Electronic Mail as a Rich Medium and Desktop Videoconferencing as a Lean Medium: A Theoretical Explanation on Paradoxical Results

Youngjin Yoo
College of Business and Management, University of Maryland

Maryam Alavi
College of Business and Management, University of Management

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by
Youngjin Yoo and Maryam Alavi
College of Business and Management
University of Maryland, College Park, MD 20742

Introduction

Media richness theory (Daft & Lengel, 1984) argues that richness of a communication medium is determined primarily by the mechanical characteristics of the medium, including feedback, multiple cues, language variety, and personal focus. According to media richness theory, text-based communication technologies such as e-mail would be perceived as lean media whereas multimedia communication technologies such as Desktop Videoconferencing System (DVS) would be perceived as rich media (McGrath & Hollingshead, 1993).

However, social influence model of communication technology (Fulk, Schmitz, & Steinfield, 1990) offers a somewhat different perspective. It argues that richness of a medium is also influenced by the social context of the technology. Lee (1995) has found that a group of established electronic mail users perceived the e-mail as a rich medium. He has argued that the richness or leanness is not an inherent property of the e-mail, but an emergent property of the interaction of the e-mail medium with its organizational and social context. Carlson (1995) reported an "U" shape trend in perceived media richness of the e-mail over a 12-week period by a group of dyads. Initial "unrealistic" expectations of and inexperience with the e-mail were believed to be the source of the initial drop in perceived media richness. On the other hand, increasing knowledge and experience with the e-mail system and teammates were believed to be the source of an increase in perceived media richness at the later stages of the project. In summary, it was argued that the richness of the e-mail, which has been considered as a relatively lean medium, was expanded over time as group members spent more time working together. However, whether similar expansion effects would be found with relatively richer media such as DVS is not clear.

Drawing on a body of literature in group development area, it is argued here that perceived richness of a relatively rich medium would go down, in fact, as group becomes more cohesive. This study investigated the changes in perceived richness of two different electronic media, e-mail and DVS. The hypotheses, study design and the results are presented in the following sections.

Theoretical Backgrounds and Research Hypotheses

Social construction perspective of electronic communication media (e.g., Fulk et al., 1990; Lee, 1995) argues that perceived richness of electronic communication media is an emergent property of social interaction among users. It argues that a group of people would develop unique "shared" meanings of an electronic medium which may not be consistent with the intention of the designer of the technology (Weick, 1979).

On the other hand, one cannot completely ignore the "objective" features of electronic media, such as the speed of transmission, the number of cues, bandwidth, etc., in determining the richness of the media. In an effort to compromise these two perspectives, Carlson (1995) has proposed the media expansion theory using an e-mail system as an example. He has argued that the objective technical characteristics of e-mail system determine the initial perceived richness of the medium. However, as people spend more time with each other as well as with e-mail, he has argued, the e-mail system would be perceived as a richer medium.

Drawing upon a body of group development literature, we argue here that a different pattern would be found in the changes of perceived richness of DVS which can be considered to be richer than e-mail from a traditional media richness theory perspective. According to the group development literature (e.g., McGrath, 1991; Tuckman, 1965), groups go through a series of developmental stages, becoming more cohesive as members spend more time with each other. Furthermore, groups at different developmental stages show different communication needs. More specifically, groups at the early developmental stages, undergoing intense socialization and group norms developmental processes, need objectively richer media such as DVS. On the other hand, once group norms are established and group interactions are routinized, group members can exchange complex communications with rather "lean" media such as e-mail (McGrath, Arrow, Grunfeld, Hollingshead, & O'Connor, 1993). At the same time, the perceived richness of "rich" media such as DVS is expected to go down as the interaction among the group members become routinized. Taken together, the following hypotheses were proposed.

H1: E-mail and DVS will show different patterns in perceived media richness changes over time.

H2: At the early stages of group development, DVS will be perceived as a richer medium than e-mail.

H3: At the later stages of group development, e-mail will be perceived as a richer medium than DVS.

Study Design And Results

The research involved a longitudinal field study to investigate the changes in perceived media richness of e-mail and DVS. The study was conducted over a six-week period and measures (described below) were collected once every two weeks.

Subjects

Fifty-seven MBA students from two major state universities from the Southwest and mid-Atlantic regions participated in the study. The subjects were divided up into fourteen, four-person teams. Each team consisted of two dyads, each representing one of the two universities.

