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ABSTRACT

Memoranda 17 through 21 are included in Volume 8. (The general nature of the memorandum and related documents are described in SO 005 892). Daniel E. Costello offers a selective review of the literature relating to educational decision processes. Tom Deats provides an essay on reflections and comparisons of knowledge utilization in education studies and in pilot study #1. The paper briefly discusses generic conceptual differences and similarities in "problem naming" between pilot study #1 and other studies dealing with information utilization. Next, C. W. Churchman explores statistical methodology of information systems and illustrates the bad fit of traditional evaluation techniques to operational strategies. The memorandum paper by Herbert Menzel, provides a framework for examining the role of communicational channels in the propagation of innovations, calling attention to the diversity of communication institutions that are available for innovation messages, discussing their differentiating characteristics, and considering the relative importance of these channel characteristics changes in the course of time. Lastly, Malcolm S. MacLean, Jr. examines creativity and knowledge utilization. (Author/SJM)

Final Report

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Toward a Reconceptualization of Knowledge Utilization in Education

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Research Memorandum #17:

"Literature Review of Educational Decision Processes"

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Literature Review of Educational Decision Processes

Daniel E. Costello

This paper is a selective review of the literature relating to educational decision processes (Addendum #1, page 2, path 1-b). Examples of special concerns include: categories of educational decision-makers; the context(s) of educational decisioning; role perceptions and values of participants in educational decisioning; and information sources, information systems, and communication systems utilized by educational decisioners, with concern for their assessment of the relative utility and credibility of such sources, media, and systems.

Categories of Educational Decision-Makers

In Decision Making and Schools for the 70's (National Education Association: Washington, D.C., 1970. PP. 11-25), William L. Pharis (et al.) examines the decision-making structure as distinguished from the decision-making process. Pharis states:

"The existing framework for educational decision-making in the United States which has evolved over many generations consists of two basic elements--the legal and the extralegal.

"The legal organization consists of formal governmental bodies and the officials at federal, state, and local levels who exercise constitutional, statutory, and judicial authority in regard to education. The extralegal or informal structure is composed of those persons, groups, and organizations which are not part of the formal, legal organization, but which do have sufficient impact on the legal framework to influence its decision-making processes. The two systems are interdependent. In fact, there is such continuous interaction between them that the modification of one system affects the other.

"In recent years, the federal government has become more directly involved in education at all levels, and questions are arising in regard to U.S. authority with respect to education.

"In legal theory, the fundamental authority in the legal structure for education is the state.

"Local school boards are created by the state to carry out educational functions at the local level.

". . . the state, having control over education, grants certain specific powers to local school districts. Acting for the state, the local agencies must, in the absence of state laws to the contrary, render the formal decision on educational policies within the agencies jurisdiction.

"The extralegal decision-making structure is composed of those persons and groups which are not part of the formal, legal framework for decision-making but which do influence decision-making."

Formal interest groups comprising the extralegal decision-making structure, as seen by Pharis, include the:

Chamber of Commerce

National Education Association

American Legion

National Congress of Parents and Teachers

AFL-CIO.

Informal influences of the extralegal structure are viewed by Pharis as subtle and difficult to identify. A term commonly used to describe groups in the informal category, as seen by Pharis, is "power structure." He uses the civil rights movement as an example of the informal influential groups comprising this extralegal decision-making category.

In "Community Decision Making Systems" (ERIC document 054 406 November, 1970), Alan J. Hahn describes the structure of decision-making in this way.

"The major types of decision-making structures are: mass participation, monolithic, and polylithic, and pluralistic. Since monolithic and polylithic structures are the most common, they are further subdivided into cohesive, executive-centered, competitive, and fragmented structures. The 10 stages in the community decision-making process are:

1. interest recognition
2. convergence of interest
3. formulation of proposals and alternatives
4. development of strategy
5. organization of political support
6. establishment of relationships with authoritative decision-makers
7. authoritative consideration
8. decision
9. policy implementation
10. interest recognition."

On a somewhat similar but different slant from Hahn's, William J. Gephart ("Decision Levels: A Neglected Factor in Cost-Benefit Analyses" Educational Technology 11:60-1 September, 1971) writes on the concept of decision-making levels, by stating:

"The institutional level is one level of decision-making in a situation that has several levels. Two others can be illustrated with ease:

the individual decision level and the societal decision level. Other decision levels may exist in some decisions.

"The failure to consider decision levels other than that of the institution is the oversight that is often in the writings on cost-effectiveness or cost-benefit analysis.

"What is the advantage of considering decisions from a multi-level point of view.

"First, decisions made at one level are not insulated from the other levels. Second, the assumptions that decisions have but one level leads to the collection of inappropriate and inapplicable information."

A relationship seems to exist, then, between the complexity of educational decisioning and the range in both diversity and numbers of educational decision-making categories. A problem which could be posed is whether educational decisioning is complex because of the kinds of decisions (nature of the problems), or because the categories of educational decisioners are so diverse and great in number. Whatever the reason may be, Pharis addresses himself to the direction which the decision-making structure for education in the 70's will be. This structure upon which Pharis elaborates will now be presented in the next section on the context(s) of educational decisioning.

