

Beyond Media Richness: An Empirical Test of Media Synchronicity Theory

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Abstract

One widely accepted theory on media use is media richness theory. However, media richness theory was developed without consideration of new electronic media and the many social factors that can influence media selection, communication processes, and outcomes. Recent empirical investigations have raised questions about media richness theory's applicability to these new media. Therefore, this paper presents a new theory called media synchronicity theory (MST) which proposes that all tasks are composed of two fundamental communication processes (conveyance and convergence). Thus, communication effectiveness is influenced by matching the media capabilities to the needs of the fundamental communication processes, not aggregate collections of these processes (i.e., tasks) as tested in examinations of media richness theory. A laboratory experiment was conducted to provide an initial investigation into the theoretical underpinnings of MST. This study examined the influence of different media on conveyance and convergence effectiveness. Results from this study provide preliminary support for the concepts embodied in MST.

I. Introduction

A fundamental need of organizations is the ability to communicate. Organizational members communicate with each other and with members external to the organization to accomplish their goals, whether in one-on-one settings, small groups, or large multi-disciplinary teams. There are many media available to support these different communication needs: face-to-face meetings, telephone, written documents, and in more recent years, computer-mediated electronic communication such as voice mail and video conferencing.

It has been suggested that future organizations will exist as a complex "network of suppliers, competitors, and customers who cooperate with each other to survive" (Nadler et al., 1992, p. 266). Such organizations will

consist of autonomous teams at all levels of the hierarchy who live and work remotely from the team's home base and use ubiquitous electronic communication to reshape themselves as the work requires. As organizations deploy personnel remotely and use a broader array of communication technologies (see Zmud, Lind & Young, 1990), a key question is for what situations do these media provide a reasonable substitute for face-to-face interaction? For if these new media prove unable to support effective distance communication, then these new organizational forms may prove ineffective.

There is a long tradition of research that has compared the effects of different communication media (for reviews, see Fowler & Wackerbarth, 1980; Johansen, Vallee & Spangler, 1979). In general, this work has compared face-to-face communication to one or more other communication media. This research generally suggests that the medium can affect the nature of communication, but that the specific effects depend heavily on the type of task (Reder & Conklin, 1987). For some tasks, there are no differences due to the medium; for others, there are dramatic differences.

Although the concept of task-media fit holds great appeal, empirical results assessing this fit have been equivocal (e.g., Daft et al., 1987; El-Shinnawy & Markus, 1992; Rice & Shook, 1990; Trevino et al., 1990; Kinney & Watson, 1992).

In this paper, we present a new theory, called media synchronicity theory (MST). Synchronous activity refers to "moving at the same rate and exactly together" (Random House, 1987). Therefore, media synchronicity is the extent to which a communication environment encourages individuals to work together on the same activity, with the same information, at the same time; i.e., to have a shared focus (cf. entrainment: McGrath, 1991). Whereas media richness theory has taken a task-centered perspective on task-media fit, MST proposes an outcome-centered approach to media selection. More specifically, MST proposes that every group communication process is composed of two primary processes, conveyance and convergence that are

necessary to reach a group outcome. The theory also proposes that media have a defined set of capabilities that are able to more or less effectively support each communication process. Communication effectiveness will be enhanced when processes are aligned with media support capabilities.

An initial study was conducted to examine the concepts the fit between different media and the conveyance and convergence processes. This experiment was intended to provide some preliminary empirical appeal to the validity of the MST concept as opposed to fully testing MST or comparing MST to prior theories.

In the next section, relevant media and group literature are reviewed and synthesized. Next, MST is developed and specific propositions are presented. A research methodology for testing these propositions is provided in the next session followed by the empirical results. Finally, the results are discussed from both theoretical and practical perspectives and an overall contribution is presented.

II. Literature Review

2.1 Media Richness Theory

One of the most widely applied theories of media use is media richness theory. Media richness theory proposes that task performance will be improved when task needs are matched to a medium's ability to convey information (Daft & Lengel, 1986). In short, Daft and Lengel argue that media capable of sending "rich" information (e.g., face-to-face meetings) are better suited to equivocal tasks (where there are multiple interpretations for available information), while media that are less "rich" (e.g., computer-mediated communication) are best suited to tasks of uncertainty (where there is a lack of information).

