communication task requirements. They should also attempt to determine the temporal order of media attitudes and assessments, and of media use.

Application of the Present Network Methods to Other Studies

The network methodology used to model social influence was initially suggested by the theoretical propositions of Salancik and Pfeffer that stress the importance of the social context in the work-place. The design of the present study was shaped by the necessity to capture and model the effects of social interaction upon co-workers. Once the relational network had been "constructed," each individual's communication alters could have been used to predict any measured behavior of that person.

This methodology can be readily adapted to other questions regarding social influences on the perceptions of organizational tasks or on structural organizational characteristics, the issues originally posed by Salancik and Pfeffer (1978). Such designs would facilitate field experiments that may capture, without inflation, the effects of others (as measured directly from these others) on their organizational colleagues. I believe that this approach enhances methodological capabilities to study other important phenomena in the field of organizational communication, and in the larger domain of organizational behavior.

Conclusions

The present research was intended to test the social influence model of media behavior proposed by Fulk et al. (1987). This theoretical model is grounded in the notion that media behavior is partly a function of shared perceptions among important others and that our attitudes and media choices are derived partly through observational learning. The construct of media richness was included in the model as an approximation of media characteristics but in a way very different from the original conception of the construct's originators.

The incorporation of relational data permitted testing propositions that proposed media richness to have antecedents based upon differences across individuals and upon the effects of social interaction among colleagues at the workplace. These relational data also permitted assessing propositions that carved out important roles for interpersonal influences on the perceptions of media attributes and on actual media usage patterns.

The data were gathered from a research site with a long (and stable) history of electronic mail experience, a site that provided extensive cooperation with the researchers as evidenced by the extraordinarily high response rate to the survey, and a site that provided a substantial amount of qualitative data. The research team

was also given access to important archival records and to computer-monitored electronic records of system use.

The results are clear. Media richness matters; it varies in ways that reflect the individual's personal experience and as a consequence of interpersonal influences. More important, the results emphasize that a more complete understanding of media behavior requires models that explicitly include the relational context. Media behavior is social behavior; as such it is subject to social influences. This should not be surprising yet the dominant perspective still considers both media tasks and media characteristics as largely invariant. The present research, in my view, provides evidence that supports the importance of socially constructed media characteristics and socially influenced media behavior.

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APPENDIX A

Survey Cover Letter

UNIVERSITY OF SOUTHERN CALIFORNIA

Dear [redacted] Employee:

This research team from the University of Southern California has been invited by [redacted] to conduct a study of computer-assisted communication at [redacted] This study is designed to contribute to the growing body of knowledge about how new modes of communication are being used in R&D organizations today. We very much appreciate your cooperation in this research. The attached survey asks you to describe use of the communication features of PROFS in your job at [redacted] We also ask for a bit of information on your background and your communication contacts to understand how situations affect communication in R&D. If you do not normally use PROFS, please complete only Section A of the survey and return it in the enclosed envelope.

Our agreement with [redacted] and you is that all individual information must remain confidential within the USC research team, so that NO ONE at [redacted] or any other source outside of the research team at USC will have access to your individual responses. To keep this agreement, we are asking that the surveys be returned directly to us at the university. We will assign code numbers to individual questionnaires for use in our analyses. In addition, our presentations of findings will be in summary form only, so that no individuals can be identified. We are totally confident that these safeguards will ensure complete confidentiality of your responses. If, however, you really feel you cannot respond to the survey, please take one minute to complete Section A only and return the survey to us. Of course, this makes our research task more difficult, and we'd like you to complete the survey if at all possible.

The survey should take about 30 minutes. Thank you very much for your time, thought and attention. If you have any questions about the survey, you may speak to any member of the research team by calling (213) 743-8900. Please return your survey by March 17.

