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Towards a framework for communication media implementation: Information richness and critical mass as complementary theories

Tony Coulson
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ABSTRACT

The rapid evolution of communication technology creates confusion for many businesses in deciding which technologies fit the organization. While technologies such as electronic mail, group decision support systems, and video conferencing are mature and readily available, a problem exists in determining how well such media will work within a particular organization.

This review examines case examples and research of communication media implementation within the framework of two theories, critical mass and information richness. Examples of using electronic mail, video conferencing, and group decision support systems are used to illustrate how a framework combining the two theories may be executed. The result is a thought provoking look at a potential framework for revealing communication media implementation issues and potential strategies for success.

INTRODUCTION

Researchers have spent years testing theories related to the implementation of communication media, particularly in the area of implementation success and technology adoption. Two noteworthy theories, information (media) richness and critical mass have experienced a depth of scrutiny, both with similar results. With each given theory, some elements of communication media are predictable, others are not. The result of this has been that individually, neither of these theories is particularly strong in universally predicting communication media implementation success. However, upon further examination, it can be noted that these theories are complementary in nature. When combined, they provide a more complete framework from which to evaluate communication media implementation issues. This paper sets out to demonstrate by literature survey that combining information richness and critical mass theories together, along with tech-
nology characteristics, provides an excellent framework for analyzing elements involved in the implementation, success, and adoption of communication media. In particular, this paper will examine three communication media where, individually, these two theories have been tested—video conferencing, group decision support systems, and electronic mail.

**INFORMATION RICHNESS**

Information richness theory has been primarily used as an evaluative measure for media choice; 'fitting' the media to the intended purpose (Daft & Lengel, 1984; Daft, Lengel, & Trevino, 1987). In essence, information (or media) richness theory rates communication media on its capacity to provide feedback, accommodate language varieties, and provide various methods of verbal and non-verbal communication (Yates & Orlikowski, 1992).

On the richness scale, a communication medium such as face-to-face interaction, is viewed as being rich, while standard reports are considered fairly rich. The importance of this classification scheme is to predict media choice and how a communication media will be used. For example, empirical research on information richness theory has shown that a manager will use rich media to convey important communiques, while he/she will use weak methods to convey not-as-important communiques (Giddens, 1979; Markus, 1988; Roberts & Scarpens, 1985). Thus, utilization of the richness scale can be used to determine what communication media might be suitable for a given purpose.

**CRITICAL MASS**

Critical mass theory attempts to explain the communication media adoption process that exists within organizations. Essentially, critical mass assesses the effects of certain users' communication choice habits on other users' choices. In effective communication media environments, individuals must communicate as part of a group. Thus, the media choice and its use determine how effective the media will be. Before a media can be deemed effective, a 'critical mass' of users must adopt the technology. As the number of adopters increases, the value of the system increases, motivating other users to adopt that system (Markus, 1994).

**TECHNOLOGY CHARACTERISTICS**

Each technology possesses certain inherent characteristics related to its operation. For example, electronic mail is quick, text-based, and the receiver can respond to mail at their own convenience. These characteristics, such as the ones described for electronic mail, influence how the technology may be applied within an organization.
COMBINING COMPLEMENTARY THEORIES

The two theories are complementary in that information richness attempts to predict how a medium will be used while critical mass focuses on how a medium is adopted. While past research has focused on each individually (Markus, 1994), this paper explores the possibilities of combining the complementary aspects of both theories. Instead of looking at one theory which focuses on predicting how the users will use a technology for a suitable purpose (richness) or another which looks at the ways users have chosen to adopt a technology (critical mass), it seems reasonable that combining the two will give further insight into implementation issues.

The proposed framework for combining these theories is composed of three elements: technology characteristics, information richness predicted uses, and critical mass adoption factors. These elements, when combined in a logical manner, may result in some insights for a communication media implementation strategy for a given organization (Figure 1).

Figure 1

The first two elements, technology characteristics and information richness predicted uses, provide the organization with general information pertaining to the generic attributes and uses of a given technology. An organization can use this information to determine whether a communication media is feasible for use within the organization.