Most tests of media richness theory have examined perceptions of media fit, not actual effects of media use (cf. Rice, Hughes & Love, 1989; Rice, 1992). Typically, managers have been asked to choose which medium to use to send a set of hypothetical messages to determine whether their choices fit the predictions of media richness theory (e.g., Daft et al., 1987; El-Shinnawy & Markus, 1992; Lengel & Daft, 1988; Rice & Shook, 1990; Trevino et al., 1990; Trevino, Lengel & Daft, 1987). The results of this stream of research have not been completely convincing. In a number of cases, managers have made different choices than those predicted by media richness theory (Carnevale, 1981; Kinney and Dennis, 1994; Kinney and Watson, 1992; Valacich, Paranka, George and Nunamaker, 1993; Valacich, Mennecke, Wachter, and Wheeler, 1994).

One explanation behind the lack of empirical support for media richness is that the task-media fit is insufficient in explaining media choice. Many researchers have thus concluded that media choice is also affected by factors beyond the richness of the medium itself. For example, Markus (1987) proposed that there is a need for a critical mass of users required before a medium will be widely used. Individuals are less likely to use a medium until a sufficient number of their colleagues also use it, especially those with whom they already communicate (Rice, Grant, Schmitz & Torobin, 1990). The availability of the medium to the message sender (Rice & Shook, 1990; Zmud et al., 1990) and ability of the sender to use that medium (King, Hartman & Hartzel, 1992) are also key to its selection. Media also have socially defined characteristics that may be important (Fulk, Steinfield, Schmitz & Power, 1987), although empirical evidence is mixed. Rice and Aydin (1991) concluded that socially defined effects "in a complex and changing arena of ongoing organizational activities, can play no more than a small role in influencing attitudes" (p. 241). Clearly, media choice appears to be affected by a plethora of factors (Rice, 1992).

A second explanation addressing the problematic findings is related to the theory guiding the matching of media to task characteristics (e.g., equivocality, analyzability) is flawed. That is, matching medium to task does not improve performance. A task, as operationalized in the various examinations of media richness, is actually a very high level construct composed of many sub-elements or processes (McGrath, 1991). For example, in Daft and Lengel's (1986) terms, resolving a task of equivocality means developing a shared framework for analyzing the situation, populating the framework with information of a shared meaning, and assessing the results to arrive at a shared conclusion for action. Each of these steps may have different media needs, such that even tasks of uncertainty may include steps that require "rich media" (McGrath & Hollingshead, 1993).

2.2 Beyond Media Richness

The focus of this section is on identifying and defining those media dimensions that have the potential to influence task performance.

Media richness theory is built on the presumption that increased richness is linked to increased social or physical presence (Zmud et al, 1990). Although a medium's ability to support the various communications processes that occur in a face-to-face context are

important, there appear to be other media dimensions that are also important to consider.

More specifically, a number of recent innovations in computer-facilitated communication (e.g., electronic mail, group support systems, voice mail and video conferencing) (Culnan & Markus, 1987) have become available after the development of Media Richness Theory. This in itself is not a significant problem, as the newer electronic, audio, and video media have been retroactively fit into the theory's framework (e.g., Daft et al., 1987; El-Shinnawy & Markus, 1992). However, some of these newer media emphasize specific media capabilities that were less evident in non-electronic media (e.g., the variety of ways that information can be communicated via video conferencing). Furthermore, these different media dimensions may provide more effective support for specific communication processes than previously theorized by Media Richness..

Dennis and Valacich (1996) identify five media dimensions that are key to understanding the effects of media use on the ability of individuals to communicate

and process information (see also Rice, 1987; Rice & Steinfield, 1993) (see Table 1). Two of these dimensions; immediacy of feedback and concurrency, are essential to further our understanding of MST.

Immediacy of feedback. The extent to which the medium enables users to receive rapid feedback (Daft Lengel, 1986; Daft & Wiginton, 1979). Immediacy of feedback is related to the ability of medium to & provide near- simultaneous bi-directional communication between sender and receiver(s) (i.e., full-duplex in communications terminology). It is also related to the ease with which the receiver can interrupt the sender to seek clarification, redirect or terminate the conversation (Rice, 1987).

