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Individual and organizational influences on voice mail use and evaluation

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Abstract. This study develops and tests a simple model predicting influences on use of voice mail, and influences of voice mail use on later system evaluations. Data were collected in two organisations, using self-report and system-monitored usage measures. The study makes distinctions between individual and organizational innovativeness, communication-based and location-based group interdependence, overall and intentional voice mail usage, and generic and specific appropriateness of voice mail. Results were quite similar across the two organizations. Individual innovativeness had no influence, but organizational conservativeness had a positive influence on system usage, possibly for less innovative uses of voice mail as voice answering rather than as a voice messaging. Task analysability had a small positive influence on usage. Group location interdependency had perhaps the most consistent influence on voice mail usage. Greater intentional self-reported use of voice mail for voice messaging, rather than simple monitored and self-reported amount of usage, had somewhat of a greater influence on system evaluations. Individual and organizational variables had no significant influence system evaluations, controlling for the influence of usage. The discussion provides some suggestions for models of new organizational media use in organizations.

1. Introduction

This study develops and tests a model of individual and organizational influences on amount and kinds of voice mail usage, and, in turn, of usage on evaluations of voice mail, in two organizations. The model is not intended to be comprehensive, as are other proposed and tested models of new media use and evaluation (Fulk *et al.* 1990, Rice *et al.* 1990, Rice and Shook 1990a,b, Sitkin *et al.* 1992, Trevino *et al.* 1987, Trevino and Webster 1992, and others reviewed by Rice 1992a). Rather, it emphasizes a few relevant variables that have not been analysed in combination before. In particular, it focuses on individual and organizational innovativeness, and highlights different conceptualizations of voice mail usage.

1.1. *Voice mail*

Voice mail (vmail) is a combination of software and hardware that is integrated with the traditional telephone network to digitize, store, and retrieve spoken messages (Barrington and Baker 1990, Parker 1987, Walters 1991). First commercially implemented in organizations around 1980, vmail services are now offered by some regional telephone operating companies, and vmail systems can be installed on personal computers. Three-quarters of the nation's largest 2000 companies already have automated call-routeing or answering systems (*New York Times* 1994). Voice mail systems have been implemented to help support libraries and university faculty, plan business strategy, provide cancer information, and even remind elderly patients to follow their prescribed medication (Bransby 1990, Hill *et al.* 1991, Flander 1991, Leirer *et al.* 1991, Okolica and Stewart 1993).

Surveys on levels of use and attitudes toward vmail (Adams *et al.* 1993, Barrington and Baker 1990, Beswick and Reinsch 1987, Grantham and Vaske 1985, Nicholson 1985, Rice and Danowski 1993, Rice and Steinfield 1994, Stewart 1993), tests of choice and outcomes of vmail (DiFiore 1986, Reinsch and Beswick 1990, Rice and Shook 1990a, Trevino and Webster 1992), and implications for implementing vmail (Ehrlich 1987, Finn 1986, Stewart 1992) are beginning to

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provide insights into how people perceive, use, and evaluate organizational vmail. Some of these studies have distinguished two quite different kinds of vmail, although most find that only the first is generally used: voice answering and voice messaging.

Voice answering is the interception, receipt, and storage of messages spoken by a caller until the receiver is prepared to hear them. This form of use occurs when someone calls intending to reach and talk to someone who cannot or does not answer the telephone but who has a vmail account. Responding to pre-recorded prompts from a voice menu, the caller presses the corresponding button(s) on the touchtone telephone keypad, and leaves a message, requests an operator, or hangs up. Here, the system simply operates as a telephone answering machine. The vmail account holder later enters the account number and selects features by pressing the telephone touch-tone keypad, listens to the recording when convenient, and responds as appropriate.

Voice messaging is the intentional use of the system for asynchronous and co-ordinated ongoing communication. This form of use occurs when a user directly dials his or her own VM account rather than the other person's telephone number. Then, after selecting the desired choices by pressing the touchtone telephone buttons, the user communicates from that account directly to the account(s) of the other user(s), even though the other parties may be near their respective telephones. Users may also store incoming messages for later reference, forward messages to other users, record and store a message for future delivery (even to oneself), 'broadcast' a single message to a number of users, change the greeting message, control the volume and speed of messages, use an online directory of names to find another user's vmailbox, add comments to a received message for forwarding to another user, set up guest accounts, etc.

For most organizations and their members, vmail is a relatively new medium. If usage is largely voluntary or not crucial to accomplishing one's task, it would seem to require somewhat of an innovative disposition even to adopt for use as voice answering. The prior research on different kinds of vmail usage finds, however, that voice messaging represents a considerably more abstract and innovative conceptualization of vmail than the more familiar voice answering. Few vendors, implementors and users think of vmail in this way, however. Consequently, fewer vmail adopters use vmail as a powerful and innovative messaging system, or achieve the possible benefits associated with these features. For example, Stewart (1992) concluded that by not understanding (or not being trained to understand) that vmail could represent new forms of non-simultaneous communication, users in one organization felt 'cheated' and felt that headquarters was 'hiding' behind the system by not answering phone calls. Rice and Danowski (1993) also found that users who did not conceptualize vmail as voice messaging were more likely to be concerned about possible depersonalizing effects of the system.

