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SOCIAL CONSTRUCTION OF COMMUNICATION TECHNOLOGY

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According to social constructivist theories of communication technology in organizations, work group members share identifiable patterns of meaning and action concerning communication technology. Empirical evidence of these patterns was found in a study of electronic mail use among a group of scientists and engineers. Social influences on technology-related attitudes and behavior were consistently stronger when individuals were highly attracted to their work groups. For individuals with low attraction, the specific patterns of influence were consistent with predictions from conformity research for compliance effects only; for those with high attraction, both compliance and internalization effects emerged.

The use of sophisticated communication technologies in the conduct of work is a commonplace in organizational life. Organizational researchers have developed theories of the social construction of such technologies. These theories propose that interactions with social agents control the technologies and their effects and that attitudes toward and uses of technologies converge in social systems (Contractor & Eisenberg, 1990; Fulk, Schmitz, & Steinfield, 1990; Poole & DeSanctis, 1990; Rice & Aydin, 1991; Rice, Grant, Schmitz, & Torobin, 1990; Schmitz & Fulk, 1991). However, precious little empirical research has been conducted to enrich knowledge claims within this paradigm. The research reported here contributes to what is hoped will be a continually expanding body of empirical evidence that can increase knowledge not only of communication technology, but also of underlying organizational social processes.

THEORY AND HYPOTHESES

Theories of the Social Construction of Communication Technology

Fueled by a growing body of historical studies of the social shaping of technological systems as diverse as electrical power networks (Hughes, 1983), the bicycle (Pinch, 1986), and missile guidance systems (MacKenzie

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& Wajcman, 1985), social constructivist thinking about technologies has penetrated the organizational context. Weick (1990) drew on Law's (1987) study of Portuguese navigation in the 13th through 16th centuries to argue that technology emerges from relations among a heterogeneous set of elements. Weick's conceptualization of the sensemaking of communication technology as "equivocal" captures a core assumption underlying this new trend in communication technology studies: technologies are equivocal because they can be interpreted in multiple and perhaps conflicting ways. Technologies provide unusual problems in sensemaking because their processes are often poorly understood and because they are continuously redesigned and reinterpreted in the process of implementation and accommodation to specific social and organizational contexts. Communication technologies in particular link disparate entities in a seamless web that engages joint sensemaking in the process of mediated interaction.

If communication technologies are indeed equivocal, what is the essential character of this equivocality, how does it arise, and how is it resolved, if at all, in the process of utilization? Trevino, Lengel, and Daft (1987) drew on structural symbolic interactionism (Stryker & Statham, 1985) to argue that technology users create rich meanings in mediated communication through their choices of media with specific symbolic features. In McLuhan's (1964) terms, the medium is the message. For example, the use of a formal, written medium symbolizes authority and can represent a dominance move on the part of the sender.

Yet symbolic features need not be fixed attributes of a medium. The symbolic meanings may well arise, be sustained, and evolve through ongoing processes of joint sensemaking within social systems. In their "adaptive structuration" approach to communication technology, Poole and DeSanctis (1990), drawing on Giddens (1979), highlighted the joint production and reproduction of structure and action in the process of interacting via communication technology. From their perspective, a constantly evolving set of social structures and technological manifestations arises as groups selectively appropriate features of both a technology and the broader social structure in which the group is embedded. As Contractor and Eisenberg noted, communication structure and uses of organizational media shape each other "in an emergent pattern of mediated and non-mediated social interaction" (1990: 147).

Structuration processes also affect meaning construction. Weick noted that communication technologies "are both a cause and consequence of structure. This dual role of technology occurs because structuring is an ongoing process that shapes the meaning of artifacts through scripts, interaction, and tradition and is itself shaped by those meanings" (1990: 22–23). Barley (1986, 1990) similarly posited that the reciprocal link between structure and action is tied to scripts that carry the rules and resources of the interaction structure. Scripts represent cognitive organization that reflects and reproduces social action. Poole and DeSanctis more forcefully stated the inescapability of coordinated meaning construction in the social shaping of

a communication technology: "Objectification and decontextualization conceal the social nature of technologies. Continually bombarded by such discourse, we forget that users constitute and give meaning to technologies. Until applied by a user in a specific context, a GDSS¹ or any other technology is simply dead matter" (1990: 178).

Within the realm of the mutual determinism of technology and social structure, what specific social processes engage individuals? In their social influence model of technology use, Fulk and colleagues (1990) identified multiple social psychological processes that can explain coordinated patterns of meanings and behaviors toward technology within social groupings. Foremost among these processes are those described by social learning theory (Bandura, 1986) and social information processing theory (Salancik & Pfeffer, 1978).

Social learning theory (Bandura, 1986) predicts coordinated behaviors and meanings that arise through several processes of modeling. (1) Observational learning occurs when individuals acquire cognitive skills, new behavior patterns, or both by observing the behavior of other individuals. (2) Inhibitory and disinhibitory effects arise from observation of the consequences of a behavior for others who have exhibited that behavior and from observers' estimates of the likelihood of experiencing the same consequences. (3) Response facilitation is present when models' behavior serves as a social prompt for behaviors for which previously there has been insufficient inducement. (4) Arousal occurs because emotional reactions in individuals tend to elicit emotional reactions in observers. (5) Environmental enhancement occurs when "a model's behavior channels the observers' attention to particular stimuli or draws observers into settings which elicit similar behavior" (Bandura, 1986: 49).

Behavioral patterning through modeling is not simply imitation; it involves considerable cognitive processing of stimuli. The symbolic representation of experiences is a key step in the retention of modeled behavior. The complex interplay of behavior and cognition can produce not only coordinated behavior, but also coordinated meaning structures. Furthermore, judgments and attitudes can be the subject of modeling and thus can be acquired through social learning. Social influences operating within closely knit networks are key sources of social learning (Bandura, 1986: 152). The application of these principles to communication technology suggests that technology-related behaviors and attitudes can be produced in a work setting through processes of modeling, which increases the likelihood that attitudes and behavior will converge between modelers and observers (Fulk et al., 1990).

Social information processing theory (Salancik & Pfeffer, 1978) proposes multiple mechanisms whereby co-workers influence the attitudes and behavior of individuals. Social information from co-workers can take several

¹ GDSS represents group decision support system technology.

forms: (1) overt statements that individuals assimilate, (2) interpretations of events, (3) communications that increase the saliency of events simply by calling attention to them, and (4) provision of standards for judging the appropriateness of particular behaviors and for appropriately rationalizing workplace activities. Fulk, Steinfield, Schmitz, and Power (1987) proposed that social information will influence perceived media characteristics, perceived communication task requirements, attitudes toward communication media, and media use behavior. The net effect is to produce "a similar pattern of media attitudes and use behavior within groups, even across tasks with different communication requirements," and "different patterns of media usage across groups" (Fulk et al., 1987: 542–543).

These constructivist perspectives share the core proposition that social and symbolic processes produce patterns of shared cognitions and behavior that arise from forces well beyond the demands of the straightforward task of information processing in organizations. The mechanisms by which these coordinated patterns theoretically are produced differ among the perspectives not so much because of conflicting premises as because the theories focus on different aspects of the social construction process. Structuration premises, for example, focus on the group level of analysis (Poole, Siebold, & McPhee, 1985), whereas the structural symbolic interactionist perspective (Trevino et al., 1987) focuses on the symbolic meanings of media, and the social influence perspective (Fulk et al., 1990) seeks to explain social effects on individual attitudes and behavior. They all share the theoretical assumption that cognitions and behavior can be predicted from knowledge of social and symbolic interaction.

The purpose of the research reported here was to empirically demonstrate such convergent patterns of meaning and action and to show that such patterns are more consistent with social influences than with other mechanisms that might have produced them. A key contributor to this demonstration is individuals' attraction to the groups in which the social influences are presumed to occur.