Concurrency. The number of simultaneous conversations that can exist effectively in the medium (Valacich et al., 1993; cf. multiple addressability: Rice, 1987; Sproull, 1991). In traditional media such as the telephone, only one conversation can effectively use the medium at one time. In contrast, with a group support system (see Jessup & Valacich, 1993 for a discussion of

Table 1 Relative Trait Salience of Selected Media

Media Richness Dimension	Face-to-Face	Telephone	Written Memo	Voice Mail
Feedback	High	Medium	Low	Low
Symbol Variety	Low-High	Low-High	Low-High	Low-Medium
Concurrency	Medium	Low	High	Low
Persistence	Low-Medium	Low-Medium	High	Medium
Rehearsability	Low	Low	High	Medium
Media Richness Dimension	Video Conference	Electronic Mail	Electronic Phone ¹	Group Support Systems ²
Feedback	Medium-High	Low-Medium	Medium	Low-Medium
Symbol Variety	Low-High	Low-High	Low-High	Low-High
Concurrency	Low	Medium	High	High
Persistence	Low	High	Low	High
Rehearsability	Low	High	Low	High

¹ Electronic phone refers to software that permits simultaneous dialog among two or more participants using computer workstations. In such systems, the screen of each station is divided into several windows (one for each participant) and any keystroke typed immediately appears on all participants' screens. An example is Phone on Digital VAX systems (e.g., see Siegel et al., 1986).

² A group support system (GSS) is a computer-supported environment which enables a group to work on a common task at any place and time, although many current commercial systems are primarily used in same-time same-place electronic meeting rooms (e.g., see Nunamaker et al., 1991).

several systems, theoretical issues, and research reviews), the electronic media can be structured to enable many simultaneous conversations on different topics to occur.

Greater concurrency also enables more people to participate in a simultaneous discussion. It is often argued that face-to-face communication can effectively support up to five participants and as the group size increases beyond this, effectiveness drops at an increasing rate (e.g., Shaw, 1981). Ten is often cited as the maximum practical size for face-to-face interaction if all participants are expected to interact (as opposed to presentations or lectures which are primarily one-way communication). This is because participants must take turns speaking because the verbal media can effectively support only one conversation directed at all participants. In contrast, a group support system can support a large number of participants because it enables greater concurrency (e.g., Gallupe et al., 1992).

In many cases, the greater the concurrency, the easier it is to generate divergent information (e.g., ideas). Yet, these multiple conversations mean that it is more difficult for the group to focus on one topic or issue, which may act in some circumstances to impede understanding.

An analysis of Table 1 suggests three important conclusions beyond those of traditional media richness theory. First, no one medium has the highest values on all dimensions (i.e., none could be labeled as "richest" in Daft & Lengel's terms). With the expanded definition as shown in Table 1, determining the ability of various media to support shared understanding in the shortest time interval is much more difficult, because a much broader (and increasing) array of communication environments are emerging.

Second, media are not monolithic. It is possible for one medium to possess different levels of a given communication dimension depending upon how it is configured and used. For example, one electronic mail system may have a very limited symbol variety by being limited to text only, while another electronic mail system may provide the ability to include graphics, pictures, and video in a mail message. In this case, the second system would support greater symbol variety than the first.

Third, ranking media in absolute terms is not practical. Daft and Lengel (1986) argued that media can be ranked in order of their richness in absolute terms without consideration of context (Lee, 1996). Past empirical research has repeatedly suggested that richness is not a continuum on which some media are richer and some are leaner. Thus, concluding that face-to-face communication is the "richest" media is inappropriate. Face-to-face communication may convey the greatest

social presence, but other factors may be more critical to media richness as defined by Daft and Lengel (1986), e.g., changing understanding within a time interval.

2.3 Media Synchronicity Theory

In this section, we develop a theory of media synchronicity, which we believe explains the effects of media use better than theories of media richness.

Group Processing Strategies

There are five basic sensemaking strategies that a group or its individual members can adopt to reduce equivocality (Weick 1985; Weick & Meader, 1993). Ideally, members will attempt all five. One strategy is action: members ask questions of or propose actions, information or opinions to other group members, and await the response. Members incorporate this new information into their understanding and adjust their interpretations accordingly.

