The poverty of media richness theory: explaining people's choice of electronic mail vs. voice mail

Maha El-Shinnawy

Department of Business Analysis and Research, College of Business Administration, Texas A&M University, College Station, TX 77843-4217, USA. email: el-shinnawy@tamu.edu

M. Lynne Markus

Programs in Information Science, The Claremont Graduate School, 130 E. Ninth St., Claremont, CA 91711-6190, USA. email: markusm@cgs.edu

How and why people choose which communication medium to use is an important issue for both behavioral researchers and software product developers. Little is yet known about how and why people in organizations choose among *new* media like electronic mail and voice mail, although the availability and use of new media are increasing dramatically. Media richness theory (MRT) is the most prominent, if contested, theory of media choice. It is concerned with identifying the most appropriate medium in terms of "medium richness" for communication situations characterized by equivocality and uncertainty. From this theory, we derived hypotheses about how and why individuals will choose between electronic mail and voice mail and tested them among users of both media in the corporate headquarters of a large company. The data are analysed using both quantitative and qualitative techniques. The results fail to support MRT, but they do support alternative explanations of people's media choice behavior. While the concept of media richness is too poor to explain the richness of people's media use behavior, our behavioral findings and explanations should prove useful to those building the next generation of integrated multimedia communication tools.

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1. Introduction

How and why individuals choose which communication medium to use is an important issue for behavioral researchers and "groupware" product developers. The reasons for academic interest in the topic are several. First, compelling arguments have been made that link media choice with personal and organizational effectiveness (Daft & Lengel, 1984, 1986). Second, media choice can affect communication patterns, organization structure and in turn the nature of organizational decision making processes (Foster & Flynn, 1984; Huber, 1990; Rice, 1992). Third, use of new communication media increasingly characterizes the "new organization"—often called the "network" organization. Product developers also need to understand the behavioral issues that affect the use of their products.

Much of what is known about how and why individuals choose which communication medium to use comes from studies in which traditional media (such as face-to-face

meetings) are compared with each other or in which *one* new communication medium (electronic mail, voice mail, facsimile, videoconferencing) is compared to traditional media. This line of research is limited by its assumption of "channel equivalence" (Reder & Schwab, 1988), that is, the ability of one medium to substitute for an ideal communication medium, usually face-to-face communication (Bair, 1989). When new media are assessed on how much they deviate from such an ideal, researchers tend to focus on the shared capabilities and to overlook the capabilities of the new media not found in the ideal communication medium (Culnan & Markus, 1987; Huber, 1990; Markus, 1994). Not surprisingly, new media frequently appear deficient in such a biased comparison (Sproull & Kiesler, 1986; Bair, 1989). Thus, such research may considerably understate the extent to which new media are actually preferred and selected for communication tasks.

Little is known about how people make choices *among* new communication media. Yet, as new media proliferate and as new combinations of media emerge (Negroponte, 1995), people in organizations will increasingly face choices among several new media in addition to, or even in lieu of, one new medium and several traditional ones. This suggests the need for, and value of, studies that examine media choice when *multiple* electronic media are available.

A prominent theory of communication media preferences and usage in organizational settings is media richness theory (MRT) (Daft & Lengel, 1984, 1986; Daft, Lengel & Trevino, 1987). MRT is concerned with determining the most appropriate communication medium for dealing with uncertainty and equivocality (Daft & Lengel, 1986; Huber & Daft, 1987). This theory suggests that communication media can be ranked on a richness continuum based on their ability to handle equivocality and uncertainty. Rich media (face-to-face and telephone) are proposed to be suitable for resolving equivocal situations while lean media (written documents) are proposed to be more suitable for reducing uncertainty.

MRT was developed and tested by comparing among traditional media, specifically, face-to-face, telephone, written addressed documents and written unaddressed documents, and was later expanded to include a comparison of electronic mail with the aforementioned traditional media in terms of their ability to resolve equivocality or reduce uncertainty. Due to its written nature, electronic mail was ranked low on the richness scale. Several studies have found empirical support for the ability of MRT to account for differences in the way individuals choose among traditional media and between traditional and new media (see for example: Daft *et al.*, 1987). However, while MRT has been argued to apply equally well to choices *among new media*, this claim has not yet been substantiated empirically.

The majority of recent media choice research has been based upon the MRT. Some studies have examined MRT conceptually (Carlson & Zmud, 1994). Other studies have examined MRT empirically. Some empirical research has examined choice either among traditional media or between one new medium and some combination of traditional media (Golden, Beaclair & Sussman, 1992; Markus, 1994). Other empirical research has compared and contrasted the new media (Rice, 1992; Adams, Nelson & Todd, 1993; Markus, Lynne, Bikson, El-Shinnawy & Soe, 1993; Soe & Markus, 1993). Except for Markus *et al.* (1993) and Soe and Markus (1993) none of these studies examined alternative electronic media in the same organizational settings. In addition, none of the above studies explicitly employed the theoretical framework of MRT. Consequently, the

ability of MRT to account for choice *among the new media* for resolving equivocality or reducing uncertainty has gone largely untested.

The purpose of this paper is to determine the applicability of MRT to settings where people have a choice among new media. Electronic mail and voice mail are the two media of interest in this study. From MRT, we derive hypotheses about the situations in which individuals in one company headquarters would choose electronic mail over voice mail (or vice versa), when both of these electronic media are available. We examine individuals' media choices using both survey and interview methods.

The research question posed in this paper is: Can MRT account for individuals' preferences for and usage of electronic mail and voice mail relative to one another in situations characterized by equivocality or uncertainty? Hypotheses about individuals' preferences for and usage of the two media in these situations are derived from MRT and tested against individuals' actual preferences for and usage of the two media when both media are available. We find only partial support for MRT. In the absence of conclusive evidence in support of MRT, we examine alternative explanations for individuals' preferences (Grudin, 1988; Bernsen, 1994; Negroponte, 1995; Levy, Zacks, Tversky & Schiano, 1996), and consider the implications of our findings for future theory and empirical research.

2. Theoretical background

2.1. BACKGROUND

Managers and organizational theorists have long recognized the central role that communication plays in all the activities and functions of the management of an organization (Tushman & Nadler, 1978; O'Reilly & Pondy, 1979; Weick, 1979). Organizational members interact with others internally and externally to coordinate activities, disseminate information and make decisions (Galbraith, 1973a). In addition to being a fundamental part of almost all organizational activities, communication also occupies the majority of managers' time. For example, Mintzberg (1973) recognized that most managerial activities involve communication. Kotter (1982), in analysing how managers operated, reported that managers spend 75% of their time communicating with others. Communication facilitates social interaction which is the foundation of all organizational actions and decision making (O'Reilly & Pondy, 1979).

