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MEDIA RICHNESS THEORY AND NEW ELECTRONIC COMMUNICATION MEDIA: A STUDY OF VOICE MAIL AND ELECTRONIC MAIL

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ABSTRACT

In situations requiring the exchange of information to resolve equivocality or reduce uncertainty, can Media Richness Theory account for differences in individuals' preferences for electronic mail and voice mail relative to one another? The results of this study indicate that, as predicted, electronic mail was preferred over voice mail for the exchange of information to reduce uncertainty. However, contrary to the predictions of Media Richness Theory, voice mail was not preferred over electronic mail for the resolution of equivocality. These results suggest that Media Richness Theory in its current formulation may not be applicable to the study of the new media. Future research should redefine and extend the concept of richness and its elements to account for the nature and functionality of the new media and investigate alternative social dimensions to individuals' preferences for and usage of the new media.

1. INTRODUCTION

There is a long tradition of research on the choice, use, and impacts of communication media (Chandler 1977; Chapanis 1971; Chapanis et al. 1972; Rogers 1986; Pool 1977; Szlichcinski 1983; Strassman 1985; Winograd and Flores 1986; Short, Williams and Christie 1976; Hiltz and Turoff 1979; Williams 1975, 1977). In the past, research was specialized by communication medium: interpersonal communication (such as memos and face-to-face interaction) and mass media (TV and newspapers). With the introduction of the telegraph (for reviews see Aronson 1971; Chandler 1977) and the telephone (for reviews see Brooks 1976; Pool 1977), scholars recognized a third category of media, machine-assisted communication media (Dominick 1983). The advent of electronic computer-mediated communication technologies, e.g., voice mail (vmail), electronic mail (email), group decision support systems, and computer supported cooperative work tools, in the 1980s, has generated a fourth category of communication media.

Electronic communication media provide such significant advances over traditional media in terms of storage, processing and transmission capabilities (Culnan and Markus 1987) that they are often referred to as "the new media" (Rice 1984; Daft and Lengel 1986). The proliferation of the new media has altered the nature of organizational communication in fundamental ways (Huber 1990; Crowston and Malone 1987; Culnan and Markus 1987; Hiltz 1984; Hiltz and Turoff 1979; Johansen, Vallee, and Spangler 1979; Rice 1980, 1984; Short, Williams and Christie 1979; Steinfield 1986; Strassman 1985; Zuboff 1988; Rogers 1986; Huber 1990).

Research on user preferences for, and usage of, the new media has, unfortunately, been limited to comparisons of new media with traditional media (Culnan and Markus 1987; Sproull and Kiesler 1986; Rice and Shook 1990). The basic limitation of this line of research is that it assumes channel equivalence (Reder and Schwab 1988), that is, the ability of a medium to substitute for an ideal communication medium, usually face-to-face communication (Bair 1989). Communication media are then assessed on how much they deviate from this ideal (Culnan and Markus 1987; Markus 1991; Huber 1990). This approach leads researchers to focus attention on the common set of capabilities shared by the ideal and the new media and to overlook the capabilities of new media not found in the ideal communication medium. Not surprisingly, in such a biased comparison, the new media frequently appear deficient (Bair 1989; Sproull and Kiesler 1986).

A prominent theory of communication media choice and usage is Media Richness Theory (MRT). MRT is concerned with determining the most appropriate communication medium for the task at hand (Daft, Lengel and Trevino 1987; Huber and Daft 1987; Trevino, Lengel and Daft 1987). It was developed and tested by comparing among traditional media and was later expanded to include email. While MRT is thought to be equally applicable to the new media (Daft and Lengel 1984, 1986), this claim has not yet been substantiated empirically.

The purpose of this paper is to determine the applicability of MRT to two new media: email and vmail. The research question posed in this paper is: Can MRT account for individuals' preferences for, and usage of, email and vmail, relative to one another, in situations requiring the exchange of information to resolve equivocality or reduce uncertainty?