A second sensemaking strategy is triangulation, seeking information in a variety of formats (e.g., quantitative, qualitative, graphical) from a variety of sources (e.g., other group members, other departments, other organizations, national databases). Any one type or source of information may be inaccurate or present an incomplete picture. By combining information from many sources, members gain a more holistic -- and presumably better -- interpretation of the situation.

A third strategy is contextualization, the connection of the new events to past events (e.g., "this is like the situation faced by company X last year"). The more contexts available, the better; in other words, the more group members who can provide information links to more contexts, the more likely the group is to arrive at a better understanding of the situation.

A fourth strategy is deliberation, the slow and careful reasoning required to induce plausible patterns from the information gained through action, triangulation, and contextualization. When this reasoning is allowed to incubate, meaning becomes clearer; when information comes too quickly and immediate responses are required, individuals fail to process the information and fall back on habitual processes and stereotypes.

The final strategy is affiliation, seeking to understand how other individuals interpret or understand information, and coming to a mutually agreed upon symbolic meaning. For example, suppose triangulation enables us to reach the conclusion that the temperature is about 85 degrees Fahrenheit. Does that mean it is "hot" or "warm?" Affiliation seeks to arrive at a shared interpretation of the available information by soliciting and integrating the meaning individual group members

place on that information. Thus for the first step of resolving equivocality (setting goals), the first three sensemaking strategies (action, triangulation, contextualization) share the same fundamental communication process: the conveyance of information. The fourth strategy, deliberation, requires no communication, although media requiring rapid feedback (e.g., face-to-face meetings) may interfere (Weick & Meader, 1993). The fifth strategy, affiliation, requires a second fundamental communication process: the convergence on a shared meaning of this information.

The key point here is that for resolving equivocality, there are two fundamental communication processes: conveying information and converging on a shared interpretation. Media richness theories emphasize the need to converge; conveyance of information is left to tasks of uncertainty. We argue that both conveying information and converging on a shared meaning are equally critical for both tasks of equivocality and uncertainty. Without adequate conveyance of information, individuals will reach incorrect conclusions. Without adequate convergence, the group cannot move forward.

Media Capabilities and Communication Processes

In this section we examine how the media capabilities defined in the previous section affect media synchronicity and are applied to the two fundamental communication processes of conveyance and convergence. Conveyance is the exchange of information. It can be divergent, in that not all participants must agree on the meaning of the information, nor must they focus on the same information at the same time. In general, low media synchronicity is preferred for conveyance processes.

On the other hand, convergence is the development of a shared meaning to information. By definition, all participants must work together to establish the same meaning for each piece of information. In general, high media synchronicity is preferred for convergence processes.

A first step in gaining an understanding of how a given communication environment supports aggregate level tasks is to examine the ability of the media capabilities described earlier -- immediacy of feedback, concurrency -- to support the two fundamental communication processes. Thus, we will view each media dimension in light of the two fundamental communication processes, conveyance and convergence.

Conveyance. The goal of conveyance is to enable the most rapid exchange of information among the participants as possible, and to enable them to effectively

process this information and arrive at their individual interpretations of its meaning. What media capabilities facilitate this?

The first characteristic is immediacy of feedback, the extent to which media enables rapid feedback, including the ease with which the information receiver can interrupt the sender. We argued that the sensemaking processes of action, triangulation, and contextualization (Weick, 1985; Weick & Meader, 1993) relied on the conveyance process for exchanging information among group members. The essence of "action" is the proposing of actions, information or opinions to other group members and awaiting their response. Triangulation is the process of seeking information in a variety of formats and from a variety of sources. Contextualization is the process of collecting information on past events and applying this information to the current situation. In all cases the fundamental processes relate to sending and receiving information between group members. With this definition of conveyance, feedback appears to play a minor role. Indeed, media possessing high levels of feedback may act to curtail information search and collection, by enabling members to critique each question or suggestion as they occur (Van de Ven & Delbecq, 1974). Such communication activities may act to derail the objectives of the conveyance process, or encourage members to act without sufficient deliberation (Weick & Meader, 1993).