Research based on the information processing model of organizations (Galbraith, 1977; Tushman & Nadler, 1978), suggests that organizational communication is influenced by two forces: the traditional concept of uncertainty (Leavitt, 1951; Meissner, 1969; Galbraith, 1973b, 1977) and the more recent concept of equivocality (Weick, 1979; Daft & Lengel, 1984; Daft & Lengel, 1986). MRT is based on the information processing model of organizations. It is concerned with identifying the most appropriate communication medium for reducing uncertainty and resolving equivocality.

Uncertainty has been defined as the absence of information (Shannon & Weaver, 1949; Miller & Frick, 1949; Garner, 1962) or "the difference between the amount of information required to perform the task and the amount of information already possessed by the organization" (Galbraith, 1973b). To reduce uncertainty, communication media need to bridge the gap between the amount of information already possessed and that

required to perform the task. As the amount of information processed increases, the level of uncertainty decreases (Daft & Lengel, 1986). Therefore, the need to reduce uncertainty leads to the acquisition of information to answer specific questions. Communication media appropriate for uncertainty reduction are those that facilitate the exchange of large amounts of accurate, objective, or numerical data (Daft & Lengel, 1986).

Equivocality, on the other hand, refers to ambiguity (Daft *et al.*, 1987) and multiple, conflicting interpretations (Weick, 1979; Daft & Macintosh, 1981). In equivocal situations, it is not evident what questions need to be asked and, when questions are asked, clear answers are frequently unavailable (March & Olsen, 1976). Equivocality arises where individuals' frames of reference differ and negotiation is necessary to reach shared understanding (Daft *et al.*, 1987). Communication media appropriate for equivocality reduction need to promote the ability to clarify or explain, rather than simply provide large amounts of data.

The issue here is the ability of the medium to process "rich" information (Daft & Lengel, 1986). Communication media are proposed to vary in their capacity to process rich information along a one-dimensional continuum that includes, in order of decreasing richness, face-to-face discussion, phone calls, written addressed communication and written unaddressed communications (Lengel & Daft, 1984). This richness continuum is a function of four factors: feedback capability, cues, personalization and language variety. The greater the medium's ability to provide timely feedback, the richer it is. Oral media can convey cues such as voice tone and inflection, and are thus considered richer than written media. Richness also concerns the medium's ability to encompass the variety offered by natural language and to convey personal feelings (Huber & Daft, 1987).

For effective communication to occur, the richness of the medium has to match the equivocality of the message (Daft & Lengel, 1984, 1986; Daft *et al.*, 1987). According to MRT, rich oral media facilitate equivocality reduction by enabling individuals to process subjective messages, to create shared meaning and to resolve ambiguity stemming from multiple, conflicting interpretations of a situation. Thus, it is believed that oral media are preferred for communication situations high in equivocality, while written media are preferred for communication situations low in equivocality (Daft *et al.*, 1987).

In summary, media that facilitate shared meaning are different from those that facilitate the exchange of large amounts of data. The fundamental claim of MRT is that, for effective communication, individuals should match media to the level of equivocality of a task. Media high in richness, such as face-to-face interaction and telephone calls, enable negotiation, clarification, explanation and exchange of subjective views. On the other hand, media low in richness, such as written media, although not appropriate for resolving equivocal issues, are most appropriate for processing of large amounts of standard, accurate, objective and quantitative data. By being sensitive to the variations in media richness, individuals can deal with their dual information needs for uncertainty reduction and equivocality resolution.

3. The media

This study examines choices among two new media: electronic mail (email) and voice mail (vmail). Email can be defined as an interactive communication medium that

facilitates communication between individuals or groups of individuals in the form of a note or document. It is an asynchronous computer-mediated messaging system that "uses computer text processing and communication tools to provide a high-speed information exchange service" (Sproull & Kiesler, 1991). It is text-based and requires access to a computer device with a terminal, keyboard and communication software. Email messages are "sent" by typing them on a computer keyboard (Table 1). They are "received" by reading onscreen or a hardcopy printout (Steinfield, 1986). Electronic mail makes use of an electronic mailbox which allows users to access their own personal messages through their own desktop device. Email systems have facilities for composing and editing messages and for directing the message to an individual or group. Email systems allow received messages to be saved, filed, printed, forwarded (redirected) or deleted.

Vmail is an asynchronous, computer-mediated communication technology that uses the telephone as its access device. Vmail employs audio rather than text; messages are transmitted and received via telephone handsets or speaker phones. Users employ the keypad of a touch-tone telephone to enter addresses and to perform other functions such as send, receive and save (Stewart & Finn, 1985). The analog speech signal is digitized, stored in computer memory and reconstructed to analog form when requested by the recipient (Finn, 1986). Thus, the analog speech signal is treated as a data packet, enabling vmail to have many of the same functions as email, such as replying without dialing the recipient's number and broadcasting a message to many recipients.

Vmail users participate in two kinds of voice messaging activities (Stewart & Finn, 1985). "Active voice messaging" refers to calls made by vmail users for the express purpose of asynchronous communication. The sender of an active voice message dials a special number directly to reach the recipient's voice mailbox. "Passive use" refers to vmail messages left due to the inability to reach the intended party for synchronous communication. Senders using the passive mode do not make a conscious first effort to use the voice mail system. Rather, they employ its recording capabilities to store messages. This amounts to the functionality of a telephone answering machine.

4. Media richness theory and the new media

Can MRT account for differences in individuals' preferences for, and usage of, email and vmail, when both of these media are available? MRT argues that choices between these media will vary with the degree of uncertainty or equivocality in the communication task. As mentioned earlier, media ranking higher on the richness scale are believed better equipped to handle equivocality than media lower on that scale. Email has been ranked low on the richness scale by virtue of its written nature (Markus, 1994). By contrast, vmail is regarded a rich medium due to the vocal information it is able to convey (Yates & Orlikowski, 1992; Adams *et al.*, 1993; Negroponte, 1995).