Convergent Meanings and Coordinated Behavior in Formal Work Groups

Decades of research in social psychology have demonstrated that formal work groups are the sites of important social influences and reality construction processes. Research on conformity distinguishes between internalization and compliance effects of groups on individuals. Internalization refers to individuals' private acceptance of group messages and the incorporation of group meanings and attitudes into their own constructions of reality. Internalization produces convergence of interpretations, attitudes, and meanings between an individual and a group. Compliance refers to individual behavior that conforms to perceived group pressures. Compliance produces convergence of behavior patterns between an individual and a group. Festinger (1953) identified these two key types of social influence as private acceptance and compliance. Some researchers have interpreted Deutch and Gerard's (1955) categories of normative and informational influence as re-

flecting acceptance and compliance (e.g., Allen, 1965; Nail, 1986). Considerable evidence has accumulated over the decades to support the existence of social influence through internalization and compliance (for reviews, see Levine and Russo [1987], Moscovici [1980], McGrath and Kravitz [1982], Bettenhausen [1991], and Levine and Moreland [1990]).

One key moderator of internalization and compliance effects is an individual's attraction to a group. In general, research has shown that high attraction to a group is conducive to internalization, as individuals enact shared norms and submit to perceived mechanisms of social control (Braver, 1975; Festinger, Gerard, Hymovich, Kelley, & Raven, 1952; Gerard, 1954; O'Keefe, Kernaghan, & Rubenstein, 1975; Rasmussen & Zander, 1954; Seashore, 1954; Wyer, 1966). Internalization under conditions of attraction results from drives to reach psychological agreement, reduced tension and anxiety, enhanced communication between an individual and the group, and perceived group pressures against dissent (Shaw, 1981).

When an individual does not experience attraction to a group, internalization is unlikely. The individual does not experience the same drive for agreement, does not perceive pressures toward attitude and value conformity, and is not motivated to seek such consensus. Also, there is less communication between the individual and the group than when high attraction exists (Back, 1951; Festinger, Schachter, & Back, 1950; McCauley, 1989; Tuckman, 1965). The absence of internalization implies the absence of convergence between the individual and the group in attitudes, meanings, and interpretation. Translating these conclusions to the concept of social construction of communication technology, I propose

Hypothesis 1: Work group technology attitudes will be a positive predictor of technology attitudes for individuals who exhibit high attraction to the group, but not for individuals who exhibit low attraction.

The net effects of compliance pressures are different from those of internalization. An individual may engage in compliance behavior toward a group in the absence of attraction. If attraction is low, a person may comply with behavioral expectations out of fear of recrimination (Janis, 1982; McCauley, 1989). This behavioral compliance does not require attitudinal compliance (internalization). The person merely complies by aligning visible behavior with group expectations. An extreme historical example of mere compliance is the finding that more than 90 percent of the members of the U.S. Army taken prisoner of war during the Korean conflict collaborated with their captors, but that their collaboration was simply "overt compliance unrelated to changes in beliefs" (McGuire, 1985: 251). Given the existence of compliance pressures, it is not surprising that research often finds low correlations between attitudes and behaviors (McGuire, 1985).

If attraction to a group is high, however, a person may comply in response to group norms (Gladstein & Reilly, 1985; Moorhead, 1982), a powerful and attractive leader (McCauley, 1989; Nemeth & Staw, 1989), or "a

more tacit form of influence, that of agreement with majority viewpoints” (Aldag & Fuller, 1993: 542). Thus, pressures are likely to be more potent when individuals experience attraction to a group. Perhaps the strongest theoretical argument for this position is presented in Janis’s (1982) model of “groupthink,” in which experienced cohesion is a critical antecedent condition. That theory proposes that when group cohesion is high—when all or most members experience attraction to the group—individuals will experience greater pressures toward unanimity and greater self-censorship, which will produce more uniform behavior. Although some empirical research supports this theory, overall this premise as articulated in relation to groupthink has yet to be subjected to adequate empirical testing (Aldag & Fuller, 1993). Applying this research and theory to the communication technology-related behaviors of members of organizational work groups, I propose

Hypothesis 2: Work group members’ technology use behavior will be a positive predictor of an individual’s technology use behavior.

Hypothesis 3: Work group members’ technology use behavior will be a stronger predictor of technology use behavior for individuals who exhibit high rather than low attraction to the group.

In combination, the literature and hypotheses suggest that when an individual experiences attraction to a group, the individual “buys in” to group norms and majority attitudes and exhibits behavior that mirrors that of the group. Conversely, when an individual experiences little attraction to the group, only outward behavioral conformity resulting from compliance pressure can be expected. The lack of internalization means that attitudinal conformity is unlikely.

Work-group- versus social-network-based social influence. Work groups are not the only sources of the social construction of technology-related attitudes and behaviors. Four studies have demonstrated convergence of technology-related meanings and behavior in communication networks. Rice, Grant, Schmitz, and Torobin (1990) and Rice and Aydin (1991) constructed relational communication networks based on interaction patterns in an organization. Rice and colleagues (1990) found that individuals were more likely to adopt electronic mail if others in the network also adopted it. Rice and Aydin (1991) found that individuals perceived their network partners as holding similar attitudes toward a computerized information system. Schmitz and Fulk (1991) and Fulk and Ryu (1990) built “ego networks” composed of “those interconnected individuals who are linked by patterned communication flows to a focal individual” (Rogers & Kincaid, 1981: 134). Each ego network included a focal individual’s supervisor and the five people who communicated most frequently with the focal individual using all media. Schmitz and Fulk (1991) found that the attitudes and

technology-related behaviors of individuals converged with the average of the actual attitudes and behaviors of the individuals in their ego networks. In a different sample, Fulk and Ryu (1990) found that individuals' attitudes and technology-related behaviors converged with their perceptions of the attitudes and behaviors within their ego networks.

What are the relative strengths of formal work group social influence and social network ties? To address this question, I included in the predictive model the previously demonstrated link between ego-network-based social influence variables and an individual's technology-related attitudes and behaviors. People with whom individuals communicate frequently using all media (their ego networks) are likely to influence their attitudes and behaviors toward use of communication media through processes of behavioral modeling (Bandura, 1986). However, the conformity pressures on individuals attracted to formal work groups are somewhat different. They appear to be importantly linked to unique group-level features, including leadership and power, norms, and identifiable majority positions (Nemeth & Staw, 1989). The net effect is to produce a different type of pressure directed toward compliance, but also directed toward internalization when the individuals are attracted to the groups. Thus, I predicted that work group social influence would show explanatory power separate from that of the influences emanating from ego networks.

Hypothesis 4: Work group members' attitudes and use of technology will explain variance in individuals' communication technology use and attitudes beyond that explained by ego-network-based social influence variables.

A related question is, how strong are work group social forces in comparison to influences emanating from an individual's ego network? Most research to date has found that network variables have only moderate effects on technology-related attitudes and behaviors (Rice & Aydin, 1991; Rice et al., 1990; Schmitz & Fulk, 1991). By contrast, the vast literature on conformity has demonstrated group effects on highly attracted individuals that are far from moderate across a wide variety of influence objects. To investigate the relative strength of these forces on technology-related behavioral patterning and coordinated meaning, I tested a final hypothesis:

Hypothesis 5: For individuals who exhibit high attraction to a work group, work-group-based social influence variables will be stronger predictors of individual attitudes and behaviors than ego-network-based social influence variables.