1.2. *Review of theory of related research*

For the purposes of this study, we can conceptualize two main categories of influences on use of vmail: individual differences (including individual willingness to change); and organizational context (including organizational orientation to change). These may vary for different kinds of vmail usage. Usage should in turn influence evaluations of the new medium, though perhaps with different relations for different kinds of usage.

1.2.1. *Education and organizational tenure:* Zmud's (1979) review of individual differences that affect use of management information systems concluded that general education was negatively related to use, but that specific knowledge about systems was positively related. Concerning organizational tenure, the general feeling in the literature seems to be that age and managerial experience/tenure are often negatively related to computer use, because upper-level organizational members may fear the possible loss of skills, control, or performance that may come with the introduction of new technologies (Floyd 1988). Further, individuals with greater tenure are more likely to have higher positions in the organizations, which have greater requirements for face-to-face rather than mediated communication (Rice and Shook 1990b). Also, individuals with more tenure are generally older, and are less likely to have experienced newer technologies in prior jobs or their university training. Floyd (1988) found that bivariate correlations among age, organizational tenure, and system use were significant, but age and tenure were not significant predictors of system use in an overall multivariate model.

1.2.2. *Individual innovativeness:* One of the most common theoretical frameworks for studying adoption, use, and management of computer-mediated communication (CMC) systems is diffusion of innovations theory (Rogers 1983). Most such studies focus on attributes of the CMC innovations (such as relative advantage or cost-benefit ratio) (Bolton 1983, Marshall 1990, Moore and Benbasat 1989) the pattern of adoption (such as the cumulative number of adopters or types of use [Price and Ridgway 1983, Rafaeli and LaRose 1993]) and/or its predictors (such as critical mass of other users; Markus 1990, Rice *et al.* 1990).

To the extent that prior research studies the individual traits of early adopters, it typically uses technology-specific terms such as computer phobia, computer anxiety, computer ease-of-use or computer-mediated communication apprehension (Brunig 1996, Davis *et al.* 1989, Howard and Smith 1986). Hurt *et al.* (1977) argue that using technology-specific

innovation characteristics as a predictor of adoption prevents easy comparisons across technologies, while the use of time of adoption as a measure of innovativeness is somewhat tautological and necessarily a *post facto* measure. They suggest the use of the more general and enduring trait of *willingness to change*, or general innovativeness. Leonard-Barton and Deschamps (1988) and Markus (1990) note that people who are more willing to change do not require as high a benefit-to-cost ratio in order to adopter an innovation, as do later adopters. Later adopters require greater inducement, such as clear supportive managerial messages and training. Anderson and Ortinau (1988) found that individual traits and behaviors such as 'adoptive innovativeness' (purchase of accessories), 'use innovativeness' (diverse uses of a product) and 'post-product integration' (extent of and satisfaction with usage) discriminated between early and late adopters of in-home PCs in 1987 better than did expectations about specific innovations. Thus, personal innovativeness should be related to greater use of a vmail system, and, in particular, to greater use of voice messaging than to simple overall vmail use.

1.2.3. *Cross-locational communication:* Rice (1987: 78) notes several studies that have found a positive relation between cross-locational communication needs and use of CMC systems, because such systems can reduce the temporal and physical constraints betewen dispersed but interdependent organizational members. Fulk (1993) found very weak relationships between inter-group interdependency and CMC use, while Reinsch and Beswick (1990) found that people who had to communicate across distances or work shifts tended to say they would choose vmail instead of email or the telephone. On the other hand, new media that are networked only within particular locations cannot of course be used for communication outside the boundaries of the organization, thus reducing the potential number of other people available to a user. Soe and Markus's (1993) study of two organizations found that social utilities—the presence of a critical mass of other users, and the social influences of peers and supervisors—were better predictors of use of vmail than were technological utilities—matching of media characteristics to task requirements, and innovation attributes such as functionality, accessibility, and cost minimization.

1.2.4. *Task analysability:* Analysable tasks are those for which predetermined responses to potential problems, and well-known procedures, are available and useful, because outcomes are well understood. When activities are analysable, there are more information cues available and more procedures established, so individuals do not have to turn to past or shared experiences for information about how to accomplish the task (Daft and Weick 1984, Perrow 1967). Daft and Lengel's (1984, 1986) concept of *media richness* states that communication channels differ in the extent to which they are able to bridge different frames of reference, make issues less ambiguous, or provide opportunities for learning in a given time interval. Using lean media (such as memos or electronic mail) for unanalysable tasks would not satisfy the task demands (social and symbolic cues, feedback, interpretability); using rich media (such as face-to-face) for analysable tasks would involve unnecessary costs (socializing, interpretation, and situational constraints). Rice (1992b) critiqued and analysed these basic propositions, finding weak support (around 10% variance explained) for the general relationship across several media and several organizations. Further, he found that voice messaging appeared to have characteristics of a 'rich medium', such as quick feedback and additional context cues, and so seemed somewhat appropriate for tasks with low analysability. This was especially true when the vmail system was implemented and used for its messaging, as opposed to only answering, capabilities (Rice and Danowski 1993, Rice and Shook 1990a).