When we examine the factors that comprise the richness concept we can understand why vmail is considered to be richer than email (Table 2). First, vmail provides dynamic verbal cues that reflect a person's tone of voice, inflections and emotions while email can only convey static visual cues in text. Thus, vmail is richer in terms of its capacity to convey multiple cues. The ability to interpret a communicating partner's tone of voice is a significant advantage of vmail (Rice & Shook, 1990). Second, vmail uses natural

TABLE 1

Basic communication activities	Description	Email features	Vmail features	Comparison
1. General	*Communication mode*: the general communication and transmission mode used by the medium	Text	Voice	The text mode of electronic mail facilitates much of its other features. The voice mode of voice mail facilitates the transmission of verbal cues which are absent in email.
	Device: system access device used	Terminal limited	Phone unlimited	Telephones are more accessible than terminals and anyone can have "passive" access to voice mail but for electronic mail access a system ID is needed.
	Retrieval and documentation: the ability to retrieve and keep a permanent copy of messages.	Save, print and file	Save	Both media provide documentation. Voice mail offers only temporary saving through saving messages in the recipient's inbox which usually has an upper limit of about ten messages, both saved and incoming. Electronic mail, however, offers permanent savings, electronic and paper filing and printing.
	File transfer: the ability to attach a file, text or data to a message to be sent.	Available	Not available	Electronic mail offers the ability to transfer a file but voice mail does not.
2. Sending	*Communication mode*: the mode of communication used to send the message.	Typing	Speech	In voice mail you need to dictate the message into the machine while in electronic mail you type it in.
	Message preparation: how the sender prepares the message to be sent.	Editing and composing	Some edit functions	As a result of the communication mode electronic mail messages are easily composed and edited by a word processor. However, to edit a voice mail message the sender has to erase the message and start over again.
	Forwarding: allows the user to forward a received message to another mailbox.	Available	Available	Both electronic mail and voice mail offer message forwarding. However, if there is a long sequence of messages, the cognitive overload in voice mail tends to be higher than email.

Broadcast: permits the sending of the same message to more than one user by creating distribution lists.	Available easy to set up	Available cumbersome to set up	Both electronic mail and voice mail provide the user with the ability to create distribution lists. While electronic mail lists can be easily set up by the user, voice mail lists usually need to be set up through the system administrator.
3. Receiving			
Communication mode: the mode of communication the recipient uses to access the message.	Reading	Listening	Messages are read in electronic mail and listened to in voice mail.
Message selection: how the receiver can have access a specific message.	Random	Non-random	Electronic mail provides random access to any of the messages in the recipient's inbox. Voice mail requires the recipient to go through all the messages sequentially.
Message access: how the recipient has access to the contents of the message when reading it in electronic mail or listening to it in voice mail.	Scanning	Linear with speed control	Recipients of electronic mail messages read their messages and can therefore scan through the messages and can get to the important points. With voice mail recipients listen to their messages and cannot scan the message. They can fast forward the message but that loses much of the message content.

TABLE 2
Comparative richness of electronic mail and voice mail

Richness	Vmail	Email	Richer medium
Immediate feedback	Absent	Absent	Neither
Cues	Multiple and dynamic	Single and static	Vmail
Language variety	High	Low	Vmail
Personal focus	High	Low	Vmail

language which, together with audio cues, provides language variety and language content. In email, while natural language is employed, audio cues are absent, which limits its language variety. Third, the audio nature of vmail makes it more amenable to the transmission of feelings and emotions (Conger, 1988). Thus, personal focus is likely to be higher in vmail than email. In addition, a study by Daft *et al.* (1987) found that oral media are better able to handle equivocality than written media. Since vmail is oral in nature while email is written, we can expect that individuals will prefer vmail over email in equivocal communication situations. In sum, due to vmail's ability to provide verbal cues and inflections and greater personal focus, in addition to its oral nature, it can be considered a richer medium than email. Consequently, the following hypothesis is given.

H1: Individual will prefer to communicate via vmail rather than via email in situations requiring the exchange of information to resolve equivocality.

For the reduction of uncertainty, communication media need not be rich, but they do need to facilitate both the processing of large amounts of data and the exchange of accurate, objective and quantitative data. Email provides capacities for easily retrieving a large number of messages. By contrast, limitations on the number of incoming and saved messages in vmail systems makes such intensive data processing almost impossible. In addition, it is cognitively taxing for a user of vmail to process lengthy messages or complex sequences of messages. Similarly, email messages promote accuracy. Senders of email messages can take their time in composing and editing while vmail users cannot. Second, email receivers can increase information accuracy by reading messages slowly or printing a hardcopy. To accomplish the same purpose, vmail messages have to be transcribed.

Email is better suited to transmitting objective and quantitative messages in the form of technical reports and documents than is vmail. The length of these reports would preclude the use of vmail to transmit them. Also, the written nature of email preserves the formality of technical reports, data or formal requests and responses. While quantitative data can be communicated via both media, senders and receivers of email messages can process quantitative data more efficiently and effectively than vmail users (Trevino, Webster & Shoemaker, 1990). In sum, due to email's superior ability to respond to situations involving uncertainty, we give the following hypothesis.

H2: Individuals will prefer to communicate via email rather than via vmail in situations requiring the exchange of information to reduce uncertainty.

5. Research method

To investigate these hypotheses, a field study using multiple data collection and analysis techniques was conducted in the corporate headquarters of a large organization (named Aerco here) in the business of research, development and production of aerospace and defense systems. In order to rule out alternative explanations and to increase the study's internal validity, the availability and accessibility of the two media of interest were prime considerations in the site selection process. Aerco corporate headquarters met both criteria. First, the company had installed both vmail (PhoneMail) and email (PROFS) systems for internal and external communications. (Email had been in use longer than vmail, a factor we will discuss later.) Second, each individual at Aerco corporate headquarters had exclusive access to a personal computer for email and a telephone set for vmail. Eighty individuals out of about 200 employees at Aerco headquarters were identified by the corporate director of information systems as regular users of both media. Due to resource constraints, 35 individuals ranging from clerks to vice presidents were randomly selected as potential study participants. Thirty-one individuals agreed to participate.

5.1. DATA COLLECTION

The principal instruments used were a self-administered questionnaire and structured interviews. The questionnaire and interview items comprising each conceptual construct were developed from the literature, pre-tested by information systems researchers and piloted in the corporate headquarters of another organization. The pre-test/pilot phase improved the questionnaire and structured interview through the exclusion and refinement of items that appeared ambiguous, misleading or inadvertently phrased to elicit a desired response.

Participants filled out a 35-item questionnaire that asked them to identify their degree of preference for either email or vmail in communication situations dealing with individuals' information processing behavior in response to equivocality or uncertainty. The questionnaire items used a preference scale ranging from 1 to 5 (1 = strong preference for vmail, 5 = strong preference for email, 3 = no difference).

Seven communication situations were adapted from a study by Daft *et al.* (1987), in which individuals identified which medium they preferred in hypothetical situations rated on their level of equivocality on a 1 to 5 scale by 30 judges. In that study, eight of the situations had ranked high on equivocality (4.0 or higher). One of these was dropped in the pre-test/pilot phase of the current study, because it was misleading (see Table 3).

