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Analyzing Message Trends in Computer Office Automation:
The Development of a Category System

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ABSTRACT

This paper examines the patterns of communication on computer office automation systems (COA) in terms of organizational functions. A new category system is devised. Two areas of organizationally functional communication are defined: Operational Control Communication and Managerial Control Communication, the latter being divided into organizing and problem solving communication.

Messages sent on a COA memorandum system are coded according to the newly defined classification scheme and the trends are examined. Evidence is presented that Problem Solving Communication declines, Operational Communication increases, and Organizing Communication maintains a consistently high level across time. The COA memorandum system is suggested to be primarily serving an organizing function in the organization being examined.

INTRODUCTION

Background

Until recently, more than ninety cents of every dollar invested to increase productivity in private business went for industrial improvements and automation. Over the last ten years, average industrial productivity increased 90% while office productivity increased only 3.3% (Uhlig, Farber, and Bair, 1979). At the same time, it has become obvious that since the bulk of information used in the transaction of business is narrative textual information, similar productivity gains may be difficult to achieve. Computer Office Automation (COA) seeks to address this problem and provide productivity gains like those already en-

joyed by industry. In order to avoid the possible negative impacts of COA, however, it is important to understand the impact that this technology can have on the business organization.

Wayne L. Rhodes, Jr., Senior Editor of Infosystems Magazine, notes that the myriads of technology "befuddle the user" and that often, in office automation, "the whole is less than the sum of its parts," (Rhodes, 1981). He goes on to point out that rarely, if ever, is the impact of the new technology on the office and the personnel working there considered. Only recently have researchers turned their attention to these concerns. Current work in this area includes studies of innovation strategies for computer based communication (Rice and Rodgers,

1981); studies of design and implementation of organizational communication technologies (Svenning and Ruchinskas, 1981); cost/benefit analysis of computer based message systems (Montgomery and Benbasat, 1983). Little has been done, however, in the area of the actual content of these new communication channels and their effect on the patterns of communication between those individuals who run an organization.

Manufacturers and vendors are moving ahead, however, even as research lags, to provide the new channels of communication (Johnson, 1981a, 1981b; Laberis, 1983). Smith and Benjamin (1983) predict that the "Automated Office will become the standard information handling environment for many American businesses by the end of this decade," (p.211). A wide variety of technological solutions to the "information problem" are now available. Local Area Networks (LAN's) both base-band (Xerox, DEC, and 3Comm's "Ethernet") and broad-band (Sytek's "Local-Net") promise to link mainframe computers, mini-computers, word processors, micro-computer workstations, and computer terminals into one compatible information sharing network. Long distance networks such as ARPAnet and Telenet or private packet-switching networks provide nation-wide links between business operations. Among the tools provided on these networks is electronic mail which holds out the promise of faster, more effective business communication and increased organizational efficiency (Edwards, 1981).

The nature of computer based communication has been misunderstood, however. Lewis M. Branscomb (1979), Vice President and Chief Scientist, IBM Corporation, notes that, "The key element is the computer, which is not only an information machine but also a communications device. The two terms, information and communication, are

often blurred when they are tossed about loosely, but it is important to make the distinction if one is to look at what may happen in the upcoming years," (p.143).

This distinction needs to be made because each area serves a separate function for the organization. The information processing system serves the operational mechanism of an organization, providing summary statistical and non-statistical information on the state of its functioning (Katz and Kahn, 1978; Derry, 1979). The communication system of an organization, however, allows for the important processes of problem solving and organizing which are part of the managerial control mechanism of an organization (Derry, 1979; Plain, 1979; Gorry and Scott Morton, 1970).

Guetzkow (1965) points to the fact that technology often determines message characteristics by determining the type, amount, and permanence of communication transmitted on any type of system. He notes that competing forms of communication such as face-to-face, telephone, and written memorandums vie for the attention of their recipients. The structure of the message channels has a strong effect on the structure and functioning of an organization. Guetzgow goes on to say that, "The multiplicity of its (communication system's) sources and destinations, whether messages are related serially or simultaneously, and whether the communication contents are transitory or storage form - interacts in important ways with the qualities of the organization itself, such as its size, its differentiated structure, and its ability to handle decisions in a coordinated manner." He points out that message flows tend to become regularized and that systematic patterns or interaction appear when channels are used on a systematic basis. It is that process of regularization this study seeks to address.