Context(s) of Educational Decisioning

From Pharis (op. cit., pp. 30-1).

"Decision-making will take place within the present framework of federal, state, and local government. Formal and informal interest groups, as well as individuals with varying degrees of political power, will continue to compete with each other for positions of decision-making authority.

"Although the apparatus for educational decision-making in the 1970's may look familiar on the surface, it will function quite differently. The locus of decision-making authority will shift further away from local school district levels to state capitals and Washington, D.C. Groups that not only recently have emerged as viable political forces will solidify their positions in the decision-making structure. New groups, and new coalitions of present groups, will form and press for acceptance of their demands.

"An old political axiom holds that as more groups compete for attention in decision-making, consensus among various groups declines, political conflicts rise, and decision-making authority flows toward the center of power. New groups, in terms

"of political power--students, teachers, black citizens--have risen to challenge the decision-making authority of older, established groups. . . . Consensus among groups is difficult to attain. More and more frequently the conflict over education decisions cannot be contained at local government levels. Sometimes it can be contained only with difficulty within states.

"More and more often the ultimate decision must be made by the state legislature or the Congress. This trend will undoubtedly continue."

Role Perception and Values of Participants in Educational Decisioning

There would appear to be an abundance of material available as to role perception and values of participants in educational decision-making. The review which we have conducted reveals this to be true. Prior to presenting this documentation, we want to state a parallel which we believe exists between the abundance and diversity of educational decision-making categories and the broad range of role perceptions and values desired by participants in the decisioning process. We find it neither inconceivable nor surprising that the two complement each other: complexity in educational decisioning resulting from the diversity and large number of educational decision-making categories, on the one hand, and a milieu of views on the role and value perceptions of participants

in educational decisioning on the other hand. We will now cite literature further explaining supporting our position.

In Information-Decision Systems in Education (Itosca, Illinois: R. E. Peacock Publishers, Inc., 1970), Andrew and Moir address themselves to this area of decisioning as evident in the following exerpts from their book. However, the first statement presented is by Howard B. Camsey, Commissioner of Education, State of Minnesota.

> "Educational decision making can no longer depend solely on past experience or mystic--it demands viable information in the right hands at the right time. Decision makers in education must avail themselves of more sophisticated information processing systems if they are to operate effectively." (p. v)

> "Power is the means to influence people and events. Information influences people and events; hence, information is power. This fact has been recognized implicitly for centuries, but in the past ten years the explicit study of this area has begun to yield results. We are now observing attempts at more systematic formulation of decision-making activities and the design of information systems to provide timely, accurate input to the decision makers. The information systems have the very important by-product of providing data for research which leads to formulating new alternatives for the decision makers." (p. vii)

"The purpose of any information system is merely to satisfy the needs of the organization of which it is a part. Thus, it is normally nothing more than a tool for adequately controlling and guiding production of services or products for which the organization exists. Only in extremely rare cases is the organization's primary purpose to provide information per se, and in that case, the information system's only purpose is still to enhance the production of an acceptable service, namely the information itself. It should, therefore, be ascertainable that any information system is not an end in itself, but merely a means to the end for which the organization exists.

"We have already established that information systems exist by the mere fact that an organism exists. In a biological sense, organisms which have neither the capability to adapt nor the requisite information system to notify them of the requirement to adapt soon become extinct. In the context of information systems used in this book, man or organizations of man which do not possess an adequate information system either (1) become bankrupt if they are dependent upon the economic considerations for their existence; (2) no longer serve their intended functions and may be promulgated unnecessarily and for

an undue length of time if they are a bureaucratic establishment; or (3) simply fade away if they are a social organization that cannot meet the needs of their members." (p. 3)

"A decision maker has been defined as a 'man at the moment of choice.' The word 'choice' implies two things: (1) the freedom to make such a selection, and (2) a set of alternatives from which to choose. There is also the implication that the decision maker has a criterion or a set of criteria on which to base his choice. These criteria are generally referred to as objectives." (p. 6)

In the same work, Andrew and Moir comment on the importance of the decision-maker considering the environment in the problem situation at hand. The environment, as seen by Andrew and Moir, is comprised of those aspects not under the direct control of the decision-maker. In economics, these aspects are referred to as exogenous variables. Andrew and Moir state:

"The environment of a problem situation is made up of the aspects of the problem which are not considered under the direct control of the decision maker. In economics these are often called the exogenous variables. This environment generally interacts with the course of action which is chosen by the decision maker. For example, one environmental

"variable that influences the effectiveness of a given curriculum is the home life of the child who is in in this curriculum. The reaction of the child to various techniques in curriculum and teaching is highly dependent upon this environmental variable. The courses of action available to the decision maker are often constrained by this environment. The short-term decisions which are made by an administrator must be made in the confines of the existing buildings which make up the school system. In the short run (less than a year), it is impossible to build and occupy new structures.

