# Media Appropriateness
## Using Social Presence Theory to Compare Traditional and New Organizational Media

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*This study assesses a scale measuring appropriateness of media for a variety of organizational communication activities and then compares seven media across six organizational sites. The ranking of media were face-to-face, telephone, meetings, desktop video and videoconferencing, voice mail, text, and electronic mail. Although information exchange and socioemotional relations dimensions emerged, the first provided a parsimonious solution. Multidimensional scaling placed traditional media in separate clusters, and new media together with some instances of text and phone, along interpersonal-mediated and synchronous-asynchronous axes. The appropriateness of face-to-face and meetings did not change over time, whereas ratings of phone and text (to some extent) and new media did. Appropriateness of new media was weakly associated with use. Finally, there was very little evidence of social information processing influence on appropriateness, except for organizational newcomers' ratings of the newest medium, desktop video.*

A growing number of organizations are adopting, using, and evaluating new media (electronic mail, facsimile, voice mail, intraorganizational video, group decision support systems, groupware, audiotex, etc.). Concurrently, theories about choice, use, and impacts of such new media have gained interest. However, as with any new development and the accompanying research, ques-

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tions still remain and new ones arise. There are many ways to characterize old and new media (see Rice, 1987, 1992).[1] Thus, as new media may include new capabilities, it is often difficult to compare them to more traditional media. Further, to-date comparisons of media within organizational research are generally limited to rankings rather than multidimensional approaches (for an excellent exception, see Zmud, Lind, & Young, 1990), to responses from members of one organization, and to measures that have not been empirically validated.

In an attempt to pursue some fundamental research questions about organizational media comparisons as well as overcome some of the limitations of prior research, this study assesses the reliability and dimensionality of a media appropriateness scale and applies it to compare seven traditional and new media across six organizations. Two sets of theories in particular motivate the present research: social presence and media richness (Daft, Lengel, & Trevino, 1987; Short, Williams, & Christie, 1976; Sitkin, Sutcliffe, & Barrios-Choplin, 1992; Trevino, Lengel, & Daft, 1987) and social influences on media perceptions (Fulk, Schmitz, & Steinfield, 1990; Rice & Aydin, 1991).

## MEDIA CHARACTERISTICS

The present research focuses on a few primary media characteristics associated with two related theories: social presence and media richness. Both emphasize how communication media differ in the extent to which they (a) can overcome various communication constraints of time, location, permanence, distribution, and distance; (b) transmit the social, symbolic, and nonverbal cues of human communication; and (c) convey equivocal information.

*Social presence* is the degree to which a medium is perceived as conveying the presence of the communicating participants (Short et al., 1976). This social presence depends not only on the words conveyed during communication but also on a range of nonverbal and verbal cues and the communication context. Daft and Lengel (1984, 1986) and Trevino et al. (1987) developed the related concept of *media richness* (apparently without awareness of the earlier social presence research). Media richness represents the extent to which media are able to bridge different frames of reference, make issues less ambiguous, or provide opportunities for learning in a given time interval, based on the medium's capacity for immediate feedback, the number

of cues and senses involved, personalization, and language variety (Daft & Lengel, 1986).

The essential underlying principle in both theoretic traditions is that a good match between the characteristics of a medium (such as high in social presence or media richness) and one's communication activities (such as socioemotional activities like getting to know someone, or equivocal tasks like strategic decision making) will lead to "better" (more effective, satisfying, etc.) performance (for studies using social presence theory to test this and related propositions, see Bizot, Smith, & Hill, 1991; Hiltz & Turoff, 1978; Johansen, 1977; Ochsman & Chapanis, 1974; Pye & Williams, 1977; Reid, 1977; Rice, 1984; Rice & Case, 1983; Rice & Love, 1987; Short et al., 1976; Steinfield, 1986; for studies using media richness theory, see Lind & Zmud, 1991; Markus, 1993; Rice et al., 1992; Russ, Daft, & Lengel, 1990; Trevino et al., 1987; Trevino, Lengel, Gerloff, & Muir, 1990).

The present study focuses on social presence, but similar analyses should be conducted using media richness scales, which have involved much less empirical evaluation.

## Development of Social Presence Concept and Measures

Social presence "varies between different media, . . . affects the nature of the interaction . . . [and] interacts with the purpose of the interaction to influence the medium chosen by the individual who wishes to communicate," varies by context, and is influenced by individual differences and experience. It is conceived of as unidimensional but considered to be "a perceptual or attitudinal dimension of the user . . . [and thus is] a subjective quality of the medium" (Short et al., 1976, p. 65). It is fundamentally related to two social psychology concepts: intimacy and immediacy (p. 72). Individuals do not necessarily have to be aware of such a concept, or intentionally select media, in order for the media-task match to have an effect. However, much as with the media richness concept (Trevino et al., 1987), those who are more aware of a medium's social presence may well choose more appropriate media and experience somewhat better communication or work performance (Rice et al., 1992; Rice, Hughes, & Love, 1989).

During the 1970s, the Communication Studies Group engaged in extensive conceptual and empirical study of the social presence construct, originally to identify the extent to which communication costs

could be reduced in British government offices. Initially, social presence was measured by responses to a set of semantic differential ratings, usually (un)/sociable, (in)/sensitive, (im)personal, and cold/warm. However, through a series of open-ended interviews, surveys, and factor and cluster analyses, the researchers identified a set of common and recurring office activities. Then, with respect to such activities, Short et al. (1976, chaps. 6-8) reviewed and conducted social psychological surveys and experiments that suggested how media might influence such aspects as the subjective presence of others, conformity, feedback, information transmission, bargaining, persuasion, problem solving, cooperation, conflict resolution, perception of others, getting to know someone, idea generation, and group cohesion. Finally, they ended up with a set of activities justified by this prior research as likely to be affected by differences in a medium's social presence: exchanging information, problem solving and making decisions, exchanging opinions, generating ideas, persuasion, getting the other on one's side of an argument, resolving disagreements or conflicts, maintaining friendly relations/staying in touch, bargaining, and getting to know someone.

Thus a social presence scale consists of perceived satisfactoriness or appropriateness of particular media for these activities. One advantage to using this type of scale instead of the semantic differential is that the respondent can explicitly consider the match between a specific medium and a specific task/activity context. Short et al. (1976) found fairly consistent ranking of media using such scales. For example, face-to-face is ranked highest, followed by video (systems with closeup images are ranked higher than those with small images), audio (with multichannel audio ranked higher than telephone or speakerphone), and written memos.

Since the work of Short et al., two additional activities identified as of concern to users of electronic mail (exchanging confidential information, and exchanging timely information—Rice & Case, 1983; Steinfield, 1986; and some of the studies used in this research) have been added to this set of communication activities. A fairly consistent subset of these activities has been used in other studies, especially those analyzing the use and effects of new media such as computer conferencing (for summaries of multiple studies, see Hiltz & Turoff, 1978, pp. 118-119; Rice & Love, 1987). However, those prior studies usually only involved one medium, used the mean of the full scale, and did not assess the dimensionality or reliability of the scale.

## RESEARCH QUESTIONS AND RATIONALES

There are several research questions outstanding about the concept of media characteristics in general, and media appropriateness in particular.

RQ1: How are old and new media rated on appropriateness for activities theoretically requiring different levels of social presence?
RQ2: Is social presence fundamentally unidimensional or two-dimensional?

