AN ORGANIZATIONAL STUDY OF ADOPTION AND IMPLEMENTATION OF ELECTRONIC COMMUNICATION MEDIA

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ABSTRACT
This study tests several assumptions about the adoption and implementation of electronic communication media (ECM) in organizations. Based on earlier work in ECM and studies of organizational communication, hypotheses are presented. The actual study involves the administration of a survey instrument (long and short versions) to a total of 600 ECM account holders at an urban midwestern university. The instrument tapped not only self-reported use of the system but also the managerial role held by each user and their feelings on organizational climate and other factors. Results show that ECM is used for disseminators in organizations, formal pressure can be used in organizations to help coerce non-users to adopt, and that ECM is considered a good support tool for task-related behavior.

Introduction
In certain respects organizational communication has not changed much through the years. Managers who built yesterday's pyramids and managers who will build tomorrow's skyscrapers have and will express their thoughts through verbal, quantitative, and pictorial means. The symbols may change, but their purpose and function do not. Similarly, the function and flow of communication also appear to transcend time and place. Managers engage in downward communication to regulate and impose control, and subordinates engage in upward communication to feedback and highlight exceptions or deviations [5].

What has changed are the media or channels of communication in the organization; the hardware used to send and receive organizational messages. The most pivotal change is the use of computer systems, specifically electronic communication media (ECM). The impact, and hence potential significance, of this new medium is evident in the reviews provided by Rice [15] and Culnan and Markus [1].

Given the relative newness of ECM, however, it is understandable that research to date has only begun to address the behavioral impact of this medium on organizational communication generally and managerial communication specifically. Moreover, the research which is available is characteristic of that which addresses any new phenomenon: it is fragmentary, reflects correlational rather than causal relationships, and is based on anecdotal rather than theory-based, systematic research methods.

Culnan and Markus [1] highlight these issues in their review of the ECM literature and point to one other deficiency. According to these authors we know more about the influence of ECM than we do about the decisions to adopt the system in the first place. In their words:

The effects of implementation decisions and processes on the use and outcomes of traditional information technologies, such as management information systems, has been widely recognized. But the literature on electronic media has paid much less attention to the topic of implementation... A more complete understanding of the intranorganizational effects of electronic media will clearly require additional theory and research on the topic of media implementation. (p. 439)

The purpose of this paper is to fill the void identified by Culnan and Markus by outlining a study designed to increase our understanding of the conditions under which organizational members decide to adopt and "log on," as well as the extent to which people will continue to use the system. A review of the literature is presented; the first section explores the qualitative differences between implementation processes surrounding management information systems (IS) versus ECM. The second section presents directional hypotheses and the associated rationale for them. Next, the research methods and results are presented, and the study concludes with implications for future research.

Implementation: IS vs ECM

Sussman and Behlolav [23] previously argued that IS is qualitatively different than interpersonal and intergroup communication systems. We can extend their reasoning and conclude that when electronic media provide the channel for the communication systems we will again note differences between it and IS, even though the latter also incorporates electronic hardware.

If ECM were simply a slight variation of IS (the way that a color television is a variation of a black and white television) then the question of implementation would be moot. We would simply...
examine the IS implementation literature and generalize to ECM. Unfortunately, this generalization is risky at best because ECM is not a slight variation of IS. ECM is qualitatively different than IS and factors affecting the former's implementation are likely to be different than those affecting the latter's. There are at least three important distinctions between an IS system versus an ECM system, distinctions which individually and collectively suggest implementation differences.

First, IS is primarily, though not exclusively, concerned with the transformation of data into information and is comprehensive in scope. ECM, on the other hand, uses hardware and software systems to transport information from sender to receiver. Whereas IS is designed to facilitate data-based decision making and transaction processing, ECM facilitates communication -- the sending and receiving of messages.

Secondly, ECM has the potential to convey messages as wide and varied as the minds of the managers who use the system. An ECM provides structures and guidelines for message transmission, not the content of the messages themselves. Information systems, on the other hand, often provide structure as well as content in the form of functional applications and various system features. Conclusions can only reflect the heuristic programs built into the system.