2. THEORY

2.1 MRT: Equivocality and Uncertainty

MRT is based on the information processing model of organizations (Galbraith 1977; Tushman and Nadler 1978), which suggests that organizational communication is influenced by two forces: uncertainty (Leavitt 1951; Meissner 1969; Galbraith 1973b, 1977) and equivocality (Weick 1979; Daft and Lengel 1984, 1986). MRT is concerned with identifying the most appropriate communication medium in response to these two forces (Figure 1).

Uncertainty has been defined as the absence of information (Garner 1962; Shannon and Weaver 1949; Miller and Frick 1949) or "the difference between the amount of information required to perform the task and the amount of information already possessed by the organization" (Galbraith 1973a). 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 and Lengel 1986). Therefore, the need to reduce uncertainty leads to the acquisition of information to answer specific questions. In short, communication media appropriate for uncertainty reduction are those that facilitate the exchange of large amounts of accurate, objective, or numerical data (Daft and Lengel 1986).

Equivocality, on the other hand, refers to ambiguity (Daft, Lengel and Trevino 1987) and multiple, conflicting interpretations of situations (Weick 1979; Daft and Macintosh 1981). In situations of equivocality, it is not evident what questions need to be asked and, if questions are asked, no clear answers are likely to be available (March and Olsen 1976). Equivocality arises where individuals' frames of reference differ and negotiation is necessary to reach a

shared understanding of the solution (Daft, Lengel and Trevino 1987). Communication media appropriate for equivocality reduction need to promote the ability to clarify or explain, rather than simply provide large amounts of data. At issue here is the ability of the medium to process "rich" information (Daft and 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 and 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. If a medium can convey cues such as voice tone and inflection, then it is richer than one that does not. Richness also concerns the medium's ability to encompass the variety offered by natural language and to convey personal feelings (Huber and Daft 1987).

In general, 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, Lengel and Trevino 1987). Thus, according to MRT (Daft and Lengel 1984, 1986; Daft, Lengel and Trevino 1987; Trevino, Lengel and Daft 1987), rich, oral media facilitate equivocality reduction by enabling individuals to process subjective messages, create shared meaning, and resolve ambiguity stemming from multiple, conflicting interpretations of a situation. For effective communication to occur, the richness of the medium has to match the equivocality of the message.

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 communication tasks. 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 effective for processing of large amounts of standard, accurate, objective and quantitative data. By being sensitive to the ability of communication media to satisfy different communication needs, individuals can deal with their dual information needs for uncertainty reduction and equivocality resolution (Figure 1).