The critical mass adoption factors are the elements which are specific to the organization. After learning about the communication media from the first two elements, and the determination that the communication media is a potentially feasible technology, the organization can then proceed to look internally at the critical mass adoption factors. In this phase, the organization
may assess the social, environmental, cultural, and work requirements of the organization, revealing specific characteristics which may impact the implementation of the communication media.

Finally, once all three elements are combined into one framework, an organization can make educated decisions regarding implementation issues related to communication media within a specific organization.

Three communication media, electronic mail, video conferencing, and group decision support systems, are to be used to demonstrate how this combination of theories are complementary and could work to produce a framework identifying implementation issues for use within a particular organization.

**ELECTRONIC MAIL**

A medium which "uses computer text-processing and communication tools to provide a high speed information exchange." (Sproull & Kiesler, 1986)

Electronic mail (E-mail) use has skyrocketed in recent years as a result of the popularity of the Internet. Consumers, businesses, and other organizations are commonly involved with this textual communication medium. This popularity brings along many promises as well as many problems particularly in the area of implementation.

Information richness theory research involving E-mail has brought about several interesting insights. Research has shown that users perceive E-mail as being a "lean" medium on the information richness scale (Markus, 1994). It is perceived as "lean" because it lacks social cues and relies solely on the use of written language. In testing this perception, researchers found that E-mail was often used for low-level communiques and short memos (Fulk, Schmitz & Steinfield, 1990). This research is consistent with the information richness theory predicting how users will successfully implement the use of a communication media (Markus, 1988; Roberts & Scarpens, 1985).

However, further examination of the E-mail information richness theory research reveals some inconsistencies. While research successfully predicted that E-mail would be used for low level communiques (Fulk et al., 1990), Markus (1994) found that managers used E-mail as a matter of convenience, including high-level communications and decision making.

The information richness prediction that E-mail would be used for short 'memo' types of communication (Fulk et al., 1990) was also shown to be unreliable. Instead, users found other uses such as using E-mail as an 'envelope' for file transfers (Markus, Bikson, El-Shinnawy & Soe, 1992).

These inconsistencies can be explained using critical mass theory. Critical mass theory assesses the effects of certain users' communication choice habits on other users' choices. In
the case where information richness predicted E-mail only be used for low-level communiques, yet it was found that managers used E-mail for high-level communication, close examination of the research reveals critical mass effects. The Markus (1994) study demonstrated that managers will often use a technology in a manner that is convenient for them. In this case, managers felt E-mail to be particularly useful, and they, as a group adopted the technology in a form that was useful to them. Once enough users adopted this manner of usage (particularly those of high stature within the organization) a "critical mass" of users was met.

The same is true for the second example where information richness seemed inconsistent. While it is certain that E-mail can be used for short-memos, when a "critical mass" of users adopt the technology for a different use, such as an envelope for file transfers, then that will become the norm (Markus et al., 1992). Users will find their own implementations depending on the environment and who adopts the technology.

Combining the principles of information richness and critical mass theory into one common framework can help determine specific implementation issues for technologies such as E-mail, all within the context of a particular organization. A basic framework may function similar to Table 1.

Table 1 combines three elements—technology characteristics, information richness predicted uses, and critical mass adoption factors, to reveal some E-mail implementation issues. Upon examining this E-mail framework, an organization can immediately see the characteristics and general predicted uses of the technology.

<table>
<thead>
<tr>
<th>Technology Characteristics</th>
<th>Information Richness-Predicted Uses</th>
<th>Critical Mass-Adoption Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic Mail</td>
<td>Perceived as a 'lean' medium</td>
<td>Key players (social factors)</td>
</tr>
<tr>
<td>Receiver can respond at own convenience</td>
<td>Short memo types of communication</td>
<td>Environment</td>
</tr>
<tr>
<td>Little lag time between message send and receive</td>
<td>Low level communiques</td>
<td>Culture/cultural norms</td>
</tr>
<tr>
<td>Receiver does not have to be present to receive messages</td>
<td>Group mailings</td>
<td>Accessibility</td>
</tr>
<tr>
<td>Relies on written word</td>
<td></td>
<td>Work/job requirements</td>
</tr>
</tbody>
</table>

The first two elements, technology characteristics and information richness predicted uses, provide the organization general information as to the generic attributes and uses of E-mail. An organization can use this information to determine whether E-mail is feasible for use within the organization.