Hare (1960) proposed two underlying dimensions of interaction content: task (completion of group or individual tasks) and social (relationships among individuals) behavior. Champness's work (reviewed in Pye & Williams, 1977) found four primary factors in media evaluations, with the first two factors being interpersonal relations and exchange of factual information. Steinfield (1986) identified two dimensions of media uses, labeled "task" and "social"; a social presence scale predicted 25% of the social factor but none of the task factor. Tsuneki (1988) found two primary factors in evaluating a wide variety of media: emotionality and transmission of meaning. Hiltz and Johnson (1990) identified four dimensions of user satisfaction with computer-mediated communication systems, and the first two were "instrumental (task)" and "socioemotional." Thus we might well expect media characteristics such as appropriateness to consist of two dimensions rather than one.

RQ3: How are organizational media related or similar, based on their perceived appropriateness?
RQ4: Are such perceptions of media stable and reliable?

Critics of measures of media characteristics propose that because they are primarily social constructions they cannot be indicators of inherently stable characteristics of media (Fulk et al., 1990). However, prior rankings of new media using social presence, media richness, or related scales (summarized in Rice et al., 1992; Rice et al., 1989) are reasonably consistent. If appropriateness scales exhibit satisfactory reliability, both within and across time periods, that would indicate that perceptions are not highly contextual or variable. A related question is whether these perceptions are more stable for familiar, traditional

media and less so for new media about which people may still be gaining experience and developing attitudes.

RQ5: Is perceived appropriateness of a new medium associated with one's usage of that medium?

Hiltz and Turoff (1978, 1981) suggest that attitudes toward, and different uses of, new media evolve as individuals gain familiarity with operation and application of these innovations. Thus appropriateness of new media may change over time and be associated with usage. However, in some of Hiltz et al.'s work, as well as other new media studies (Rice & Case, 1983; Rice, Grant, Schmitz, & Torobin, 1990), attitudes toward new media appear fairly stable across time, even comparing preimplementation to postimplementation attitudes, regardless of changes in usage.

RQ6: Stimulated by social information processing theory (Salancik & Pfeffer, 1978), some researchers (e.g., Fulk et al., 1990) have suggested the following: Are media characteristics social constructions rather than inherent and enduring aspects of the media themselves?

This is a fundamental issue underlying the validity and utility of any media characteristics scales because, to the extent that media perceptions are highly contextual and influenced by other individuals, such scales will have low external validity and possibly low cross-time reliability. Social information processing theory would argue that there are at least two primary organizational sources of social information about contextual or ambiguous phenomena, such as media characteristics: job position and communication networks.

As one's job position is higher in the organization, members will be involved in greater task ambiguity, spend more time communicating, and participate in more face-to-face and meeting communication than text-based communication (Daft & Lengel, 1984; Rice & Shook, 1990a). Thus perceptions of media appropriateness should differ across job positions and be more similar within job positions because occupants of similar job positions use similar media for similar tasks and have similar job norms and experiences. Further, to the extent that one communicates or interacts with salient others who have strong attitudes about a new medium, one should develop a similar attitude about the medium (Rice, 1993). Evidence as to the extent to which media perceptions are influenced by social information processing is

generally weak, when existent, and confounded by conceptual and operationalization vagueness (Rice & Aydin, 1991; Rice et al., 1990; Schmitz & Fulk, 1991).

## METHOD

### Sites and Systems

This study uses data from six prior studies, all intended to analyze use and effects of new media but with slightly differing goals, situations, and thus measures.[2]

The first site (R&D1) was a technical research and development organization. During a 10-week summer period each year, advanced student interns are selected to work on a specific project with a specific mentor on the permanent research staff. The sample of 25 interns and 23 mentors were participants in a study of a switched desktop video system, consisting of a small monitor and camera on each person's desk controlled through software commands and menus on each person's workstation (Fish, Kraut, Root, & Rice, 1993). Half the mentor-intern pairs were randomly assigned to either have or not have this new medium. However, they all also had email and telephone as a regular organizational medium. Questionnaires were administered at the beginning of the summer intern program (T1), halfway through (T2), and at the end (T3).

A small, decentralized federal agency office (GOVT) in charge of providing services and supplies to other agencies was the second site. These civil servants were mostly white-collar professionals, although some were clerical workers. A questionnaire was administered to all employees before, and 9 months after, implementation of a local area network linking personal computers and providing electronic mail services. The sample consisted of 50 of the 62 employees at T1 and 67 of the 86 at T2, with 36 respondents common to both time periods.

The third site (R&D2) was an R&D organization of approximately 900 employees that had implemented an electronic mail system approximately 4 years before. All 780 holders of computer accounts at this R&D organization received a questionnaire through interdepartmental mail; of these, 508 returned usable responses to the researchers in a sealed envelope.

The fourth site (AERO) was a division of a Fortune 500 aerospace company, which had implemented IBM's PROFS (professional office

system) approximately 8 months before. The sample consisted of 136 respondents from 148 users (all 73 who received training and a randomly selected 75 who did not; however, there were no significant differences between the two groups except that all 12 nonrespondents came from the second group).

The U.S. branches of an international chemical company that had been using voice mail for approximately 3 years was the fifth site (CHEM). Questionnaires were sent to 255 users sampled randomly within two strata: East or West Coast (50% each) and level of system usage during one selected month (light: 9 or fewer messages sent and received in one month; moderate: between 10 and 49; and heavy: over 50); 165 responded.

A large insurance organization (INS) in the process of pilot testing a voice mail system provided the sixth site. A questionnaire was administered before, 5 months after, and another year after implementation. The sample eventually comprised 458 employees; approximately 190 responded at T1, 243 at T2, and 300 at T3; approximately 80 were in both T1 and T2, and approximately 120 were in both T2 and T3 samples.

## Measures

From all six sites come data on media appropriateness, new media usage, and job positions and from two sites communication network data.

### *Media Appropriateness*

At each site, the questionnaire asked respondents to rate how appropriate various media (identified below) are for each of 10 communication activities: exchanging information, negotiating or bargaining, getting to know someone, asking questions, staying in touch, exchanging time-sensitive information, generating ideas, resolving disagreements, making decisions, and exchanging confidential information. Responses were reversed for the R&D2, AERO, CHEM, and INS sites to have higher values mean more appropriate for all sites. For the GOVT, R&D2, and AERO sites, the final item values were binary (*inappropriate* = 0, *appropriate* = 1). For the other sites, the final item values were 1 = *inappropriate* to 5 = *appropriate*. Means were computed for each medium in each site. Then, the 5-point scale means

were converted into a percentage of the 4-point item range (mean – 1 divided by 4) to make them directly comparable to the binary-item scale means. To the extent that these transformations do not make the measures comparable, or even distort the original measurements, the results will not be strictly comparable across sites.

*System Usage*

For the R&D1 site, continuous computer-monitored usage data of messages sent and messages received from both the electronic-mail system and the desktop video system were collected and aggregated separately at T2 and T3. For the GOVT and R&D2 sites, self-reported usage was measured by the percentage of the day spent using electronic mail. At the R&D2 site, computer-monitored usage data were the sum of all messages ever sent and ever received in each of five 4-week periods (over a 14-month period before the survey was administered), divided by the total number of business days in those periods.

For the AERO site, self-reported usage was measured by the percentage of the day spent using electronic mail. Computer-monitored usage included the average number of log-ons and the average number of connect time per business day since the user first logged on to the system. A few managers who had their secretaries use their account for them for more than 50% of the time (asked on the questionnaire) were dropped from all usage analyses.

For the CHEM site, self-report usage was measured by the number of voice messages sent and received in an average week. Computer-monitored usage measured the total number of voice messages sent and received during the month selected for the second sampling stratum. For the INS site, self-reported usage was measured by the total voice messages sent and received per average business day. Computer-monitored usage included both the number of voice messages sent and the number received, each divided by the number of weeks since each respondent first used the system.