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 (Daft, Lengel and Trevino 1987; Trevino, Lengel and Daft 1987; Trevino et al. 1990). However, the ability of MRT to account for differences in the way individuals choose among and use the new media is as yet undetermined (Trevino, Webster and Shoemaker 1990). This study examines choices among two new media: email and vmail.
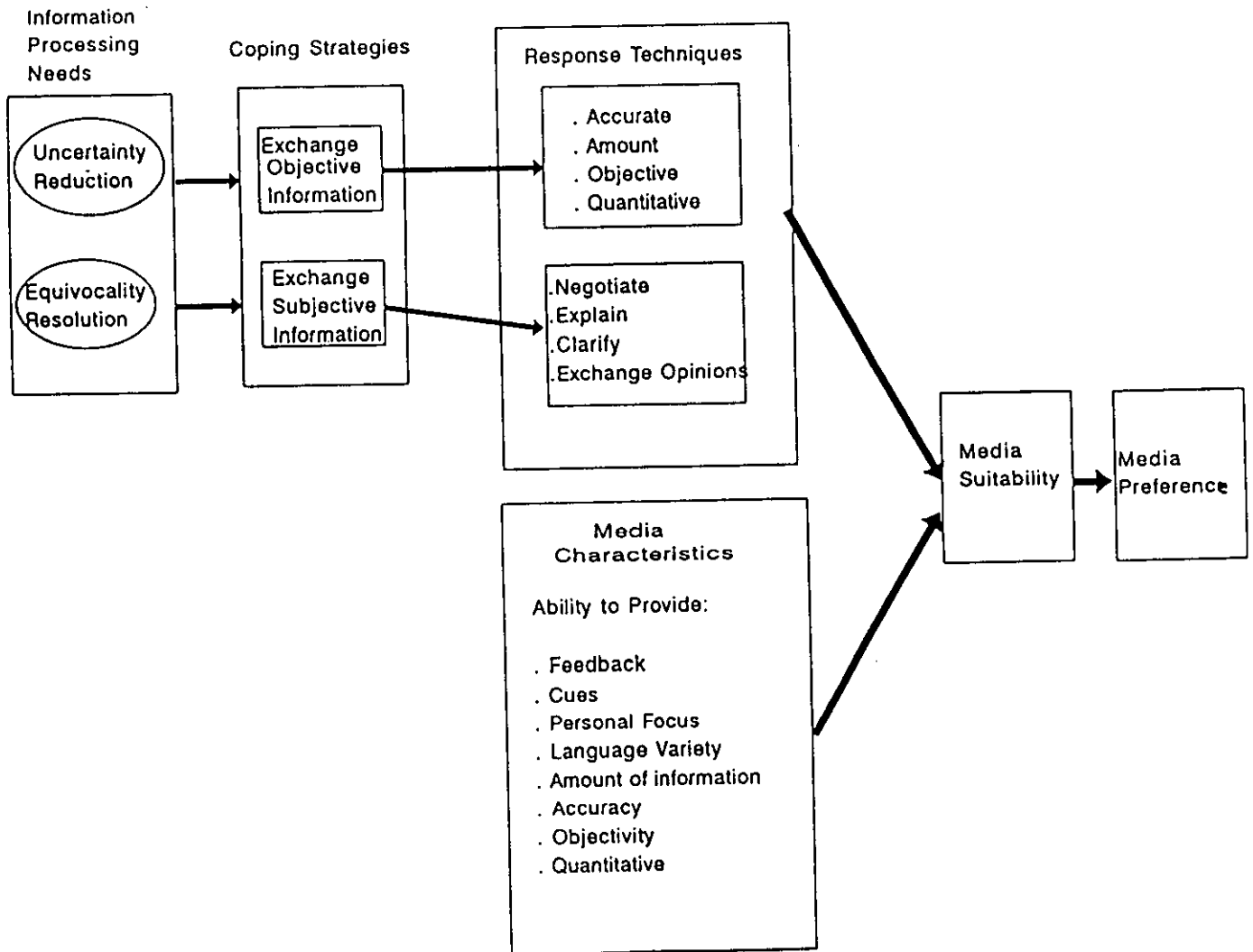
Figure 1. Media Preferences and Usage in Uncertainty and Equivocality Situations

2.2 The Media

Email is a computer-mediated messaging system that "uses computer text processing and communication tools to provide a high-speed information exchange service" (Sproull and Kiesler 1991). It is text-based and requires access to a computer device with a terminal, keyboard and communication software. To send an email message, it is typed on a keyboard (Table 1). It is received by being read on a terminal screen or on a printed hardcopy (Steinfield 1986). Most email systems have features 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 (re-directed), or deleted.

Vmail is an asynchronous, computer-mediated communication technology that uses the telephone as its access device. Vmail employs audio messages, rather than text messages, transmitted and received via the telephone. 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. Users of vmail systems can participate in two kinds of voice messaging activities (Stewart and 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 mes-

Table 1. Comparison of Electronic Mail and Voice Mail: Differences

Basic Comm Activities	Description	EMail Features	VMail Features	Comparison
1. General	Communications 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 has an upper limit of about ten messages, both saved and incoming. Electronic mail, however, offers permanent saving, 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 message to the mailbox of another user.	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 electronic mail.
	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 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 to 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 to get to the important points. With voice mail, recipients listen to their messages and cannot scan the message. They can fast forward messages, but that loses much of the message content.

sages 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 having the same functionality of an answering machine.

Vmail messages are sent by verbalizing them into a telephone handset and are received by listening to them. Users of vmail utilize the keypad of a touch-tone telephone to enter addresses and to perform other functions such as send, receive and save (Stewart and Finn 1985). Since vmail messages are digitized, users can broadcast messages, reply to incoming messages (asynchronously), forward messages and perform many of the same functions that can be performed in email.