Finally, an ECM, because of the distinctions already mentioned, has far greater potential for affecting the social and political fabric of the organization than an IS. Various writers have noted that IS affects political, social, and functional networks in an organization [9, 17]. We concur with this conclusion and expand it. Using IS to make managerial decisions will affect power and status differences in organizations, but this effect will be less than the impact of an electronically mediated communication system, which allows members to cut across all hierarchical levels, all functions, and to convey any message. Figure 1 summarizes what we believe are the primary distinctions between an IS and an ECM and why implementation of the former is likely to be qualitatively different than implementation of the latter.

![Figure 1: ECM Versus IS Hypotheses](image)

In this section we propose seven hypotheses that explore the conditions under which ECM will be adopted. Moving from a micro to macro perspective, we present hypotheses related to individual managers followed by hypotheses related to organizational issues.

The Individual

On the individual level the hypotheses are based on a single fundamental question: What are the attitudes and motivation for accepting or rejecting ECM?

Lucas [8] summarizes six studies in which the attitudes toward the information systems quality, suitability, and ability to accomplish management goals appear to predict use of the system. Schultz and Slevin [21] developed a series of statements from anecdotal literature into a Likert type scale that appeared to measure dimensions of use of an information system. The dimensions included effect of system on performance, interpersonal relations, structural changes, goal congruency, support to users, relationship between the system developers and management, and urgency for system generated results. Although it is unclear as to whether the Schultz and Slevin instrument measures perceptions or attitudes, it seems to provide some usefulness in assessing the implementation of a management information system.

Robey [18] uses the Schultz and Slevin instrument to predict the use of the system. His results indicate that the strongest dimension of use is performance of the system with support, relationship with system developers and urgency of information having significant correlations with use. The strength of his results suggest an expectancy model of system use shown in Figure 2 below.

![Figure 2: Expectancy Theory Model of User Behavior](image)

This model provides a theoretical basis for understanding a propensity to use an ECM to perform managerial activities. By applying expectancy theory concepts one may be able to create the necessary linkage between the cognitive processes of the individual, the needs of the organization, and anticipated use of the system.

For example, one can assume that the communication needs of executives and the subsequent extrinsic-intrinsic rewards of using ECM are different than those of operations personnel and first line supervisors. The degree of environmental uncertainty is greater for the CEO than operating personnel. The former are thus likely to use a "valued" source to reduce this uncertainty. McCleod and Jones [10]...
suggest that the most-valued source is the immediate subordinate of the decision-maker. These contacts are largely face-to-face, conveying "rich" sources of data [2]. At lower hierarchical levels, information is more frequently transmitted in writing through memos, documents and manuals. These less rich media are appropriate given the relative degree of equivocality they must reduce [24].

A related theoretical premise suggests that all messages have report (content) characteristics and demand (meta-message) characteristics [6]. "Rich" media are those that contain not only the former, but also the latter. If "rich" media are required to reduce uncertainty and equivocality, we may conclude that managers will choose those media that best reduce the uncertainty and ambiguity surrounding their organizational role.

For example, Rogers [19] reports a case study which indicates that use (specifically of an electronic mail system) is a function of having a computer terminal, whether or not the individual needs to communicate with people in other subdivisions (intraorganizational boundary spanning), and whether the individual needed to broadcast information (dissemination) to large numbers of people. The same study indicated that "mail" was not very useful in handling conflict resolution or bargaining (i.e., reducing equivocality). Moreover, it did not appear to be a means for getting to know someone or handling confidential matters. As mentioned earlier, the reception through ECM of the report (or content) portion of a message without benefit of the command dimension may seriously undermine those roles that depend heavily on the relationship facet of messages, those facets that speak to the subtlety, nuance, and ambiguity of organizational life.