Sincerely,

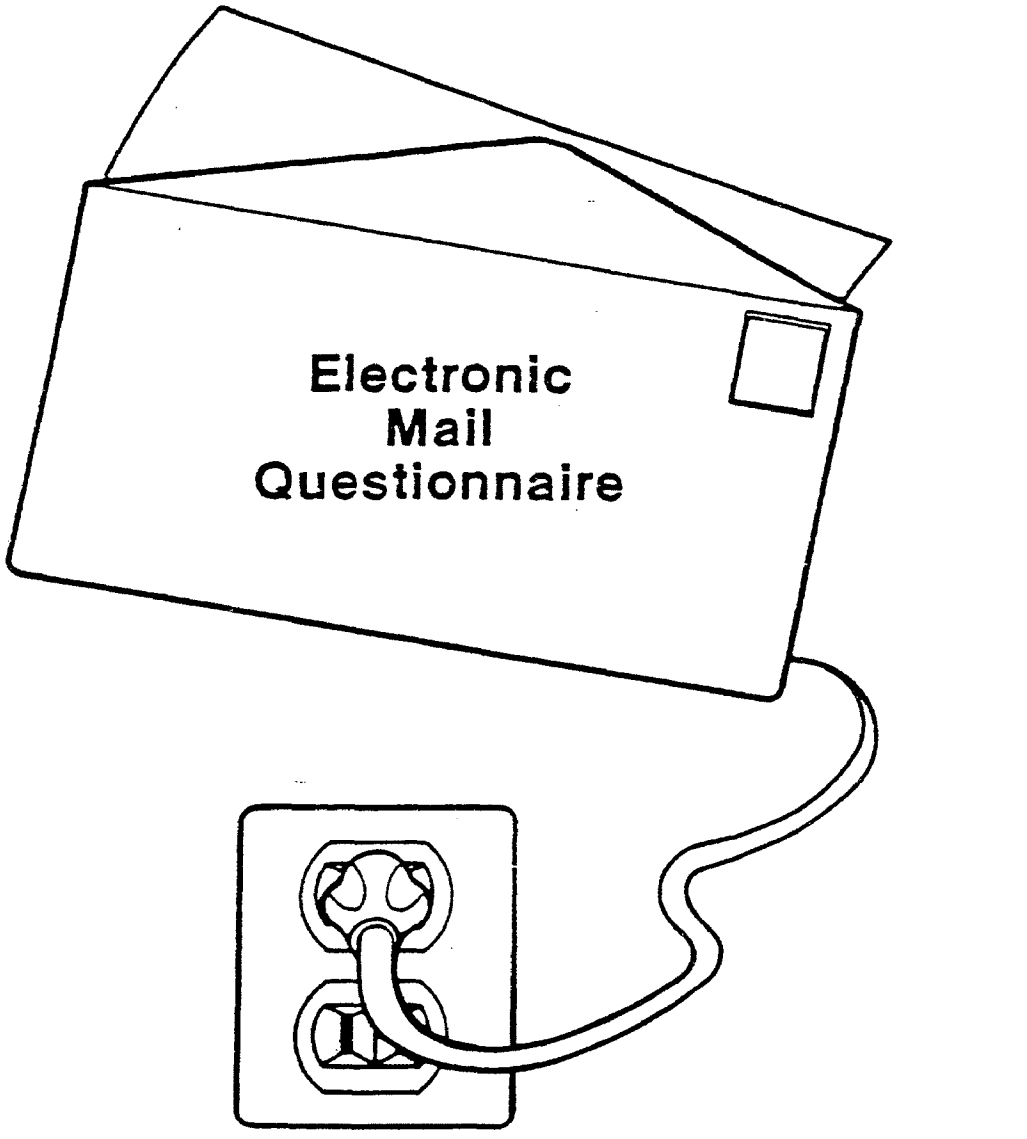
Janet Fulk

Janet Fulk, Ph.D., Principal Investigator
Joseph Schmitz, M.A., Project Manager
Daehee Ryu, M.A., Research Assistant
Charles Steinfield, Ph.D., Project Consultant, Department of Telecommunications, Michigan State University

3502 South Hoover Street
Los Angeles, California 90089-0281
213 743 6273

APPENDIX B

Survey



[redacted] ELECTRONIC MAIL COMMUNICATIONS SURVEY

INSTRUCTIONS

In this survey, we would like you to consider only the COMMUNICATION capabilities of the PROFS integrated office system. For convenience we will refer to these communication capabilities as "electronic mail". Electronic mail communication WOULD include:

(1) sending notes, messages or documents
(2) forwarding notes or documents
(3) receiving notes, messages or documents
(4) any other activities which directly involve COMMUNICATION WITH ANOTHER PERSON.

Electronic mail WOULD NOT include the word processing activities involved in creating text; storing or filing documents; keeping reminders for yourself; or other activities which you do by and/or for YOURSELF.

As best you can, please try to think of the electronic mail activities for which you use PROFS and reply to the survey items ONLY in terms of these electronic mail communications with others.