1.2.5. *Organizational conservativeness:* As Rockart & Short (1991) argue, 'although information technology may enable the technical infrastructure to connect people and information together more effectively in the networked firm, to realize the benefits...we need also to have—or to develop—a favourable cultural setting for innovation and change' (p. 215). Other researchers also argue for the importance of an organizational culture supporting innovation (Clark *et al.* 1988, Gudela and Baitsch 1991, Lewis and DeLaney 1991, Tomaskovic-Devey and Risman 1993). Aydin and Rice (1991), Johnson and Rice (1987), and Rice (1991) all found that organizational support for innovativeness was a significant predictor of innovative behavior (such as use of a new information system, or using it in new ways), even when controlling for other variables. Monge *et al.* (1992) and Johnson and Rice (1987) found that organizational communication variables (level of information and group communication) were related to organizational innovation, whereas motivational variables (perception of equity, expectations of benefits, and perceived social pressure, general organizational mission) were not. Daft (1982), however, notes that while more innovative organizations are more like to *adopt* new practices or technology, more bureaucratic organizations might be more successful in *implementing* innovations (especially routine or efficiency-oriented ones), because of their greater ability to establish procedures, administer decisions, and provide resources.

1.2.6. *Voice mail usage:* The use of vmail can be conceptualized in many ways, such as adoption (ever used), number of messages sent (and/or received), diversity of features used (such as forwarding messages, use of distribution lists), types of uses (voice answering or voice messaging), etc. (Rice and

Danowski 1993, Rice and Shook 1990a, Rice and Steinfield 1994, Trevino and Webster 1992). These measures may be collected through self-report and/or system-generated reports, which both have advantages and disadvantages (Rice 1990). For example, system-monitored data avoid the problem of inherent correlations among self-reported measures and can provide large amounts of reliable longitudinal usage data, but require considerable programming skills and/or access to system monitor reports. Monitored usage and self-reported usage are typically weakly correlated ($r = 0.3$ to 0.5), but rarely measure the same phenomenon or apply to the same time periods. So multiple measures of usage allow researchers to triangulate their study of CMC usage.

Although simple measures of amount of system usage are familiar and understandable, they may not necessarily be the only, or even valid, indicators of acceptance or positive evaluation (Hiltz and Johnson 1989). Further, extensive usage does not necessarily imply innovative uses of an innovation, depending on initial adoption rationales, management policies, and conceptualizations of the innovation (Johnson and Rice 1987). For example, one may use a vmail system frequently as a simple answering machine, but infrequently for the more innovative voice messaging capabilities.

1.2.7. *Evaluation: media appropriateness:* Related, but prior, to the work on media richness by Daft and colleagues, Short *et al.*'s research (1976) found fairly consistent ranking of media using a 'social presence' scale measuring the perceived appropriateness of different media for communication activities such as exchanging information, negotiating or bargaining, and getting to know someone. For example, face-to-face was ranked highest, with written memos lowest. A fairly consistent subset of these activities has been used in other studies, especially those analysing the use and effects of CMC systems (for reviews and results, see Rice 1987: 76-77, 1993, Rice *et al.* 1989, Rice and Love 1987). With respect to CMC systems, however, perceived appropriateness is an evaluation that should be measured after some extended use, to avoid inaccurate or projected expectations that are not grounded in actual experience with the medium (Rice *et al.* 1990). It may also be the case that the more general measures of appropriateness, such as social presence or media richness across a standard set of tasks, are not sufficiently anchored in suitability of the medium for the whole complex of one's work characteristics, symbolic values and communication constraints (Trevino *et al.* 1987).

1.2.8. *Evaluation: managing one's work:* There are many ways of conceptualizing how CMC systems might be evaluated, such as technical reliability and responsiveness, productivity, increased customer satisfaction, depersonalization, job fragmentation, health hazards, managerial control, job mobility, etc. (Hiltz 1988, Rice 1987, 1988). To the extent that a new medium such as vmail can help overcome communication constraints (such as time or location; see Rice 1987), it may help improve one's work by allowing the user to better manage one's time.

1.3 *Overall model and proposed relationships*

Based on these short summaries of related research, the model in figure 1 suggests the following relationships. Education should be positively, and tenure should be negatively, related to use. Individual innovativeness should be positively related to use, especially for messaging as opposed to answering. Cross-locational communication should be positively related, if the other units were part of the system; and task analysability should be negatively related to more innovative types of vmail use (such as voice messaging), but positively related to general or voice answering use. Organizational conservativeness should be negatively related to vmail use, especially for messaging as opposed to answering. Finally, usage, especially voice messaging, should be positively related to evaluations such as appropriateness of vmail and improvements in one's work.

2. Method

2.1. *Sites and samples*

A large insurance organization (INS) in the process of implementing and evaluating a vmail system provided the first site. The questionnaire reported in this study was administered five to six months after initial implementation. The sample eventually included 458 employees who were given vmail accounts; approximately 280 responded, although there were system-monitored usage data for those who did not respond to the questionnaire.

The US branches of an international chemical company that had been using vmail for approximately three years was the second 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 the selected month of May (light—9 or fewer messages sent and received in one month; moderate—between 10 and 49; and heavy—over 50); 165 responded.