Because media usage measures (as well as communication or participation measures in general) are generally negatively skewed, these were all transformed by first ranking them and then converting those rankings into a normal distribution (using the Blom formula). Rice (1990; Rice & Shook, 1988) discusses a variety of advantages and problems with system-monitored usage data.

*Job Positions*

For each site, the following job positions were identified for respondents either through questionnaires or archival records: R&D1: mentors and interns; GOVT: executives, middle managers, supervisors, professional staff, technical staff, secretary/clerical, and other; R&D2: executives, managers, researchers, technical staff, administrative, and clerical; AERO: managers, business, engineering, administrative, secretarial/clerical, and other; CHEM: managers, professional staff, sales reps, sales and marketing, technical, administrative, secretary/clerical, research, and other; and INS: managers, professional staff, insurance agent, sales, technical staff, administrative, secretary/clerical, and other.

*Communication Networks*

From the R&D1 data, the following network data were used:

*Social* network relations, T3: "How frequently do you communicate with the following people about social topics and topics that relate to how the organization functions?" and *work* network relations, T3: "How frequently do you communicate with the following people about work projects?" Both were measured from 1 = *less than once per month* to 7 = *several times per day* and had 46 respondents. Because these two networks were highly correlated ($r = .90$), they were first standardized and then added together.

*Electronic mail* network, T3: The number of system-monitored messages sent or received among all 48 individuals. Messages sent to self were excluded.

*Desktop video* network, T3: The number of system-monitored messages sent or received among all 23 users.

From the GOVT data, the following network data were used:

*General* network relations, T2: "How frequently do you communicate about any and all communication with others in this organization, including communication about specific tasks, organizational announcements, social activities, and the like? It may involve telephone calls, hallway talk, work-group sessions, problem-solving and other similar activities" (measured from 0 = *not at all* to 5 = *several times per day*; 29 respondents had network data and full scale means).

**TABLE 1**
**Adjusted Means of Communication Activity Evaluation Full Scale, High Social Presence Scale, and Low Social Presence Scale, Ranked by Full Scale Means**

| *Medium* | *Time Period* | *Site* | *Scales* | | |
|---|---|---|---|---|---|
| | | | *Full* | *High* | *Low* |
| Face | 3 | R&D1 | .95 | .97 | .92 |
| Face | 1 | R&D1 | .94 | .95 | .91 |
| Face | | CHEM | .90 | .94 | .85 |
| Phone | 2 | INS | .87 | .84 | .91 |
| Phone | 3 | INS | .83 | .80 | .86 |
| Phone | | CHEM | .82 | .76 | .90 |
| Phone | 1 | INS | .82 | .78 | .89 |
| Meet | 1 | R&D1 | .81 | .81 | .80 |
| Meet | | CHEM | .79 | .81 | .75 |
| Meet | 3 | R&D1 | .77 | .77 | .76 |
| Phone | 1 | R&D1 | .74 | .64 | .89 |
| Phone | 3 | R&D1 | .70 | .60 | .85 |
| Video | 3 | R&D1 | .69 | .62 | .80 |
| Text | 2 | INS | .68 | .67 | .70 |
| Text | 1 | INS | .63 | .61 | .67 |
| Email | 1 | R&D1 | .62 | .47 | .84 |
| Text | | CHEM | .62 | .58 | .68 |
| Email | 3 | R&D1 | .61 | .48 | .80 |
| Vmail | | CHEM | .61 | .48 | .81 |
| Vmail | 2 | INS | .60 | .49 | .77 |
| Vmail | 3 | INS | .54 | .40 | .75 |
| Email | 2 | GOVT | .49 | .32 | .75 |
| Email | 1 | GOVT | .46 | .35 | .64 |
| Email | | R&D2 | .44 | .24 | .72 |
| Text | 1 | R&D1 | .40 | .31 | .53 |
| Email | | AERO | .39 | .22 | .63 |
| Text | 3 | R&D1 | .36 | .27 | .48 |

NOTE: Each row shows the scale mean for the named medium, rated at the time period (only one time period if no number), for a particular site, ordered according to mean rating of the full scale mean. Media, time periods, site, and ratings are all described in text.

## RESULTS

### RQ1: Means and Comparisons

The first column of values in Table 1 are the adjusted means, ranked from highest to lowest, of the full 10-item appropriateness scale for

each medium at each site. We will return to the other two columns of means after the dimensionality and reliability analyses. Table 2a ranks each medium by its average mean across all relevant sites on each full mean scale (as well as the mean score across all the 10 mean scales). Table 2b does the reverse: It ranks each full mean scale by each medium across all relevant sites.

The overall ranking of media according to the full appropriateness scale, from highest to lowest, is face, phone, meeting, desktop video, vmail, text, and email. Face is ranked first for all activities except for staying in touch and exchanging time-sensitive information, for which the telephone is most appropriate (because of its ability to support synchronous communication across distances). Overall, the next most appropriate media are the telephone and meeting. The meeting, however, receives its lowest ratings on these same two activities precisely because it must overcome the most temporal and physical obstacles, such as scheduling and organizing multiple participants. Face-to-face and meetings appear most appropriate for getting to know someone and generating ideas, whereas the new media appear most appropriate for exchanging information, particularly time-sensitive information, asking questions, and staying in touch, similar to the traditional medium of the telephone.

## RQ2: Dimensionality for Each Medium at Each Site

To evaluate the dimensionality of the appropriateness scales, for each medium for each site, the 10 scale means were entered into a principal components analysis with varimax rotation, first seeking two components, and then with relevant follow-up analyses. Table 3 provides the factor loadings, with explanatory notes concerning the follow-up analyses.

In most media/sites, two primary dimensions emerge: *high* appropriateness (activities requiring high social presence or information richness, which include negotiate/bargain, get to know, generate ideas, resolve disagreements, make decisions, and exchange confidential information) and *low* appropriateness (activities requiring low social presence or information richness, which include exchange information, ask questions, stay in touch, and exchange time-sensitive information). Note that exchanging information loads on the high appropriateness factor for some media/sites.

*(text continues on page 467)*

TABLE 2

## Ranking of Media by Full Mean Scales (Evaluations of Appropriateness of Medium for Communication Activities) and Ranking of Mean Scales by Medium

A. Ranking of the Seven Media for Each Full Mean Scale and Overall Mean Scale

| *Rank* | *Exch* | *Negb* | *Getk* | *Askg* | *Stay* | *Time* | *Geni* | *Resl* | *Make* | *Conf* | *Overall Mean* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Face | Face | Face | Face | Phone | Phone | Face | Face | Face | Face | Face |
| 2 | Email | Meet | Meet | Phone | Face | Face | Meet | Meet | Meet | Phone | Phone |
| 3 | Meet | Phone | Phone | Meet | Video | Vmail | Phone | Phone | Phone | Meet | Meet |
| 4 | Phone | Video | Video | Video | Meet | Video | Video | Video | Video | Text | Video |
| 5 | Video | Text | Text | Vmail | Vmail | Meet | Vmail | Text | Text | Vmail | Vmail |
| 6 | Text | Vmail | Vmail | Email | Email | Email | Email | Vmail | Vmail | Video | Text |
| 7 | Vmail | Email | Email | Text | Text | Text | Text | Email | Email | Email | Email |

B. Ranking of the 10 Full Mean Scales for Each Medium

| *Rank* | *Face* | *Phone* | *Meet* | *Video* | *Vmail* | *Text* | *Email* |
|---|---|---|---|---|---|---|---|
| 1 | Getk | Askq | Geni | Exch | Time | Exch | Exch |
| 2 | Askq | Stay | Exch | Askq | Askq | Stay | Askq |
| 3 | Resl | Time | Make | Time | Stay | Askq | Stay |
| 4 | Negb | Exch | Askq | Stay | Geni | Geni | Time |
| 5 | Conf | Make | Negb | Geni | Exch | Make | Geni |
| 6 | Make | Resl | Resl | Make | Make | Conf | Make |
| 7 | Geni | Negb | Getk | Negb | Conf | Time | Resl |
| 8 | Exch | Geni | Stay | Resl | Resl | Resl | Conf |
| 9 | Stay | Getk | Time | Getk | Negb | Negb | Negb |
| 10 | Time | Conf | Conf | Conf | Getk | Getk | Getk |

NOTE: Exch = exchanging information; Negb = negotiating and bargaining; Getk = getting to know someone; Askq = asking questions; Stay = staying in touch; Time = exchanging timely information; Geni = generating new ideas; Resl = resolving disagreements; Make = make decisions; Conf = exchanging confidential information.