Please note that this survey has been set up for computer processing using coding numbers which appear in the far right margin of the survey. You can ignore these coding numbers--they are purely to help us process responses to the survey.

SECTION A: CONFIDENTIAL IDENTIFICATION INFORMATION

Please provide the following information in the space provided:

A-1. Name (fill in) _____
First Middle Initial Last

A-2. PROFS user ID number(s)(fill in) _____

_____

A-3. Office number and building (fill in) _____

A-4 Are you a PROFS user? (Check one)

_____ Yes

_____ No (If NO, thank you for completing this page. Please return the survey in the enclosed envelope.)

SECTION B: COMMUNICATION MEDIA USE

Please think back to one DAY in the last week or two which you would consider a typical workday. Keep this day in mind when responding to items B-1 and B-2. Remember to use the definition of electronic mail provided on the previous page.

B-1. On a typical work DAY, how many of each of the following electronic mail communications (notes, messages, and document transmittal) are you involved in? (fill in)

a. Number of NOTES

____ Notes SENT that are authored by you, **including all copies**

____ Notes SENT that are authored by you, **excluding multiple copies**

____ Notes FORWARDED

____ Notes RECEIVED

b. Number of MESSAGES

____ Messages SENT that are authored by you, **including all copies**

____ Messages SENT that are authored by you, **excluding multiple copies**

____ Messages RECEIVED

c. Number of DOCUMENTS

____ Documents SENT that are authored by you, **including all copies**

____ Documents SENT that are authored by you, **excluding multiple copies**

____ Documents FORWARDED

____ Documents RECEIVED

Now, we would like you to think about the proportion of time spent using electronic mail.

B-2. On a typical work DAY, what percent of the time do you spend in each of the following forms of communication? (fill in)

DAY

____% Using PROFS for electronic mail

____% Using PROFS for other functions

____% Writing/reading written reports (paper)

____% Writing/reading written letters or memos (paper)

____% Using the telephone

____% In scheduled face-to-face meetings

____% In other face-to-face conversations (not scheduled)

____% Other activities (NOT communicating with others)

100% of my time on a typical WORKDAY

Now we would like you to think of a typical WEEK in your recent work schedule, and respond to the next item for that WEEK.

B-3. In a typical work WEEK, what percent of your ELECTRONIC MAIL communication is with each of the following persons? (fill in) Please write "N/A" for any category that does not apply. So, for exampl if you have no subordinates, write "N/A" in the space to the left of the "% Your direct subordinates" category.

	WEEK
DOWNWARD:	___% Your direct subordinates
	___% Subordinates of your direct subordinates
	___% Other individuals whom you outrank at [redacted]
UPWARD:	___% Your immediate supervisor
	___% Your supervisor's boss
	___% Other individuals who outrank you at [redacted]
LATERAL:	___% Individuals at your level in your department
	___% Individuals at your level in other departments at [redacted]
EXTERNAL:	___% Individuals at other [redacted] locations
OTHER:	___% Other individuals

100% of my electronic mail communication in a typical WEEK

B-4. Do other persons use your PROFS ID(s) on your behalf for electronic mail communications? (check o

___ No

___ Yes **IF YES, please specify person and type of use below:**

_____

B-5. How long have you used electronic mail at [redacted] (fill in)

_____ year(s)

B-6. How much experience, if any, did you have using computers before using electronic mail at [redacted] (check one)

___ None

___ A little

___ A moderate amount

___ Quite a bit

___ An enormous amount

B-7. How would you rate your skills in using a PROFS keyboard? This includes both knowledge of the keyboard and typing skills. (check one)

____ Very poor
____ Poor
____ Adequate
____ Good
____ Very good

B-8. Did you receive user training on PROFS electronic mail use from PROFS staff? (check one)

____ No
____ Yes

If yes, how helpful was the training?