The first site provided exceptionally detailed and comprehensive measures, across sites and over time, and initial studies taking advantage of the multiple measures have appeared elsewhere (Rice and Shook 1990a, Rice and Danowski 1993, Rice and Steinfield 1994). The second site, however, involved only a short, cross-sectional survey. In order to directly and parsimoniously compare the same model at two different organizational sites, we use only those measures common to both sites. As explained above, this

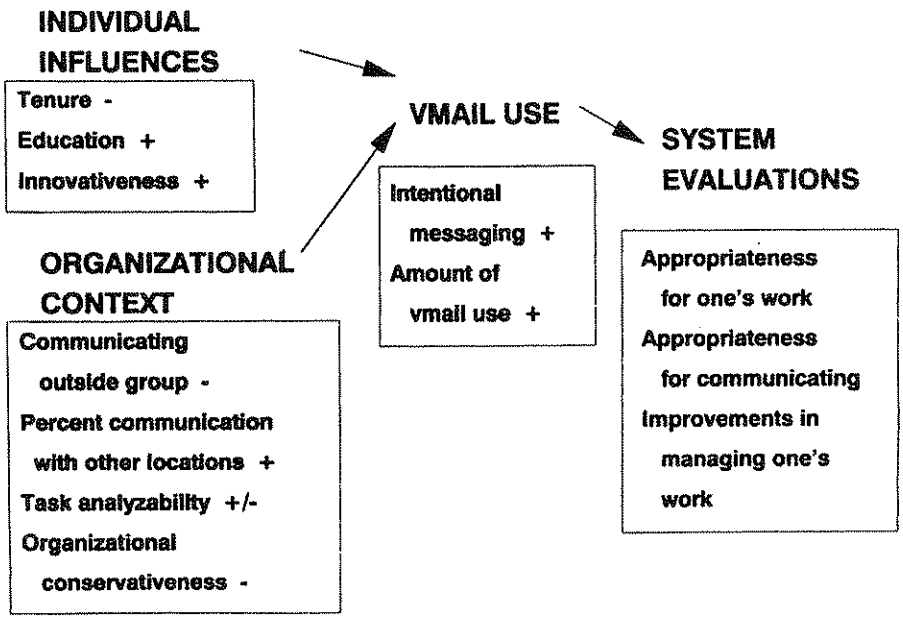

Figure 1. Visual model of proposed relationships among individual differences, organizational context, voice mail usage, and voice mail evaluations.

necessarily limits the comprehensiveness of any testable model. Note, also, that the first site could be considered in the early stages of adoption, without widespread use across the organization, but high levels of adoption within the selected departments after a year's use. The second site could be considered well along in adoption, having used the system for nearly three years.

2.2. *Measures*

The questionnaire wording, value ranges (some requiring reversal), descriptive statistics, factor loadings, and scale alpha reliabilities (where relevant) of all items appear in table 1. The alpha reliabilities were acceptable (0.76 to 0.93), and, along with the scale means and factor loadings, quite consistent across both sites.

2.2.1. *Individual difference: Tenure* was measured simply as the number of years and months (converted into total months) the respondent had been at the organization. *Education* was measured as the level of highest education. Hurt *et al.*'s (1977) 10-item *personal innovativeness* scale (alpha = 0.89) was used. Other researchers have reported similarly high reliabilities for the full scale (Goldsmith and Nugent 1984, Okolica 1994, Richmond *et al.* 1982). Although Hurt *et al.* proposed that the scale is uni-dimensional, they provided no support for this claim, even noting that an initial analysis found it to be two-dimensional. However, we found the best uni-dimensional scale for both sites consisted of only four of their 10 items, all indicating disagreement with statements about being reluctant to try an innovation (rarely trust new ideas until others do, last to accept something new, reluctant to try until see the innovation work for others, and must see others using the innovation first).

2.2.2. *Organizational context: Cross-locational communication needs* was measured by two items: what percentage of your communication is outside your section/group, and to what extent do you communicate with workers in other locations. *Task analysability* was measured by four items assessed and standardized by Withy *et al.* (1983) (clearly known way to do your work, clear guidelines for doing your work, understandable sequence of steps, and rely on established practices and procedures). *Organizational conservativeness* was measured by three items indicating the extent to which the respondent disagreed that the company sought out or was adaptable to change (company always moving toward new ways of doing work, company is flexible and adapting to change, people in the company always searching for new ways to do work).

2.2.3. *Usage: Amount of vmail usage* was measured by both self-reported and system monitored usage data. For the INS site, self-reported usage was measured by the estimated total voice messages sent and received per average business day. Computer-monitored usage was indicated by the number of voice messages sent and received by each user (as recorded on weekly usage reports produced by the vmail system), added together, and then divided by the number of weeks since each respondent first used the system. For the CHEM site, self-report usage was measured by the estimated total voice messages sent and received in an average week. Computer-monitored usage was measured by the total

Table 1. Descriptive statistics, factor loadings, and scale reliabilities.