Richness, usefulness, and frequency of use. Two attitudes and one behavior were of particular interest in the research reported here. The first attitude is the perceived richness of a technology, or an individual's percep-

tion of the technology's ability to facilitate shared meaning (Trevino et al., 1987). Richness perceptions are based on the capability of a technology to: (1) provide instant feedback, (2) transmit verbal and nonverbal cues, (3) use natural language rather than numbers, and (4) convey personal feelings and emotions. Richness has been a central variable in the study of communication media use in organizations. The second attitude is the perceived usefulness of the technology as a communication medium. Schmitz and Fulk (1991) described perceived usefulness as a key evaluative belief about a technology. The behavior is the reported frequency of use of the technology. Thus, I expected internalization effects for the two attitudes, perceived richness and perceived usefulness, and compliance effects for the behavior, perceived frequency of use.

Media expertise. The communication technology studied in this research was electronic mail. Schmitz and Fulk (1991) included three media expertise variables in their model of social influence on media perceptions for electronic mail: medium experience, computer experience, and keyboard skills. They argued: "Individuals with little experience or skills will have difficulty making judgments of its richness and may be inhibited from using the medium even in a supportive social environment. Experience and skill should facilitate electronic mail assessments and 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 electronic mail familiarity" (1991: 492). To attain consistency with this earlier research, I included these predictors of the perceived richness of a technology in the model employed here.

Schmitz and Fulk also proposed a link between the actual use behavior of significant sources of social influence and an individual's perception of the usefulness of technology. They argued: "Coworkers who model electronic mail use facilitate the acquisition of positive evaluative beliefs (attitudes) by their peers. Clearly, individuals may form negative assessments of behavior modeled by coworkers, but social processes elaborated by Bandura (1986), Rose (1962), and Salancik and Pfeffer (1978) suggest that positive assessments are more likely" (1991: 494). Again, to attain consistency with this earlier work, I included this additional link to the perceived usefulness of the technology in the model tested here. There was little evidence to suggest that internalization and compliance would influence this link differently, however. Thus, I proposed no moderating hypothesis.

Perceived task attributes and demographics. Social constructivists have argued that the role of social interaction has been underestimated in technology effects models of communication technology use. The research reported here was designed to provide empirical evidence of effects consistent with social constructivist premises, in support of existing theoretical statements. Social constructivist models are not deterministic, however. That is, theorists do not presume that social interaction is the only explanation for technology-related attitudes and behaviors. Multiple models point

to the influences of task features and individual differences on technology-related behavior. I viewed those variables as controls in this research in order to estimate incremental social influence effects. In essence, the social influence effects predicted here have gone unmeasured under other models of technology use. Incremental variance explained would represent opportunities for increasing the comprehensiveness of models of communication technology effects. I included seven task and individual demographic predictors as control variables. Task routineness may affect technology use, in that media of lower "bandwidth" (Short, Williams, & Christie, 1976), or richness (Daft & Lengel, 1984), may be appropriate for routine tasks. Such media convey fewer nonverbal cues and provide leaner, less varied feedback (Daft & Lengel, 1984). Thus, they are less appropriate for complex and ambiguous tasks than are richer media (Daft & Lengel, 1984; Short et al., 1976). When an individual's job is highly nonroutine, use of less rich media, such as written memos and electronic mail, will be relatively infrequent (Daft & MacIntosh, 1981). Job pressures will lead an individual to favor media that provide rapid communication capabilities, such as telephone and electronic mail. Both Trevino and colleagues (1987) and Steinfield and Fulk (1986) found support for this prediction. Task interdependence within a group should lead individuals to increase communication in general, across all media, over the amount of communication associated with relative autonomy in carrying out a task. Similarly, task interdependence across groups should lead to a higher volume of information processing and communication than intergroup independence (Daft & Lengel, 1986). If social influence processes are indeed powerful, they should be able to demonstrate unique effects beyond those attributable to perceived task attributes. In sum, technology use for electronic mail should be positively related to task routineness, job pressures, task interdependence with a group, and task interdependence across groups.

Three individual-level demographic characteristics were included as control variables: age, education, and gender. Age and educational level were included because younger and more educated individuals are believed to be more receptive to technology (Dutton, Rogers, & Jun, 1987). Gender was included because women's acceptance of technology is a key issue in the computing literature (e.g., Gattiker, in press). These demographic controls must be considered limited, however, since the data in this study were highly skewed toward highly educated men.

Endogenous relationships. Schmitz and Fulk (1991) proposed in addition that perceived richness will predict both the perceived usefulness and frequency of use of a technology. They argued:

The SI [social influence] model proposes that efficiency is not the only criterion for assessing media—a richer medium can be seen as equally useful for unambiguous tasks as for ambiguous ones. Media richness does not constrain a medium's usefulness only to complex and difficult communication tasks. The more types of situations for which a medium is usable (the richer it is

perceived to be in terms of speed, number of channels, type of language, and personalness), the more useful it may be seen and the more it may be used, regardless of efficiency considerations. As Markus' (1988) research showed, individuals do not always make the most efficient and effective media choice using criteria of objective efficiency (1991: 492).

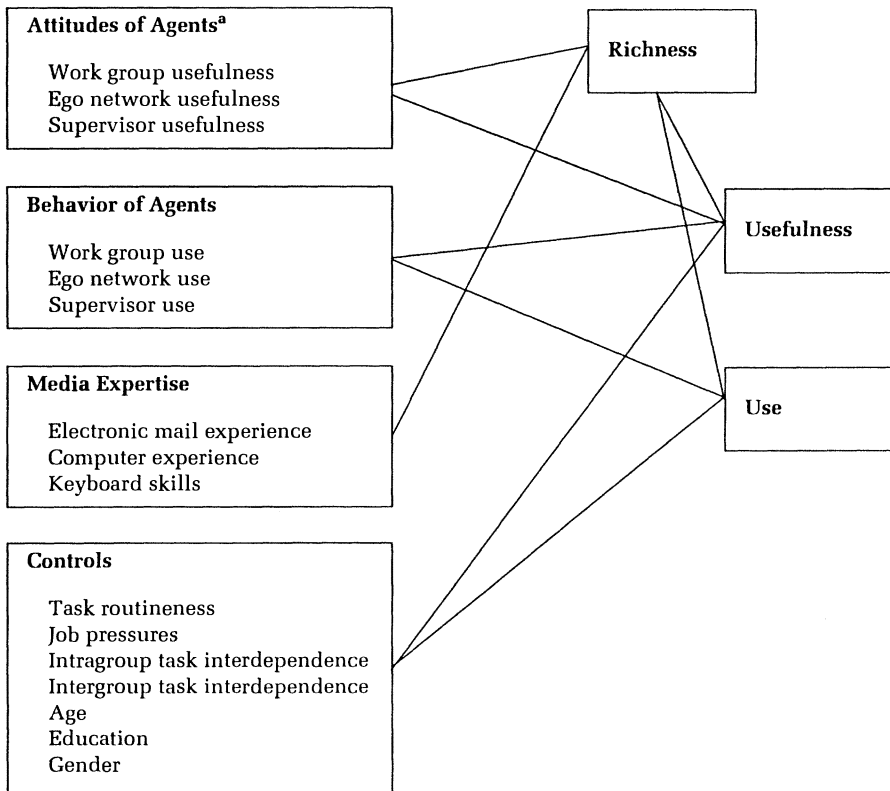
Thus, this proposed relationship is also empirically modeled. Figure 1 and Table 1 provide summaries of the overall model that was tested separately for individuals with high versus low attraction to a work group. Table 1 indicates the specific hypotheses.