The critical mass adoption factors are the elements which are specific to the organization. After learning about E-mail from the first two elements, and the determination that E-mail is a potentially feasible technology, the organization can then proceed to look internally at the critical mass adoption factors. By assessing the social, environmental, cultural, and work requirements
of the organization, specific organization characteristics which may impact the implementation of E-mail are revealed.

Finally, once all three elements are combined into one framework, an organization can make educated decisions regarding implementation issues related to E-mail within a specific organization.

VIDEO CONFERENCING

The quality and availability of video conferencing systems has been improving over the last thirty years. While the improvement of technology has not influenced companies to adopt this communication medium on a mass-market level (Johansen, 1984), the future reveals many possibilities.

Information richness theory research involving video conferencing has received much scrutiny over the years. From an information richness perspective, this communication medium is very 'rich' as it offers verbal and non-verbal communication cues between conversants. As a result, researchers have found video conferencing to be offered as a substitute for face-to-face meetings. Within this context, the advantages of video conferencing include reduction in travel costs and 'quick response' to management situations where swift group consensus is necessary (Edigo, 1990).

To strengthen the information richness predictions of video conferencing being used as a substitute for face-to-face meetings, Krauss and Fussel (1990) found that the video element can express a type of social presence to help facilitate communication effectiveness. This virtual-social presence enhanced the feelings between workers and created an environment of understanding that the authors termed 'mutual knowledge.' Within this environment, the frequent contact between video communicators developed into a strong relationship with high degrees of empathy and understanding.

Further examination of information richness theory research pertaining to video conferencing has revealed some inconsistencies. While some information richness research predicted video conferencing being used as a substitute for face-to-face interaction, thereby saving travel costs and improving response times, case research showed different results. Case research demonstrated that even with video conferencing systems in place, travel reductions were almost nonexistent (Johansen, 1984). Some groups still desired the advantages of physical presence. As for the 'quick response' nature of video conferencing, research initially suggested positive results. Unfortunately, in-depth case examples showed the by-product of 'quick response' was an increase in the frequency of meetings. In other words, with video conferencing in place, executives spent less time doing their work and spent more time on video conference meetings (Johansen, 1984).

These inconsistencies can be explained using critical mass theory. Critical mass theory assesses the effects of certain users' communication choice habits on other users' choices. In the
case where travel reductions were not realized (Johansen, 1984) and physical presence was pre-
ferred, close examination of the research reveals critical mass effects. Social factors, including
key players, are a large influence on the technology adoption process (Markus, 1994). In this
case, the key players were not comfortable with the technology. Therefore, the group chose not to
adopt video conferencing. Social factors, including key players, are a large influence on the
technology adoption process (Markus, 1994).

The same is true for the second example where quick response times for meetings had the
by-product of too many meetings and lower productivity. Critical mass explains this phenomena
by way of social factors and key player influence. The key players adopted video conferencing
for quick meetings and was ultimately used for too many meetings. Social factors persuaded the
users not to miss the meetings and conform to the wishes of the key players.

To further support the critical mass element of video conferencing, Edigo (1990) noted that
much of the video conferencing research has focused on video conferencing as being a sole
communication method versus being part of a suite of communication tools. However, research
has indicated that, when used as a supplemental communication medium, users tended to find
their own appropriate uses for video conferencing. Hence, these results support the hypotheses of
critical mass theory (Markus, 1994). In the case of video conferencing, users who found a use for
the technology influenced other group members to follow suit (Edigo, 1990).

Combining the principles of information richness and critical mass into a framework for
video conferencing implementation issues is seen in Table 2.