	Insurance company $n = 228$ to 298			Chemical company $n = 130$ to 158		
Variables and scales	Mean	SD	Factor loading	Mean	SD	Factor loading
Education[a]	3·1	1·2	—	3·4	1·0	—
Years at organization	10·6	8·5	—	8·9	7·2	—
% communicate outside section/group[b]	69·4	19·7	—	48·7	31·2	—
Do you comm. with workers in other loc.?[c]	3·9	1·1	—	3·4	1·1	—
Clearly known way to do your work?[d]	2·9	1·1	0·82	3·2	1·1	0·80
Clear guidelines for doing your work?	3·0	1·1	0·75	3·3	1·1	0·78
Understandable sequence of steps?	2·8	1·1	0·75	2·9	1·1	0·81
Rely on established practices & procedures	2·9	1·1	0·83	3·4	1·0	0·77
eigenvalue/pct variance			2·48/62%			2·48/62%
Analysability mean scale	2·9	0·9		3·2	0·8	
Scale alpha			0·80			0·79
Co. is always moving toward new ways[e]	3·2	1·6	0·92	5·3	1·3	0·89
Co. flexible and adapting to change	3·4	1·6	0·93	5·0	1·5	0·90
People in co. always searching new ways	3·6	1·6	0·92	5·0	1·4	0·92
eigenvalue/pct variance			2·56/85%			2·44/81%
Org. conservativeness mean scale	3·4	1·5		5·1	1·3	
Scale alpha			0·91			0·88
Rarely trust new ideas until others do[e]	5·6	1·3	0·68	5·6	1·1	0·74
Last to accept something new	6·0	1·2	0·75	6·1	1·2	0·69
Reluctant till see innov. work for others	5·8	1·2	0·86	5·7	1·3	0·85
Must see others using innov. first	6·0	1·0	0·85	6·1	1·0	0·84
Eigenvalue/pct variance			2·48/62%			2·45/61%
Individual innovativeness mean scale	5·9	0·9		5·9	0·9	
Scale alpha			0·78			0·78
Use vm evenings & weekends[g]	3·8	1·9	0·85	5·1	2·0	0·88
Use vm instead of direct call	3·5	2·0	0·75	5·1	2·0	0·86
Often use vm instead written msg	4·3	1·9	0·87	5·4	1·9	0·88
eigenvalue/pct variance			2·0/68%			2·3/77%
Intentional voice messaging use mean scale	3·9	1·6		5·2	1·7	
Scale alpha			0·76			0·85
Reported msgs sent & recvd/day (week)[f]	6·6	5·5	0·75	25·2	24·3	0·88
Monitored msgs sent & recvd/week (may)[f]	5·6	5·8	0·75	57·5	60·6	0·88
eigenvalue/pct variance			1·13/56%			1·56/79%
Amount of vmail use factor score	0·0	1·0		0·0	1·0	
Exchange info[h]	4·1	1·0	0·63	4·3	1·1	0·77
Negotiate, bargain	2·5	1·2	0·61	2·5	1·4	0·60
Get to know someone	2·3	1·2	0·63	2·3	1·2	0·64
Asking questions	4·2	1·1	0·70	4·2	1·2	0·76
Staying in touch	3·6	1·3	0·77	4·1	1·2	0·79
Exchange time-sensitive info	4·3	1·0	0·64	4·4	1·0	0·69
Generating ideas	3·6	1·1	0·71	3·7	1·2	0·79
Resolve disagreements	2·8	1·3	0·72	2·7	1·3	0·75
Making decisions	3·2	1·3	0·77	3·5	1·3	0·80
Exchange confidential info	3·2	1·5	0·64	2·8	1·4	0·57
eigenvalue/pct variance			4·7/47%			5·2/52%
Vm appropriateness mean scale	3·4	0·8		3·4	0·9	
Scale alpha			0·87			0·89

Table 1.—*Continued*

Variables and scales	Insurance company $n = 228$ to 298 Mean	SD	Factor loading	Chemical company $n = 130$ to 158 Mean	SD	Factor loading
Vm appropriate for my work[g]	5·7	1·5	0·93	6·0	1·5	0·97
Vm appropriate for business area	5·4	1·8	0·93	5·9	1·6	0·97
eigenvalue/pct variance			1·94/87%			1·87/94%
Work appropriateness mean scale	5·6	1·5		5·9	1·5	
Scale alpha			0·84			0·93
More work done/manage time better[g]	4·8	1·6		5·3	1·7	

Notes

[a]hs = 1, some college = 2, college degree = 3, some grad school = 4, grad degree = 5.

[b]percentage reversed, as question asked about communicating inside group.

[c]1 = very little extent, 2 = little extent, 3 = some extent, 4 = great extent, 5 = very great extent. Even though this and the next item loaded on a single factor at both sites (0·74, 55% for INS and 0·77, 60% for CHEM), the two items did not constitute a reliable single measure (alphas less than 0·3, *r*s less than 0·20).

[d]1 = very little extent, 2 = little extent, 3 = some extent, 4 = great extent, 5 = very great extent.

[e]1 = strongly agree, 2 = agree, 3 = somewhat agree, 4 = undecided, 5 = somewhat disagree, 6 = disagree, 7 = strongly disagree.

[f]For all usage measures, raw usage amounts are reported here, but ranked/normalized forms were used in analyses. Note that measures are not identical. Values for reported usage are for average, recent time period, while values for monitored usage in INS are mean usage per week since firstusing the account, and values for monitored usage at CHEM are for one selected month. Values for monitored usage for INS are based on only those who sent at least one message, dropping 69 respondents. Every respondent at INS was measured as using the system in at least one way (monitored sendingvoice messaging, receiving voice messaging, receiving voice answering, or reported sending and receiving; 2·6% had only one of these, while 69% had all four).