The second media dimension is concurrency, the number of effective conversations existing simultaneously in the medium. Groups communicating through a medium with high concurrency will participate in a broader range of topics and will produce more information and ideas in a given time (Valacich et al. 1994). Conveyance of information will be enhanced by environments that allow multiple, simultaneous communication exchanges. Thus conveyance will be enhanced when concurrency is high.

Convergence. The goal of convergence is to enable the rapid development of a shared meaning among the participants. What media capabilities facilitate this?

The convergence process is most closely linked to Weick's (1985; Weick & Meader, 1993) sensemaking affiliation process. Affiliation is the process of coming to a mutually agreed upon symbolic meaning of shared information. Affiliation is a give-and-take process of "quickly" comparing views and negotiating shared understandings. These objectives would suggest that high levels of feedback are needed during affiliation (i.e., convergence) processes.

Again, concurrency refers to the number of simultaneous conversations existing in the medium. For convergence processes, media that focus the

communication onto a single issue will help in achieving a shared understanding of that issue. Thus, environments that provide low communication concurrency will be preferred for convergence processes.

In summary, communication environments that support high immediacy of feedback and low concurrency encourage the synchronicity that is key to the convergence process. Communication environments that support low immediacy of feedback and high concurrency provide the low synchronicity that is key to the conveyance process. This suggests the following propositions:

- P1: For group communication processes in which conveyance is the goal, environments providing low synchronicity (low feedback and high concurrency) will be more effective.
- P2: For group communication processes in which convergence is the goal, environments providing high synchronicity (high feedback and low concurrency) will be more effective.

III. Research Method

A laboratory study was conducted to evaluate the propositions using a 2 x 2 within-subjects factorial design. Two levels of decision processing (convey and converge) and two levels of media synchronicity (high and low) were employed. The experimental decision task required the use of both convey and converge processes. Groups who used one medium for the conveyance process used the alternative medium for the converge process and vice versa (see Figure 1). Therefore, we had two sets of groups: high synchronicity when conveying and high synchronicity when converging versus low synchronicity when conveying and low synchronicity when converging. This provided the strongest theoretical test of MST.

Figure 1
Research Design

Decision Process			
Media Synchronicity		Conveyance	Convergence
	High Media	Set A (written)	Set A (face-to-face)
	Low Media	Set B (face-to-face)	Set B (written)

3.1 Subjects

Subjects were undergraduate business students from a large Midwestern university. The subjects participating in the experiment fulfilled a required research credit as part of their coursework. Students were randomly assigned to groups consisting of five members and groups were randomly assigned to treatments. A total of 100 students participated in this study resulting in 20 groups; 10 in each cell.

3.2 Independent Variables

Two decision processes were isolated within a larger decision-making context. As previously described, decision making encompasses a series of convey and converge sub-processes. The conveyance process was operationalized as an idea generation and sharing activity. Consistent with the concept of conveying information, ideas were shared or communicated to group members. For example, a group member might say "I believe X is a potential solution". Other group members were not allowed to expound upon or critique that idea which would move the group process out of a conveyance stage and into a convergence stage. This restriction on evaluating others' ideas, therefore, helped explicitly isolate the conveyance process.

For the convergence process, subjects took the entire range of ideas generated in the conveyance process and selected those that the group felt were the best candidate solutions for further evaluation. Once the candidate solutions were established, a single "group solution" was selected.

High synchronicity has been defined as media that provide high feedback and low concurrency. To operationalize high synchronicity, we used face-to-face communication. Face-to-face communication provides high feedback due to bi-directional communication and the ability to clarify, redirect, or end the communication. It provides low concurrency because it does not allow for parallel conversations, which provides focus on a single issue at a time.

Low synchronicity, on the other hand, has been defined as media that provide low feedback and high concurrency. To operationalize low synchronicity written communication was used. Written communication provides low feedback in that others are not able to interrupt, question, or expound upon the ideas as they are being communicated. Written communication facilitates high concurrency by enabling multiple ideas to be generated in parallel.