The communication situations comprising the uncertainty construct were developed from the theoretical definition of individuals' information processing behavior under uncertainty. This involves decisions about the amount and type of information exchanged (Daft and Lengel, 1986). These items were tested during the pre-test and pilot stage. Seven communication situations comprise this construct (see Table 3).

Semi-structured interviews ranging from 45 to 90 min in length were conducted with each individual to supplement the questionnaire by providing the underlying reasons for individuals' responses to questionnaire items. In order to triangulate on the postulated

TABLE 3
Concepts, constructs and measures

Conceptual constructs	Research constructs	Survey item	Measure description
Equivocality	Negotiate	26	• To present some confusing changes in the employee benefit package to 20 subordinates
		19	• To work out a personality problem that has affected the working relationship between you and your boss
	Explain	25	• To explain to a new rather sensitive employee that she mishandled a personnel conflict in her work group
		1	• To get an explanation from a subordinate who is a personal friend, about what appears to be a "padded" expense report
		4	• To get an explanation from a peer in another department of a complicated technical matter in which you have no experience
	Clarify	2	• To get clarification of an ambiguous directive from your boss
		3	• To work out confusing terminology used by a new subordinate reporting progress on a routine work assignment
Uncertainty	Amount	15	• To send a lengthy message informing your superior about the steps you undertook in solving a problem
		22	• To receive lengthy information about a two-day management
		21	• To exchange a large number of messages with your work group
	Accurate	11	• When you would like to exchange important information that needs to be conveyed accurately
	Objective	14	• To transfer files and reports
		24	• To exchange technical reports and information
	Quantitative	23	• To exchange numerical information

constructs using dissimilar methods (Campbell & Fiske, 1959), the interviews sought to gather information on the reasons for individuals' preferences (see Table 4).

5.2. DATA ANALYSIS

According to Cook and Campbell (1979), instrument validation should precede other core empirical validation. Instrument validation refers to the adequacy with which the questionnaire and interview questions measure what they are intended to measure. The reliability (external validity), content and construct validities of the instrument was assessed. Cronbach alphas (Cronbach, 1951, 1971) for the multiitem measures that comprise

TABLE 4
Outline of interview topics

1. Job description
2. Overview of daily communication activities
3. Electronic mail
   Number of messages received and sent daily
   Nature of electronic mail messages
   General usage pattern
   How long used it
   What does she/he use it for
   Who she/he uses it to communicate with
   Benefits and advantages of electronic mail
   What is electronic mail particularly "good" for
   What is electronic mail particularly "bad" for
4. Voice mail
   Active vs. passive use
   Number of messages received and sent daily
   Number of voice mail messages
   General usage pattern
   How long used it
   What does she/he use it for
   Who she/he uses it to communicate with
   Benefits and advantages of voice mail
   What is voice mail particularly good for
   What is voice mail particularly bad for
5. Comparison of media
   Nature of communication in electronic mail vs. voice mail
   Dealing with ambiguous, prolonged difference in opinions
   Dealing with uncertainty, complexity or technical exchanges
   For sending, for receiving
   Message selection, access and preparation
   Documentation: keep a record, print, save, file
   Broadcasting
   File transfer

the equivocality and uncertainty constructs were 0.76 and 0.80, respectively. Both are in the acceptable range (Nunnally, 1967). These values indicate that the instrument is reliable.

Content validity refers to the adequacy of the content of a measuring instrument and its relation to established literature (Cronbach, 1971; Kerlinger, 1973). The questionnaire was developed through careful review of the theoretical and empirical literature. In addition, the items comprising the equivocality construct had been evaluated by 30 independent judges in the study by Daft *et al.* (1987). Moreover, the pre-test/pilot phase increased the instrument's content validity by judging the relevance of each item to the property being measured. This step also indirectly improved the reliability of the instrument by reducing measurement errors due to misunderstood questions and discrepancies in answers.

Construct validity is concerned with identifying whether the measures chosen are true constructs or simply artifacts of the chosen methodology (Campbell & Fiske, 1959;

Cronbach, 1971). Construct validity is concerned with the possibility that operations that are meant to represent the measurement of a particular independent variable can be constructed in terms of other variables (Kirk, 1982). Individual items were correlated with their total scores and all found to be significantly correlated (Tables 5 and 6). In addition, by triangulating questionnaire and interview data (Campbell & Fiske, 1959; Jick, 1990), we were able to determine that the findings were robust and unaffected by instrumentation. This ensures that the assumption of independence of method is not violated (Straub, 1989).

The next step in questionnaire data analysis involved identifying the medium preferred by individuals in different communication situations. The preference mean for each questionnaire item was computed and compared with the point of no difference between email and vmail. (The point of no difference was a rating of three on any questionnaire item.) Then each individual was given a score on the uncertainty and equivocality constructs, which are averages of the seven items which comprise each.

Using the Shapiro–Wilk Statistic, we tested the null hypothesis that the input data values are a random sample from a normal distribution. We thus proceeded with a parametric statistical technique (Kerlinger, 1973). Each item and construct mean was analysed using a one-tailed t-test to determine whether it was significantly greater or less than zero. Means, standard deviations, t-scores, probability levels and significance are reported in Tables 7 and 8.

Interview notes were transcribed immediately after the interviews. Analysis was conducted following the methods prescribed by Miles and Huberman (1984). Two kinds of analyses were conducted. First, the overall pattern of responses by each respondent was assessed to determine whether there was a bias for one medium vs. the other and

TABLE 5
Item and total score correlations for Hypothesis 1[†]

	Q1	Q2	Q3	Q4	Q19	Q25	Q26
Q1	1.0000						
Q2	0.3215	1.0000					
	0.0778						
Q3	0.2783	0.6180	1.0000				
	0.1288	0.0002					
Q4	0.1406	0.3340	0.5522	1.0000			
	0.4504	0.0664	0.0013				
Q19	0.2688	0.2454	0.2437	0.1966	1.0000		
	0.1436	0.1833	0.1865	0.2893			
Q25	0.3925	0.1474	0.2505	0.2944	0.4528	1.0000	
	0.0290	0.1740	0.1740	0.1080	0.0105		
Q26	0.3049	0.3119	0.3548	0.1646	0.3856	0.2119	
	0.0954	0.0877	0.0502	0.3763	0.0322	0.2525	1.0000
Equivocality	0.6245	0.6950	0.7511	0.6034	0.5980	0.5730	0.6110
construct	0.0002[‡]	0.0001[‡]	0.0001[‡]	0.0003[‡]	0.0004[‡]	0.0008[‡]	0.0003[‡]

[†] Please see Table 3 for a complete description of survey items.
[‡] Significant at $p < 0.05$.