2.3 MRT and The New Media

Can MRT account for differences in individuals' preferences for, and usage of, email and vmail when both media are available? MRT argues that choices between these media will be made on the basis of the degree of equivocality and uncertainty 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. Trevino, Lengel and Daft (1987) have ranked email low on the richness scale by virtue of its written nature. By contrast, vmail is regarded as a rich medium due to the vocal information it is able to convey (Yates and Orlikowski 1990). When we examine the factors that comprise the richness concept, we can understand why vmail is considered to be richer than email (Table 2).

Table 2. Comparative Richness of Electronic Mail and Voice Mail

Richness	Voice Mail	Electronic Mail	Richer Medium
1. Feedback	Absent	Absent	Neither
2. Cues	Multiple or dynamic	Single and static	Voice mail
3. Language Variety	High	Low	Voice mail
4. Personal Focus	High	Low	Voice Mail

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 (Trevino, Webster and Shoemaker 1990). The ability to interpret a communication partner's tone of voice is a

significant advantage of vmail (Rice and Shook 1990). Second, vmail uses natural language which, together with audio cues, provides language variety and language content. For email, while natural language is employed, audio cues are absent, which limits its language variety (Trevino, Webster and Shoemaker 1990). 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 (Trevino, Webster and Shoemaker 1990). In addition, a study by Daft, Lengel and Trevino (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 is a richer medium than email, and it is hypothesized that

> H1: Individuals will prefer to communicate via vmail rather than 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 saving, filing and eventually retrieving a large number of messages. By contrast, limitations on 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. Finally, unlike vmail, email systems have a file transfer capability for sending and receiving large amounts of data in the form of written reports and documents.

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. Third, the ability to file, save, print and manage email messages allows more accurate retrieval and documentation of communication episodes. Similar management of a vmail mailbox and printing of voice messages is not possible with currently available technology.

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 on both media, senders and receivers of email messages can process quantitative data more efficiently and effectively than vmail users (Trevino, Webster and Shoemaker 1990). In sum, due to email's superior ability to respond to situations involving uncertainty, we hypothesize the following:

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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 benefits package to twenty 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 seminar.
		21	• To exchange a large number of messages with your work group.
	Accurate	11	• When you would like to exchange important information about 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.

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

3. RESEARCH METHOD

To investigate these hypotheses, a survey-based 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 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 met both criteria. First, the company had installed both vmail (PhoneMail) and email (PROFS) systems for internal and external communications. Second, each individual at Aerco had exclusive access to a personal computer for email and a telephone set for vmail. In addition, individuals had access to portable computers and inbound WATS communication lines to reach their voice and electronic mailboxes when away from the office. Eighty individuals were identified by the corporate director of information systems as regular users of both media. Due to resource constraints, thirty-five individuals ranging from clerks to vice presidents were randomly selected as potential study participants. Thirty-one individuals agreed to participate.

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 it has been used
   What does she/he use it for
   Who she/he uses it to communicate with
   Benefits of electronic mail
   Advantages of electronic mail
   What is electronic mail particularly "good" for
   What is electronic mail particularly "bad" for

4. Voice mail
   Active versus passive use
   Number of messages received and sent daily
   Nature of voice mail messages
   General usage pattern
   How long it has been used
   What does she/he use it for
   Who she/he uses it to communicate with
   Benefits of voice mail
   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 versus
       voice mail
   Dealing with ambiguous, prolonged difference in
       opinions
   Dealing with uncertainty, complexity, or technical
       exchanges
   For sending
   For receiving
   For working in groups
   Message selection
   Message access
   Message preparation
   Documentation: keep a record, print, save, file
   Broadcasting
   File transfer

3.1 Data Collection

The principal instrument used was a self-administered questionnaire. The 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 through the exclusion and refinement of items that appeared ambiguous, misleading, or inadvertently phrased to elicit a desired response.

Participants were requested to fill 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 one to five (1=strong preference for vmail, 5 = strong preference for email, 3 = no difference.)

Seven communication situations were adapted from a study by Daft and Lengel (1987) that requested individuals to identify which medium they preferred in hypothetical situations rated on their level of equivocality on a one to five scale by thirty judges. In that study, eight of the situations had ranked high on equivocality (4.0 or higher). One of these was dropped in the pretest/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. Seven communication situations comprise this construct (Table 3).