[g]1 = strongly agree, 2 = agree, 3 = somewhat agree, 4 = undecided, 5 = somewhat disagree, 6 = disagree, 7 = strongly disagree. Item values reversed.

[h]1 = appropriate, 2 = somewhat appropriate, 3 = neutral, 4 = somewhat inappropriate, 5 = inappropriate. Item values reversed. 2nd factors had eigenvalues of 1·49 and 1·33, but only 1st factors used for parsimony (see Rice 1993).

number of voice messages sent and received during the month used for the second sampling stratum.

Because media usage measures are generally negatively skewed, these were all transformed by first ranking the usage values, and then converting those rankings into a normal distribution. The two measures were then combined into a factor score for each site. Note that system-monitored number of messages sent and received accurately represents the use of vmail for messaging (because they count only messages sent directly from one vmail account to another). However, reported number of messages sent or received may confound internal vmail and normal recording of external callers' messages, even though telephone answering and voice messaging were defined on the questionnaire. Voice answering was defined as 'your phone "rolls over" and a caller gets your voice message when you aren't available', and messaging was defined as 'someone else on the system dials into their box and then sends you a message. You use the reply function to respond. You can also send a group distribution message to several people at once.'

Respondents were also asked the extent to which they agreed that they (*a*) often called a colleague's voice box to leave a request for information instead of calling to reach that person directly; (*b*) used voice messaging in the evenings and on weekends when one thinks of messages one needs to send to colleagues; and (*c*) often used a voice message instead of a short written message. These questions represent *intentional voice messaging use*, although this does not necessarily involve the more advanced communication processing features of voice messaging.

2.2.4. *Evaluations:* At each site, the questionnaire asked respondents to rate the *vmail appropriateness* for each of ten communication activities (such as exchanging confidential information, and asking questions). Rice (1993) provides reliability, validity, and dimensionality analyses of these items and scales. Voice mail's *work appropriateness* was measured by the extent to which respondents agreed with the statements that voice messaging is appropriate for the kind of work one does in the organization, and appropriate for one's business area within the organization. The final *work evaluation* measure was the extent to which the respondent agreed with the statement, 'I get more work done because I am able to manage my time better.'

3. Results

3.1. *Bivariate relationships*

The boxed correlations in table 2 are those specifically hypothesized by the model. There are a few significant correlations among the influence variables, and strong correlations between and among the use and the evaluation variables. Tenure and analysability are unrelated to use, education has the predicted negative relationship to both use scales, and both communicating inside the work group and communicating with people in other locations have a positive relation to reported intentional uses of vmail in CHEM. Individual innovativeness is unrelated to either usage scale. Most surprisingly, organizational conservativeness is positively related to intentional vmail use in CHEM and amount of vmail use in INS. Individual innovativeness is associated with only the vmail appropriateness evaluation in INS, while organizational conservativeness is, again surprisingly, positive related to all three work evaluations in CHEM. Both usage scales are strongly associated with all three measures of vmail evaluations in both organizations.

3.2. *Multivariate relationships*

Because of the correlations among some of the variables in each component of the model, the separate bivariate relations overstate the significance and strength of the unique relationships across the components in the model. Canonical correlation analysis is one way to analyze such multivariate relationships. It determines the strongest correlation(s) between two sets of multiple variables that each have theoretical meaning, usually as a set of independent, and a set of dependent, variables. It does this by deriving a linear combination of variables—called a canonical *variate*—within each set that *maximises* the (canonical) correlation between the two sets (rather than maximizing the variance explained by the single linear combination of variables, as in factor analysis). The extent to which each variable contributes to this variate is indicated by that variable's *loading* on the variate, also called a *standardized structure coefficient*. Just as with factor analysis, there may be several linear combinations of variables within each set, resulting in possibly several canonical correlations. The canonical correlation between each pair of these linear combinations of independent and dependent variables may then be tested for statistical significance. Figure 2 shows the canonical relations among and between the influence and usage variables, and figure 3 shows the canonical relations among and between the usage and evaluation variables, for the two organizations.

3.2.1. *Influences of individual and organizational context on system use:* For the INS site, one influence variate explained

Table 2. Correlations for INS (upper) and CHEM (lower).