TABLE 6
Item and total score correlations for Hypothesis 2

	Send lengthy	Receive lengthy	No. of messages	Transfer files	Technical informat.	Accuracy	Numerical data
Send lengthy	1.0000						
Receive lengthy	0.5808	1.0000					
	0.0006						
No. of messages	0.5471	0.6603	1.0000				
	0.0015	0.0001					
Transfer files	0.2820	0.5074	0.3370	1.0000			
	0.1243	0.0036	0.0638				
Technical informat.	0.5299	0.7375	0.4836	0.5107	1.0000		
	0.0022	0.0001	0.0058	0.0033			
Accuracy	0.0079	0.0739	0.0997	0.2599	0.0428	1.0000	
	0.9663	0.6926	0.5936	0.1580	0.8192		
Numerical data	0.0061	0.4067	0.3731	0.6862	0.4639	0.1978	1.0000
	0.9738	0.0232	0.0387	0.0001	0.0086	0.2863	
Uncertainty construct	0.6462	0.7837	0.7537	0.7228	0.7754	0.3848	0.6298
	0.0001[†]	0.0001[†]	0.0001[†]	0.0001[†]	0.0001[†]	0.0325[†]	0.0001[†]

[†] Significant at $p < 0.05$.

TABLE 7
Survey results for Hypothesis 1

Conceptual construct	Research construct	Survey item[†]	Mean	S.D.	t-statistic	Probability PR $> |T|$	Hypothesis supported?
Equivocality	Negotiation	26	3.7097	1.4421	2.74	0.0102[†]	
		19	3.3548	1.3303	1.49	0.1480	
	Explanation	25	4.3548	1.1120	6.78	0.0001[†]	N.A.
		1	3.2581	1.6925	0.85	0.4026	
		4	3.6452	1.5176	2.37	0.0246[†]	
	Clarification	2	2.9032	1.6402	− 0.33	0.7448	
		3	3.1613	1.4628	0.61	0.5439	
Equivocality	Index	N.A.	3.4839	0.9322	2.89	0.0071[†]	No

[†] Please see Table 3 for a complete description of survey items.
[‡] Significant at $p < 0.05$.

to determine whether the respondent's assessment of the two media was consistent with the type of reasoning posited by MRT. Second, statements reflecting reasons for selecting a particular medium were coded and categorized using the theoretical constructs of MRT. The quotes presented below were selected for their representativeness rather than for their uniqueness.

TABLE 8
Survey results for Hypothesis 2

Conceptual construct	Research construct	Survey item	Item description[†]	Mean	S.D.	t-statistic	Probability PR > |T|	Hypothesis supported?
Uncertainty	Amount	15	Send lengthy	3.8387	1.3190	3.54	0.0013[‡]	
		22	Receive lengthy	4.0968	0.9783	6.24	0.0001[‡]	
		21	Amount	3.3226	1.1369	1.58	0.1246	
Uncertainty	Type	11	Accurate	3.7097	1.4421	2.74	0.0102[‡]	N.A.
		14	Objective	4.5161	0.7690	10.98	0.0001[‡]	
		24	Technical	4.4193	0.9583	8.25	0.0001[‡]	
		23	Quantitative	4.4516	1.0595	7.63	0.0001[‡]	
Uncertainty		N.A.	Index	4.0507	0.7139	8.19	0.0001[‡]	Yes

[†] Please see Table 3 for a complete description of survey items.
[‡] Significant at $p < 0.05$.

6. Results

6.1. HYPOTHESIS 1

Hypothesis 1 predicted that the individuals would prefer to communicate via vmail rather than via email to resolve equivocality. This hypothesis was not supported (Table 7). The equivocality construct had a mean of 3.48 and a standard deviation of 0.93. This result indicates *that not only did individuals* not *prefer vmail in equivocal communication situations*, *but*, *contrary to our expectations*, *they preferred email* (t-statistic = 2.89, $p < 0.01$). Specifically, individuals preferred to communicate via email as opposed to vmail for situations that require explanation or negotiation. Thus, for the specific case of email and vmail, the results fail to support the hypothesized relationship derived from MRT between a medium's richness and its ability to handle equivocality.

Interview results lend support to the survey results and shed light on why they occurred. Interviewees generally did not perceive vmail as an appropriate medium for communicating information to resolve equivocality. Vmail was preferred for short, spontaneous, one-way drops of information, in contrast to the lengthy, ongoing, pro-longed and ambiguous communication typical of equivocal situations (Daft & Lengel, 1987). The following quotes illustrate how Aerco employees compared and contrasted the media:

> "I use voice mail moistly for "fyi" or "call me back" type of messages. If I am requesting information then I use email."

> "If an issue requires back and forth communication I am much more comfortable on email. Messages are more understandable … since people have thought the message through. Sometimes people don't think through [a message] on voice mail. They tend to ramble and are not focused. I have to do a lot of work to narrow down the issue."

In contrast to claims about the usefulness of multiple cues in promoting clarity, facilitating meaning and reducing ambiguity, vmail's capacity for conveying multiple cues were

unimportant in Aerco employees' media choices:

> "The tone of voice (is) not important in PhoneMail. I don't believe that adds any personal touch."

> "Verbal cues introduce distortions … since voice is harder to understand and interpret."

Inteviewees preferred email's functionality of documentation and "multiple addressability" (see Sproull, 1991). Interviewees found vmail messages hard to manipulate, store, print and file or send to multiple people:

> "If it's sticky and requires negotiation, I definitely go for email. I can keep a record, file, print and save incoming mail. It's very cumbersome to do the same with vmail."

> "Distribution lists are easier to set up and use in email. All my distribution lists are in email."

To summarize, Hypothesis 1 predicted that individuals will prefer to communicate via vmail rather than via email to resolve equivocal situations. This hypothesis was not supported. In fact, the survey results confirm the contrary: email was preferred for dealing with equivocality. Interview data suggest that email was preferred over vmail in equivocal situations due to email's ability to handle ongoing and prolonged communication as opposed to one-way drops of information, *its absence of verbal cues* (which our respondents believed introduced distortions), and its documentation and multiple addressability functionality.

6.2. HYPOTHESIS 2

Hypothesis 2 predicted that individuals will prefer email over vmail to exchange information to reduce uncertainty. The results support this hypothesis at a significance level of $p < 0.0001$ (see Table 8). The uncertainty construct had a mean of 4.05 and standard deviation of 0.71 (t-statistic $= 8.20$; $p < 0.0001$). This result shows that people do prefer electronic mail for communication situations involving uncertainty. Specifically, they prefer email over vmail for exchanging large amounts of information in the form of lengthy messages, for exchanging accurate, objective, technical and quantitative information. For ensuring accuracy of information email was preferred to vmail (mean $= 3.71$, S.D. $= 1.4$, $p < 0.01$). Email was also preferred for exchanging reports and files of an objective nature (mean $= 4.50$, S.D. $= 0.77$, $p < 0.0001$). And, when dealing with numerical information, respondents preferred electronic mail (mean $= 4.45$, S.D. $= 1.05$, t-statistic $= 7.63$, $p < 0.0001$).