METHODS

Data and Procedures

The research was conducted in the production research company of a major petrochemical corporation studied by Schmitz and Fulk (1991). The

FIGURE 1
Schematic of Relationships



^a For the low-attraction-to-group respondents, no links from attitudes were hypothesized

TABLE 1
Hypothesized Model^a

Variables	Endogenous Variables		
	Individual Attitudes		Individual Behavior
	1. Richness	2. Usefulness	3. Use
Exogenous			
Attitudes of influence agents			
1. Work group usefulness	$\gamma_{1,1}$	$\gamma_{2,1}$	
2. Ego network usefulness	$\gamma_{1,2}$	$\gamma_{2,2}$	
3. Supervisor usefulness	$\gamma_{1,3}$	$\gamma_{2,3}$	
Behavior of influence agents			
4. Work group use		$\gamma_{2,4}$	$\gamma_{3,4}$
5. Ego network use		$\gamma_{2,5}$	$\gamma_{3,5}$
6. Supervisor use		$\gamma_{2,6}$	$\gamma_{3,6}$
Media expertise			
7. Electronic mail experience	$\gamma_{1,7}$		
8. Computer experience	$\gamma_{1,8}$		
9. Keyboard skills	$\gamma_{1,9}$		
Controls			
10. Task routineness		$\gamma_{2,10}$	$\gamma_{3,10}$
11. Job pressures		$\gamma_{2,11}$	$\gamma_{3,11}$
12. Intragroup task interdependence		$\gamma_{2,12}$	$\gamma_{3,12}$
13. Intergroup task interdependence		$\gamma_{2,13}$	$\gamma_{3,13}$
14. Age		$\gamma_{2,14}$	$\gamma_{3,14}$
15. Education		$\gamma_{2,15}$	$\gamma_{3,15}$
16. Gender		$\gamma_{2,16}$	$\gamma_{3,16}$
Endogenous			
1. Richness		$\beta_{2,1}$	$\beta_{3,1}$
Hypothesis 1: $\gamma_{1,1}(H) > 0$; $\gamma_{1,1}(L) = 0$ $\gamma_{2,1}(H) > 0$; $\gamma_{2,1}(L) = 0$			
Hypothesis 2: $\gamma_{3,4}(H) > 0$; $\gamma_{3,4}(L) > 0$			
Hypothesis 3: $\gamma_{3,4}(H) > \gamma_{3,4}(L)$			
Hypothesis 4: Coefficient of determination for full model > coefficient of determination for reduced model excluding $\gamma_{1,1}$, $\gamma_{2,1}$, $\gamma_{2,4}$, $\gamma_{3,4}$ in both high and low conditions.			
Hypothesis 5: For the high-attraction condition: $\gamma_{1,1} > \gamma_{1,2}$ and $\gamma_{2,1} > \gamma_{2,2}$ and $\gamma_{3,4} > \gamma_{3,5}$			

^a H = high-attraction condition; L = low-attraction condition.

company provided electronic mail access for all employees, excluding maintenance and workshop personnel below the rank of supervisor. Virtually all company sites worldwide could be reached through the electronic mail system, as could some vendors.

Surveys were distributed to all electronic mail account holders. The survey was described as a university-sponsored research project and confidentiality was guaranteed. Respondents mailed the surveys directly to the university. Prior to receiving the survey, each employee received an electronic mail message from the company's chief executive that assured em-

ployees that the project was university-sponsored and that the company would have access to summary statistics but not to any individual responses. Of the 636 persons with electronic mail access, 622 actually used the system. Ninety-two percent of the latter returned the surveys. A total of 551 surveys, representing 89 percent of the electronic mail users, provided complete communication network data.

The company was functionally organized into six major divisions, each with a number of work groups. Work group membership did not cut across divisional lines, and there were no cross-functional project teams. The largest group included 17 individuals. Included in this research were all members of groups of 4 persons or more. Groups of 1 to 3 persons primarily represented laboratory technicians working individually with scientists, rather than formal work groups. Of the 76 groups of 4 or more persons, usable data were available for 68. The net number of respondents was 408 individuals. They were primarily men (80%) who held at least B.A. degrees (80%) and were between 30 and 50 years of age (72%).

The survey was supplemented by observations of system use and by postsurvey interviews with 27 individuals chosen to maximize variation in hierarchical level, job type, and attitudes toward electronic mail. Individuals' work group membership was obtained from company records. Actual electronic mail message traffic was computer-captured for a period of one week of system use for comparison to the survey reports.

Measures

Endogenous variables. Perceptions of electronic mail richness were measured by asking respondents to rate electronic mail on a five-point scale (1 = not at all rich, 5 = extremely rich). To assist with this judgment, respondents were provided with Daft and Lengel's (1984) definition of media richness, in which four criteria are applied: (1) ability to give and receive timely feedback, (2) ability to transmit a variety of nonverbal cues, (3) ability to tailor messages to personal circumstances, and (4) communication using rich and varied language. Average daily electronic mail use was measured by summing five items reporting the exact number of electronic mail notes and messages each respondent sent, received, and forwarded. This measure correlated .45 with a measure of message traffic over a period of one week taken from computer-captured data two months after survey administration. This magnitude is consistent with that found by Schmitz (1988) for a sample of government employees. Respondents assessed electronic mail usefulness on a five-point scale (1 = not at all useful, 5 = extremely useful).

Exogenous variables. All measures of social influence were obtained from the survey data provided directly by the sources of social influence on a focal individual. The ego network was identified by asking each individual to identify the supervisor and five individuals with whom they had frequent communication using all media. The actual survey responses for each of these ego network partners were then appended to the data record for each focal individual. Thus, the supervisor usefulness measure was the actual

response a focal individual's supervisor provided on the five-point scale measuring electronic mail usefulness, and supervisor use was the sum across the five items measuring electronic mail use reported by the supervisor. Network use and network usefulness were calculated as numerical averages of network members' reports. If data were missing from more than 25 percent of an individual's ego network members, the ego network values were treated as missing.²

Individuals who shared a supervisor were considered members of a given formal work group. Supervisors were identified from company records, and the actual survey responses of the work group members were appended to each focal individual's data record. Work group usefulness and work group use were calculated as averages from the actual responses of the group members (excluding the focal individual), in the same fashion as for the ego network.

Medium expertise. Respondents reported their number of years experience using electronic mail. Computer experience and keyboard skills were rated on five-point scales (1 = none, 5 = an enormous amount, and 1 = very poor, 5 = very good, respectively).

Attraction to a group. Measurement techniques for this variable have varied substantially across studies. One method has been to measure the levels of attraction of individual group members to a group as a whole, average them, and then apply this average score to the group as a whole for studies at a group level of analysis, and to individual members for studies at the individual level. As Evans and Jarvis (1980: 366) noted, this procedure fails to take into account variability in attraction among group members. Given these concerns as well as the individual-level focus of the hypotheses for this research, attraction was defined as each individual's attraction to his or her work group (Evans & Jarvis, 1980).

Attraction was measured by Stogdill's (1965) five-item scale, which asks for perceptions of the degree to which members of an individual's work group: (1) cooperate with each other, (2) regard each other as friends, (3)

² The reliability of the work group and network exogenous variables is an important issue, particularly given that the usefulness measure is a single-item scale. A typical strategy would be to calculate interrater reliability within groups and networks, a calculation reported later for the attraction-to-group measure. However, this strategy is less helpful for the usefulness measure than for the attraction moderator. Indeed, interrater reliability for the exogenous variables is conceptually similar to the hypotheses themselves, except that it is at the group and network rather than individual levels. If social constructivist predictions are on the mark, responses to these measures should be quite similar in groups in which most individuals report high attraction (a high reliability coefficient is observed) and less similar in groups in which attraction is lower. Overall tests would combine the two types of group and arrive at an average reliability figure. As indicated in the discussion section, research on cohesion has shown that attitudes and behaviors are more similar across individuals in cohesive groups. Thus, how should the lower reliability for the groups in which average attraction is low be interpreted? I could label it low reliability but could also describe it as totally consistent with a lack of internalization in such groups.

know that they can depend on each other, (4) stand up for each other, and (5) work together as a team. Schriesheim (1980) reported a convergent validity coefficient of .75 between this measure and Seashore's (1954) measure and a significant result for a within-versus-between-group analysis of variance, demonstrating more similarity of scores within a group than across groups. Several studies have obtained acceptable reliabilities and significant predictive correlations using the scale (Greene, 1976; Stogdill, 1965). In this group of respondents, the coefficient alpha was .86, and analysis of variance results were significant ($F_{67,341} = 2.17, p < .05$).