<table>
<thead>
<tr>
<th>Technology Characteristics</th>
<th>Information Richness-Predicted Uses</th>
<th>Critical Mass-Adoption Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video Conferencing</td>
<td>Perceived as a 'rich' medium</td>
<td>Key players (social factors)</td>
</tr>
<tr>
<td></td>
<td>Substitute for face-to-face meetings</td>
<td>Environment</td>
</tr>
<tr>
<td></td>
<td>Individual or group meetings</td>
<td>Culture/cultural norms</td>
</tr>
<tr>
<td></td>
<td>Quick response time for meeting</td>
<td>Accessibility</td>
</tr>
<tr>
<td></td>
<td>implementation</td>
<td>Work/job requirements</td>
</tr>
<tr>
<td></td>
<td>Virtual social presence</td>
<td></td>
</tr>
</tbody>
</table>

The three elements contained within Table 2, technology characteristics, information richness
predicted uses and critical mass adoption factors, reveal some video conferencing implement-
ation issues.

The first two elements, technology characteristics and information richness predicted uses,
provide the organization general information as to the generic attributes and uses of video
conferencing. This information can be used by an organization to determine whether video
conferencing is feasible for use within the organization.
After learning about video conferencing from the first two elements, and the determination that video conferencing is a potentially feasible communication media, the organization can then proceed to look internally at the critical mass adoption factors. The critical mass adoption factors are the elements which are specific to the organization. By assessing the social, environmental, cultural, and work requirements of the organization, specific organization characteristics which may impact the implementation of video conferencing are revealed.

Finally, the combination of all three elements into one framework, can help an organization make educated decisions regarding implementation issues related to video conferencing within a specific organization.

GROUP DECISION SUPPORT SYSTEMS (GDSS)

GDSS is an interactive computer-based system that facilitates the solution of unstructured problems by a set of decision makers working together as a group (Desanctis & Gallupe, 1987).

GDSS technology is a response to the modern competitive environment where decision making ability can mean success or failure for an entire company (Huber & McDaniel, 1986). The goal of a GDSS is to facilitate decision making abilities within a group by adding a structured computerized environment. According to Desanctis and Gallupe (1987) GDSS focuses on improving decision making effectiveness by using the following techniques:

- Removal of physical communication barriers—Allowing groups to interact electronically although they are geographically separated.
- Removal of interpersonal communication barriers—Modern GDSS usually conceals the identity of those who enter comments on the screen. It is thought that participants will not be influenced by status and personality traits.
- Structuring the discussion—Sets of questions are posed and poll results of input are taken. This keeps the discussion on track, without looking at what the group views as unimportant.
- Systematizing the discussion—This adds parameters to group input in non-polling discussions, moving the discussion along.

For the purpose of this review, a GDSS is hereby classified as a hybrid of group interaction media, particularly in the context of the electronic meeting technologies.

When comparing the face-to-face aspects of group discussion versus written communication systems, one is eliminating non-verbal communication attributes such as status, body language, and spoken anomalies. From an information richness perspective, GDSS is an interesting case. It is a lean medium in that it is based on written language, however it is a rich medium in its
Towards a Framework

mass communication and mass interaction capabilities (McGrath, 1990). Therefore, it may be concluded that GDSS is a "middle" medium on the information richness scale.

Research on the information richness aspects of GDSS communication has explored the written interaction, anonymity of participants, and group mediation. The results from GDSS research on the written interaction has shown that some types of decisions, such as opinion polling and surveying, are well suited to being made with only written interaction (Desanctis & Gallupe, 1987). Research based on the anonymity aspects of GDSS show that anonymity is helpful for decisions that should not be affected by individual status (Gabarro, 1987). Finally, research on group mediation has shown that the highly structured nature of a GDSS can help mediate large group exercises, facilitating discussions and preventing them from being bogged down while at the same time providing communication capabilities to a large audience (McGrath, 1990).

Research has revealed several inconsistencies with the "middle" information richness aspects of GDSS as a communication media. While information richness research predicted that anonymity is good for decisions which should not be influenced by individual status, other research had different results (Desanctis & Gallupe, 1987). Working in an anonymous environment does not provide rewards for critical input. Hence, there may not be an incentive for individuals to share knowledge because of the lack of recognition. In a corporate culture where recognition leads to advancement, a GDSS may lack participative effectiveness (Gabarro, 1987). Anonymity of input also creates problems for decision making where individual accountability and responsibility are required. Status and leadership are lost in the anonymous environment, but may be a necessity for some types of decisions (McGrath, 1990).