COMMUNICATION CATEGORIES

Communication in Organizations

What kinds of communication take place in an organization? While the literature does not explicitly address this question, two categories are implied in relation to organizational functions (Gorry and Scott Morton, 1970). First, the communication of operational control information, and second, the communication of managerial messages. In most organizations today, operational information is processed and transmitted via MIS and EDP systems, while the managerial communications are transmitted in a variety of ways including face-to-face meetings, telephone calls, and memorandums. March and Simon (1958) address this division when they contrast "programs" or "highly complex sets of responses" which result in predictable behavior and functioning with what they identify as the "innovative" process. Derry (1979) notes that the operational control mechanisms hold together organizations and provide a "blueprint" for their daily operations while the managerial control mechanisms facilitate the "problem solving activities of management" through which the organization adapts to new situations. Gorry and Scott Morton (1970 p.14) go one step further and note that most structured information falls into the area of operational control while the semi-structured and unstructured information and problems fall into the classification of managerial control and communication. They point out that "computers and related systems which have so far been largely applied to the structured area have not had any impact on management decision making."

Operational Control Information

The communication of operational information consists of the routine col-

lection, summarization, and passing along of information concerning production, sales, and use of resources, or in other words, the predictably necessary information for daily operations and decision making. Mintzberg (1973) notes that one of the functions of a manager is the "collection, transmission, and receipt of routine data and reports," (p.65).

Operational information may be broken down into two general types. The first type of operational information, the statistical summary, is readily recognizable as it falls into the familiar province of the MIS and EDP systems. Examples of this type of operational information are monthly financial reports, inventory control reports, and affirmative action reports of employee breakdown by ethnic category.

The second type of operational information consists of summaries of activities, actions taken, problems solved or to be solved; any kind of summarized, non-statistical information provided on a regular basis in a standardized format. It should be noted that almost all operational information can be considered "structured."

Managerial Control Communication

Managerial communication can be broken down into two categories, Problem Solving and Organizing. This division is supported by a number of sources. Barnard (1938) notes that the "first function" of an executive is communication and that managers scan their environment for relevant information to use for problem solving and in the ongoing design and adaptation of the organization.

Boulton (1978) points out that the executive must monitor the changing environment so that the corporation may meet changing demands. To accomplish these goals, he suggests that it is

necessary to have "communication of objectives, strategies, and organizational and external matters, and an adequate structure to facilitate such communication," (p.10-11).

Whisler (1970) defines four managerial activities in this regard, communication, computation, goal setting, and pattern perception (p.155). He notes that communications with others such as peers, superiors, subordinates, and individuals outside the organization constitute a large portion (one-half to three-quarters) of a manager's function. He goes on to say that problem solving also takes up much of the routine day-to-day operations performed by a manager. Whisler indicates that goal setting, the process of making organizational decisions, is a key part of the manager's activities and the final activity, that of pattern perception, the discovery of unforeseen connections between events or data, is perhaps the most intangible, although the most important function served by the manager.

Reviewing what has been said thus far leads to a picture of the communication functions served by a manager as well as some estimate of the time spent exercising the activities. The manager's most frequent activity would seem to be that of organizing, followed closely by activities related to problem solving. Both these activities fall into the semi-structured and unstructured categories as described by Gorry and Scott Morton (1970).

This leads to the formulation of the first set of hypotheses for this study:

(Ia). There will be significantly more Organizing type messages than Problem Solving type messages sent on a COA Memorandum System.

(Ib). The pattern of communication as represented by frequency of message

traffic on the COA Memorandum System will differ according to the category of message type.

Computer Office Automation (COA)

Only a small amount of literature exists concerning the COA memorandum system. Field and pilot studies of this type of system have only begun to occur during the last several years. An early study of this type of system is reported by Uhlig (1977) who describes the results of a two-and-a-half year experimental utilization study of a COA memorandum system designed for the U.S. Army Material and Readiness Command (DARCOM). The study (Martin, Von Gehren and Uhlig, undated) noted that the reaction from top management was consistently good. Managers reported a reduction of turnaround time necessary in getting decisions on important problems. Users noted that they could send and receive messages at any time they chose and therefore deal with them more efficiently. The storage and retrieval system allowed users to keep better track of their messages and Uhlig noted an increased "corporate awareness" among the users. He also pointed out that the COA memorandum system, "made it possible to form committees to bring together headquarters and field personnel for discussion of important issues, without having to bring the committee members together in the same geographic location..."

Looking back over Uhlig's conclusions and considering the characteristics he described, it seems likely that the function of organizing will tend to be most strongly reflected in this type of system. Additionally, because of the more rigidly controlled nature of the memorandum system, the function of problem solving which requires more interaction will appear at a reduced level. Other studies and speculations in this area (White, 1977; Meyer,

1979; Leduc, 1979) appear to be consistent with this view.