Task features and demographics. *Task routineness* was measured by four items describing how often a job involved (1) routine and repetitive tasks, (2) tasks with clearly defined outcomes, (3) standard operating procedures, and (4) well-defined subject matter. The coefficient alpha for this measure in these data was .77. *Job pressure* was measured by two items describing how often a job involved (1) crises and urgent matters and (2) time pressures. The coefficient alpha was .76. Both measures used a five-point response scale (1 = very rarely, 5 = very often). *Intragroup task interdependence* was measured by four items based on work by Lynch (1974) describing the degree to which, within a group, work products are (1) independent of others' work, (2) fed into someone else's work, (3) dependent on input from someone else's work, and (4) completed with others in a team approach. Coefficient alpha was .74. *Intergroup task interdependence* was measured by the same four measures recast to contrast an individual's work group and other groups in the company. The response categories for both intragroup and intergroup interdependence ranged from 1, "not at all," to 5, "very much." Coefficient alpha was .75. Each respondent also reported gender, age at last birthday, and the highest level of education completed.

Analysis

Individuals were assigned to two group "conditions," high attraction to the group and low attraction to the group, on the basis of a median split of the attraction-to-group scores. I tested the model using maximum likelihood estimation in PC LISREL 7.12 and compared the results for the two conditions. The fit of each structural model was assessed by three methods. The first was a chi-square test. A nonsignificant chi-square suggests a good fit of a theoretical to an observed covariance matrix. Because chi-square is sensitive to sample size and represents an overly conservative estimate for large samples, I also report the ratio of chi-square to degrees of freedom. Wheaton, Muthen, Alwin, and Summers (1977) proposed that a ratio of 5 or less represents a good fit. Second, an adjusted goodness-of-fit ratio above .9 and not very different from the unadjusted ratio represents a good fit (Jöreskog & Sörbom, 1989). Third, the root-mean-squared residual gives an estimate of the average magnitude of the fitted residuals, which normally should be less than approximately .05. I assessed the significance of individual paths using

t-ratios. Coefficients of determination are reported for each endogenous variable and for each model as a whole.

Hypothesis 1 was tested by examining the *t*-ratios in each condition for the paths from (1) work group usefulness to richness and (2) work group usefulness to usefulness. The hypothesis predicts significant, positive *t*'s for high-attraction individuals and nonsignificant *t*'s for low-attraction individuals.

Hypothesis 2 was tested by assessing the significance of the *t*-ratio for the path from work group use to use for the two attraction conditions. To test the difference in paths posited in Hypothesis 3, I estimated a multisample LISREL model, using the high and low attraction-to-group conditions as the two samples and specifying as a constraint that the two paths would be equal. The chi-square for this model was compared to the chi-square for a multisample null model with no equality constraints (γ was free for both conditions). A significant difference in the chi-square values would lead to a rejection of the null hypothesis that the paths are equal, and the magnitudes of the paths suggest the direction of the difference (Jöreskog & Sörbom, 1989: Chapter 9). A significant chi-square difference and a path coefficient of larger magnitude for the high-attraction individuals would support Hypothesis 3.

To test Hypothesis 4, I estimated a LISREL model that excluded the two work group exogenous variables for each condition. The difference in the coefficient of determination between this model and the full model was tested for significance. A significantly higher coefficient of determination for the full model would indicate support for the hypothesis.

Hypothesis 5 was tested for the high-attraction condition by estimating a null model that constrained the coefficient for each work-group-based social influence variable to be equal to the corresponding coefficient for ego-network-based social influence. I compared the chi-square for this constrained model to that for the unconstrained model. A significant drop in the chi-square value for the constrained model would indicate a difference in the two models; the direction of the difference would be reflected in the magnitude of the coefficients (Jöreskog & Sörbom, 1989).

Finally, to assess the unique contribution of the social influence variables, I calculated a reduced model for all respondents by excluding the media expertise, task, and demographic variables from the exogenous variable set. The decrement in the coefficient of determination would indicate the amount of variance explained uniquely by these other variables.

RESULTS

Tables 2 and 3 present descriptive statistics, and Table 4 presents LISREL results. For the high-attraction-to-group respondents, the chi-square with 20 degrees of freedom was statistically significant at 42.07, but the chi-square-to-degrees-of-freedom ratio was acceptable at 2.10. The adjusted goodness-of-fit ratio was not good at .80, possibly as a result of the addition

TABLE 2
Means, Standard Deviations, and Correlations, Low-Attraction-to-Group Respondents^a

Variables	Means	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19		
1. Use	15.49	15.35																					
2. Richness	3.43	0.94	.27																				
3. Usefulness	4.18	0.83	.31	.52																			
4. Keyboard skills	3.61	0.94	.29	.22	.31																		
5. Computer experience	2.98	1.27	-.07	-.06	-.01	.27																	
6. Electronic mail experience	5.80	2.67	.16	-.07	.04	.17	.07																
7. Work group use	16.23	9.59	.35	.15	.27	.10	-.11	.17															
8. Work group usefulness	4.30	0.40	.22	.13	.18	.12	-.06	.09	.50														
9. Supervisor use	27.58	14.21	.15	.11	.03	.03	-.15	-.01	.18	.05													
10. Supervisor usefulness	4.61	0.56	.12	.15	.13	-.01	-.12	-.01	.08	.06	.06												
11. Ego network use	20.38	10.31	.31	.11	.22	.23	-.06	.12	.27	.18	.14	.18											
12. Ego network usefulness	4.41	0.42	.16	.12	.20	.11	.04	-.04	.20	.37	-.05	-.03	.37										
13. Gender	1.21	0.41	.05	.06	.14	.10	-.07	-.04	-.01	.03	-.01	.04	.02	-.05									
14. Age	40.33	9.38	.06	-.11	.05	.14	-.01	.10	-.01	-.11	.04	.01	.04	.06	-.13								
15. Education	4.44	1.31	-.01	-.08	-.09	-.04	-.02	-.01	.04	-.04	.02	.02	.01	.09	-.37	.17							
16. Task routineness	2.83	0.84	.08	.17	.09	.10	-.19	-.07	.03	.05	.12	.10	.12	.06	-.03	.01	-.08						
17. Job pressures	6.58	2.02	.25	.14	.20	.15	-.08	.06	.09	.13	-.01	.09	.03	.06	.06	.11	-.03	.14					
18. Intragroup interdependence	2.84	0.84	.11	.14	.05	.11	-.01	.08	.13	.03	-.04	.07	.04	.04	.01	-.05	-.01	.13	.14				
19. Intergroup interdependence	2.60	0.94	.04	.09	.02	.06	-.03	.04	.18	.13	-.06	.02	.08	.12	-.06	.09	-.02	.09	.21	.30			

^a N = 279. Correlations greater than .13 are significant at $p < .05$.