Variables	Ten	Educ	Anly	Innov	Orgcn	CoutG	Cloc	Vmuse	Sysuse	Wapp	Vmapp
Education	**−0·25**[c]	—									
	−0·19[b]	—									
Analyzability	−0·09	0·03	—								
	−0·10	−0·01	—								
Individual	−0·02	**−0·14**[a]	−0·07	—							
innovativeness	0·06	0·09	−0·01	—							
Organizational	**0·23**[c]	**−0·08**	**−0·01**	—							
conservativeness	**0·09**	**−0·17**[a]	0·15	0·09	—						
% Communication	−0·05	−0·01	0·32	−0·03	−0·02	—					
outside group	0·11	−0·04	**−0·28**[c]	−0·06	−0·04	—					
Communicate with	**0·15**[b]	−0·11	**0;23**[c]	0·07	0·04	0·11	—				
other locations	−0·01	−0·07	−0·03	−0·14	0·08	**0·20**[a]	—				
Intentional	0·01	−0·06	0·08	0·13	0·03	−0·04	0·05	—			
vmail use	0·12	**−0·24**[c]	0·21	−0·01	**0·26**[a]	**−0·23**[b]	**0·20**[b]	—			
Amount of	−0·01	−0·12	0·11	0·10	**0·17**[a]	−0·05	0·11	**0·41**[c]	—		
vmail use	0·14	**−0·20**[b]	0·05	−0·05	0·07	−0·11	**−0·21**[c]	**0·56**[c]	—		
Work	0·03	0·00	0·07	0·12	−0·01	0·03	0·09	**0·47**[a]	**0·29**[c]	—	
appropriateness	**0;16**[a]	**−0·26**[c]	0·16	−0·06	**0·27**[a]	0·11	0·22	**0·86**[c]	**0·58**[c]	—	
Vmail	0·04	0·03	0·07	**0·15**[a]	0·04	−0·00	0·05	**0·41**[c]	0·23[c]	0·42[c]	—
appropriateness	0·03	**−0·19**[b]	0·15	0·03	**0·31**[a]	**−0·17**[a]	0·14	**0·66**[c]	**0·31**[c]	**0·66**[c]	—
Work Evaluation	0·09	−0·04	**0·14**[a]	0·03	−0·02	0·11	**0·14**[a]	**0·52**[c]	**0·37**[c]	**0·68**[c]	**0·40**[c]
	0·06	**−0·18**[a]	0·15	−0·04	**0·21**[b]	−0·02	**0;15**[a]	**0·72**[c]	**0·36**[c]	**0·79**[c]	**0·60**[c]

Note: n for INS = 176 to 289; n for CHEM = 130 to 158.
Boxed correlations are explicitly proposed relationships in model.
[a] = $p < 0{\cdot}05$; [b] = $p < 0{\cdot}01$; [c] = $p < 0{\cdot}001$.

	INS site 1	INS site variates 2	CHEM site 1	CHEM site variates 2
Standardized structure coefficients (variate loadings)				
Independent variables				
Education	−0.43	0.40	−0.45	−0.07
Tenure	−0.41	0.21	0.08	0.21
% Comm. out group	−0.71	0.31	−0.62	0.01
Comm. other loc.	0.04	0.49	0.59	0.60
Analyse	0.50	0.43	0.27	−0.65
Org. Conserv.	0.37	0.43	0.10	−0.18
Ind. Innov.	0.24	0.10	−0.03	−0.31
Dependent variables				
Intentional VM use	0.68	−0.89	0.79	−0.85
Amount of vmail use	0.49	1.01	0.33	1.11
Overall Canonical Correlations				
Squared Can. Corr.	0.14	0.07	0.26	0.11
Wilks' Lambda	$F_{14,224} = 2.0^{b}$	$F_{6,113} = 1.4$ ns	$F_{14,210} = 3.5^{c}$	$F_{6,206} = 2.1^{a}$

$^{a} = p < 0.05$; $^{b} = p < 0.01$; $^{c} = p < 0.001$

Figure 2. Canonical correlations and standardized structure coefficients (variate loadings) for influence and usage variates for INS and CHEM organizations.

14% of the variance in the system use variate. This influence variate was characterized by a greater percentage of communicating inside one's group, task analysability, lower education, lower tenure, and greater organizational conservativeness. The first usage variate was characterized somewhat equally by intentional vmail use and overall amount of vmail use (variate loadings of 0.68 and 0.49). Note that while the canonical correlation between the second pair of influence and use variates was not significant, the second vmail use variate clearly distinguished between greater intentional use of vmail and amount of vmail use (loadings of −0.89 and 1.01), providing some evidence for the validity of this distinction between intentional use of voice messaging, and simple overall amount of voice mail use.

For the CHEM site, two canonical correlations were significant, explaining 26% and 11% of the variance, respectively. The first influence variate was characterized by communicating with others in one's group, communicating with people in other locations, lower education, and greater task analysability. The first use variate was similar to the one for INS, though with a greater emphasis on intentional vmail use (0.79 compared to 0.33). So the need to communicate with others outside one's group and in other locations were the main influences on both kinds of vmail use.

The second influence variate was characterized by communicating with people in other locations, lower task analysability, and less individual innovativeness. Again, the second usage variate was similar to the one for INS (−0.85 and 1.11). So the need to communicate with people in other groups, especially by people with less analysable tasks, were the primary influences on less intentional messaging use and greater amount of vmail use.

3.2.2. *Influences of system use on vmail evaluations:* For both sites, only one canonical correlation between usage and evaluation variates was significant (INS $cc^2 = 32\%$; CHEM $cc^2 = 71\%$). For both sites, the usage variate was characterized more by intentional messaging (0.82, 0.89) than by amount of use (0.33, 0.18).

For the INS site, the evaluation variate was primarily characterized by vmail appropriateness (0.56) and work evaluation (0.50), while for the CHEM site, it was almost entirely characterized by work appropriateness (0.90). So at INS, greater intentional vmail use influenced greater appropriateness of vmail for general communication activities, and improvements in work management. At CHEM, the usage variate primarily influenced greater perceived appropriateness of vmail for one's specific work in the organization.