This suggests the second set of hypotheses for this study:

(IIa). There will be a significant upward trend of Organizing type messages over time on a COA Memorandum System as it defines itself in use.

(IIb). There will be a significant downward trend of Problem Solving type messages over time on a COA Memorandum System as it defines itself over time.

Why Develop A New Category System?

The analysis presented here required a way of reliably categorizing messages according to their organizational function in order to trace the trends that might develop as the computer office automation system was being used. In creating the category system, a number of guidelines were considered. It would have to be descriptive of the functions of managers as evidenced in their communications, it would have to be generalizable to other organizations, and it would have to be generalizable to other forms of mediated communication such as paper memorandums, telex, telephone, etc.

Existing Category Systems

A number of suggestions for categorizing types of communication in organizations have been made in the past. Whisler (1970, p.155) speculated that management consisted of at least four activities. The first, Pattern Perception, was essentially a creative task. It consisted of discovering hitherto unseen connections between events in the environment. The second, Goal Setting, was the process of making organizational decisions involving values and preferences. The third, Computation, consisted of figuring out the most efficient and economical means of obtaining organ-

izational objectives. The fourth and final category, Communication, Whisler indicated, was the sending and receiving of information which allowed the functioning of a large, scattered group.

O'Reilly and Pondy (1979, p.120) noted what they considered to be the five standard functions of management. First, Planning, which involved obtaining information about the current situation and using this information to forecast and plan for future situations. Second, Organizing, which was the process of arranging people and resources into a functioning organizational structure. Third, Staffing, which involved all activities undertaken to attract, select, keep, and manage the human resources of the organization. Fourth, Directing, which consisted of the sending of requests and approvals to influence organizational activities. The final category, Controlling, consists of the evaluation and coordination of effort and resources within the organization.

Leduc (1979, p.236) described six categories of message content in relation to type of task carried out. The categories were derived by inspection of messages sent by the Business Planning Group (BPG) of Bell Telephone, Canada using the NLS (On Line System) developed at the Augmentation Research Center at Stanford Research Institute. The first category was Personal Messages, all those not dealing with business or job. The second, Information-Exchange, related to the exchange of professional information unrelated to specific projects or jobs. The third, Project-Oriented, related to specific projects set up in a formal fashion. The fourth, Personnel-Management, included direct requests from superiors to subordinates and vice versa. The fifth, Administrative, dealt with routine office tasks including sending reports, summaries, and agendas. The sixth category in-

cluded all incomplete or unidentifiable messages.

None of the suggestions for categorizing communication in organizations discussed so far represented a satisfactory approach for this study. The categories suggested by Whisler are too general to allow for reliable coding but they do provide a good starting place in terms of the functions of managers which may be reflected in their communication.

The category systems suggested by Pondy and by Leduc are more specific in content but seem directed primarily by subject or topic area. Because of this, messages which seem to be the same type, for example a message requesting routine information, may be categorized in a number of different places depending on whether it refers to staffing, projects, or controlling the organization. Both category systems seem to ignore basic functions of a manager in an organization and instead look at general categories of activity which go on in the organization.

The New Category System

The new category system developed for use in this study is based on the observed organizational function of a message rather than its content, subject matter, or intended recipient. This organizational function seems to be more generalizable between different organizations than content or subject matter. A message which provides a requested solution to a problem would serve the same function whether it concerned baby food or pesticide, automobiles or jogging shoes.

The overall perspective of the new categories is that of the operational and managerial functions served by communication in an organization as described by Gorry and Scott Morton (1970). In a general sense, opera-

tional functions are all those activities which are part of the established routine of operations which provide the structure and form of an organization. Managerial functions, on the other hand, are the activities related to the modification and adaptation of organizational functions which meet new and changing circumstances as well as the minor prompts and decisions needed to keep an organization functioning smoothly (semi-structured and unstructured). The communication between managers should reflect these two basic functions.

The new category system divides communication into the general areas of Operational and Managerial communication (March and Simon, 1958; Gorry & Scott Morton, 1970; Derry, 1979; Plain, 1979). Operational communication in an organization includes all routine reports which are sent on a regular basis in a standardized format. Much of a manager's activities are structured by the requirements of such summary reporting.

Managerial communication includes all other messages sent in the organization. These may be split into two sub-areas, Organizing and Problem Solving. The Organizing sub-area consists of the following sub-types: requests for routine action, requests for routine information, notification of routine decisions, unsolicited reports (documenting), requested information, organizational and personal scheduling, and personal comments. The Problem Solving sub-area consists of the following sub-types: complaints, opinions, requests for information or action to multiple recipients, requests for information or action to one/two recipients, discussion of alternatives, and notification of decisions/approvals/solutions and new procedures.