**TABLE 3**

**Loadings of Activity Ratings on Two Factors, by Site and Medium**

| *Site and Medium* | *Rating of Communication Activities* | | | | | | | | | | *Percentage Variance* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Exch* | *Negb* | *Getk* | *Askq* | *Stay* | *Time* | *Geni* | *Resl* | *Make* | *Conf* | |
| R&D1 | | | | | | | | | | | |
| Face 1 | .75 | .92 | .94 | .05 | −.05 | .51 | .06 | .93 | .79 | .70 | 45 |
| | .27 | −.22 | −.17 | .61 | .53 | .23 | .74 | −.04 | .07 | .01 | 14 |
| Face 2 | .00 | .48 | .06 | .00 | .86 | .22 | .09 | −.11 | .90 | .48 | 25 |
| | −.34[a] | −.14 | .87 | .00 | −.15 | −.42[a] | .93 | .18 | −.09 | .16 | 21[a] |
| Meet 1 | .07 | .89 | .53 | .47 | .50 | −.02 | .22 | .88 | .34 | .57 | 32 |
| | .74[a] | −.05 | .20 | .11 | .17 | .62[a] | .70 | −.02 | .59 | .32 | 15[a] |
| Meet 2 | .60 | .75 | .26 | .32 | .29 | −.01 | .69 | .61 | .80 | .71 | 49 |
| | .43 | .47 | .83 | .46 | .71 | .81 | −.08 | .49 | .32 | .23 | 12 |
| Phone 1 | .43 | −.03 | .21 | .78 | .59 | −.32 | .66 | .43 | .25 | .65 | 34 |
| | .19 | .88 | .56 | −.01 | .05 | .36[a] | .44 | .71 | .62 | .24 | 14[a] |
| Phone 2 | .41 | .74 | .61 | .51 | .41 | −.01 | .85 | .63 | .74 | .09 | 40 |
| | .69 | .33 | .03 | .16 | .30 | .88 | −.09 | .48 | .30 | .53 | 13 |
| Video 2 | .82 | .62 | .09 | .75 | .59 | .63 | .78 | .44 | .63 | −.02 | 46 |
| | .00 | .65 | .69 | .08 | .25 | .13 | .24 | .59 | .60 | .76 | 13 |
| Email 1 | .44 | .81 | .77 | .39 | .16 | .53 | .67 | .77 | .73 | .44 | 38 |
| | .09 | −.04 | .21 | .71 | .89 | −.46 | .14 | .18 | .18 | −.30 | 16 |
| Email 2 | .70 | .69 | .54 | .15 | .13 | .60 | .43 | .73 | .78 | .73 | 45 |
| | .33 | .33 | .42 | .76 | .81 | .18 | .61 | .23 | .33 | −.35 | 14 |
| Notes 1 | .00 | .59 | .61 | .65 | −.07 | .28 | .43 | .82 | .68 | .61 | 36 |
| | .73[a] | .08 | .56 | .02 | .68[a] | .44[a] | .49 | .31 | .26 | −.11 | 13[a] |
| Notes 2 | .68 | .89 | .39 | .29 | −.13 | .62 | .60 | .75 | .78 | .59 | 47 |
| | .31 | .05 | .53 | .69 | .86 | .32 | .53 | .31 | .40 | −.09 | 13 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GOVT | | | | | | | | | | | |
| Email 1 | .67 | .28 | .46 | .59 | .80 | .79 | .60 | −.05 | −.09 | .67 | 32 |
| | .03 | .60[a] | .02 | .08 | .00 | .08 | .54[a] | .74[a] | .70[a] | −.47 | 19[a] |
| Email 2 | .17 | .35 | .47 | .09 | −.20 | .41 | .73 | .68 | .81 | .32 | 30[a] |
| | .73 | .35 | .22 | .77 | .77 | .40 | .13 | .02 | −.06 | .47 | 17 |
| R&D2 | | | | | | | | | | | |
| Email | .78 | .09 | .06 | .79 | .67 | .39 | .62 | .05 | .25 | .08 | 28 |
| | .06 | .67 | .53 | .05 | .12 | .06[a] | .25 | .77 | .62 | .46[a] | 15[a] |
| AERO | | | | | | | | | | | |
| Email | .81 | .10 | −.23 | .71 | .54 | .61 | .40 | .25 | .46 | .11 | 30 |
| | −.10 | .75 | .60 | .11 | .36 | .01 | .46 | .74 | .31 | .51 | 16 |
| CHEM | | | | | | | | | | | |
| Face | .40 | .25 | .82 | .31 | .09 | −.04 | .51 | .85 | .83 | .64 | 42 |
| | .62 | .56 | .17 | .73 | .67 | .72 | .42 | .17 | .10 | .19 | 14 |
| Meet | .63 | .57 | .52 | .74 | .73 | .55 | .39 | .24 | .32 | −.08 | 39 |
| | .21 | .01 | .48 | .21 | .23 | .14 | .53 | .72 | .75 | .81 | 12 |
| Phone | .52 | .18 | .06 | .69 | .66 | .68 | .45 | .62 | .64 | .42 | 33 |
| | .18 | .70 | .78 | .23 | .06 | −.29 | .30 | .42 | .16 | .28 | 12 |
| Vmail | .82 | .11 | .15 | .81 | .83 | .82 | .64 | .35 | .62 | .22 | 52 |
| | .22 | .81 | .83 | .20 | .24 | .08 | .46 | .76 | .50 | .63 | 14 |
| Text | −.14 | .71 | .41 | .20 | .23 | .71 | .10 | .73 | .57 | .35 | 34 |
| | .67 | .05 | .45 | .74 | .59 | −.01 | .46 | .32 | .45 | .44 | 12 |

*(continued)*

**TABLE 3 Continued**

| Site and Medium | Rating of Communication Activities | | | | | | | | | | Percentage Variance |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Exch* | *Negb* | *Getk* | *Askq* | *Stay* | *Time* | *Geni* | *Resl* | *Make* | *Conf* | |
| INS | | | | | | | | | | | |
| Phone 1 | .52 | .17 | .13 | .30 | .57 | .64 | .76 | .68 | .78 | .56 | 43 |
| | .21 | .72 | .83 | .74 | .42 | .38 | .14 | .36 | .19 | .03 | 11 |
| Phone 2 | .80 | .20 | .01 | .76 | .56 | .73 | .66 | .39 | .52 | .41 | 45 |
| | .03 | .67 | .86 | .30 | .49 | .14 | .30 | .74 | .51 | .35 | 12 |
| Phone 3 | .08 | .73 | .81 | .21 | .22 | .13 | .68 | .87 | .70 | .69 | 45 |
| | .75 | .17 | .03 | .74 | .72 | .72 | .40 | .08 | .38 | .19 | 16 |
| Vmail 1 | .82 | .06 | .09 | .80 | .54 | .80 | .62 | .23 | .45 | .49 | 47 |
| | .05 | .81 | .81 | .18 | .55 | .10 | .39 | .79 | .64 | .41 | 15 |
| Vmail 2 | .73 | .10 | .07 | .79 | .50 | .67 | .60 | .26 | .61 | .49 | 38 |
| | .04 | .77 | .79 | −.03 | .37 | .11 | .32 | .76 | .33 | .36 | 14 |
| Text 1 | .22 | .63 | .57 | .09 | .24 | .66 | .58 | .60 | .62 | .72 | 38 |
| | .60 | .25 | .23 | .81 | .67 | .25 | .32 | .38 | .29 | −.23 | 11 |
| Text 2 | .01 | .66 | .74 | .36 | .59 | .39 | .40 | .74 | .49 | .13 | 36[b] |
| | .81 | .18 | .01 | .57 | .39 | .30 | .49 | .15 | .42 | .62 | 10 |

NOTE: See Table 2 note for descriptions of abbreviations.

a. Third factor explained 12%-14%; items loading on that factor are indicated by superscript a.

b. As the second factor here had an eigenvalue of 1.01, a follow-up analysis found one factor with all items loading .48 or greater.