____ Not at all helpful
____ Slightly helpful
____ Moderately helpful
____ Very helpful
____ Extremely helpful

B-9. How much informal training on electronic mail use have you received from sources other than PROFS staff? (check one)

____ None
____ A Little
____ A Moderate Amount
____ Quite a Bit
____ An Enormous Amount

SECTION C: CHARACTERISTICS OF YOUR JOB

C-1. Which of the following categories best fits your job? (check one)

____ Research
____ Technical Services
____ Research Management
____ Support Services

C-2. How many subordinates directly report to you? (fill in, use "0" if you have no subordinates reporting to you)

____ Number of direct subordinates I have

C-3. For the following questions, please circle the number which best describes how often your job involves each of the listed activities. Use the following list of categories for your response:

1 = Very rarely
2 = Occasionally
3 = About as often as not
4 = Fairly often
5 = Very often

HOW OFTEN DOES YOUR JOB INVOLVE... (circle number)		Very rarely				Very often
a.	Routine, repetitive tasks	1	2	3	4	5
b.	Tasks with clearly defined outcomes	1	2	3	4	5
c.	Working with people you do not know	1	2	3	4	5
d.	Finding novel solutions to problems	1	2	3	4	5
e.	Many different kinds of tasks	1	2	3	4	5
HOW OFTEN IS YOUR JOB GOVERNED BY... (circle number)						
a.	Crises/urgent matters	1	2	3	4	5
b.	Standard operating procedures	1	2	3	4	5
c.	Well defined subject matter	1	2	3	4	5
d.	Time pressures	1	2	3	4	5
e.	Rules, policies and regulations	1	2	3	4	5
f.	Unexpected problems/situations	1	2	3	4	5

C-4. The next questions ask how much your work is linked to others in [redacted]. The term "group" as used below refers to all individuals who report directly to the same supervisor as you do. Please circle the number that best describes your work, using the following scale:

1 = Not at all
2 = Slightly
3 = Moderately
4 = Quite a bit
5 = Very much

WITHIN YOUR GROUP, are the products of your work...(circle one)		Not at all				Very much
a.	Independent of others' work	1	2	3	4	5
b.	Fed into someone else's work	1	2	3	4	5
c.	Dependent on input from someone else's work	1	2	3	4	5
d.	Completed with others in a team approach	1	2	3	4	5

BETWEEN YOU and OTHER GROUPS at [redacted] are the products of your work... (circle one)

		Not at all				Very much
a.	Independent of other groups	1	2	3	4	5
b.	Fed into another work group	1	2	3	4	5
c.	Dependent on input from another work group	1	2	3	4	5
d.	Completed as a team with another group	1	2	3	4	5

SECTION D: USES OF ELECTRONIC MAIL

D-1. Listed below are a number of communication activities for which electronic mail might be used. Please indicate your opinion about the effectiveness of electronic mail for each of the tasks using the following scale:

1 = Not at all effective
2 = Slightly effective
3 = Moderately effective
4 = Very effective
5 = Extremely effective

		Not at all effective				Extremely effective
EXCHANGING INFORMATION						
a.	Exchanging simple information	1	2	3	4	5
b.	Exchanging complex information	1	2	3	4	5
c.	Exchanging documents	1	2	3	4	5
d.	Scheduling meetings/phone calls	1	2	3	4	5
e.	Coordinating project activities	1	2	3	4	5
f.	Exchanging confidential information	1	2	3	4	5
HIGHLY INVOLVING COMMUNICATION						
g.	Persuading/selling a point of view	1	2	3	4	5
h.	Bargaining/negotiating	1	2	3	4	5
i.	Resolving disagreements	1	2	3	4	5
j.	Making decisions	1	2	3	4	5
k.	Generating new ideas	1	2	3	4	5
l.	Evaluating ideas/proposals/results	1	2	3	4	5
m.	Getting quick action/response	1	2	3	4	5
n.	Getting people involved and excited about a project	1	2	3	4	5

PERSONALIZED INTERACTIONS		Not at all effective				Extremely effective
o.	Staying in touch with someone	1	2	3	4	5
p.	Getting to know someone	1	2	3	4	5
q.	Communicating positive performance feedback	1	2	3	4	5
r.	Communicating negative performance feedback	1	2	3	4	5
s.	Airing complaints/gripes	1	2	3	4	5
t.	Communicating humor, wit or sarcasm	1	2	3	4	5
u.	Displaying feelings/emotions	1	2	3	4	5
v.	Showing personal concern or interest	1	2	3	4	5
DIVERSE COMMUNICATION CONTACTS						
w.	Communicating with many individuals	1	2	3	4	5
x.	Communicating with other locations	1	2	3	4	5
y.	Locating new information sources(people)	1	2	3	4	5
z.	Finding new information	1	2	3	4	5
aa.	Reaching someone who is difficult to get hold of	1	2	3	4	5

D-2. How does electronic mail **influence each of the following aspects of your work?** Please use the following scale:

1 = Not at all positively
2 = Slightly positively
3 = Moderately positively
4 = Very positively
5 = Extremely positively

		Not at all positively				Extremely positively
a.	Turnaround time	1	2	3	4	5
b.	Quantity of work you complete	1	2	3	4	5
c.	Quality of your work	1	2	3	4	5
d.	Working with others as a team	1	2	3	4	5
e.	Speed of communication with other departments/sections	1	2	3	4	5
f.	Frequency of communication with other departments/sections	1	2	3	4	5
g.	Quality of communication with other departments	1	2	3	4	5

D-3. The next item asks you to think about how "**information rich**" different communication media are for **your work needs. By information rich**, we mean that the medium permits you to:

- give and receive timely feedback
- transmit a variety of different cues beyond the spoken message (nonverbal cues)
- tailor messages to your own or other personal circumstances
- use rich and varied language

Please rate how **information rich** each of the following media are as you employ them using the following scale:

1 = Not at all rich
2 = Slightly rich
3 = Moderately rich
4 = Very rich
5 = Extremely rich

		Not at all rich				Extremely rich
a.	Formal Numeric Text (computer output)	1	2	3	4	5
b.	Formal Written Text (documents, bulletins)	1	2	3	4	5
c.	Personal Written Text (letters, memos)	1	2	3	4	5
d.	Telephone	1	2	3	4	5
e.	Face-to-face	1	2	3	4	5
f.	Electronic Mail	1	2	3	4	5

SECTION E: COMMUNICATING WITH OTHER SITES

E-1. Does your work involve communicating (over ANY medium) with anyone who is NOT located at [redacted] (check one)

____ No **(If No, please SKIP to section F.)**

____ Yes

E-2. Please fill in the approximate NUMBER of persons you communicate with (using ANY medium) wh are located in each of the following places.

NUMBER OF PERSONS

____ at the General Office

____ at the regional offices

____ at [redacted]

____ at [redacted]

____ at field sites

____ at travel agencies

____ other (please specify)_____

E-3. Approximately what percent of the persons you communicate with **outside** [redacted] are reachable by electronic mail? (fill in)

____ % Percent of my work contacts **outside** [redacted] who are reachable by electronic mail

E-4. In your past, was there a time when these outside persons were NOT reachable by electronic mail? (check one)

____ Yes

____ No **(If No, please skip to section F.)**

E-5. The following questions ask you to compare your PRESENT patterns of communication with outside persons to those you had BEFORE you could reach these persons via electronic mail. Please indicate the extent to which you agree or disagree with each of the following statements using the scale below:

1 = Strongly disagree
2 = Disagree
3 = Neither agree nor disagree
4 = Agree
5 = Strongly agree

As COMPARED to the time BEFORE I could reach outside persons via electronic mail, NOW...

		Strongly disagree				Strongly agree
a.	I less frequently ask others to contact outside persons for me	1	2	3	4	5
b.	Others less frequently ask me to contact outside persons for them	1	2	3	4	5
c.	I have more frequent contact with outside persons	1	2	3	4	5
d.	I know more people at other sites	1	2	3	4	5
e.	People at other sites know [redacted] better	1	2	3	4	5
f.	I consult people at other sites more often about plans, policies, or decisions because they are easier to contact	1	2	3	4	5
g.	People at other sites consult me more often	1	2	3	4	5
h.	I know more about what is going on in other parts of the company	1	2	3	4	5
i.	I have a better sense of being part of the total [redacted] organization	1	2	3	4	5
j.	It is easier to reach higher level managers at other sites without going through channels	1	2	3	4	5

SECTION F: FREQUENT COMMUNICATION CONTACTS

In the space below please give the full names of your **supervisor and FIVE individuals** that you communicate with most frequently **using ALL FORMS of communication**, including telephone, face-to-face conversations and meetings, written, and electronic media.

Then, for each of these persons, think about their perceptions of electronic mail communications. How useful would you guess each of these persons considers electronic mail to be as a communications medium? Please indicate what you think their opinions might be on a scale from 1 to 5, where higher numbers indicate more usefulness.

If you have no idea what a person's opinion might be, write their name down, then just circle the "??" option at the end of the line. Please use the "??" category ONLY if you feel you can't make a reasonable estimate.

F-1. Your supervisor and five most frequent communication contacts using ALL MEDIA.