THE CASE

Setting the Scene

A large manufacturing concern tested COA memorandum system which was designed to replace paper memorandums and telex messages in its operations. A number of different networks were set up, ranging in size from six to twenty-two participants. The users were asked to utilize the system for their regular business communication. However, they were not limited to the system and could use other modes of communication.

The subjects for this study were six regional managers in the company. All of the managers were located in different parts of the country. One of the group, user A, was nominally considered to be the superior of the group. Users B through F were considered to be on the same organizational level.

The user group of six managers generated 208 discrete messages during the three-and-a-half months of the initial phase of the study. The system continued in full operation, unmonitored, for an additional three months. Finally, an eight-month period of operation was monitored, producing 312 discrete messages. Altogether, the system was in operation for fourteen-and-a-half continuous months. Each message sent on the system during the monitored periods was copied and retained for analysis.

Each message on the system carried the name of the sender; the name(s) of the recipient(s); the name(s) of the "carbon copy" recipient(s); the date transmitted; and the text of the message itself.

Coding Issues

The unit of analysis for the purpose of this study was defined as a body of

text, preceded by a data, sender name, and recipient(s) name(s) (Holsti, 1969). Several alternative schemes were considered including coding each paragraph as a message. However, the contextual indicators which identified message types were often absent from the individual paragraphs and evaluation of the entire message, including heading and all text, proved to be the only feasible way to code the messages according to organizational function.

The reliability of the coding scheme was ascertained by using two independent coders who had not been exposed to the category system previously. Two different random samples consisting of eight messages from each of the fourteen sub-types were selected at random from the coded messages for the reliability check. Each coder was trained for approximately one hour and then spent approximately two hours coding their respective samples. It is important to note that the coding was done in a fashion which allowed the coders to check and recheck their messages for consistency.

The first coder achieved a reliability of .98 using Scott's Pi (Holsti, 1969) while the second coder, using a different sample, achieved a reliability figure of .93. It should also be noted that none of the errors were made outside of the major subareas. The majority of messages were easily coded in the first forty-five minutes.

Organizing the Data

The data for the initial usage phase and the operating phase were examined separately. The data in the initial usage phase was grouped by month and the total frequency of all messages sent was computed. Also computed by month were the raw frequencies of messages categorized as Operational, Organizing, and Problem Solving. The

data in the operating phase was then computed in the same fashion.

Following these procedures, all data was normalized by computing the percentages of each type of message sent within each month. This was done to eliminate the confounding factor of inconsistent usage of the system itself on the message types. Various uncontrolled factors such as weather conditions, vacation schedules, and system down time had an effect on the total frequency of messages sent via the system. These factors, while interesting in themselves, are not being examined here.

LOOKING AT THE RESULTS

Management Expectations

The management of the manufacturing corporation did not set up the experimental utilization of the computer based memorandum system with a specific use in mind. Rather, they indicated in their initial messages that the capabilities of the system were to be used and explored. Specifically, the regional managers using the system were requested to, "Do some useful things not yet being done; do better some things we are already doing; and, save every cent we can get this tool to save." They were told to think how the capabilities of the system might be combined together in new ways to enhance their work as individuals and as a group.

Despite this relatively open approach toward utilizing the system, certain attitudes and ideas about the system were evident. The immediate superior of the regional managers group noted in an initial message on the system that, "Gone forever will be your days of isolation. With a few strokes of electronics I can reach out and grab any one of you." It is clear that the system was expected to add a new im-

mediacy and a personal touch to the operations of the group.

Almost immediately after the system was implemented, participant A, the nominal superior within the regional managers group, instructed the rest of the participants to use the new system to send their monthly activity reports. Thus the first direct instruction concerning system use was to set up a routine reporting system.

Reviewing the management expectations concerning the computer based memorandum system as expressed in the initial messages sent, it is apparent that it was seen as a means of transmitting reports, requests, and printed material in a much faster way than was possible previously. However, the regional managers had been asked to experiment with the system and use it in as many ways as possible. The result of this confusion was seen clearly in the initial usage phase of this study.

Initial Usage Phase

During the initial phase, it was easily apparent that no message type predominated. Instead, the participants were attempting to use the system for everything and anything they could. System usage during this phase peaked in July, approximately six weeks into the initial period, and fell rapidly thereafter. However, while the actual frequency of use declined, the percentage of Operational messages (routine reports) increased although not at a statistically significant level ($\chi^2=11.87$, $df=6$, ns). Kendall's Non-Parametric Correlation (Bradley, 1968, p.284-288) showed no relationship with time for Organizing or Problem Solving messages.