TABLE 4
**Factors and Loadings of Activity Evaluations Across All Media**

| *Activity Evaluation* | *Factor 1* | *Factor 2* |
|---|---|---|
| Exchange information | .29 | .65 |
| Negotiate/bargain | .91 | .36 |
| Get to know someone | .86 | .43 |
| Ask questions | .47 | .81 |
| Stay in touch | .37 | .84 |
| Exchange time-sensitive information | .23 | .78 |
| Generate ideas | .80 | .40 |
| Resolve disagreements | .91 | .39 |
| Make decisions | .90 | .40 |
| Exchange confidential information | .91 | .28 |
| Eigenvalue | 7.4 | 1.0 |
| Percentage variance explained | 74 | 10 |

## RQ2: Overall Dimensionality of Media Across Sites

To assess the dimensionality of the communication activity evaluations over all the media and sites, each medium in each site was treated as a case, and the adjusted means of all the "cases" were entered into a principal components analysis. Table 4 shows that the six high social presence activities loaded on the first dimension (74% variance), and the four low social presence activities loaded highest on the second dimension (10% variance). However, as the first dimension explained the bulk of the variance, and the eigenvalue of the second dimension was just slightly over 1.0, it can be argued that averaged over these six sites, media appropriateness is unidimensional.

## RQ3: Scaling of Appropriateness Ratings and Media

To visually portray how the appropriateness ratings and the media are associated among themselves, two multidimensional scalings were conducted based on the media-by-ratings means matrix.

To scale the *ratings*, the columns were correlated, and this matrix was converted into dissimilarities and then entered into a MDS program. As the scaling solution (explaining 90% of the variance) in Figure 1 shows, the three low appropriateness activities cluster together, and the six high social presence activities cluster together. Exchanging

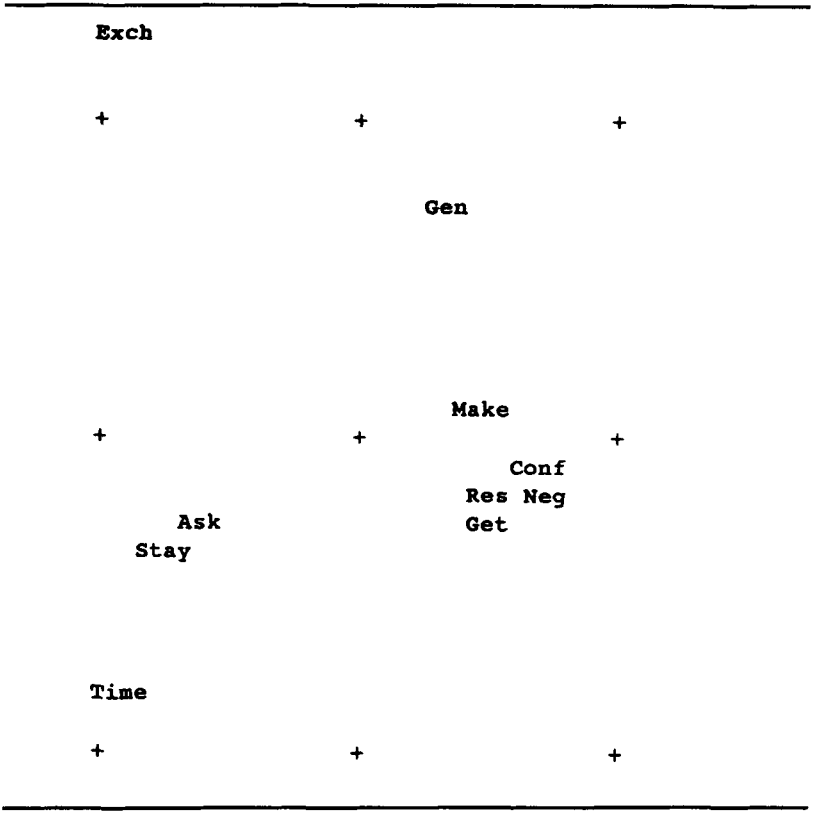


**Figure 1: Multidimensional Scaling of Communication Activities**
NOTE: See Table 2 note for descriptions of abbreviations.

information is located by itself. It appears as though "exchanging information" is an activity fundamental and common to *both* dimensions of social presence appropriateness.

To scale the *media,* the rows were correlated, converted, and scaled, with the results shown in Figure 2 (94% variance explained). Note the considerable consistency in how media are perceived across multiple sites.

To help interpret the dimensions, the two coordinates for each medium were regressed separately on the appropriateness mean, using stepwise regression (beta coefficients precede variable and partial $R^2$ follows; all statistically significant at $p < .05$, except stay in touch and exchanging confidential information, both $p < .10$).

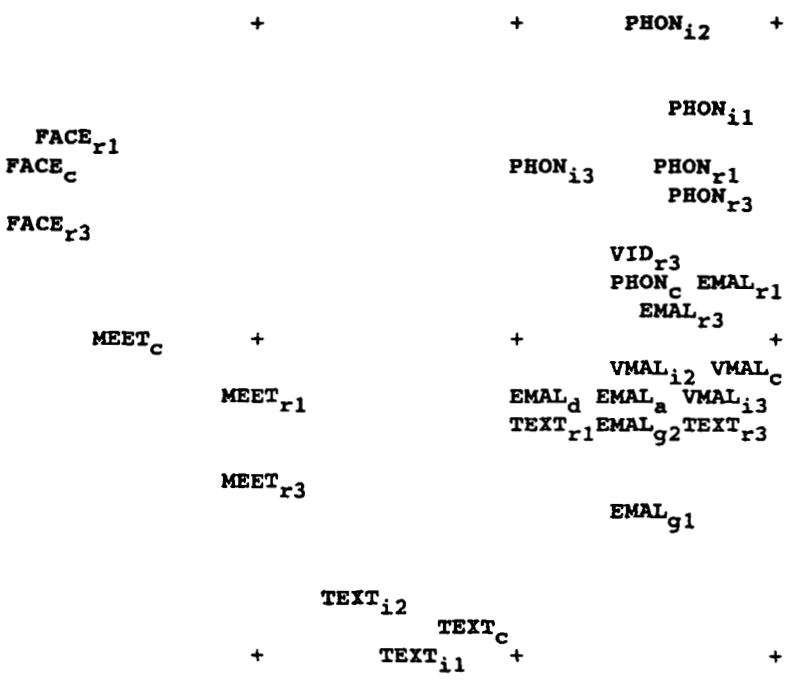


**Figure 2: Multidimensional Scaling of Communication Media**
NOTE: Legend for subscripted sites: r = R&D1; g = GOVT; a = AERO; d = R&D2; c = CHEM; i = INS.
1, 2, 3 = Time period for sites with multiple time period measurements.