3.3 Dependent Variables

The dependent variable measuring the effectiveness of the conveyance process was the number of unique ideas generated by the group members. The variables measuring the effectiveness of the converge process included number of ideas evaluated (e.g., number of ideas considered during the converge process), time to consensus¹ (minutes required to reach final group solution), and whether consensus was reached (binary indicator of unanimous decision). Other dependent variables were identified to measure the effectiveness of the overall decision process including decision accuracy (e.g., group solution score measured as a percentage of optimal), commitment to the group decision (e.g., the degree of solution shift between the group decision and the final individual decision), and group influence (e.g., the degree of solution shift between the initial individual decision and the final individual decision).

3.4 Procedure

In each experimental session, subjects in all treatments generated an individual answer to a decision problem with an optimal solution (Parkway Drug, see Mennecke and Wheeler, 1993). Each solution could be evaluated arithmetically resulting in an overall solution score. Subjects were then placed into a group and participated in a short training session focusing on effective group decision-making processes. This training focused on how to initially brainstorm prior to evaluating solutions and involved a practice problem. After the training session, the subjects were asked to return to the Parkway Drug task and generate the best possible group solution.

As part of the conveyance process, subjects were given a maximum of 20 minutes to generate and share ideas. When using face-to-face communication, group members verbally shared these ideas without compiling a written list. On the other hand, individuals in groups using written communication each wrote their ideas on a sheet of paper. To transition group members from a conveyance to a convergence stage, the researchers facilitated the groups in selecting a listing of candidate solutions. Regardless of treatment, group members were asked to suggest possible "best" solutions for further consideration. These solutions were numbered and written onto a flipchart visible to all members. The

¹ Due to time constraints, groups were limited to 15 minutes for the converge process where they were expected to produce a unanimous solution. If the groups were unable to reach consensus in this time, the time to consensus was measured as 15 minutes. The consensus reached dependent variable was used to measure whether the group did or did not reach a unanimous decision.

merit of any of these candidate solutions was not discussed at this time.

The converge process lasted 15 minutes. In this process, face-to-face groups verbally evaluated and discussed ideas with the goal of attaining unanimous consensus on the best solution. On the other hand, groups using written media used ballots to individually vote on the solution they felt was best. These groups were informed of the results of the vote and then asked to vote again. If consensus was not reached after the second vote, each individual could share with the group their preferred selection and their rationale for that selection. This process continued until either groups reached unanimous consensus or time ran out. In the cases where time ran out, the final solution was selected based on the solution that had the largest number of votes.

After the group solution was identified, each group member was asked to individually complete a short survey. Subjects were asked to indicate what solution they believed was best where this solution could be their initial individual decision, the group decision, or any other solution.

IV. Results

To analyze the differences between sets of groups, t-tests were used. Proposition 1, examining conveyance, suggested that media low in synchronicity (written) would be more effective. Results from the t-test indicate that groups using written media generated significantly more unique ideas than groups operating face-to-face ($t=5.25$, $p<.001$). Means for each group were 24 and 12.5 respectively. Therefore, Proposition 1 was supported.

Proposition 2 investigated the influence of media synchronicity on convergence where media high in synchronicity were expected to be more effective. Results from the t-test indicate that groups using face-to-face media were significantly more likely to reach consensus than groups using written media ($t=6.0$, $p<.001$). Similarly, groups using face-to-face media reached consensus in significantly less time than groups using written media ($t= -2.18$, $p<.022$). Means for each group were 12.1 minutes and 14.8 minutes respectively. The number of ideas evaluated was not significant between groups. Therefore, Proposition 2 is partially supported.

Finally, measures were assessed to provide further insight into overall decision-making effectiveness. Results from the t-tests indicate that there were no significant differences in decision accuracy or

commitment across groups. However, there was a significant difference in group influence ($t=1.71$, $p<.05$). Groups applying media in the most theoretically appropriate media per MST demonstrated a greater shift between the initial individual decision and group decision (mean = .22) than groups using media least appropriate for the decision processes (mean = .17).

V. Discussion

Based on the results presented here, there does appear to be some preliminary support for Media Synchronicity Theory. While these results are not definitive, they do suggest that conveyance and convergence are very different processes that may require different media for each in order to be most effective. This contradicts the conceptual orientation of Media Richness Theory, which is oriented around task-level activities (i.e., aggregated collections of fundamental communication processes). Media Synchronicity conceptualizes tasks as made up of both conveyance and convergence processes. Given that there appear to be differences in the media which best supports each process, predictions about overall task-technology fit may be problematic. While additional work is necessary to further evaluate MST, these results provide motivation for disaggregating tasks into more fundamental communication processes to better understand how technology can be most effectively designed and employed.