One possible explanation for these results is that the initial period must be viewed as a shakedown time for the system. Conflicting managerial ex-

pectations such as immediacy versus sending routine messages vied for supremacy within the system. The decline in actual system use might be attributed to the frustration of its participants concerning the type of messages to send on the system. The general level of use continued to decline until the end of the initial usage period. No further analyses were attempted for this period.

Operating Phase

When the tracking of the messages was resumed after a three month break, the picture presented was much clearer. Actual frequency of use had stabilized at a higher level than at the end of the initial usage period. Also, distinct trends of system use had begun to emerge. First of all, there were considerably more Organizing type messages on the system (53%) than any other type of message confirming Hypothesis Ia. From this indicator alone, it would seem that a great proportion of the business transacted on the system involved the function of Organizing.

The messages sent during the operating phase of the system were stratified by message type (Operational, Organizing, and Problem Solving) and chi-square was computed. There were significant differences ($X^2=75.135$, $df=2$, $p<=.001$) between the total number of each type of message on the system during the operating phase.

The chi-square was then distributed across the three categories with the following result: Operational $X^2=36.96$, $df=1$, $p<=.001$; Organizing $X^2=38.16$, $df=1$, $p<=.001$; and Problem Solving $X^2=.0096$, $df=1$, n.s. There were significantly more Organizing messages and significantly less Operational messages on the system during the operating phase, again supporting Hypothesis Ia.

The operating phase then was broken down into two equal time periods and stratified by message type. The resulting chi-square statistic was significant ($X^2=16.731$, $df=2$, $p<=.0002$) indicating that there were significant changes in the frequency of message types between the two time periods. When the table was partitioned, (Castellan, 1965) it could be noted that Problem Solving messages were responsible for the larger part of this difference ($X^2=12.95$, $df=1$, $p<=.0001$) lending support to Hypothesis IIb while Organizing and Operational communication were not significantly different between the two time periods ($X^2=3.78$, $df=1$, ns). The messages were also divided by month periods and the resulting chi-square statistic was significant ($X^2=39.6$, $df=14$, $p<=.0003$) showing a developing trend.

Plotting the message types (by percentage of month total) across the eight month operating phase time span showed a somewhat confused although provocative picture. Operational messages could be seen to increase sharply near the end of the time span. Problem Solving type messages reached a peak between the months of February and March, when they were equal in frequency with the Organizing messages during that time period, and then began to decline sharply. The Organizing messages, on the other hand, reached their lowest point during the February - March period (although still accounting for 40% and 50% of total messages) and then began an erratic rising pattern which peaked at 73% in May. This was then followed by an erratic decline to 43% in August.

The plots for each message type were smoothed (Table 1) (Tukey, 1977) and plotted a second time. Here, the trends are quite clear and the pattern of system usage becomes very evident (Figure 1). Now it can be seen that the Organizing messages begin a slow rise from the beginning of January

Table 1.

TUKEY 3RH SMOOTHING SEQUENCE

MESSAGE TYPE	PERCENTAGE	3	3R	>	H	RESIDUAL	
ORGANIZING	JAN	.60	.48	.48		.48	.12
	FEB	.44	.48	.48	.48	.48	-.04
	MAR	.48	.48	.48	.52	.50	-.02
	APR	.54	.54	.56	.52	.54	.00
	MAY	.73	.56	.56	.56	.56	.17
	JUN	.56	.64	.56	.56	.56	.00
	JLY	.64	.56	.56	.56	.56	.08
	AUG	.43	.56	.56		.56	-.13
RESIDUAL TOTAL						.18	
PROBLEM SOLVING	JAN	.35	.44	.44		.44	-.09
	FEB	.44	.44	.44	.44	.44	.00
	MAR	.48	.44	.44	.365	.40	.08
	APR	.29	.29	.29	.36	.325	-.035
	MAY	.19	.28	.28	.24	.26	-.07
	JUN	.28	.19	.19	.21	.20	.08
	JLY	.14	.14	.14	.165	.15	-.01
	AUG	.14	.14	.14		.14	.00
RESIDUAL TOTAL						.045	
OPERATIONAL	JAN	.05	.05	.05		.05	.00
	FEB	.11	.05	.05	.065	.065	.045
	MAR	.04	.11	.08	.08	.08	-.04
	APR	.17	.08	.11	.125	.115	.055
	MAY	.08	.17	.17	.14	.155	-.075
	JUN	.17	.17	.17	.20	.185	-.015
	JLY	.23	.23	.23	.20	.215	.015
	AUG	.43	.23	.23		.23	.20
RESIDUAL TOTAL						.185	

through June where they reach a plateau at 56% of month total which continues through August. This result supports Hypothesis IIa. The Problem Solving messages, on the other hand, begin a slow, steady decline in February which continues through July where it begins to level off at 14% of month total, supporting Hypothesis IIb. The Operational message trend is also very clear in this graph. They show a slow,

steady increase over the entire time period beginning at 5% in January and reaching 25% in August, a surprising result not anticipated.