Semi-structured interviews ranging from 45 to 90 minutes 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 constructs using dissimilar methods (Campbell and Fiske 1959), the interviews sought to gather information on the reasons for individuals' preferences (Table 4).

3.2 Data Analysis

According to Cook and Campbell (1979), instrument validation should precede other core empirical validation. The reliability, content and construct validities of the instrument was assessed. Cronbach alphas (Cronbach 1951, 1971) for the multi-item measures that comprise 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 (Kerlinger 1973; Cronbach 1971). The questionnaire was developed by careful review of the literature. In addition, the items that comprise the equivocality construct were evaluated by thirty independent judges in a study by Daft and Lengel (1987). Moreover, the pretest/pilot phase increased the instrument's content validity by judging the relevance of each item to the property being measured. This step also indirectly affects the reliability of the instrument by reducing measurement errors due to misunderstood questions and discrepancies in answers.

Table 5. Item and Total Score Correlations for Hypothesis 1[1]

	Q1	Q2	Q3	Q4	Q19	Q25	Q26	Equivocality Construct
Q1	1.000							
Q2	0.3215	1.000						
	0.0778							
Q3	0.2783	0.6280	1.000					
	0.1288	0.0002						
Q4	0.1406	0.3340	0.5522	1.000				
	0.4504	0.0664	0.0013					
Q19	0.2688	0.2454	0.2437	0.1966	1.000			
	0.1436	0.1833	0.1865	0.2893				
Q25	0.3925	0.1474	0.2505	0.1080	0.0425	1.000		
	0.0290	0.1740	0.1740	0.1080	0.0105			
Q26	0.3049	0.3119	0.3548	0.1646	0.3856	0.2119	1.000	
	0.0954	0.0877	0.0502	0.3763	0.0322	0.2525		
Equivocality Construct	0.6245	0.6950	0.7511	0.6034	0.5980	0.5730	0.6110	1.000
	0.0002*	0.0001*	0.0001*	0.0003*	0.0004*	0.0008*	0.0003*	

*Significant at $p < 0.05$.

[1] Please see Table 3 for a complete description of survey items.

Table 6. Item and Total Score Correlations for Hypothesis 2[1]

	send lengthy	receive lengthy	no. of messages	transfer files	technical informat.	Accuracy	Numerical Data	Uncertainty Construct
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	1.0000
	0.0001*	0.0001*	0.0001*	0.0001*	0.0001*	0.0325*	0.0001*	

*Significant at $p < 0.05$.

Construct validity is concerned with identifying whether the measures chosen are true constructs or simply artifacts of the chosen methodology (Campbell and Fiske 1959; Cronbach 1971). 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 and Fiske 1959; Jick 1990), we were able to determine that the findings were robust and unaffected by instrumentation. This insures 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 were able to test 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 analyzed using a one-tailed t-test to determine whether it was significantly less or greater than zero. Means, standard deviations, t-scores, probability levels and significance are reported in Tables 7 and 8.

4. RESULTS

Hypothesis 1 predicted that individuals will prefer to communicate via vmail rather than email to resolve equivocality. This hypothesis was not supported (Table 7). *Not only did individuals not prefer vmail in equivocal communication situations, but, contrary to our expectations, they preferred email.* Thus, for the specific case of email and vmail, the results fail to support the hypothesized relationship 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, not at all typical of equivocal communication situations, which tend to be lengthy, ongoing, prolonged and ambiguous (Daft, Lengel, and Trevino 1987). The following are some excerpts of interviews with Aerco employees:

"I use PhoneMail mostly for "fyi" or "call me back" type of messages. If I am requesting information, then I use PROFS."

"If an issue requires back and forth communication I am much more comfortable on PROFS.

Messages are more understandable...since people have thought the message through. Sometimes people don't think through [a message] on PhoneMail. 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 through intonation, inflection and verbal cues were unimportant in a person's decision to communicate via a particular medium:

"The tone of voice [is] not important in Phone Mail...I don't believe that adds any personal touch."