Mintzberg's role typing [11] is one which helps us understand linkages between information needs and hierarchical role. According to this model, managers in an organization exhibit a set of behaviors that can be clustered into roles that represent the nature of a manager's job. Of particular importance to this paper is the fact that more than half of the observed behaviors in the Mintzberg studies were communication activities (meetings, telephone calls, speeches, memos).

The sample in the Mintzberg study consisted of CEO's from five different types of organizations. Research into differential use of managerial behaviors has suggested that certain clusters are viewed as more important at various levels in the organization [14]. Specifically, they found that the roles of figurehead, disseminator, negotiator, resource allocator, liaison, and spokesperson are more important at higher levels in the organization. Of these roles, negotiator, resource allocator and spokesperson require richer communication media than disseminator and figurehead.

Thus, we may assume that ECM will be used for those purposes or to enact those roles requiring less rich media -- those void of inferential messages or without affective meta-message properties. Such managerial behaviors include information dissemination and liaison but not negotiator or disturbance handler. This leads us to our first formal hypotheses:

H1: Respondents scoring high in the liaison role will use ECM more frequently than those with lower scores.
H2: Respondents scoring high in the disseminator role will use ECM more frequently than those with lower scores.
H3: Respondents scoring high in the negotiator, resource allocator, and spokesperson roles will use ECM more frequently if medium is perceived as "rich."

The Organization

A second set of hypotheses regarding use may be generated by an understanding of the communication innovation process [19, 20]. This point of view suggests that there is a social process by which communication technology is accepted and put into use. Some key characteristics include the adoption of the technology by key leaders, support by those controlling resources, and reward structures that encourage use. Again drawing from the expectancy model, a manager might therefore be expected to exhibit higher use if the CEO (or divisional manager) is using the ECM system, if it is encouraged by those who control resources, and if deprival (the opposite of reward) is incurred by failure to use the system.

This rationale suggests that division heads play a pivotal role as gatekeepers and influence leaders in the adoption process. Specifically, we hypothesize that there is a direct and positive relationship between managers' perceptions of formal and informal pressure by supervisors to adopt ECM and subsequent adoption. Thus, our second set of hypotheses is as follows:

H4: Those subjects reporting formal pressure to adopt and use ECM will use ECM more frequently than those who do not report formal pressure.
H5: Those subjects reporting perceived informal pressure to adopt and use ECM will use ECM more frequently than those who do report perceived informal pressure.

A third set of hypotheses can be extrapolated by focusing on the communication climate within which managers function. Falcione, Sussman, and Herden [3] provide a descriptive model of communication climate which also includes expectancy theory constructs. Of particular relevance to the present context is their observation that:

The link among the climate subsystems and outcome factors is mediated by expectancies and instrumentality. This suggests that the communication climate is necessary for member satisfaction and productivity, but not sufficient. Other factors are "error terms" or "unaccounted variance" in the studies cited above may be found in the members' expectations concerning communication practices and productivity and instrumentality between effort and productivity (p. 223).
Their interpretation suggests that communication climate may not only be a predictor of ECM usage but may also be a dependent variable—affected by the extent to which managers see ECM as fulfilling their communication needs. This last rationale provides the basis for the following hypotheses:

H6: Subjects reporting an open communication climate will use ECM more frequently than subjects who do not report open climates.

H7: Subjects reporting a task-oriented communication climate will use ECM more frequently than subjects who do not report such climates.

Methods

Procedure

All data were obtained from account holders with access to PROFS (IBM Professional Office System) on the IBM 3081 at a medium-sized, midwestern, urban university. At the time data were collected, the ECM had been in place for 18 months. The sole source of data were responses to questionnaires distributed and returned through campus mail.

Sample

The present study was part of a larger PROFS usage study. The larger sample consisted of all PROFS account holders (n=400); the smaller sample and the one used to test the previously stated hypotheses consisted of account holders in four administrative units and one academic unit (n=200). One hundred forty nine usable questionnaires were returned from the larger sample producing a return rate of 37.2%. The return rate for the smaller sample was higher at 49.5% (n=99).