To finally confirm the trends Kendall's Non-Parametric Correlation was used as a trend test by correlating the percentage of month totals with the time periods (Bradley, 1968) represented as monotonically in-

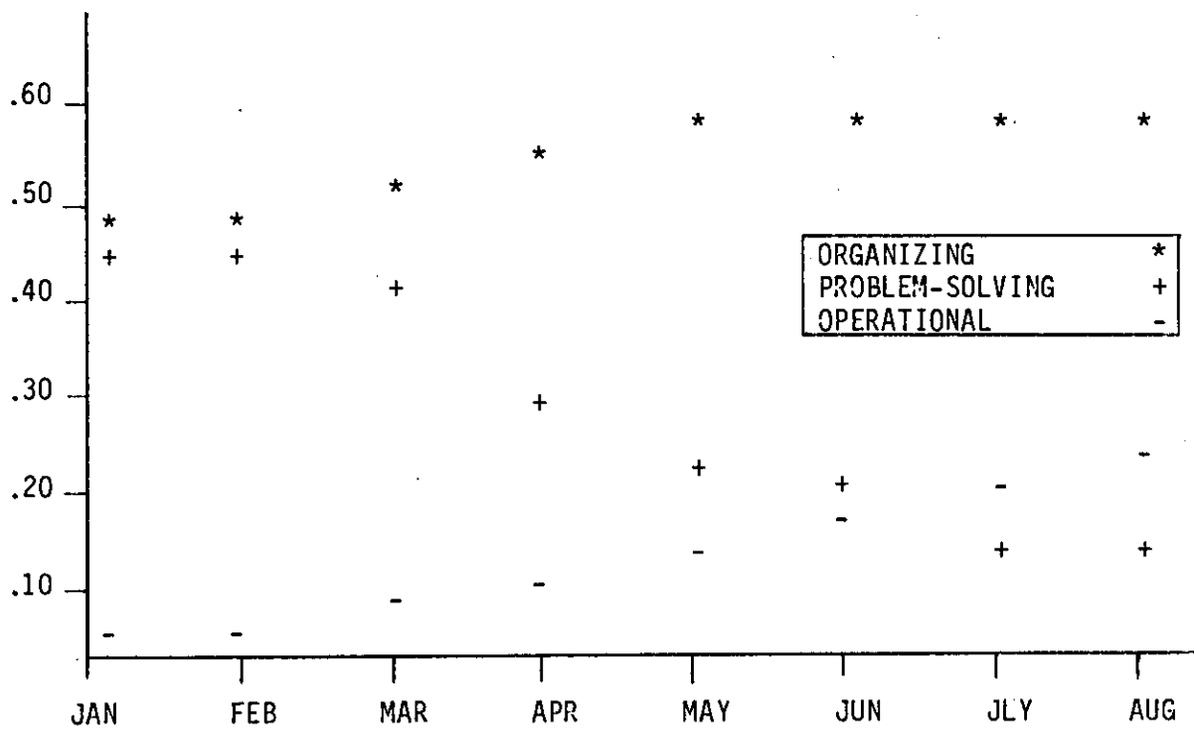


Figure 1. Tukey 3RH Smoothed Sequence Plotted

creasing values from one to eight. The resulting correlation figures (Operational .6429, Problem Solving -.6429) indicate that the increase in Operational messages and the decrease in Problem Solving messages were both significant at the .025 level confirming Hypothesis IIb and further indicating the unforeseen upward trend in Operational type messages. The Organizing category, however, did not significantly correlate with time. This was to be expected, however, since the smoothed plot indicated that this message type had stabilized and reached a level which was apparently functional on this system lending some support to Hypothesis IIa.

A review of these results reveals that the trends that were established seem consistent with the organizational context described earlier. Operational messages apparently increased because they were required by participant A,

the nominal superior of the regional managers. The other participants were required to utilize the system for this function. It seems logical to assume that the downward trend of the Problem Solving category could be primarily due to the impact of the system itself because problem solving activities require a high degree of interaction which the system did not supply. Only the initial phases of problem solving such as information gathering and the final phases such as notification of non-routine decisions appear on the system. The plateau reached by the Organizing message category also seems to be an effect of the system itself. The fast and relatively permanent (compared to telephone calls or personal conversations) response of the computer based memorandum system seemed to make it ideal for organizing, setting policy, reporting decisions, and keeping track of organizational functioning.