The interviews also support these findings. Individuals overwhelmingly preferred email for performing tasks typical of uncertainty situations, such as the need to reserch the subject, exchange a large amount of information or obtain and disseminate accurate, objective, technical or quantitative data (Daft & Lengel, 1987). Individuals commented:

> "If I ask a question where the other person has to do research and transfer me a sizable amount of information I use email."

> "Since our library system is on-line I can always send a message to [the librarian] and request that she … download the information I need and … send it to me on email. … I guess I could have made the initial request on vmail but that seems like such a roundabout way to do things."

Interviewees reported that messages they sent via email were more accurate and clearer than the ones they sent via vmail, where the message cannot be edited carefully. In addition, individuals believed that they were far more capable of receiving messages accurately on email than on vmail:

> "My vmail messages are far from accurate. … I get tongue-tied [with voice mail]."

> "Email messages are usually more comprehensible and accurate than vmail messages."

For exchanging reports and files of an objective or technical nature, individuals also preferred email due to its documentation ability and its permanence when compared to vmail's more transient nature.

> "If I need information that is technical and complicated, I don't want to rely on a bunch of words. If it's a simple message, fine. I also use it (PROFS) to have a record. I don't like having a PhoneMail message that disappears."

> "For technical documents … I usually do a file transfer on email. … I'm used to using PROFS as a writing tool. … We do quite a bit of coauthoring of planning documents on PROFS. … We send the document back and forth, annotate it, and so on 'til it is complete and is distributed on PROFS."

Finally, for exchanging numerical information, the qualitative results indicate that individuals do not like to rely on vmail when dealing with numbers:

> "I'm bound to have problems if I communicate numbers on vmail. Who wants to sit with a paper and pencil and jot down these numbers? I would much rather have it on PROFS where I can see it and print it if I so desire."

In summary, Hypothesis 2 predicted that individuals will prefer to communicate via email rather than via vmail in situations requiring the exchange of information to reduce uncertainty. The survey results support this hypothesis. In addition, the interview data confirm that email is preferred due to its capacity to provide a large amount of information that can easily be processed by both the sender and receiver as well as its ability to adequately provide accurate, objective and quantitative information. Vmail's oral nature and its limited capacity were major deterrents in situations characterized by uncertainty.

6.3. ALTERNATIVE EXPLANATIONS

Given the lack of conclusive support for MRT, we further analysed our data for explanations of their preferences for email and vmail. Analyses of both the questionnaire and interview data reveal that individuals' media choices were a function of the medium's communication mode and documentation capabilities as well as the user's role as message sender or recipient.

6.3.1. The medium's communication mode

A major reason people gave for favoring electronic mail was its textual communication mode. This finding is not surprising given that standard written natural language is more amenable to graphical manipulation, while spoken natural language can only be manipulated auditorily (Bernsen, 1994; Negroponte, 1996). Certain functions can be

TABLE 9
Alternative explanations

Explanations	Measures	Mean	S.D.	*t*-statistic	Medium	Significant
Mode	Numerical	4.41	0.94	8.39	Email	Yes
Documentation capabilities	To keep a record	4.67	0.92	10.00	Email	Yes
	Hard copy	4.96	0.18	61	Email	Yes
	File transfer	4.51	0.75	11.10	Email	Yes
Recipient vs. initiator	Recipient	4.09	0.96	6.34	Email	Yes
	Initiator	2.54	1.01	− 2.40	Vmail	Yes
	Access	4.25	0.98	7.12	Email	Yes

performed with written text which are not possible with spoken language (Levy *et al.*, 1996).

The textuality of electronic mail was found convenient in cases where senders have low voices or heavy accents. The tendency of some people to talk too fast was not a problem for their communication partners when the speakers used email.

For numerical information electronic mail was the medium of choice according to the questionnaire data (Table 9; mean $= 4.41$, S.D. $= 0.94$, $t = 8.39$, $p < 0.05$). When a message includes numerical information such as telephone numbers, electronic mail provides a written record of the essential information. Email users particularly appreciated the ability to download numbers into a spreadsheet package and display them graphically. Graphical displays promote memorability for the recipient (Levy *et al.*, 1996).

By contrast, recipients of voice mail messages found it difficult to remember numbers unless they transcribed them. In this case, recipients often reported impatience and frustration at having to listen to voice mail messages slowly and repeatedly to transcribe numbers accurately. In general, interviewees agreed that the textual mode of electronic mail enabled them to manage their communications better than in vmail:

> "Electronic mail is in written form which ensures accuracy, readability and enables manipulation of messages."
> "Electronic mail's typed nature enables me to interface and manipulate my group messages."
> "I prefer to look at things on a screen. With voice mail, I have to take notes … I am more proficient at the written word."

"Mosaic messages," which result from a series of attached and forwarded messages (Markus, 1994), were a concern to users of both media. Although mosaic messages can be very useful in tracking the history of a problem or project, they result in lengthy communication sequences. While mosaic messaging is possible in both electronic mail and voice mail, users found that receiving mosaic messages in vmail placed much heavier cognitive demands than the same message in email. Indeed, some people preferred to handle mosaic messages on paper.

Interviewees were asked this hypothetical question: would you prefer to have your electronic mail messages read to you on voice mail; or your voice mail messages transcribed into electronic mail? 74% preferred having messages transcribed into

electronic mail, 16% preferred electronic mail read into voie mail and 9% did not have a choice. Individuals commented:

> "I can read faster than I can listen"
> "I prefer to look at things on a screen. With voice mail, I have to take notes … I am more proficient at the written word."

The 16% who preferred vmail delivery of messages said that this was mainly due to their heavy travel schedules. When they were traveling they found telephones more available and convenient than computers and printers. In short, the textual mode of electronic mail was a major reason that many respondents reported preferring email to vmail.

6.3.2. Medium functionality in documentation

A second major reason for people's email preference was email's superior functionality in communication documentation and retrieval. Our respondents preferred electronic mail for keeping a record of the communication (Table 9; mean = 4.67; S.D. = 0.92; $p < 0.05$), for printing messages (Table 9; mean = 4.96; S.D. = 0.18; $p < 0.05$) and for filing messages (Table 9; mean = 4.35; S.D. = 0.91; $p < 0.05$). With electronic mail, people were able to save and organize their communication exchanges by time, topic, contributor or any other way. People valued the "sense of order" that email message filing gave them: they described it as a road map and a common reference point. Electronic mail was preferred for its functionality in mailbox management.