From a managerial perspective, these results are important because they provide insight into ways in which organizational decision-making could be improved. For example, while there were no differences across groups in terms of decision accuracy, the degree of consensus in reaching those decisions was higher for groups using face-to-face media for the convergence process. Given an "equal quality" decision, it would seem that managers would find consensus to be desirable. While greater consensus may not provide an immediate benefit (there was no change in decision accuracy), greater consensus *may* lead to more long-term organizational benefits. For example, groups with greater consensus may feel a greater commitment to a given course of action because of their participation in the decision-making process. Similarly, organizational decisions are likely to be much easier to implement in a consensual environment due to the increased "buy in" from those affected by the decision. Finally, greater consensus may yield greater harmony and cooperation among individuals and workgroups due to the feeling of increased "ownership" of the decision.

Also of interest to managers are the results indicating that not only were groups more likely to *reach* consensus, those who did reach consensus did so significantly *faster* than their counterparts using written media. Given the increasing complexity and tempo of today's decision-making environment, the degree to which technology can be employed to help move groups toward consensus (again, with no degradation in decision accuracy) may help organizations and workgroups become more efficient. For example, managers with appropriate technical support may be able to arrive at a consensus faster than managers without this support, saving themselves and the organization valuable time and effort.

From a technical standpoint, the results reported here offer important suggestions for the design of technology used to support group decision-making. Given that the media which most effectively support conveyance and convergence processes appear to be different, designers should explicitly build in tools which can most effectively support each process (vs. the task as a whole). How might this be implemented? One suggestion may be to structure the decision-making process around the fundamental communication processes that underlie the decision-making process. Obviously, this may include the need for multimedia applications in order to optimize user performance for each process. For example, providing "notepad" and/or "whiteboard" features for conveyance processes and "chat" features for convergence processes. This would allow decision-makers to shift media types to those that may most effectively support the micro-level processes embedded within a given task.

Another technical suggestion that may be feasible (particularly in next-generation decision support systems) would be to include an intelligent "agent" designed to monitor the group decision-making process. Depending on whether the group needed (or was headed toward) a conveying activity, the agent monitoring the group's activity could suggest (or enforce) a shift to a media with low feedback and high concurrency. Once the group began convergence activities, the agent could shift users into a "verbal" mode in order to provide users with high feedback and low concurrency.

5.1 Limitations and Conclusions

As with all studies, the research results presented here are subject to a number of limitations. Specifically, this study was designed to provide an initial test of theory at the expense of generalizability. Specific limitations to generalizability include the use of student subjects and the limited range of media analyzed. We recognize that

a range of media options exist; however, we selected two media which were as highly differentiated on the feedback and concurrency dimensions as possible (see Table 1).

In addition, we structured the decision making process used in this task around definitive conveyance and convergence activities. In order to control the fundamental communication process being used at any given time, we created and enforced rules designed to prevent any "overlap" between conveyance and convergence (e.g., not allowing group members to comment or discuss other members' ideas during the conveyance process). However, we recognize that the decision-making process may iterate between convey and converge activities over time and that forcing groups into one activity or the other at any given point of time may not be representative of how groups actually make decisions in all cases. However, we do believe that structuring the problem in this manner was consistent with the goals of the study and provided a reasonable test of the theory.

In conclusion, we have found preliminary support for differences across two fundamental communication processes used in decision-making tasks: conveyance and convergence. Our results have suggested that there is no "one best fit" between tasks and media. Instead, our results suggest that technology "fit" is more properly assessed at the sub-process level. Therefore, to meaningfully examine and better support group communication, future research aimed at evaluating media effectiveness should focus on fundamental communication processes embodied in the tasks themselves.

Furthermore, because Media Synchronicity Theory considers more advanced electronic communications media, it has the potential to be more robust in its ability to predict communications effectiveness than alternative theories. Given the equivocal findings of current theoretical perspectives, we believe that Media Synchronicity Theory offers the field a new lens through which group decision-making processes may be examined in a more meaningful way.

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