Interaction Patterns

To look at the pattern of interaction between the members of the network in relation to message categories, the non-parametric, multidimensional scaling program KYST was used to generate the patterns (Kruskal and Wish, 1978). Proximity values were first obtained by processing the total raw frequencies of a from/to matrix of messages by category sent during the operating phase of the study using a procedure suggested by Norton (1979). The total number of messages of each type sent by each dyad,

$$A = \sum_{i=1}^2 (a_i),$$

was calculated. An adjustment factor for the degree of reciprocation was then calculated,

$$I^{adj} = 1 - \sum_{i=1}^2 \frac{|a_i - \bar{a}_i|}{A}$$

Finally, an adjusted figure for the interaction of each dyad was arrived at in the following fashion, $A^* = I^{adj}(A)$. These values served as input for the KYST program. A plot was derived from each set of proximity values for Organizing and Problem Solving message types. No proximity values could be obtained, however, from the Operational communications sent during this period since all of these messages were sent to participant A and there was no reciprocation. The two patterns obtained were then compared to each other to ascertain if differences in utilization patterns existed for the different categories of communication.

The pattern of interaction between the six participants did differ according to the function of the message types they were sending. Looking at the Or-

ganizing messages first, it is clear that the interaction pattern here is simply a "wheel" pattern where messages flow into the center to a coordinator, participant A, and then back out to the other participants (Figure 2). Additionally, it can be seen that a secondary hub for this type of information is participant B who is in close contact with A.

Looking at the Problem Solving interaction, the picture is one of a problem solving triad (A, B, and D) who handle the problems, asking for information and transmitting decisions to other participants (C, E, and F) (Figure 3). The bulk of the interaction is still between A and B, however. These two patterns tend to support Hypothesis Ib.

It is likely that the formation of these patterns is not directly related to the computer based memorandum system itself but rather to other organizational factors. It is interesting to note, however, that the system apparently did not encourage equal discussion as might have been expected, between all its geographically separated but electronically close participants. Instead, the traditional wheel pattern seemed to remain in effect.

Future investigations should include communication satisfaction surveys, communicator style measures and managerial style measures in an effort to explain the patterns in terms of the participants and climate of the organization. This kind of data would be helpful in determining if the system or its participants were the major factor in deciding patterns of interaction.

There were 520 individual messages sent during the operating phase (312 discrete messages sent to 520 individual recipients). Of these, 283 were Organizing, 195 were Problem-Solving,