3.2.3. *Influences of individual and organizational context on vmail evaluations* As with regular correlations among three variables, the canonical correlation between two canonical

	INS site 1 variates	INS site 2 variates	CHEM site 1 variates	CHEM site 2 variates
Standardized structure coefficients (variate loadings)				
Independent variables				
Intentional VM use	0.82	−0.74	0.89	0.82
Amount vmail use	0.33	1.05	0.18	−1.19
Dependent variables				
Work appropriateness	0.20	−0.16	0.90	−1.32
VM appropriateness	0.56	−0.86	0.15	0.74
Work evaluation	0.50	0.97	0.01	1.07
Overall Canonical Correlations				
Squared Can. Corr.	0.32	0.03	0.71	0.04
Wilks' Lambda	$F_{6,282} = 10.9^c$	$F_{2,142} = 2.0$ ns	$F_{6,274} = 41.2^c$	$F_{2,138} = 2.6$ ns

[a] = $p < 0.05$; [b] = $p < 0.01$; [c] = $p < 0.001$

Figure 3. Canonical correlations and standardized structure coefficients (variate loadings) between usage and evaluation variates for INS and CHEM organizations.

variates may be controlled for the influence of a third variate. As with partial correlation, the resulting partial canonical correlation tests for an independent, direct relation. Thus, a final canonical correlation analysis tested whether there was any direct influence of the set of influence variables on the set of system evaluations, independent of and controlling for the shared variance of each set with the variance of intervening system use. The answer is no: the partial canonical correlations for both sites were small and not significant (INS $cc^2 = 0.08$; CHEM $cc^2 = 0.09$).

4. Discussion

The bivariate relations predicting vmail usage were less powerful than the bivariate predicted relationships between vmail usage and evaluation. Of particular note is that individual disposition toward change had essentially no influence in the tested model. It may be that the limited measure of amount of voice mail message sent and received does not capture the salient innovative aspects of voice messaging use. Supporting this interpretation, Okolica (1994) found, in a multiple regression analysis, that individual innovativeness uniquely explained a small amount of variance (3%) in a measure of vmail use that explicitly listed various messaging capabilities, such as creating a group distribution list, or annotating and forwarding messages. However, on average, people in her study rarely used these features.

The major surprise was that organizational conservativeness had a significant *positive* bivariate relationship with voice mail usage, and, in CHEM, with all three evaluation measures. In the canonical analyses, this latter relationship disappears when usage is partialled out. Still, this result seems to reject the notion that vmail is *necessarily* perceived as an innovative organizational implementation, a sign of adaptation, flexibility, and change. Indeed, as discussed in some of the vmail implementation studies noted earlier, vmail typically is implemented and used as a cost-cutting technology similar to an answering machine. This conceptualization is a non-innovative, though often quite useful, way of using a potentially innovative communication medium.

This interpretation is also consistent with the slight positive influence of task analysability on vmail use (except on the second usage variate in CHEM). In line with media richness theory, vmail, when implemented and conceptualized as a non-innovative technology that primarily improves telephone contacts, would be more frequently used for analysable tasks. However, Rice (1992b) and Rice and Shook (1990a) discuss how voice messaging (as opposed to answering) may well be quite appropriate for unanalysable activities requiring rich media. With respect to innovation theory, it seems in these two organizations that a general individual disposition toward change does not influence one's overall amount of vmail use, or intentional voice messaging usage. It may be either that this 'willingness to change' measure is too global and generic (in spite of the

theoretical calls for such general innovation measures), that it better predicts general adoption rather than extent of usage, or that organizational context is simply far more important than this individual difference for what is essentially an organizational-level innovation.

The quite similar results from the two sites allow us to have greater confidence in the overall model and the conceptualizations of vmail usage. There were two similar usage variates in both sites. One indicated general overall use, with a slight emphasis on intentional voice messaging use. This variate is not only more general, but better predicted. The other (not significant in one site) distinguished clearly between general amount of messages sent and received, versus using vmail for specific intentional and messaging purposes. This distinction between overall usage and types of usage helps to identify possible (though admittedly small) differential influences of communicating outside one's group, and of task analysability. Calling someone else's vmailbox directly even if the person might otherwise answer, or outside of working hours, seems less likely when one communicates a lot within one's own group.

The distinction in results involving these two types of group interdependence reinforces a growing awareness—and organizational practice—that communicating *within a work group* does not necessarily mean communicating *within a single location*. This implies a joint effect of task interdependency and cross-locational communication needs. The literature on recent changes in organizations toward outsourcing, decentralization, collaboration, and globalization points to an increasing prevalence of such working conditions. The greatest influence on general vmail usage seems to be a need to work with people in your group who are at other locations. Thus, vmail might become increasingly useful for overcoming physical and temporal communication constraints on interdependent tasks and colleagues, who are likely working on similar or related projects, but from different departments, divisions, buildings, or even cities. This result also reinforces the argument that local, rather than organization-wide, critical masses are important factors in the initial adoption and diffusion of interactive communication media (Markus 1990, Rice 1990, Soe and Markus 1993).

With respect to more operational aspects of conceptualizing models of new media use, the results of this study suggest the following: (1) distinguish between group task interdependency and group communication constraints (such as time or location); (2) distinguish between more conceptual uses of new media (such as between voice messaging and simple overall amount of use); (3) distinguish between using a new medium and evaluations of it as differential adoption outcomes; and (4) distinguish between evaluations of new media that are oriented toward generic communication activities versus those specifically focused on one's work.

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