TABLE 3
Means, Standard Deviations, and Correlations, High-Attraction-to-Group Respondents^a

Variables	Means	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19		
1. Use	16.53	13.45																					
2. Richness	3.65	0.87	.21																				
3. Usefulness	4.40	0.69	.31	.39																			
4. Keyboard skills	3.64	0.94	.17	.29	.29																		
5. Computer experience	3.00	1.35	-.07	-.09	.04	.18																	
6. Electronic mail experience	5.97	2.68	.10	-.03	.07	.23	-.02																
7. Work group use	15.83	9.76	.50	.23	.24	.14	-.02	.14															
8. Work group usefulness	4.25	0.44	.32	.21	.27	.20	.07	.02	.48														
9. Supervisor use	25.00	12.60	-.01	-.09	-.06	-.07	-.02	-.01	.01	-.10													
10. Supervisor usefulness	4.60	0.53	.03	.06	.17	-.04	-.03	-.03	.11	.06	.01												
11. Ego network use	19.51	10.32	.29	.25	.28	.11	-.10	.15	.30	.31	-.19	.15											
12. Ego network usefulness	4.35	0.37	.20	.17	.21	.23	.08	-.01	.22	.46	-.12	.04	.43										
13. Gender	1.20	0.38	.02	.06	.03	.03	.02	-.15	.03	-.11	.03	.01	-.01	.08									
14. Age	41.76	9.34	-.04	-.09	.09	.13	.10	-.02	.09	.15	-.07	.23	.04	.05	-.12								
15. Education	4.47	1.29	.11	-.05	-.03	-.02	-.11	.11	.09	.04	.07	.01	.09	-.12	-.37	.01							
16. Task routineness	2.87	0.95	.08	.25	.05	.06	-.33	-.01	.06	.13	.02	-.13	.14	.05	-.04	-.03	.04						
17. Job pressures	6.44	2.01	.26	.11	.07	.14	-.03	.11	.19	.10	-.05	.10	.11	.22	-.16	-.03	.13	.08					
18. Intragroup interdependence	3.06	0.87	.12	.10	.03	-.07	-.12	-.11	.02	-.04	-.12	-.06	.04	-.04	-.02	-.05	.01	.11	.04				
19. Intergroup interdependence	2.61	0.65	.14	.12	-.01	-.05	.07	-.09	.07	.15	-.13	.03	.12	.11	-.14	-.02	.04	.07	.26	.41			

^a N = 240. Correlations greater than .13 are significant at p < .05.

TABLE 4
Results of LISREL Analyses

Variables	Individual Attitudes				Individual Behavior: Use	
	Richness		Usefulness		High-Attraction	Low-Attraction
	High-Attraction	Low-Attraction	High-Attraction	Low-Attraction		
Attitude of agents						
Work group usefulness	.14*	.07	.15*	-.02		
Ego network usefulness	.04	.07	.03	.08		
Supervisor usefulness	.06	.14*	.11	.03		
Behavior of agents						
Work group use			.05	.19*	.41*	.25*
Ego network use			.13	.10	.13*	.21*
Supervisor use			.01	-.07	.03	.05
Media expertise						
Electronic mail experience	-.11	-.11				
Computer experience	-.16*	-.10				
Keyboard skills	.33*	.25*				
Controls						
Task routineness			-.06	-.01	-.01	-.02
Job pressures			.02	.11*	.16*	.20*
Intragroup task interdependence			.06	-.04	.09	.05
Intergroup task interdependence			-.12	-.10	.02	-.10
Age			.01	.11*	-.08	.07
Education			-.03	-.05	.06	-.01
Gender			-.01	.10	.05	.03
Richness			.33*	.48*	.07	.19*

* $p < .05$, one-tailed test

of a large number of nonsignificant control variables. After removal of the nonsignificant controls, the adjusted goodness-of-fit index rose to a minimally acceptable .87. The root-mean-squared residual was acceptable at .031. Overall, these statistics indicate a minimally adequate but not exceptional fit of the model to the data. The total coefficient of determination for the model was .47. Coefficients for each exogenous equation were .16 for richness, .24 for usefulness, and .32 for use.

For the low-attraction individuals, the chi-square was a significant 28.49, but the chi-square-to-degrees-of-freedom ratio was acceptable at 1.42. The adjusted goodness-of-fit ratio was marginal at .86 and rose to .88 with removal of the nonsignificant controls. The root-mean-squared residual was acceptable at .026. Overall, the model appears to provide an adequate but not strong fit to the data. The total coefficient of determination was .39. Coefficients were .11 for richness, .38 for usefulness, and .26 for use.

Hypothesis 1 proposes that work group attitudes will be predictors of individual attitudes for people with high attraction to their work groups but not for low-attraction individuals. For the LISREL analysis for high-attraction condition, both proposed links are significant. Work group usefulness predicts richness (.14) and usefulness (.15). In the low-attraction

analysis, neither path is significant (.07 and $-.02$, respectively). Thus, findings support Hypothesis 1.^{3,4}

Hypothesis 2 proposes that work group members' technology use behavior will predict individuals' technology use in both low- and high-attraction conditions because of compliance effects. Significant LISREL coefficients from work group use to use in both the high- (.41) and low-attraction (.25) conditions support the hypothesis.

Hypothesis 3 proposes that the link between work group use and individual use will be stronger for respondents with high attraction to their groups. For the multisample analysis, the chi-square difference between the model that constrained these paths to be equal and the baseline, unconstrained model was a significant 4.05 ($p < .05$), suggesting rejection of a null hypothesis predicting equal coefficients in the two conditions. As Jöreskog and Sörbom (1989) indicated, the magnitude of the structural coefficients indicates the direction of the difference. Since the path of greater magnitude was the high-attraction-to-group condition (.41, versus .25 for low attraction) Hypothesis 3 was supported.⁵

Hypothesis 4 proposes that work group social influence variables will explain variance beyond that explained by ego network variables. The coefficient of determination for the model with only ego network sources of social influence was .33 for the high-attraction group condition, compared to .47 for the model including work group sources. This difference is significant ($F_{2,190} = 25.09, p < .05$). For the low-attraction condition, the ego network model produced a coefficient of determination of .32, compared to .36 for the full model. This difference, although smaller than that for the comparison for the high-attraction condition, is nevertheless significant ($F_{2,190} = 5.94, p < .05$). In each case, work-group-based social influence variables explained additional variance, supporting Hypothesis 4.

Hypothesis 5 proposes that work group social influence will be a stron-

³ To establish this effect using a simpler model, I computed partial correlations between work group usefulness and usefulness for each condition, partialing use. A significant partial coefficient for the high-attraction individuals but not the low-attraction ones would be consistent with the hypothesis. The partial correlation coefficient for the high condition was .19 ($p < .05$), and for the low condition, it was .05 (n.s.).

⁴ Schmitz and Fulk (1991) also proposed paths from electronic mail use by social influence sources to individual attitudes. Although I proposed no moderating effect for this link, it is interesting to examine it in the subgroup analyses. Work group use predicted usefulness for the low-attraction condition, but not the high-attraction condition. One possible explanation might be that the explanatory power of the attitudinal variable, work group usefulness, in the high-attraction condition subsumed the effect of the behavior-to-attitude link. Since internalization was unlikely in the low-attraction condition, the behavior-to-attitude link remained as hypothesized. Supervisor use was not significant for either respondent group, and network use was not significant for the high-attraction individuals.

⁵ To establish that attraction to group is a moderator using a simpler model, I performed a multiple regression analysis in which use was regressed on the exogenous variables, attraction to group, and the cross-product of attraction to group and work group use. A significant coefficient resulted ($\beta = .32, p < .05$), indicating a significant moderating effect.

ger positive predictor of individual attitudes and behavior than ego network social influence for individuals who exhibit high attraction to their groups. The chi-square value for the null model, in which the three structural coefficients for the ego network paths are constrained to be equal to the corresponding structural coefficients for the work group paths, produced a chi-square of 51.28, compared to a chi-square value of 42.07 for the unconstrained (theoretical) model. The difference between these two values is 9.21, with 3 degrees of freedom, which is significant ($p < .05$). Thus, the data show that the null hypothesis of equal path strength must be rejected. Examination of the magnitude of the coefficients suggests the direction of the difference. The coefficients for ego network and work group are as follows: .04 versus .14 for network usefulness–richness, .03 versus .15 for network usefulness–usefulness, and .13 versus .41 for network use–use. These coefficients demonstrate stronger effects for work group influence. Thus, findings support Hypothesis 5.⁶

Table 4 also shows some significant paths for the control variables. For respondents with low attraction to their groups, job pressure was a significant, positive predictor of both use and usefulness. Age was a positive predictor of usefulness. None of the other control variables produced significant paths. A comparison of the coefficient of determination for the full model including the control variables (.39) to the coefficient of determination for a model that excluded all the control variables (.30) indicates the amount of variance that age and job pressure explained uniquely. This difference of .09 is statistically significant ($F_{7,194} = 3.56, p < .05$).