THEIR perceptions of electronic mail:

	Full Name	Not useful		Moderately useful		Extremely useful	No Idea
Supervisor	_____	1	2	3	4	5	??
1.	_____	1	2	3	4	5	??
2.	_____	1	2	3	4	5	??
3.	_____	1	2	3	4	5	??
4.	_____	1	2	3	4	5	??
5.	_____	1	2	3	4	5	??

F-2. Please list any persons NOT listed above that you have FREQUENT contact with using ELECTRONIC MAIL:

Full names	*Locations (If outside* [redacted]
_____	_____
_____	_____
_____	_____
_____	_____

F-3. Who would you say is the single most important source of information regarding PROFS electronic mail communications? (fill in)

_____ *Full name of person*

F-4. Who would you say is the single most important source of NON-TECHNICAL information related to your work, such as company policies, management issues, etc.? (fill in)

_____ **Full name of person**

F-5. Who would you say is the single most important source of new TECHNICAL information which can help you in your work? (fill in)

_____ Full name of person

SECTION G: WORK GROUP CHARACTERISTICS

G-1. The following statements refer to the group of individuals **who have the same immediate supervisor as you do**. Please indicate how often each statement describes this group using the following scale:

1 = Strongly disagree
2 = Disagree
3 = Neither agree nor disagree
4 = Agree
5 = Strongly agree

		Strongly disagree				Strongly agree
a.	The members of the group are very cooperative with each other	1	2	3	4	5
b.	The assignments in my group are clearly defined and logically structured	1	2	3	4	5
c.	Our superior(s) within the group watches over us carefully in order to make sure that we do things correctly	1	2	3	4	5
d.	The members of this group regard each other as friends.	1	2	3	4	5
e.	There are a lot of policies and standard procedures in my group which a new person must know before beginning a job.	1	2	3	4	5
f.	The group members know that they can depend on each other.	1	2	3	4	5
g.	As long as we keep within broad limits, we can plan and schedule our work as we want to without consulting other members of the group.	1	2	3	4	5
h.	Written policies and procedures are kept to minimum in my group.	1	2	3	4	5
i.	The group members stand up for each other.	1	2	3	4	5
j.	Supervision in the group is much too close.	1	2	3	4	5
k.	Standard operating procedures within the group are spelled out for almost everything that a person does.	1	2	3	4	5
l.	People here must submit frequent oral and written reports to their superior in the group.	1	2	3	4	5
m.	Members of the group work together as a team.	1	2	3	4	5

		Strongly disagree				Strongly agree
n.	My group has very detailed reporting procedures for almost all activities and functions.	1	2	3	4	5
o.	We are expected to have very little contact with the boss on a project, regardless of its importance, unless we specifically ask for help or advice.	1	2	3	4	5

G-2. How long have you worked with the group you have just described? (fill in)

_____ year(s)

SECTION H: BACKGROUND CHARACTERISTICS

H-1. What is your sex? (check one)

_____ Male

_____ Female

H-2. What is your age as of your last birthday? (fill in)

_____ Age at last birthday

H-3. What is the highest level of education you have completed? (check one)

_____ Some high school

_____ High school diploma

_____ Some college

_____ Bachelor's degree

_____ Master's degree

_____ Doctorate

H-4. How long have you worked at [redacted] (fill in)

_____ year(s)

SECTION I: GENERAL COMMENTS

I-1. Did you use information from a mail log to help in filling out this survey? (check one)

_____ No

_____ Yes

I-2. Overall, how useful do you consider electronic mail to be as a communication medium? (circle one)

Not useful		Moderately useful		Extremely useful
1	2	3	4	5

I-3. What do you like most about using electronic mail?

I-4. What do you dislike most about using electronic mail?

I-5. Are there any questions about electronic mail that we should have asked you, but didn't? If so, please describe them below.

THANK YOU VERY MUCH FOR YOUR COOPERATION

Please use the back of this page for any comments you may have about this study. Return the completed questionnaire in the attached envelope to:

Dr. Janet Fulk
Annenberg School of Communications
University of Southern California
Los Angeles, CA 90089-0281
(213) 743-8900

APPENDIX C

Interview protocol

I. GROUNDING USE OF E-MAIL IN SPECIFIC TASKS

1. Think of a recent time when you were working on something and you found the use of electronic mail to be particularly useful and appropriate. We'd like you tell us more about this specific task situation. Could you first briefly describe the situation?