Another inconsistency with the "middle" information richness aspects of GDSS as a communication media involves the ability for successful mass-interaction. GDSS's ability to communicate effectively to large groups where English is not the primary language has shown to be difficult (Aiken, Hwang, Paolillo, Mim, Lu, 1994). Previous GDSS application has been analyzed in an ethnocentric manner, with little focus on international issues, in particular, the impact of non-English language and culture on GDSS performance. Aiken et al. (1994) conducted a study of GDSS suitability in a non-English environment. In this case the experimenters concentrated on three Pacific rim languages: Japanese, Chinese, and Malaysian. Software that supported the different languages was tested to see if the results varied from English speaking results. The results of the pilot studies showed that there was no significant benefit of using a GDSS in mass-interaction business meetings for the three cultures, thereby refuting the information richness prediction.

These inconsistencies can be explained using critical mass theory. In the first case where research showed that the anonymity aspects of GDSS may be negative in some environments (Gabarro, 1987), the group culture aspects of critical mass theory may help explain this occurrence. In the Gabarro (1987) case, the group culture of the organization was focused on rewards and responsibility, thereby demonstrating a critical mass effect.
In the Aiken et al. (1994) case where information richness mass-interaction benefits were negatively affected by language can be explained by cultural aspects of critical mass. In this scenario critical mass could not form to reap benefits of a GDSS because of ethnic culture issues.

By combining the principles of information richness and critical mass theory into one common framework specific implementation issues for GDSS within the context of a particular organization are revealed (Table 3).

Similar to the previous communication media which have been analyzed (electronic mail and video conferencing), Table 3 combines the three elements—technology characteristics, information richness predicted uses, and critical mass adoption factors—to reveal implementation issues. The result is a GDSS framework where an organization can see the characteristics and general predicted uses of the technology.

The generic uses and attributes of GDSS are revealed by the first two elements, technology characteristics and information richness predicted uses. An organization can use this information to determine the initial feasibility of the GDSS communication media. If it is determined that GDSS is feasible for use within an organization, then the organization can proceed to examine the critical mass adoption factors. In this phase the organization assesses the social, environmental, cultural, and work requirements of the organization, and specific organization characteristics which may impact the implementation of GDSS.

### Table 3

<table>
<thead>
<tr>
<th>Technology Characteristics</th>
<th>Information Richness-Predicted Uses</th>
<th>Critical Mass-Adoption Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDSS</td>
<td>Perceived as a 'middle' medium</td>
<td>Key players (social factors)</td>
</tr>
<tr>
<td></td>
<td>Mass interaction</td>
<td>Environment</td>
</tr>
<tr>
<td></td>
<td>Opinion polling</td>
<td>Culture/cultural norms</td>
</tr>
<tr>
<td></td>
<td>Anonymous decision making</td>
<td>Accessibility</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Work/job requirements</td>
</tr>
</tbody>
</table>

Removal of physical communication barriers
Removal of interpersonal communication barriers
Structuring the discussion
Systematizing the discussion

Once all three elements are combined into one framework, an organization can make educated decisions regarding implementation issues related to GDSS within a specific organization.
DISCUSSION

This paper demonstrates how information richness and critical mass theories are complementary in nature. Together, they are able to provide the basics for a framework to analyze communication media implementation issues. This is extremely important for practitioners within organizations who are always searching for more effective ways to determine the successful implementation of a communication media. From this literature survey, practitioners can base their decision making on a logical framework devised of the combination of two well-researched theories, information richness and critical mass.

This literature survey opens the door for the development of a formal assessment methodology. An assessment for identifying the technological characteristics, information richness predicted uses, and the critical mass adoption factors. The critical mass factors are probably the most complex section of any newly developed assessments due to the complex elements (key players, environment, culture/cultural norms, accessibility, and work/job requirements) which impact critical mass adoption of a given technology. Once assessments are developed, case analyses and field research could be applied to determine the effectiveness of this framework.

REFERENCES