For the horizontal coordinates, 78% of the variance was explained by the following equation: –.51 (generating ideas, 52%) +.52 (exchanging time-sensitive information, 18%) –.70 (getting to know someone, 9%) +.26 (staying in touch, 3%) ($F$[4, 26] = 24.3).

For the vertical coordinates, 95% of the variance was explained by the following equation: .71 (exchanging time-sensitive information, 63%) –1.45 (making decisions, 26%) +.72 (resolving disagreements, 19%) +1.05 (getting to know someone, 5%) –.21 (exchanging confidential information, 1%) ($F$[4, 26] = 103).

So the horizontal dimension involves aspects of media that facilitate generating ideas and personal relations on the left (face-to-face and meetings) and timely but less personal or frequent relations on the right (email, phone, and video)—or, more simply, *interpersonal*

*versus mediated.* The vertical dimension involves aspects of media that facilitate exchanging information in real time and asking questions in the upper half (face-to-face and telephone) and asynchronous exchanges of information in the lower half (email and text)—or, more simply, *synchronous versus asynchronous.* Text is seen as the opposite of direct interpersonal communication on the synchroneity dimension but not on the mediated dimension. Note that these two dimensions can be thought of as reflecting the two primary social psychology concepts underlying the social presence concept noted earlier: *intimacy* (the extent of unmediated interaction) and *immediacy* (the extent of synchronous interaction).

### RQ2: Dimensionality—Low and High Appropriateness Subscales

So far, the scale rankings and the multidimensional scaling results indicate that these 10 appropriateness items fairly well discriminate among the media in ways consistent with social presence and information richness theories. However, there is evidence that the underlying measurement of appropriateness consists of two dimensions, as implied by the separate principal components analyses and the communication activities scaling solution in Figure 1. The "low appropriateness" factor involves relaying information, especially if it is time-sensitive (which may require synchronous relations through face-to-face communication or asynchronous communication through new media when physical and temporal obstacles arise). The "high appropriateness" factor involves creative, interpersonal, emotional, and outcome-oriented activities.

Looking at the means of the *low* appropriateness subscale in Table 1 (which orders the media according to the full scale), it can be seen that one phone rating and all the new media ratings are ranked higher on the low appropriateness subscale than their full scale ranking would place them.

### RQ4: Reliabilities—Cross-Sectional

Within-time reliabilities were assessed by Cronbach's alpha and are shown in Table 5. Except for the face-to-face channel at T2 for the R&D1 site, which appears anomalous for all three scales, the full scale had generally acceptable reliabilities from .68 to .88. The low appro-

priateness subscale had lower reliabilities, with unacceptably low reliabilities for all media at T1 at the R&D1 site and a low value for text at the CHEM site but better values at T2 at the R&D1 site and elsewhere, ranging from .56 to .81. The high appropriateness subscale performed slightly better, ranging from .65 to .85, except for T1 at the GOVT site (which, remember, measured *expectations* about the use of email before it was implemented).

RQ4: Reliabilities—Across Time

Significant *t* tests across time indicate that the mean value changes; significant correlations across time indicate that relative differences among individuals are stable, even if the overall mean changes. Note that stability in means over time, especially in appropriateness of a new medium and especially before and after implementation of the new medium, is not necessarily expected or even desired. Further, to the extent that the two subscales represent meaningful differences in aspects of media, they might exhibit different over-time associations. However, in lieu of a theory of differential perception of media appropriateness (that is, that perceptions would be more variable for some categories of individuals than others, such as organizational newcomers, thus reducing the overall correlation), we would expect the correlations to be significant. Table 6 presents the correlations and *t* tests for those media and sites with across-time measures.

Almost all of the scale correlations are significant. The two exceptions are the troublesome face scale at R&D1 and email at GOVT ($r = .33, p < .10$ because of the sample size). Also, although some of the low appropriateness subscale correlations are lower than the full scale and high subscale correlations (especially R&D1 meeting, text, and email, GOVT email, INS phone T3-T2), others are similar and in two cases higher (R&D1 face, INS vmail). So, in general, the appropriateness scales appear to indicate moderately consistent patterns of responses across individuals, with perhaps some differential responses to the low appropriateness scale.

As we would hope, the face and meeting scales, which are theoretically nonsubstitutable by most new media, appear stable across time, based on *t* tests. However, the phone and text scales, theoretically substitutable by most new media (see Rice & Associates, 1984; Rice & Case, 1983), do show changes in appropriateness over time. At the R&D1 site, there is a near-significant decline in the full phone appro-

**TABLE 5**
**Alpha Reliabilities for Full Scale, Low Social Presence Scale, and High Social Presence Scale, for Six Sites**

| | *Face* | | *Meet* | | *Phone* | | | *Text* | | *Email* | | *Video* | *Vmail* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Site and Scale Type* | *T1* | *T2* | *T1* | *T2* | *T1* | *T2* | | *T1* | *T2* | *T1* | *T2* | *T2* | *T1* | *T2* |
| R&D1 | | | | | | | | | | | | | | |
| Full | .79 | .39 | .73 | .86 | .77 | .80 | | .77 | .86 | .80 | .84 | .85 | — | — |
| Low | .41[a] | .19 | .33[a] | .67 | .41 | .71[b] | | .47 | .78 | .43[c] | .74[b] | .73 | — | — |
| High | .85 | .37 | .72 | .84 | .78 | .78 | | .78 | .84 | .81 | .82 | .82 | — | — |
| CHEM | | | | | | | | | | | | | | |
| Full | — | .80 | — | .80 | — | .75 | | — | .77 | — | — | — | — | .89 |
| Low | — | .68 | — | .72 | — | .64 | | — | .48 | — | — | — | — | .87 |
| High | — | .76 | — | .72 | — | .65 | | — | .70 | — | — | — | — | .85 |
| INS | | | | | T1 | T2 | T3 | | | | | | | |
| Full | — | — | — | — | .83 | .84 | .86 | .81 | .80 | — | — | — | .87 | .82 |
| Low | — | — | — | — | .74 | .78 | .74 | .63 | .62 | — | — | — | .81 | .70 |
| High | — | — | — | — | .76 | .78 | .87 | .75 | .72 | — | — | — | .82 | .75 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GOVT | | | | | | | | | | | | | |
| Full | — | — | — | — | — | — | — | — | .71 | .72 | — | — | — |
| Low | — | — | — | — | — | — | — | — | .65[d] | .65 | — | — | — |
| High | — | — | — | — | — | — | — | — | .42 | .68 | — | — | — |
| R&D2 | | | | | | | | | | | | | |
| Full | — | — | — | — | — | — | — | — | — | .70 | — | — | — |
| Low | — | — | — | — | — | — | — | — | — | .61[e] | — | — | — |
| High | — | — | — | — | — | — | — | — | — | .63 | — | — | — |
| AERO | | | | | | | | | | | | | |
| Full | — | — | — | — | — | — | — | — | — | .68 | — | — | — |
| Low | — | — | — | — | — | — | — | — | — | .56 | — | — | — |
| High | — | — | — | — | — | — | — | — | — | .56 | — | — | — |

a. Deleting "stay in touch" item would have raised reliability a moderate amount.
b. Deleting "time-sensitive information" item would have raised reliability a moderate amount.
c. Deleting "time-sensitive information" item would have raised reliability a considerable amount.
d. Deleting "asking questions" item would have raised reliability slightly.
e. Deleting "time-sensitive information" item would have raised reliability slightly.