Questionnaire

The questionnaire was composed of seven sections: 1) a cover letter, 2) questions soliciting demographic and user information, 3) an ECM usage and satisfaction section, 4) a role typology questionnaire, 5) an organizational climate instrument, 6) a job satisfaction measure, and 7) a perceived job stress measure. The larger sample received sections 1-3 of the questionnaire; the smaller sample received the entire questionnaire. The present study reports hypotheses related to sections 1-5 of the questionnaire.

Cover Letter

This was a single page letter that introduced the questionnaire, provided the rationale for research, guaranteed confidentiality and anonymity, and provided supporting signatures from top administrators at the university.

Demographic and User Information

This section contained twelve questions related to demographics, prior experience with computers, training on PROFS, and the extent to which the chief administrator of the respondent's unit applied formal or informal pressure to use PROFS. Pressure to use PROFS was assessed by a simple Yes or No response. For example, has the chief administrator in your unit applied formal pressure through rules or official policies to use ECM?

ECM Usage and Satisfaction Questionnaire

This instrument contained twenty four items. Five of the items were adapted from the Roberts and O'Reilly Communication Climate Questionnaire [16]. These items focused on perceived freedom to communicate with direct superiors, percentage of time spent in directional communication (upward, downward, lateral), percentage of total time spent using ECM, perceived communication overload, and desirability of communicating with different target groups (superiors, subordinates, peers). For each of these five questions the Roberts and O'Reilly item was recast to reflect ECM usage (e.g., of the total time you spent communicating on the job, approximately what percentage of time do you spend communicating electronically with . . . ).

The remaining sixteen items were designed to measure perceived satisfaction with reliability and accuracy of, and richness of ECM usage. These items were loosely based on previous user satisfaction instruments [4].

Role Typology

The Favett and Lau [13] role typology questionnaire was used to assess respondents' perceptions of the degree to which they enacted the ten Mintzberg roles [11]. The questionnaire contains 69 items requiring respondents to indicate the importance of behaviors and activities along seven-point scales. Favett and Lau report acceptable reliability ranges across the ten role types.

Organizational Climate Questionnaire

Form B of the Litwin Stringer Questionnaire [1968] was used to assess perceived organizational climate. The dimensions used in the present study were based on Muchinsky's [12] factor analysis of 695 respondents. That analysis resulted in six factors with reliability coefficients ranging from .54 to .91.

Results

A summary of the results of the seven hypotheses being tested is reported in Table 2 below. The hypotheses that ECM will be used for the information dissemination and liaison managerial was tested by using a Pearson correlation between the 10 managerial roles described by Mintzberg [11] and the percent of total communication time spent using ECM. The predicted relationship between the disseminator role and use of ECM has a correlation coefficient of .19 (p < .05) thus allowing acceptance of the hypothesis that the disseminator role can be enacted in the less rich electronic communication environment (H2). The liaison role did not have a significant association with time spent using ECM (H1). This may be due to the fact that managers who act in this capacity are building relationships within and external to the organization. Such activities may not be handled across subunits or interorganiza-
tionally due to lack of access to compatible ECM systems.

The hypotheses that there was a direct and positive relationship between formal and informal pressure to use ECM and its adoption (H4, H5) were tested by a chi-squared analysis. The null hypotheses thus tested were as follows:

1. There will be no difference in time spent using ECM with perceptions of formal pressure to use it.
2. There will be no difference in time spent using ECM with perception of informal pressure to use it.

The first hypothesis was rejected with a $X^2 = 35.862$ ($p < .001$) thus allowing the conclusion that there is some relationship between formal pressure to use ECM and its actual use. The second hypothesis was accepted with a $X^2 = 19.221$ ($p = .083$). Although there is some evidence of the relationship between informal pressure and use, it is not significant at a sufficient level to validate the proposed associations in this study.