2. a. Why did you choose electronic mail for this task?

b. What specific features of electronic mail were most useful for this task?

c. What features of the task made it a good candidate for using electronic mail?

3. In our questionnaire, we asked you to rate the characteristics of your job. How would you rate:

1. the routineness of this task

2. the potential for misinterpretation of this task

3. the time pressure associated with this task

4. other task characteristics

4. We're also interested in the extent to which you feel electronic mail is NOT appropriate for specific task situations. Once again, think of a recent time when you were working on something, and avoided using electronic mail. Now please briefly describe this situation.

5. a. Why did you not use electronic mail in this task situation?

b. What specific features of electronic mail made it not useful for this task?

c. What features of the task made it bad for using electronic mail?

6. Once again how would you rate:

   1. the routineness of this task

   2. the time pressure associated with this task

   3. the level of interpersonal involvement this task requires

   4. other task descriptors...

7. Can you think of one task in your work for which electronic mail is ideal? Please describe it, and what makes it so ideal for email.

II. INFLUENCE OF ELECTRONIC MAIL ON IMPORTANT OUTCOMES

1. a. Are there specific outcomes associated with your job, such as the things you are trying to produce?

   b. Using the previous year as reference, can you briefly describe 1 or 2 specific outcomes upon which you worked?

2. Let's first discuss (outcome 1), did you use electronic mail to facilitate your work on this? If so, in what ways did it affect your ability to produce this outcome?

Probes... (these are phrased in the positive, but could be negative)

(a) enabled quicker development of outcome (if so, how? greater access to relevant information, speedier dissemination of info to project team members, more timely feedback/evaluation of info, more efficient coordination of group efforts...?)

(b) enabled development of a higher quality outcome (if so, how and in what ways? - more useful, fewer initial problems...?)

(c) enhanced satisfaction with work on project (how so? more frequent contact with others, more open and accurate communication, less interruption, less telephone tag...?)

(d) any other desirable or undesirable influences?

3. Do you use PROFS to similar effects on other outcomes you mentioned? Any differences?

4. What is the single greatest impact PROFS has on your work?

III. PROFS COMMUNICATION WITH ORGANIZATIONS OUTSIDE PRC

1. Has there been a time in the recent past when your work required you to contact someone outside PRC? a. Did you use PROFS to accomplish any part of this work? Why did you decide to use PROFS for this communication?

b. Did you use the telephone, letters or any other media as well as PROFS to accomplish this task?

c. Was this task fairly typical of the kind of situation in which you would use PROFS to communicate outside PRC? If yes, what things about it make it typical? If no, why not?

2. Has there been a recent project on which you communicated with someone outside PRC and did NOT use PROFS?. If yes, describe the task.

a. Why did you decide NOT to use PROFS for the task?

(Probe for task characteristics, system capabilities or communication partner preferences which may account for different uses of PROFS).

b. Is this situation fairly typical of the kind of situation in which you would NOT use PROFS for external communication? Why or why not?

3. In general, when you do communicate with PROFS outside PRC, do you send messages to a specific individual who then responds, or do you send to a contact who then distributes information for you or gathers information you need? Or, perhaps both?

If both, what differences are there between situations when you make direct contact and those where you use an intermediary?

4. Overall, would you say that PROFS helps more people at PRC to communicate DIRECTLY to others off site, rather than, say, going through someone else at PRC--someone who maintains regular contacts at other sites?

5. Do you ever contact people at other sites for people here? If yes, is it less now that other sites are getting up to speed on PROFS?

6. Has there ever been a time when you used PROFS to communicate with individuals outside PRC that you didn't already know or didn't know well?

IV. GATEKEEPING

One of the POTENTIAL outcomes of electronic communication is the ease of communication with individuals that you otherwise might not have direct contact with.

1. Have there been times when you used PROFS to "talk" to individuals outside your immediate work group that you otherwise might NOT contact directly?

a. If yes, please describe the situation.

2. Have you found ways to use PROFS to initiate a first contact with individuals who have information you need?

a. If yes, please give an example.

b. Have others used PROFS to initiate contact with you?

3. Have you used PROFS to provide technical information to others outside your work group?

a. If yes, please give an example.

4. Have you used the TDF (text display facility) to search for information or (personal) sources of information you need? -- has this lead you to initiate contacts with others?

a. If yes, please give an example

V. CONFIDENTIALITY.

Next we'd like to ask you about confidentiality and information security.