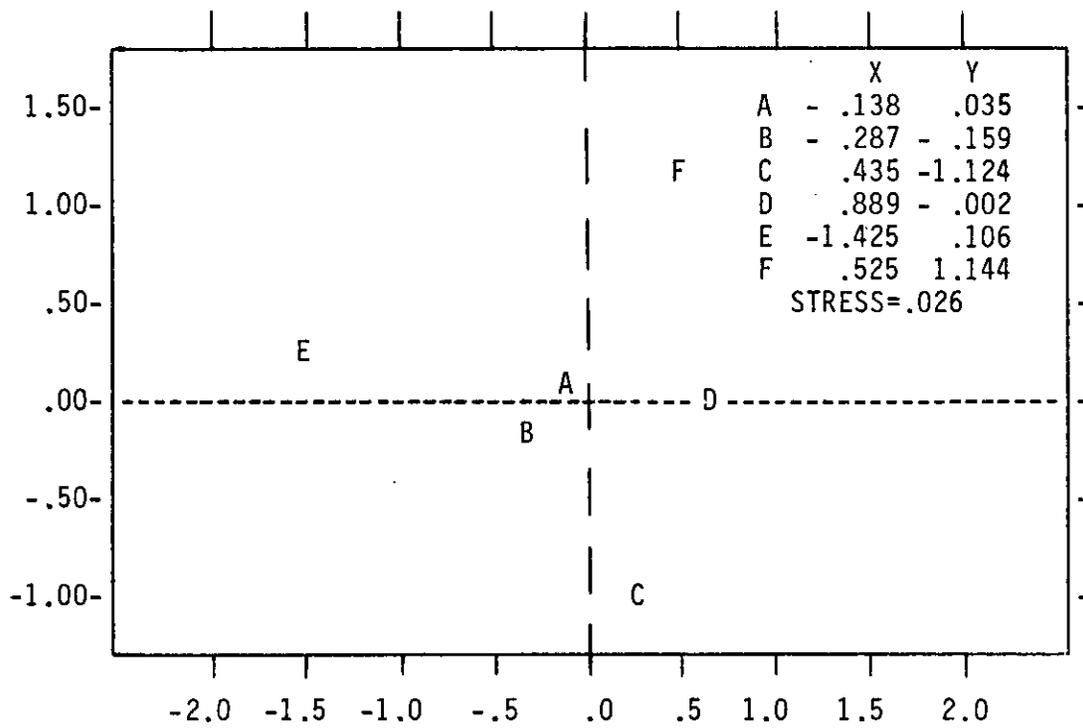


Figure 2. Organizing Proximities Plotted by Kyst

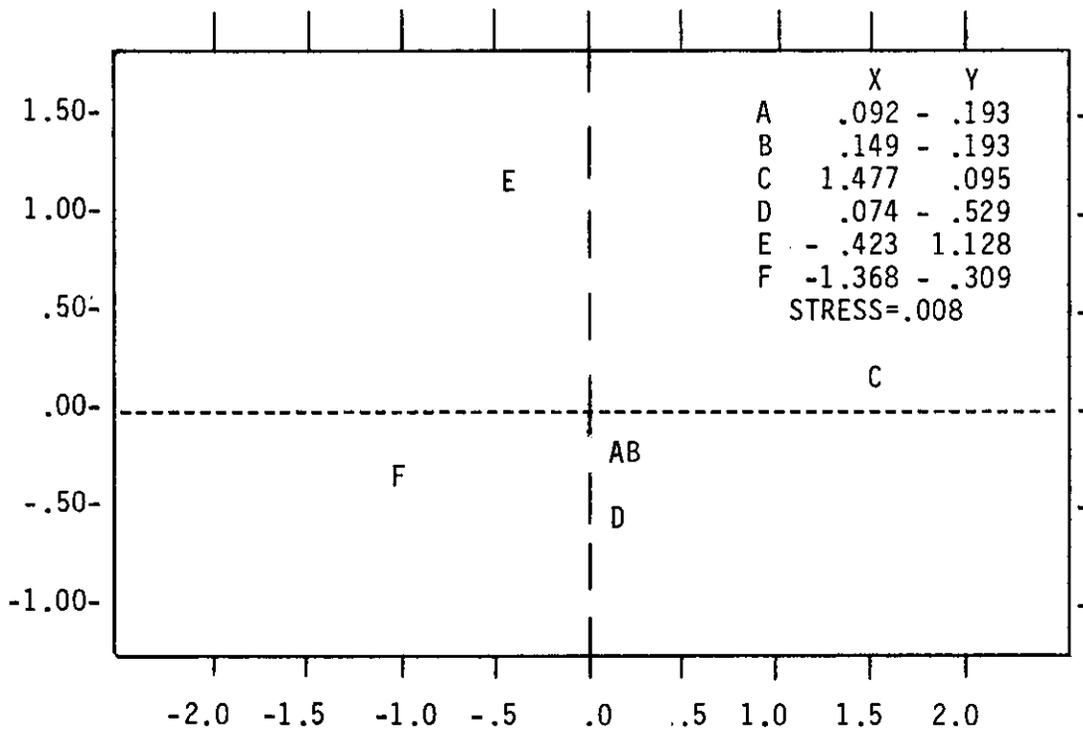


Figure 3. Problem Solving Proximities Plotted by Kyst

and 42 were Operational (routine reporting) messages.

CONCLUSION

This study has dealt with the implementation and use of a COA memorandum system in a manufacturing company among a small group of regional managers. As such, the results are not necessarily generalizable to other circumstances and situations. However, the category system devised here should be extremely serviceable in future studies of computer based communication systems. The specific, organizationally functional categories are reliable to code and generalizable to any form of mediated communication where messages may be saved for examination. It needs to be noted, however, that the category system created here needs further validation before it can become an accepted tool for the researcher.

An important point to note here is that this study is based on an examination of the actual messages sent by the managers to each other rather than on self-reported data. The actual utilization of the new channel of communication rather than the perceptions about channel usage have provided the basis for the conclusions drawn here.

One particular caution must be noted at this point concerning the results reported here. There was no opportunity in this study to ascertain the pattern of communications between managers in this organization prior to the introduction of the computer based memorandum system. In the perfect research situation, the category system would first have been used to analyze the message trends of the paper memorandums and telex communication between the managers. This opportunity, however, was not open to the researcher. It should be noted, therefore, that the introduction of the COA

memorandum system may have disrupted the normal flow of communication between the managers. The results of the analysis of the message patterns during the initial phase and operating phase of the study could represent a reestablishment of the disrupted patterns rather than the establishment of new patterns caused by the introduction of the new channel of communication. Only additional studies with the opportunity to include such baseline information can confirm the conclusions drawn here.

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