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

Interviewees preferred the functionality of email in terms of documentation and multiple addressing ability. 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 on vmail rather than 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, the absence of verbal cues that can introduce distortions, and the functionality it offers in the form of documentation and multiple addressing capabilities.

Hypothesis 2 predicted that individuals will prefer email over vmail to exchange information to reduce uncertainty. The results support this hypothesis (see Table 8). Email is, in fact, preferred over vmail for communication situations involving the exchange of information to reduce uncertainty (see Table 8). Specifically, for exchanging a large amount of information in the form of sending and receiving lengthy messages, email is preferred over vmail. Also, for exchanging accurate, objective, technical and quantitative information, individuals preferred email over vmail. For the accurate exchange of information, email was preferred. For exchanging reports and files of an objective nature, respondents preferred email. When dealing with numerical information, respondents preferred email.

Table 7. Survey Results for Hypothesis 1

Conceptual Construct	Research Construct	Survey Item[1]	Mean	Standard Deviation	T-Statistic	Probability PR > |T|	Hypothesis Supported?
Equivocality	Negotiation	26	3.7097	1.4421	2.74	0.0102*	na
		19	3.3548	1.3303	1.49	0.1480	
	Explanation	25	4.3548	1.1120	6.78	0.0001*	
		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	na	3.4839	0.9322	2.89	0.0071*	NO

*Significant at p < 0.05

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[1]For a complete description of items, see Table 3

Table 8. Survey Results for Hypothesis 2

Conceptual Construct	Research Construct	Survey Item	Item Description[1]	Mean	Standard Deviation	T-Statistic	Probability PR > |T|	Hypothesis Supported?
Uncertainty	Amount	15	Send Lengthy	3.8387	1.3190	3.54	0.0013*	na
		22	Receive Lengthy	4.0968	0.9783	6.24	0.0001*	
		21	Amount	3.3226	1.1369	1.58	0.1246	
	Type	11	Accurate	3.7097	1.4421	2.74	0.0102*	
		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		na	Index	4.0507	0.7139	8.19	0.0001*	YES

The interview results also support these findings. Individuals overwhelmingly preferred email for performing tasks typical of uncertainty situations, such as the need to research the subject, exchange a large amount of information or obtain and disseminate accurate, objective, technical or quantitative data (Daft, Lengel, and Trevino 1987). With regard to the ability to research an uncertain subject and exchange a large amount of information, 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 round about way to do things."

Interviewees reported that messages they send on email are more accurate and clearer than the ones they send on 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 comprehendible 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 until 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 on email rather than 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.

5. DISCUSSION AND IMPLICATIONS

The purpose of this paper was to evaluate the ability of MRT to account for differences in individuals' self-reported preferences for, and usage of, the new media relative to each other. As predicted, in situations requiring the exchange of information to reduce uncertainty, email was preferred to vmail. However, in situations that entail negotiation, explanation or clarification in order to resolve equivocality, vmail was not preferred to email, contrary to the predictions of MRT. Thus, the hypothesized relationship between the richness of a communication medium and its ability to handle equivocality was not supported in the case of email and vmail.

Why were the claims of MRT not supported here? We speculate that MRT is not general enough to capture differences in individuals' preferences for, and usage of, alternative new media. The very different nature of the new media may render the concept of richness, and some of its elements, inapplicable for the study of the new media.

There are clear differences among traditional media in their relative ability to provide immediate feedback. Both face-to-face communication and telephone conversations provide immediate feedback, while written addressed and written un-addressed communication do not. However, these differences are not so distinct when comparing among the new, asynchronous media. The new media are asynchronous yet fast (Sproull and Kiesler 1986). Message transmission speed is almost instantaneous, with little or no transit time. While this speed can expedite feedback, nonetheless, as with any communication medium, feedback speed is user-controlled. Thus, immediacy of feedback for the new media is more a function of the users of the medium than it is of the medium itself.