1. Have there been times when you decided NOT to use PROFS because of issues of confidentiality or information security?

If yes, would you be willing to describe in broad, general terms what your concerns were?

If no, can you imagine a situation in which that issue would come up in your work, and you might choose not to use PROFS?

2. Do you happen to have run across PROFS communications by others that appeared to disclose information that perhaps should have been "private"?

If yes, please describe in general terms.

3. Do you happen to have come across situations in which PROFS communications were sent to people who should NOT have had access to THAT particular information?

If yes, would you describe the situation in general terms?

4. Are you aware of when someone felt that a situation involving PROFS communication may have impinged on a user's privacy?

If so, would you describe this situation in general terms?

5. We all run into situations where messages of one kind or another inadvertently get misdirected. Have you or others ever inadvertently sent a PROFS note or message to the wrong recipient?

6. Have you heard of times when PROFS was used to send a message which reached individuals not anticipated by the sender, for example, from being forwarded? What happened?

7. Have you ever felt, looking back, that maybe PROFS was not the best choice for communicating a sensitive matter, and wished that a different way of communication had been used?

If yes, please describe the situation.

8. Have you experienced or heard of times when individuals outside PRC obtained "sensitive" information via their PROFS accounts?

If yes, would you be willing to describe this occasion?

VI SOCIAL INFLUENCES

1. (FOR NEW USERS ONLY) We are also interested in how situations affect the way people use electronic mail for communication. If we can go back to the time when you first started using PROFS for electronic mail... Approximately when was that?

Can you recall exactly how you came to try it out for the first time? That is, did anything in particular happen to get you started on using it?

Were many other people that you work with using it heavily then?

Do you think you went into it with high expectations about how useful it would be, low expectations, or perhaps no specific expectations at all?

When you first started using PROFS electronic mail, did these expectations change? What caused these changes, do you think?

2. (FOR ALL) Organizations often have written and unwritten rules about how people should communicate. Do you sense any rules or expectations about what you should or should not use PROFS electronic mail for? Can you give some examples? (Probe for whether they seem to be just rules or whether they are normative statements reflecting attitudes on appropriate use of PROFS)

What would happen if a person violated this rule/expectation?

How did you come to be aware of this rule/expectation? PROBE TO INSURE COMMENTS APPLY TO WRITTEN OR UNWRITTEN OR BOTH

3. Do you see any differences in how people use electronic mail in different parts of PRC? For example, do some groups seem more enthusiastic users, or some groups use it more to communicate with regional offices or field sites, or some groups just prefer the phone or memos?

a. If yes, ...probe how different

b. If no, ...so, then you don't often feel the need to think about another group's way of communicating in order to decide how best to get a message across with them...?

4. Sometimes organizations have stories about electronic mail that get passed around. These stories might relate a funny incident, a disappointment, a time PROFS saved a project at the last minute, a time when using electronic mail screwed something up, a time somebody used electronic mail in a funny way, or maybe even about something that happened here with electronic mail in the early days.

before a lot of the newer people were here. Do you know of any such stories or incidents here at PRC?

a. If yes, ...probe for details.
b. If no, ...what about similar incidents from your own experience?

5. Do people ever talk in general about using PROFS for electronic mail?
If yes, probe how the talk is initiated, content, circumstances, effects.

6. Do you find that individuals vary in so far as there is a best way to communicate with them about an issue, problem, or task? For example, whether its best to write a memo, pick up the phone, use electronic mail? Probe individual differences and the extent these preferences are modeled.

7. Does your supervisor have any preferences about when to use and when not to use PROFS? Probe for examples and if media preferences of supervisor and individual converge or diverge.

8. On one of my earlier visits here I heard the term "cheerleader" used to describe someone who was really excited about the ability of electronic mail to improve PRC communication. Is there anyone you know of that you would call a cheerleader for electronic mail?

a. If yes, what things does this person do that lead you to think of him/her as a cheerleader? Probe, then move to naysayer below.

b. If no, So, no one stands out as a really aggressive and upbeat supporter. How about the other side of the coin--is there anyone you are aware of who might be negative about the effects of PROFS--you need not give particular names. We're just interested in whether you know of someone who plays that role. If yes, what things does this person do that lead you to think of him/her as negative or cynical about PROFS? Why do you think the person feels that way? Probe.

CONCLUSION

Ask for overall feelings and assessments

Are there any questions I should have asked but did not?

GIVE THANKS AND GO