**TABLE 6**
**Over-Time Correlations and *t* Tests Among Full Scale and Subscales**

| | Site | | | |
|---|---|---|---|---|
| | *R&D1* | *GOVT* | *INS* (n = 120 to 275) | |
| *Scale for Medium* | (n = 45) | (n = 29) | *T2-T1* | *T3-T2* |
| Face | | | | |
| Full | | | | |
| Correlation | .17 | — | — | — |
| *t* test | .08 | — | — | — |
| Low | | | | |
| Correlation | .39*** | — | — | — |
| *t* test | .05 | — | — | — |
| High | | | | |
| Correlation | .19 | — | — | — |
| *t* test | .10 | — | — | — |
| Meet | | | | |
| Full | | | | |
| Correlation | .54*** | — | — | — |
| *t* test | −.12 | — | — | — |
| Low | | | | |
| Correlation | .40*** | — | — | — |
| *t* test | −.14 | — | — | — |
| High | | | | |
| Correlation | .52*** | — | — | — |
| *t* test | −.11 | — | — | — |
| Phone | | | | |
| Full | | | | |
| Correlation | .59*** | — | .39*** | .44*** |
| *t* test | −.15† | — | .12* | −.20*** |
| Low | | | | |
| Correlation | .53*** | — | .32*** | .31*** |
| *t* test | −.12 | — | .02 | −.22*** |
| High | | | | |
| Correlation | .58*** | — | .37*** | .41*** |
| *t* test | −.16 | — | .19*** | −.19** |
| Text | | | | |
| Full | | | | |
| Correlation | .68*** | — | .52*** | — |
| *t* test | −.19* | — | .17** | — |
| Low | | | | |
| Correlation | .36** | — | .46*** | — |
| *t* test | −.19 | — | .12† | — |
| High | | | | |
| Correlation | .80*** | — | .49*** | — |
| *t* test | −.18* | — | .20** | — |

**TABLE 6 Continued**

| Scale for Medium | Site | | | |
|---|---|---|---|---|
| | R&D1 (n = 45) | GOVT (n = 29) | INS (n = 120 to 275) T2-T1 | T3-T2 |
| Vmail | | | | |
| Full | | | | |
| Correlation | — | — | — | .49*** |
| *t* test | — | — | — | -.23*** |
| Low | | | | |
| Correlation | — | — | — | .57*** |
| *t* test | — | — | — | .05 |
| High | | | | |
| Correlation | — | — | — | .47*** |
| *t* test | — | — | — | -.35*** |
| Email | | | | |
| Full | | | | |
| Correlation | .55*** | .33† | — | — |
| *t* test | -.04 | -.02 | — | — |
| Low | | | | |
| Correlation | .44*** | .05 | — | — |
| *t* test | -.16 | .08 | — | — |
| High | | | | |
| Correlation | .60*** | .29 | — | — |
| *t* test | .04 | -.09 | — | — |

NOTE: Sample sizes are approximate, as pairwise deletion was used. The *t* tests are of later time period mean minus earlier time period mean; mean difference (*not* *t* value) and significance (if $p < .10$) are reported.
†$p < .10$; *$p < .05$; **$p < .01$; ***$p < .005$.

priateness scale but not in either subscale. At the INS site, the phone increases in appropriateness (but not for low appropriateness activities) as users become initially familiar with vmail, but after considerable experience with vmail, it declines (for both the full scale and subscales). At the R&D1 site, where email was a new medium and might substitute for text, text declines in perceived appropriateness, except for the low appropriateness subscale. At the INS site, where vmail was the new medium and cannot well substitute for text, text increased in appropriateness, also except for the low appropriateness activities. Vmail itself decreased in overall and high appropriateness but not in low appropriateness. And at the R&D1 and GOVT sites, email did not change in either the full or subscale means.

### RQ5: Association of New Media Appropriateness and Usage

All three scales for each new medium (email, vmail, video) were regressed on the available usage measures for each site from the latest time period. Table 7 shows that three of the seven media/sites (R&D1 video, GOVT email, and INS vmail) show no significant associations at all. In the four media/sites with significant regression equations, the variance explained ranged from .05 to .16. In two out of three of those significant regressions, self-reported measures had stronger associations with the appropriateness scales than did monitored measures. And in two of those, the low appropriateness subscale had a stronger association than did the full scale; however, whenever either of the subscales was significantly predicted, the full scale was too. Except for monitored messages received in the R&D1 email analysis, when usage was significantly associated with media appropriateness, it was positively associated.

### RQ6: Social Influence on Media Perceptions Within Job Positions

Each full scale and subscale was analyzed for mean differences, using analysis of variance and Duncan range comparison tests, based on the job positions measured for the respective site.

For the R&D1 site, the only two significant differences between the mentors and interns was for low appropriateness phone T2 ($R^2 = 11\%$) and low appropriateness email T2 ($R^2 = 8\%$). In both cases, mentors ranked these media 10 percentage points higher. For the GOVT site, none of the email scales showed significant mean differences. But this conclusion is partially due to the small sample sizes because executives, middle managers, and technical staff all rated email lower than the other job categories, with professional staff rating it the highest. For the low email scale at the R&D2 site, there was a very slight significant difference ($R^2 = 3\%$), with ratings higher for higher-level individuals (.94 and .83 for executives and managers, respectively, and around .70 for all others). There were no significant differences for the email scales for the AERO site or for any media for the INS site.

At the CHEM site, there were no significant differences for the face, meeting, or phone scales. There were significant differences for the full text scale ($R^2 = 9\%$) and the low appropriateness text scale ($R^2 =$

TABLE 7

## Stepwise Regressions of New Media Full Scale and Subscales on Usage Measures

| Site and Usage Measures | Scales | | |
|---|---|---|---|
| | *Full* | *High* | *Low* |
| R&D1: Email | | | |
| Monitored messages sent | .55* | .59** | .46* |
| Monitored messages received | −.43† | −.26 | −.47* |
| $F(2, 44)$ | 2.8† | 4.4* | 2.2 |
| Adjusted $R^2$ | .08 | .13 | .05 |
| R&D1: Video | | | |
| Monitored messages sent | .17 | .31 | .08 |
| Monitored messages received | .32 | .13 | .36 |
| $F(2, 21)$ | 2.1 | 1.8 | 1.9 |
| Adjusted $R^2$ | .10 | .07 | .08 |
| GOVT: Email | | | |
| Self-reported percentage of day | −.04 | .12 | .04 |
| $F(1, 53)$ | .1 | .7 | .1 |
| Adjusted $R^2$ | .00 | .00 | .00 |
| R&D2: Email | | | |
| Monitored messages sent | .06 | .06 | .04 |
| Monitored messages received | .03 | .08 | −.02 |
| Self-reported percentage of day | .37*** | .27*** | .32*** |
| $F(3, 437)$ | 28.2*** | 19.9*** | 17.7*** |
| Adjusted $R^2$ | .16 | .11 | .10 |
| AERO: Email | | | |
| Monitored messages sent | −.01 | −.10 | .14 |
| Monitored messages received | .24 | .29 | .14 |
| Self-reported percentage of day | .25 | .10 | .31† |
| $F(3, 38)$ | 2.8* | 1.5 | 2.8* |
| Adjusted $R^2$ | .12 | .04 | .12 |
| CHEM: Vmail | | | |
| Monitored messages sent | .25** | .28*** | .19* |
| Self-reported sent and received | .00 | .14 | −.08 |
| $F(2, 141)$ | 4.7** | 11.1*** | 2.0 |
| Adjusted $R^2$ | .05 | .13 | .01 |
| INS: Vmail | | | |
| Monitored messages sent | .03 | .06 | .00 |
| Monitored messages received | .02 | .03 | .00 |
| Self-reported sent and received | .29 | .16 | .31 |
| $F(3, 41)$ | 1.2 | .4 | 1.4 |
| Adjusted $R^2$ | .02 | .00 | .04 |

NOTE: Only significant independent variables are included in final stepwise results. Values for usage measures are standardized beta coefficients.
†$p < .10$; *$p < .05$; **$p < .01$; ***$p < .005$.