For the high-attraction-to-group respondents, one control path was positive and significant, that from job pressure to use. The difference between the coefficient of determination for this model (.47) and a model that excluded all control variables (.42) is statistically significant ($F_{7,194} = 2.61, p < .05$). For high-attraction individuals, job pressure explained an additional .05 of the variance. These results show that both social influence and task variables contribute uniquely and significantly to explained variance in technology-related attitudes and behaviors.

DISCUSSION

This study sought to demonstrate shared meanings and behavioral patterns related to communication technology among members of well-defined organizational social systems. Multiple social constructivist premises predict such convergence, and the empirical data demonstrated such a pattern.

⁶ Interestingly, a similar model estimated for the low-attraction individuals produced a chi-square that was not significantly different from that of the theoretical model. No hypothesis was proposed for this condition; however, it is clear that the equality-constrained model cannot be judged substantially different from the theoretical model. Thus, for the low-attraction-to-group individuals, it appears that work group and ego network sources have relatively similar strengths as social influence sources.

This central finding lends empirical confirmation to recent theoretical arguments in favor of the pivotal contribution of social agents. Furthermore, the texture of findings for the attraction subgroups provides even stronger support for the power of social influences as significant explanatory variables.

The results showed that work-group-based social influence explained unique variance in individual attitudes and behaviors, even after ego-network-based social influence, media expertise, perceived task features, and demographic characteristics were controlled. This unique variance was a notable .14 for the high-attraction respondents and a much smaller .04 for the low-attraction individuals. Furthermore, a social influence model that included both work group and ego network predictors but excluded the control variables explained considerably more variance in individual attitudes and behavior than has been found in social influence studies to date: .30 for the low-attraction respondents and .42 for the high-attraction respondents. Clearly, unexplained variance of .48 (high condition) and .70 (low condition) remains to be pursued. Nevertheless, these results suggest the viability of future research and theorizing on the social shaping of attitudes and behaviors related to communication technology.

The subgroup analyses demonstrated that work group social influences were stronger predictors for individuals with high attraction to their work groups, as predicted by the literature on conformity. Attitudes of the remaining work group members predicted each individual's attitudes in the high-attraction condition but not in the low-attraction condition, consistent with an internalization rationale. Work group behavior was a stronger predictor of each individual's behavior for the high-attraction respondents, consistent with a compliance explanation. It is also notable that for the low-attraction respondents, the behavior-to-behavior coefficients for the formal work group and ego network sources were roughly equal (.25 and .21, a nonsignificant difference), whereas for the high-attraction individuals, the work groups were by far the more potent social influence predictor (.44 versus .14, a difference significant at $p < .05$).

One concern raised by these results is whether these differences in predictiveness are the result of differences in the degree to which the work groups and ego networks overlapped for the two conditions. If individuals with low attraction to their work groups included more work group members in their ego networks than did individuals with high attraction, the mutual partialing in the analysis would understate the effects of both social sources more severely for the low-attraction condition. To examine this alternative explanation, I examined overlap. On average, 1.41 work group members were also members of the ego network for the low-attraction respondents. For the high-attraction respondents, 1.73 members were also members of the ego network. The difference is significant ($t = 2.36, p < .05$) but is in a direction that favors greater underestimation of social effects for the high-attraction respondents. Thus, the results should be viewed as a more conservative test for the high-attraction-to-group individuals, where the greatest work group social influences were found.

It is also interesting to note the strength of the endogenous links from richness; the link to usefulness is particularly strong (.33 and .48, for high and low attraction, respectively), and the link to use for the low-attraction group is also significant (.19). Although the fact that the variables are both self-reported attitudes may influence these coefficients, that explanation is unlikely to tell the whole story. The richness of a communication medium appears to be an important contributor to attitudes and behaviors related to the technology, particularly when an individual experiences low attraction to a work group. In this sense, the study confirms the theoretical importance accorded perceptions of media richness as formulated by information richness theory (Daft & Lengel, 1984) and incorporated by the model of the social information processing of technology (Fulk et al., 1987). Clearly, the concept of media richness as a shaper of technology use in organizations bears further exploration. Careful attention to uncovering other antecedents of media richness perceptions may also prove valuable. One particularly promising avenue might be investigation of the factors that lead media perceptions to vary from those that would be anticipated on the basis of objective characteristics of a technology itself.

The richness linkage also contributes to identification of indirect social influence effects. Work group usefulness has an indirect effect of .05 ($.14 \times .33$) on usefulness for the high-attraction individuals. The total effect is thus .20 (.05 indirect + .15 direct). For the low-attraction individuals, the indirect effect is .03 ($.07 \times .48$), for a total effect of .01 [.03 + (-.02)]. For the low-attraction respondents, the primary indirect effect of a social influence factor is .07 for supervisor usefulness ($.14 \times .48 = .07$). Overall, it appears that for the high-attraction condition, work group social influences combine with richness to influence usefulness, but that for the low-attraction condition the primary contributor is richness perceptions. Furthermore, the predictive coefficients for richness are more substantial for the low-attraction individuals than for the high-attraction ones. This rationale would be consistent with social constructivist premises that would predict more independent judgments based on perceptions of media features in the absence of internalization pressures. In the presence of such pressures, richness perceptions themselves will be subject to some social construction.

An interesting feature of the findings is the strong results for job pressure, but not for the other task controls. Although I expected that social influences would operate over and above perceived task characteristics, the relative lack of predictive power for three key task characteristics was certainly unexpected. One possible explanation for these findings in relation to use is that task demands for communication behavior may have been different for the high- and low-attraction respondents. An examination of the bivariate correlations indicated a significant correlation of a perceived task feature with attraction to the work group for intragroup task interdependence only ($r = .21, p < .05$). To examine this possible explanation for use, I reestimated the model with the two attraction groups combined. This model produced a small but statistically significant link from intragroup task

interdependence to use (.08), concurrent with a larger, significant coefficient for work group use (.26). None of the other task features was significant. Thus, although this analysis uncovered one additional possible task influence, this type of influence did not substitute for that of the work groups.

Schmitz and Fulk's (1991) contention that efficiency may not be the only mechanism at work in media selection hints at one possible explanation for the failure of task routineness as a predictor. Individuals with routine tasks would find many media options effective, even though a less rich medium might be most efficient. Thus, individuals may opt to use rich media for lean tasks, as a result, for example, of social norms about how to communicate within a work group.

Substantial differences in perspectives and orientations across interdependent groups might explain the results for intergroup task interdependence. These differences would require reconciliation through communication that could reduce barriers and create shared meaning in equivocal situations (Daft & Lengel, 1986), that is, through media richer than electronic mail. No measures of differences in orientations across groups are available. However, the fact that the organization was departmentalized by function suggests the strong possibility of substantial differences across groups operating in different functional environments.

Future research should account for the link of task perceptions to work group conditions. Task perceptions may well arise from social shaping within a work group. From a structuration theory perspective, groups create interaction structures for completing tasks, and these structures constrain communication patterns. Thus, task-based patterns of this type are in part the product of interaction structures socially constructed by groups. Groups create social definitions of tasks and required interactions that then serve to structure behavior. Advocates of social influence perspectives have also viewed tasks as socially constructed. As Weick (1990) argued, tasks themselves are also equivocal, subject to interpretation and reinterpretation in their implementation context. Drawing on Salancik and Pfeffer's (1978) social information-processing approach to job attitudes and task design, Fulk and colleagues (1990) argued that communication tasks are also in part socially constructed. The same social influence processes that produce convergence on technology meaning and use also produce convergence on task interpretations. Tasks then become malleable social constructions, rather than fixed constraints that function as external controls on behavior.