The ability to convey cues such as voice intonations is considered an important element of richness. They are believed to provide the user of a medium with the ability to transmit the necessary nuances and innuendos that are thought to convey the intended meaning of a message. However, in this study, subjects perceived the verbal cues and variety in vmail as introducing both noise and distortions to the message. On the other hand, email messages which provide no verbal cues were considered more inter-

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pretable. It can be inferred that cues do not necessarily determine the capacity of the medium to accurately convey the desired meaning of the message. For the new media, this ability depends on the adaptability of the medium to the users' diverse messaging needs. A medium that can be adapted will convey messages faithful to its users' intent. Such a medium is more likely to be used in equivocal situations for negotiation or explanation than a medium that may convey erroneous cues or noise.

In a similar vein, while MRT assumes that the four elements that comprise the richness dimension are of equal importance, it may be that some of the elements are more important than others. Little is known regarding how the four elements are weighted to determine the richness of a medium (Fulk and Boyd 1991). Further research may determine that immediacy of feedback is the most important element of richness. If so, then MRT's inapplicability for the study of individuals' preferences for, and usage of, two asynchronous media would be apparent.

It follows that the ability of a medium to handle equivocality may depend on more than its richness. Interview data suggest that two very important elements in determining individuals' medium preferences in equivocal situations are its functionality and adaptability. In traditional media, functionality is both limited and fairly consistent across media. However, the range of functions in the new media is much more extensive and varies widely from one medium to another. We need to determine how this wide-ranging functionality affects individuals' media preferences in differing situations. Adaptability refers to the ability of a medium to be tailored to individual preferences and needs for the task at hand. It enables users to fit the medium to their diverse needs and convey accurate, meaningful messages. Together, these three dimensions — richness, functionality and adaptability — may comprise a better measure of the ability of a medium to handle equivocality.

While MRT addresses the ability of individuals to choose media that fit the task, it ignores other factors underlying individuals' preferences for, and usage of, communication media. Social influence (Fulk et al. 1987; Fulk and Boyd 1991) in the form of organizational norms and pressure from superiors and peers may cause an individual to prefer a given medium even if that medium is not the most efficient one for performing the task at hand. Similarly, the lack of a critical mass of users (Markus 1987) may prevent someone from using a medium even though that medium may be the most appropriate for the task.

Why were the claims of MRT not supported? The elements that determine the richness of a medium and its ability to handle equivocality may be sufficient and adequate for studying traditional media. However, the nature of the new media may be disturbing some of these relationships and rendering them inapplicable and insufficient and of differing importance. In addition, it seems that the ability of a medium to handle equivocality is not only a function of its richness; other factors such as functionality and adaptability may be equally if not more important.

Finally, individuals may prefer a medium for reasons other than an analysis of its ability to handle equivocality; these reasons may include social pressure, lack of a critical mass of users or personal preference regardless of the task.

6. LIMITATIONS

This study was conducted in a single organization in which the availability and accessibility of the media of interest were controlled for. It should be noted, however, that due to the relative newness of vmail technology compared to that of email, the length of time these media were made available prior to the time of this study could not be controlled for. In normal conditions, extended exposure to a medium could influence preference. However, this organizations's heavy emphasis and extensive use and training in information technology has rendered its users adept in the use of the new media.

In addition, this study is limited by the fact that it was conducted in a single organization. Although there is no reason to believe that these results would be different in an organization with a similar environment, caution should be exercised in making generalizations.

7. CONCLUSIONS AND FUTURE RESEARCH

The results of this study indicate that, as predicted, email was preferred over vmail for the exchange of information to reduce uncertainty. Contrary to the predictions of MRT, vmail was not preferred over email for the resolution of equivocality. This study, raises serious questions about the ability of MRT to explain individual preferences for, and usage of, the new media. In addition, it casts doubt on the use of richness as the sole determinant of the ability of a medium to handle equivocality. These results suggest that MRT in its current formulation may not be applicable to the study of the new media.

As a step toward generalizing MRT, we need to study the adequacy, sufficiency, and relative importance of the four elements that define the media richness dimension and their applicability to the study of the new media. In addition, we need to investigate the importance of functionality and adaptability in determining individuals' preferences for and usage of communication media. Moreover, we need to examine to what extent social factors such as social influence and critical mass affect individuals' preferences for, and usage of, the new media. Insight into the above issues will provide the necessary foundations for a media preferences and usage theory that is applicable to the new media.

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