11%), with generally lower ratings by higher-level individuals and with ratings for the low appropriateness slightly higher than for the full scale. There were also considerable and significant differences for all three vmail scales ($R^2$ = 27%, 20%, and 30%, respectively). Here, the patterns were not so straightforward. Sales managers, sales representatives, administrators, clericals, and others rated it highest, whereas managers, professionals, technical staff, and researchers rated it the lowest. The high appropriateness subscale had higher means (from .51 to .92) than did the full scale or low appropriateness subscale (from .25 to .78).

### RQ6: Social Influence on Media Perceptions Through Communication Networks

To test the proposition that perceptions of appropriateness of new media are influenced by the perceptions of those with whom one communicates frequently, the "contagion" routine in Burt's (1991) STRUCTURE program was used. For each actor *i* in each network, each *j*'s full appropriateness score was multiplied by the frequency of communication between *i* and *j*, and then that product is averaged over all *j*s for that *i*. This "contagion" influence was used to predict each *i*'s appropriateness score, resulting in a mean correlation over all *i*s for each network. Finally, because the influence scores are clearly not independent, the significance of the correlation was estimated by a jackknife sampling procedure in the program. The program also includes an option that finds the smallest grouping of individuals that generates a difference in correlations from the previous larger grouping of at least $r$ = .05 and reports a "sensitivity parameter," which indicates to what extent more proximate others have greater influence. For the R&D1 site, the influence of others through one's *combined social and work* network, and through one's *email network*, on perceptions of *email* appropriateness was $r = .08^{(\text{sensitivity} = 2)}$ and $r$ = .01 for all respondents, $r$ = .05 and $r$ = –.05 for interns, and $r$ = .11 and $r = .13^3$ for mentors, respectively (none significant). For influence through the *combined network* and through one's *video network* on perceptions of *desktop video* appropriateness, the overall influence was $r$ = .05 and $r$ = –.11, $r$ = .19 and $r = .26^2$ ($p < .05$) for interns, and $r$ = –.18 and $r = -.33^2$ for mentors, respectively. For the GOVT site, there was no significant network influence ($r = .06^5$) on one's full *email* appropriateness mean.

## SUMMARY

### RQ1: Means and Rankings

The overall appropriateness rankings of media were face-to-face, telephone and meetings, desktop video, voice mail, text, and electronic mail. This ranking is very similar to those of many other comparisons (see Rice et al., 1992), except that email has often been ranked higher than text and, in some cases, telephone. This indicates that this appropriateness scale may not be capturing enough of the ability of email to overcome situational constraints or even support socioemotional content (Rice & Love, 1987) and that stable and higher assessments of email might await greater diffusion and familiarity.

### RQ2: Dimensionality

Using the separate media/sites as cases, two factors consistently emerge, although using the aggregated cases results in one primary factor. The factors represent the two fundamental dimensions discussed earlier: information exchange (less equivocal) and socioemotional relations (more equivocal). New media are rated relatively higher on the low appropriateness scale than their means on the full scale would indicate. Thus the two subscales should be considered for particular analyses requiring more subtlety than the full scale provides. However, as the scaling results (shown below) indicated, the activity "exchanging information" appears to be general and related to both dimensions.

### RQ3: Media Comparisons

Most of the traditional media cluster separately among themselves (face-to-face, meetings, text, and phone), whereas the new media cluster together, with some instances of text and phone. These clusters have face validity and show that new media combine some aspects of text and the telephone but are still seen quite differently than is unmediated interpersonal communication. The two distinguishing dimensions appear to be interpersonal-mediated and synchronous-asynchronous.

RQ4: Reliability and Stability

Three summary results stand out. First, the full scale exhibits generally acceptable reliability, whereas the low appropriateness subscale is slightly less reliable. There are three plausible explanations for the basic pattern of reliabilities. First, the low appropriateness subscale had fewer items, so it would be more susceptible to variation than the high or full scale. Second, exchanging information was included in the low, even though it often loaded on the other dimension for particular media/sites. Third, the "task" or information relaying activities may be more fundamental to all communication activities and thus harder to distinguish than the "socioemotional" or interactive, interpretive activities. As for the exceptionally low values for the face-to-face scale at T2 at the R&D1 site, half of the sample was student interns new to the organization and perhaps to corporate settings in general and so were unfamiliar with norms for interpersonal organizational communication.

Second, the two media that have the highest social presence or media richness—face and meeting—do not change in perceived appropriateness, whereas the other two traditional media that are plausibly substitutable or influenced by new media—phone and text—both show general stability in the low appropriateness subscale but may change in appropriateness for high social presence activities. Third, although the full scale appears generally serviceable, in some cases the two subscales present different pictures of how perceptions of media change over time and perhaps in contrast to other media.

RQ5: Association of
Usage and Appropriateness

There appears to be no consistent pattern in the analyses, except that (a) in most but not all analyses, new media usage and new media appropriateness were positively but weakly associated, (b) the full scale is the most parsimonious choice, and (c) both self-reported and computer-monitored usage measures should be included because they appear associated with different aspects of perceptions.

RQ6: Social Influence on
Perceived Appropriateness

Of 27 media ratings (each with three scales), only 8 had significantly different means across job positions. Five of those involved new

media (all three scales for vmail at one site and the low email scale at two sites), and most involved the low appropriateness subscale. Differences in job positions explained more than 11% variance only for vmail appropriateness ratings at the one site. There is also very little evidence of social information processing influence through communication networks, except concerning desktop video for interns at R&D1 through the social/work network and the video network. That is, only those who might be most impressionable early on (interns) were influenced (slightly) about the most ambiguous medium (desktop video) and more through the subset of those communicating over the new medium itself than through the general work and social networks.

## CONCLUSION

One contribution of this study is identifying one way to establish cross-organizational and cross-media measurement and conceptual consistency in analyses of new media. For example, although media richness theory has made considerable theoretical contributions, there is still very little empirical validation of the media richness construct. Social presence theory (and, to the extent that it makes similar claims, media richness theory), as indicated by the media appropriateness scale and subscales, appears to provide a useful, consistent, meaningful, stable, and discriminating way to characterize media. Other social presence, media richness, and additional scales may also be useful. However, the concept of media appropriateness across generic organizational communication activities provides one way to understand how new media augment, substitute, and complement traditional media. With this and other measures of media characteristics, we might be better able to make comparisons across media, organizations, and analyses, and better able to understand how new media have positive and negative attributes for organizational communication.

## NOTES

1. Even a summary of prior studies applying uses and gratifications theory to characterize and compare media would require a lengthy review (for just a few examples, see Dobos & Jeffres, 1988; Elliott & Quattlebaum, 1979; Lichtenstein & Rosenfeld, 1984; Lometti, Reeves, & Bybee, 1977; Perse & Courtright, 1993).

2. For more details and other analyses from these sites, see R&D1: Fish, Kraut, Root, and Rice (1993); GOVT: Rice and Contractor (1990), Rice, Grant, Schmitz, and Torobin (1990), Rice et al. (1992), and Rice and Shook (1990a); R&D2: Eveland and Bikson (1987), Markus (1987), Rice, Hughes, and Love (1989), and Rice and Shook (1990a); AERO: Rice and Shook (1988, 1990a); CHEM: Rice et al. (1992); INS: Rice et al. (1992), Rice and Shook (1990a, 1990b), and Rice and Steinfield (in press).

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