The hypotheses that media richness and task-orientation in the communication climate is positively related to ECM use (H6, H7) were measured by Pearson correlation coefficients between Factors 1 and 5 in the ECM Climate instrument (see Table 1 above) and the percent of communication time spent in ECM. Factor 1 consists of scales that measure the ability of ECM to provide information for decision-making; this scale was used as a proxy for the task-orientation of the ECM climate. The Pearson $r$ for Factor 1 with usage was .371 ($p < .001$). Factor 4 consisted of items that reflected trust of the ECM. However, it did not have a significant association with use. One possible explanation is that openness moderates the relationship between use and no use rather than a continuum of usage. This possibility was not investigated.

The hypothesis that adoption of the roles of negotiator, resource allocator, and spokesperson (informational role cluster) will result in the use of ECM if the media is perceived as rich (H3) was tested by separating the sample into two groups: those who perceived the media as rich and one that perceived the media as not rich [2]. Factor 4 was used to divide the sample. Those who scored below the mean on this scale were determined to perceive the media as rich; those who scored above the mean were determined to perceive the media as not rich. SAS 5th Edition Regression procedure was used to test the following model:

$$Y = a + b_1 x_1 + b_2 x_2 + b_3 x_3$$

where $x_1$ = negotiator

$x_2$ = resource allocator

$x_3$ = spokesperson

$Y$ = frequency of initiation and replying to messages

The full model was significant with an $F = 8.270$ ($p = .0001$). Therefore, the null hypothesis that the beta's are equal to each other and equal to zero can be rejected. The model for the group who perceived the media as rich ($n = 61$) was significant with an $F = 5.104$ ($p = .0035$). The model for the group who perceived the media as not rich ($n = 34$) was significant with an $F = 3.433$ ($p = .0289$). However, Chow's $F = 4.47$ ($p = .05$) indicating that the groups were not significantly different from each other. Therefore, the hypothesis that the use of the informational role cluster predicted the

### Table 1

<table>
<thead>
<tr>
<th>ECM Climate Factors</th>
<th>Use of ECM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1</td>
<td>$r = .371$</td>
</tr>
<tr>
<td>(H6)</td>
<td>$p &lt; .001$</td>
</tr>
<tr>
<td>Factor 2</td>
<td>$r = .55$</td>
</tr>
<tr>
<td>(H7)</td>
<td>$p &lt; .001$</td>
</tr>
<tr>
<td>Hottinger's Roles</td>
<td></td>
</tr>
<tr>
<td>Liaison</td>
<td>$r = .371$</td>
</tr>
<tr>
<td>(H1)</td>
<td>$p &lt; .001$</td>
</tr>
<tr>
<td>Co-ordinator</td>
<td>$r = .203$</td>
</tr>
<tr>
<td>(H2)</td>
<td>$p &lt; .051$</td>
</tr>
<tr>
<td>Informational Roles</td>
<td>$F = 3.278$</td>
</tr>
<tr>
<td>(H2)</td>
<td>$p &lt; .0031$</td>
</tr>
<tr>
<td>Organizational Pressures</td>
<td></td>
</tr>
<tr>
<td>Formal Pressure</td>
<td>$F^2(35) = 8.62$</td>
</tr>
<tr>
<td>(H4)</td>
<td>$p &lt; .0001$</td>
</tr>
<tr>
<td>Informal Pressure</td>
<td>$F^2(25) = 4.32$</td>
</tr>
<tr>
<td>(H5)</td>
<td>$p &lt; .001$</td>
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use of ECM is accepted; however, the perception of media richness does not appear to moderate the relationship.

Discussion

These results suggest that future research in ECM would be beneficial to the systems professional and user alike. The study attempted to make predictions about user behavior by correlating self-reported use of the system with such factors as perceptions of managerial role and organizational climate. While not all of our predictions were supported, we found the following:

1. Those users performing a disseminator role will use ECM more frequently than non-disseminators.
2. Those users performing informational roles will use ECM more frequently than non-informational role players.
3. Those users who receive formal pressure from superiors will use ECM more frequently than those who do not receive formal pressure.
4. Those users reporting more open communication climates will use ECM more frequently than those who do not report open climates.

REFERENCES