In comparison to email, vmail's message storage features are primitive. No filing capability was available, and messages held in short-term storage in the "inbox" reduced the users' total message-storage capacity. (It should be noted that some of these limitations are not absolute constraints of vmail systems, but the decisions of system administrators. Nevertheless, users experience them as absolute constraints.) Here are just a few of the reasons related to documentation and retrieval capabilities that our respondents preferred email:

> "Email is permanent, I can go back 2 years and still have a record."
> "If I ask a question where the other person has to do research and transfer me information, I use email" [implies that the recipient will have a record/reminder of the request].
> "I like email better because I can keep a record, retrieve, save and print messages."
> "I like to keep a record, file, print and save incoming messages."
> "I like to have a copy of the electronic mail messages I send."

In case where more than one individual is involved in producing a document (for example, a multiauthored report), the ability to have a copy of the document is critical. Email senders were able to attach a previously prepared file to an explanatory message. The questionnaire data reveals that users preferred email (Table 9; mean = 4.51, S.D. = 0.75, $t = 11.10$, $p < 0.05$) for making comments, annotating documents, making corrections and returning documents to co-authors. By contrast, dictating and annotating documents on vmail was considered extremely tedious. This is in line with the research finding that people generally dislike dictating (Gould & Bios, 1978, 1983). (However, with widespread availability of the capability for voice annotating text, people whose role is primarily that of a commentator may prefer voice annotation.) In sum, email's greater functionality in documentation, "memory" and retrieval generally led our respondents to prefer it to vmail.

6.3.3. Communicator's role as recipient or initiator

Grudin (1988) has suggested that individuals prefer voice mail for sending messages (if they were not going to be recipients of these same vmail messages), because all the benefits of voice mail are for the sender: speech is faster to produce, conveys emotion and nuance easily and may be available without access to a computer terminal. Our data support Grudin's observation that the role a person plays in communication strongly influences their medium preference.

For *receiving* messages, respondents clearly preferred email (Table 9; mean $= 4.09$, $t = 6.34$, $p < 0.05$). Email was viewed as having numerous benefits to message receivers. Email allows recipients to scan quickly across and within messages, enabling them to concentrate on important points and ignore irrelevant ones. Furthermore, when message senders have used email's carbon copy and blind carbon copy features, recipients can easily stay up to date on what is happening and can gain valuable clues about organizational politics and issue urgency by examining who has been involved in a particular communication.

While vmail has some scanning and carbon copy features, they are quite limited in comparison to email. In PhoneMail, for example, recipient could scan message headers and listen to them in the order they chose, and they could adjust the speed at which messages were played back. But respondents preferred email (Table 9; mean $= 4.25$, S.D. $= 0.98$, $t = 7.12$, $p < 0.05$), mainly due to its visual nature which was believed to provide more mailbox control. One interviewee said: "Nonsequential access in electronic mail is a time-saver". In terms of accessing incoming messages one person was really angry with the voice mail system. He said:

> "I asked to be removed from the voice mail system. People are misusing it, they tend to ramble. In email, I can ignore what they're saying. I can read faster than I can hear. I can get to the key word and subject very quickly. [With voice mail] if you want to get to the important point you have to plow through all the message and you can get bored."

Furthermore, vmail message recipients do not know who else has received the message unless the sender has announced this is the message itself (which skilled vmail users often do for this very reason).

All in all, users clearly preferred email to vmail for message receiving. The following comments are typical:

> "Reading is faster than listening."
> "I can grasp the essence of the message quickly in electronic mail."
> "I like the quite environment that electronic mail provides."

By contrast, for *sending* messages, our respondents preferred vmail. Questionnaire results showed statistically significant preference for vmail when people were initiating communications (Table 9; mean $= 2.54$, S.D. $= 1.01$, t-statistic $= -2.4$, $p < 0.05$). In fact, the message sending role was the *only* situation in this study where vmail was clearly preferred to email. Typical interview comments include:

> "I'm on the phone so often it's easier to send messages on voice mail."
> "I like to talk on the phone, it's quicker."
> "I like to send messages on voice mail because it saves time. It doesn't help the receiver though!"
> "Voice mail conveys a sense of urgency."

It seems that senders prefer vmail because it helps them get work off their desks faster. It is generally more accessible and easy to use. The sender who is comfortable with dictation can speak a message informally without worrying about grammar or spelling:

> "Phone is more accessible."
> "Speech is quicker and easier."
> "I can use colloquial language on voice mail. I like talking better than writing."
> "Voice mail can convey the correct mood without a lot of work."

Although vmail was generally preferred to email for message sending, there were important exceptions to its use in this way. In this organization, people only used voice mail for message sending when they suspected (e.g. after work hours) or knew (e.g. when they dialed the person's number and PhoneMail answered) that the person was *not* at his/her desk. To send a message when the recipient was available for a conversation was considered rude.

> "Why would I dial my boss's voice mail box when I can call him directly? Isn't that rude?"
> "I would only leave a voice mail message if that person wasn't in their office. Otherwise it would look like I was trying to avoid them."

7. Discussion

The purpose of this paper was to evaluate MRT's ability to account for people's patterns of choosing among and using alternative new media. The findings of this study provide only partial support for MRT. They are consistent with MRT's predictions about media choice in situations involving uncertainty reduction, but not in situations involving equivocality reduction. Viewed another way, the findings of this study show that one medium, email, was "dominant" or strongly preferred to the other for almost all asynchronous communication tasks. Vmail appears to have been used primarily as an answering machine (a feature that it does not share with email), and its asynchronous capabilities (which it does have in common with email) were generally not used, for fear of seeming rude. Although email was preferred for situations of uncertainty, as MRT predicts, our detailed analysis suggests that email was preferred for reasons that have less to do with email's richness than with users' communication roles and medium features unrelated to the richness construct.

We can offer three explanations of MRT's failure to explain people's choices among new media. First, even if media richness is an important determinant of people's media choices, the ways in which that concept has been conceptualized and measured in the context of traditional media may be inapplicable or inappropriate for the new media. As discussed earlier, the richness construct is believed to consist of four elements, derived from analysis of traditional media: (1) capacity for immediate feedback, (2) ability to convey multiple types of cues, (3) language variety, and (4) personal focus. There are clear differences among traditional media in their ability to support these capabilities taken as a set. For instance, face-to-face and telephone allow for immediate feedback, the transmission of multiple cues, language variety, etc., whereas written addressed communications and written unaddressed communication do not.