Procedures

Each student team completed a group task involving an analysis of business case which had two different versions containing common as well as unique information. A central issue in the case was the design of an interorganizational technology linkage between two companies in the grocery industry.

E-mail and DVS were used for communication among student teams for the project. Since both universities mandate e-mail usage for MBA students for various administrative purpose, all the subjects had past experiences with e-mail prior to this project. However, since most students at both universities were new to DVS, a two-and-half hour special training session was given.

Measures

An eight-item perceived media richness scale developed by Burgeon and Hale (1987) was used to measure the perceived media richness of e-mail and DVS. Initial exploratory factor analyses and reliability tests showed proper psychometric properties on both media.

Results

H1 was tested using the profile analysis. The profile analysis is a variant of repeated measure analysis of variance, involving one or more between-subject factors and a within-subject factor with repeated measures

(Bray & Maxwell, 1985). An analysis of interaction term between a between-subject factor (i.e., e-mail and DVS in this case) and a within-subject factor (i.e., phase 1, 2, and 3 in this case) allows us to determine whether the patterns of perceived richness of e-mail and DVS over time are statistically similar or dissimilar.

Results of the profile analysis showed a significant interaction at 0.1 level ($p=0.058$). This implies differences in patterns of perceived media richness of e-mail and DVS over time. Therefore, H1 was supported.

In the profile analysis, when the interaction term is significant, the main factors shouldn't be interpreted; instead, it is recommended to analyze each subgroup of the sample separately (Bray & Maxwell, 1985). Therefore, H2 and H3 were tested by three separate pairwise t-tests in which each students' perceived richness of e-mail and DVS at each stage were compared.

Results of pairwise t-tests showed that at both phase 1 and 3, subjects were evaluated e-mail significantly richer than DVS. At phase 2, there were no significant differences. Therefore, H2 was rejected and H3 was supported.

Discussion and Summary

The results of the study imply that users' perceptions of media change over time as group members spend more time with one another and the technologies. More importantly, the pattern of the changes differ depending on the characteristics of the media. More specifically, an analysis of means of perceived richness shows that perceived richness of the e-mail shows a "U" pattern as Carlson (1995) found. On the other hand, perceived richness of DVS shows an opposite "∩" pattern.

At phase 1, subjects seemed to evaluate the technologies based on their past experiences. They all had past experiences of using the e-mail and no experiences with DVS. This lack of experience with DVS seemed to limit the richness of DVS (Fulk et al., 1990). From a group developmental perspective, phase 2 is when most conflicts among group members occur. Subjects seemed to find e-mail was relatively limited in handling these conflicts; at the same time, they seemed to find possibility of using DVS to reduce these conflicts which was shown as an increase in perceived richness. Phase 3 represents a typical established group communication pattern. At this stage, subjects had established group norms and routinized the group interaction patterns. Therefore, they found e-mail to be rich enough for their project; at the same time, they found DVS was not as useful as it was at phase 2.

This study found that perceived media richness varies over time. We further found that prior experience with technology and group development process play important roles in determining the pattern of perceived media richness changes over time. Although more research is needed to substantiate the findings, the results provide useful guidelines for future research and practice.

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Table 1. Results of Profile Analysis

Source	SS	df	MS	F
Between-subjects				
Media (e-mail & DVS)	9.69	1	2.00	4.83**
Residual	158.29	79	9.69	
Within-subjects				
Session (1, 2, & 3)	4.68	2	2.34	3.51**
Session x Media	3.66	2	1.83	2.75*
Residual	105.21	158	0.67	

Multivariate Analysis of Interaction Term

Test Name	Value	Exact F	Hypoth. DF	Error DF	Sig. of F
Pillais	0.07047	2.95682	2.00	78.00	0.058*
Hotellings	0.07582	2.95682	2.00	78.00	0.058*
Wilks	0.92953	2.95682	2.00	78.00	0.058*
Roys	0.07047				

Note: $*\ p < 0.1$
$**\ p < 0.05$

Table 2. Results of pairwise t-tests

Phase	DVS Mean	E-mail Mean	t-value	df	Sig. t
1	0.97 (1.22)	1.53 (0.77)	2.61	47	0.012
2	1.41 (1.29)	1.43 (0.83)	0.11	44	0.915
3	1.27 (1.26)	1.85 (0.92)	2.40	50	0.020