Alternative Explanations Based on Survey Methodology

A possible alternative explanation for these findings as a set is that the survey reports represent attributions, or biased reports of individual attitudes and behaviors, or both. Survey data are generally vulnerable to such criticism. There are several reasons why this explanation is less tenable here than in the typical survey situation. First, I took great care to avoid the same-source data problem for the social influence variables. The social influence measures were taken from the data provided by the social influence

sources themselves, rather than by each focal individual. This process should prevent the upward bias that undoubtedly has been introduced in previous research in which individuals have been asked not only to assess their own attitudes and behaviors, but also to estimate the attitudes and behaviors of their network partners (e.g., Fulk & Ryu, 1990; Rice & Aydin, 1991). Indeed, the method used in this study may have been overly conservative and may have underestimated true social influence effects.

Second, demand characteristics of the survey situation may have consistently influenced the reports of attitudes and behavior for all persons. Great care was taken to ensure confidentiality of responses, and postsurvey interviews confirmed that respondents trusted the confidentiality of the survey reports. Also, the self-reported behavior correlated with objective measures of communication technology use at about the level that has typically been found in other studies (.45), despite the fact that only one week's worth of computer-captured data were available and that this week was a period of vacation.

Third, unlike the ego network measures, in which respondents identified individuals to whom their attitudes and behaviors were then correlated, the formal work group assignments used were based on company records. Thus, the correlation is unlikely to be at risk for upward bias from the same-source problem.

Finally, accounts from the interview data buttress the social influence explanation for the survey data. Several respondents noted that there was a tendency for groups to vary in their communication media preferences. For example, one respondent noted that some groups used electronic mail for everything, whereas her own group used hard copy more often. One administrative secretary also noted, "Every group is different. Some groups pick it [electronic mail] up, for example, one group has a travel file where they have, essentially, a group shared ID that has to do with their travel. Other groups won't bother." Schmitz and Fulk (1991) provided detailed interview data demonstrating not only the role of supervisors and network members in shaping individual perceptions of electronic mail, but also the role of several key norms, metaphors, and stories in shaping how perceptions of the medium might converge in this organization as a whole.

Management Implications

Social constructivist models and the findings of this study have several management implications. In general, technological implementations benefit from substantial attention to nontask and nontechnical conditions. First, monitoring interactions in an organization's social system during the early phases of implementing communication technologies makes early detection and correction of difficulties possible.

Second, when a communication technology is phased in, the early users should be individuals who are (1) positively disposed toward the system and (2) important informal leaders in work groups and the organization as a whole (Fulk et al., 1990). Such individuals can be identified through pre-

implementation research. Investigation of work group structure can identify individuals who are highly attracted to their groups and groups that exhibit the most cohesion. A survey of communication needs can be used to identify the people and groups with the greatest needs for the innovation. For example, a need for cross-locational communication supports electronic mail implementation. A survey can also tap existing attitudes toward a technology. Initial implementation should begin with the individuals who are found to exhibit these predisposing factors in preimplementation research.

Third, adaptive structuration theory suggests the following: "When people struggle with a new technology, the solution may not always be to change the system but to explore ways in which to promote effective use of the technology, through training, advice giving, leadership, or the addition of structures that limit the possibility for misuse" (Poole & De Sanctis, 1990: 190).

Fourth, formal or informal peer training effectively uses social influence processes. In the presurvey and postsurvey interviews here, many users described relying on other group members for help in using less familiar features of the electronic mail system. Virtually all members of this organization had received formal training in using the electronic mail system. However, they relied on co-workers for help in using advanced capabilities or features they did not use regularly. A manager can support such informal peer training or can design system training to incorporate formal peer training on the system. A formal peer help function can support such formal training.

Theoretical Concerns

When viewed generally, this research also suggests that multiple distinct theories of social interaction effectively converge on a set of general behavioral and attitudinal predictions. A valuable direction for future theorizing would be to seek a coherent integration. For example, one issue that bears closer scrutiny is level of conceptualization. Structuration theory takes groups as conceptual units (Poole et al., 1985). A key concern is the relationship of a group as a whole to its technological and social context. This perspective provides little detailed theoretical rationale for describing the individual-group relations that underlie process of compliance and internalization. Perhaps differential conformity pressures are the result of different scripts in different groups. Or perhaps the processes that produce convergent attitudes and behaviors also produce differences in the group-level variable of cohesion (overall attractiveness of a group to all its members), so that cohesion is both a contextual feature and an outcome of interaction processes. There is considerable potential for deeper analysis using structural premises to explain the patterns found here. The process of seeking the micro processes consistent with structural explanations is likely to uncover a number of areas of theoretical convergence with other micro theories of social interaction. Social learning theory is clearly focused on the individual level, yet when multiple models contribute to social learning in

a work group context, a group-level process involving the joint production of meaning occurs. Social learning premises might be expanded to account for the interactive effects found during the process of mutual modeling and joint sensemaking. Such findings would help to move social learning theory closer to structural approaches. For example, Poole and DeSanctis argued that groups do not simply create interaction structures, which are instead “more often appropriated by the group from larger social institutions” (1990: 180). Social learning theory suggests several processes by which this appropriation might take place. Bandura (1986) argued that there are many sources of modeling over and beyond an individual’s immediate social network, including sources as distant as television. Appropriation from the larger social structure will require at a minimum some form of observational learning, as well as disinhibitory effects. Response facilitation effects also may serve as social prompts directing members to appropriate certain structural features rather than others.

Social learning theory also parallels the literature on conformity and social information processing. Observational learning facilitates group members’ acquisition of new attitudes and behaviors. Through response facilitation, groups induce individuals to display the behavior learned. To the extent that group norms and expectations serve as social prompts, social learning and conformity explanations for patterned behaviors and meanings in formal work groups converge. Bandura’s (1986) description of the attention-directing nature of environmental events in the modeling process is somewhat parallel to the premise of social information-processing theory that co-workers exert influence by directing attention to certain aspects of an environment, thus increasing their saliency.

Even within the individual-group conceptual level, focus on variation in addition to central tendency might lend additional insights (Zalesny & Farace, 1986). For groups with the same average technology use level, social influence pressures on an individual may be stronger when responses are more tightly clustered around that average. Given that low variation in attitudes and behaviors tends to characterize cohesive groups (Seashore, 1954), this prediction would be consistent with the results of this research.

These ideas for potential theoretical convergence, although at this point quite rudimentary, bear further examination. Such an approach would move the field toward a goal of theoretically explaining not only the outcome of social interaction effects, but also the detailed processes by which these effects are produced. Nevertheless, the focus on outcomes has a number of values. First, it permits assessment of social constructivist predictions in general across multiple theoretical perspectives. Second, it avoids the measurement problems in empirically assessing structuration theory that the notion of the duality of structure and action creates. Archer (1982) proposed “analytical dualism” as a potential solution based on the assumption of a virtually instantaneous sequence of action-structure relations. By alternatively punctuating the action-structure sequence from moment to moment, causality can be alternatively assigned to action, then structure, then action,

and so on. Thus, the method can permit assessment of process in structuration without contradicting the core concept of the duality of structure and action. Haines (1988) also suggested that communication network theory and methods offer potential for understanding the duality inherent in structural processes.

Clearly, a great deal more theoretical and methodological groundwork must be completed before researchers can effectively grapple with a multi-level, integrated theory of the social construction of communication technology in organizations. The accomplishment of such a task in the realm of communication technology would promise a possible expansion of the theoretical richness of social interaction perspectives on meaning and action in organizations in general.

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