However, the new media combine these attributes in unexpected ways. For instance, email, which relies on text, is asynchronous, but fast (Sproull & Kiesler, 1986). Thus, it has

low language variety and cues compared to face-to-face communication, but it can also allow for immediate feedback. A single yardstick of richness may not be able to capture the ways that new media stretch old constraints.

In a similar vein, MRT essentially assumes that all four elements are of equal importance in the richness construct. Little is known about how we may rank or weight the four elements (Fulk & Boyd, 1991). Further research may determine that immediacy of feedback, for example, is the most important element of richness. Such a finding would clearly affect the results of studies like ours, which weighted each element equally.

Our study had particularly interesting results about the richness element of "cues variety." Nonverbal and paraverbal language are frequently believed extremely useful in conveying accurately the nuances and innuendoes in a message (Negroponte, 1995). In our study, however, we found that users believed that the vocal cues in vmail introduced both noise and distortion into a message. Email was believed to convey the true meaning of a message more accurately because it eliminated these distracting and misleading cues. Similarly, videoconferencing is frequently claimed to be superior to audio-only conferencing more for its ability to transmit information displays (e.g. meeting overheads) than for its ability to display people's faces and gestures. Clearly, if cue variety were reevaluated as a contributor to media richness, our study might have produced very different results.

A second explanation for MRT's failure to account for the media preferences we found in our study is that people may value factors other than richness *per se* for the ability to reduce communication equivocality. A prime example is the textuality of email. Email may not be rich, but the fact that it is text-based may increase people's confidence that a message was relayed and interpreted accurately. Further, it affords a number of documentation storage, search and retrieval capabilities, not currently possible or easy to use in vmail, that render it far superior for complex organizational communication tasks.

By contrast, vmail, rated relatively "rich" by MRT standards looks quite lean when compared to email on a broader yardstick of functionality. Negroponte (1995: p. 158), for example, argues that with asynchronous media and especially voice mail, "the advantage is less about voice and more about off-line processing and time shifting." Despite vmail's vaunted ability to convey such qualities as compassion, forgiveness or honesty, "text digits are easier to process, filter and transfer than voice digits" (Negroponte, 1995: p. 152). As the technology advances and as voice and text can be manipulated equally well (or jointly) as "digital assets," we may see a change in electronic mail's dominance. But, at present, electronic mail is clearly the medium of choice in many organizations.

A third explanation for the relative failure of MRT to explain our findings is that users may prefer new media for reasons unrelated to their ability to handle message equivocality. MRT does not, for instance, distinguish between message senders and recipients. In essence, the theory assumes that all people engage equally in both communication roles. But it is known that some individuals mainly receive communications and rarely initiate them, while others are heavy communication initiators as well as recipients. It seems quite plausible, as Grudin (1988) reported and our study found, that heavy communication initiators would evaluate the capabilities of vmail quite differently than those who are primarily communication receivers.

More recently, with the widespread use of the Internet, researchers have been reframing this issue as one of pushing vs. pulling information, Negroponte (1995) suggests that

"the economic models of media today are based almost exclusively on 'pushing' the information and entertainment out (much like the interruption of a phone call or a conference [face-to-face] meeting. Tomorrow's will have as much or more to do with 'pulling'—inherent in how we access our asynchronous media" (Negroponte, 1995: p. 170). When we compare email and vmail, we find that the former is far superior to the latter in information "pulling" capacity. This may explain in part why electronic mail was the preferred medium in the organization we studied.

   We can summarize our explanations of MRT's failure to explain people's media choices in our study as follows. First, even if media richness is an important determinant of people's media choices, the ways in which that concept has been conceptualized and measured in the context of traditional media may be inapplicable or inappropriate for the new media. Second, the ability of communicators to handle equivocality may depend, not only on the richness of their media (however measured) but also on other media features and functionalities such as communication mode and filing/retrieval capabilities. Third, users may prefer new media for reasons unrelated to their ability to handle message equivocality; for instance, they may choose media on the basis of their communication role (as senders or recipients of messages) and other personal, task, social or organizational factors (travel demands, social pressure from colleague, size of the installed base of users, communication style preference, etc.). A more useful theory of media choice must accommodate these possibilities.

8. Limitations

Our study is designed to control the availability and accessibility of both email and vmail to users. However, because vmail was relatively new in the organization, whereas email had been used for some time, we could not obtain control for people's length of experience with the media. In normal conditions, extended exposure to a medium could influence preference. However, the heavy emphasis on the use of new information technologies in this organization and the training provided to users minimizes the chances that people's relative inexperience with vmail explains our results.

   This study was conducted in a single organization at a single point in time. There is some evidence that technology usage patterns do not evolve smoothly over time, they may change sharply as a result of external events such as retraining, hardware upgrades, and new software releases (Tyre & Orlikowski, 1994). Furthermore, differences in work habits and organizational culture are believed to influence organizational patterns of technology use (Markus *et al.*, 1993; Markus, 1994). Consequently, one cannot expect the specific patterns of media use observed in this study to generalize to other organizations. In fact, one might reasonably expect that, in organizations where people travel extensively (e.g. consulting firms), people might generally prefer vmail to email.

   However, we do not claim that the specific usage patterns we observed in this study are generalizable to other organizations. What we claim to be generalizable (subject to replication and verification by other researchers) is our finding that MRT does not effectively account for the usage patterns we found in this setting and that other explanations of media choice do a better job than MRT in accounting for those patterns (cf. Yin, 1994).

9. Conclusions

In this study, we found that MRT did not adequately explain individual's choices between two new electronic media (electronic mail and voice mail). The theory appears not to take into account the full range of new media functionalities and the new relationships—among users and between users and the technologies—involved in the use of new media. In our opinion, the relatively poor showing of this theory when applied to only two of the many new media in the emerging communication environment does not bode well for its usefulness with respect to other new media and multimedia integrations. We conclude that behavioral researchers and product developers need to look elsewhere for a useful theory of new media choice.

One likely candidate to replace it is Bernsen's (1994) taxonomy of representational modalities. Bernsen's taxonomy takes into account two of the factors that our study found to provide better explanations of people's choice behavior than the concept of media richness, specifically communication mode and documentation functionality. We find Bernsen's typology more comprehensive of the characteristics that differentiate the new media than the four elements that comprise the information richness continuum.

In addition to exploring alternative explanations for media choice, future research should also examine a wider range of new media, communication tasks and contextual factors (e.g. travel behavior). Ultimately, both good theory and rich empirical descriptions of people's communication behavior are needed, if behavioral research is to provide sound guidance to the designers, buyers and users of new multimedia tools in tomorrow's organizations.

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