"It should be noted that the noncontrollable environmental variables in one problem situation may be controllable in another. This is particularly true when one considers the time horizon or time span of the decision noted above. For short-term decisions many of the variables are fixed and cannot be controlled. However, in the long run many of these variables can be influenced by action taken by the decision maker or some other body which he influences. Examples of this are quite numerous in the field of education. The funds available from local sources for the coming year are fixed by the school board, the tax structure, etc.; however, with

imagination and hard work it is often possible for the administrator and his staff to influence the availability of the funds for education in future years.

"Decision makers too often neglect the environmental aspects of the problem. The outcomes of a system can be thought of as the product of the interaction of the chosen course of action with the environment in which the system is operating. Therefore, it is obvious that the success or failure in meeting the system objectives is dependent not only on the choice which the decision maker makes but also the state of the environment in which he is operating. Decision makers must be ever cognizant of the environment in which they are operating." (p. 13-14)

Techniques of decision-making are by no means static. Value and role perceptions change in conjunction with society. A useful description of the traditional and modern techniques of decision-making is offered in outline form by Herbert A. Simon (The Shape of Automation for Men and Management. New York: Harper & Row, 1966, p. 62).

TRADITIONAL AND MODERN TECHNIQUES OF DECISION-MAKING

Types of Decisions	Decision-Making Techniques: Traditional	Decision-Making Techniques: Modern
Programmed: Routine, repetitive decisions Organization develops specific processes for handling them	1. Habit 2. Clerical routine: Standard operating procedures 3. Organization structure: Common expectations A system of subgoals Well-defined informational channels	1. Operations Research: Mathematical analysis Models Computer simulation 2. Electronic data processing
Nonprogrammed: One-shot, ill-structured novel, policy decisions Handled by general problem-solving processes	1. Judgment, intuition, and creativity 2. Rules of thumb 3. Selection and training of executives	Heuristic problem-solving technique applied to: (a) Training human decision makers (b) Constructing heuristic computer programs

The accountability factor in decision-making is discussed by Dr. William G. Monahan, formerly of the University of Iowa College of Education, and now Dean of the College of Human Resources and Education at the University of West Virginia. "Some Limitations and Cautions in the Use of Quantitative Techniques in Decision-Making" (Educational Technology. 9:31-5, September, 1969), Dr. Monahan states:

> "Let me begin by pointing out that the most precautionary aspect surrounding the use of quantitative techniques in support of administrative decisions is an obvious one; I would put it in this fashion: since computational procedure, processing equipment and technique are, in and of themselves, inert, nonhuman phenomena, only the man can be held accountable for the decision.
>
> " . . . I want to return to the caution that I expressed at the beginning of the paper--that only men are accountable for decisions, regardless of how they are arrived. The implications of this fact of human accountability are primarily qualitative; that is, judgments regarding the value of any decision, plan or procedure cannot be easily built-in to any quantitative system, if they can be built-in at all."

"Value Decisions and Continuing Education" (Peabody Journal

of Education. 47:67-71, September, 1969). is an article by John Martin Rich of the University of Texas. Dr. Rich states:

> "Making intelligent value decisions, both within formal education and in one's larger expanse of life's activities, involves a process of finding renewed strength by seeking the locus of evaluation within ourselves.
>
> " . . . the most critical dimension of one's continuing education is the value dimension, for all decisions regarding one's direction in life, his career, and his relations to others are value decisions.
>
> "Secondly, a knowledge of the process of making such decisions may enable the individual to make them more intelligently.
>
> "Finally, if one is to grow and develop throughout life--in his career and as a person--he must provide prime consideration and become more acutely sensitive to the critical importance of value decisions."

For a final contribution in this section on role perception and values of participants in educational decisioning, we cite selections from a work previously mentioned (Pharis, et. al., Decision-Making and Schools for the 70's). Commenting on the decision-making process, Pharis states (pp. 5-6):

"One of the most persistent and widespread myths in American culture is the idea that a good decision maker is an instant decision maker.

"Decision making should be a rational process based on reason, not an emotional reaction.

" . . . it is vital to distinguish between a decision and the decision making process.

"All one needs to make a decision is to have authority. A decision is not necessarily good, bad, or indifferent. It does not require information, knowledge, expertise, or accountability. Some of these may accompany the decision but they are not prerequisites.

"The decision-making process, on the other hand, requires that certain steps be followed. These steps may be followed in a rigid, self-conscious manner, or they may be abbreviated so much that they are almost unconscious actions. But in either case, sound decisions are the result of a sound process.

"The decision-making process consists of the following distinct steps:

1. Informal problem identification
   (recognition of the need for a decision)
2. Information gathering

3. Problem identification

4. Identification of alternatives for action

5. Alternative projection

6. Decision selection

7. Decision evaluation."

As indicated in the beginning of this section, an abundance of views have been expressed on role and value perceptions in decision making. Among the many views which we have surveyed in the literature, we have chosen the ones presented here as significant for the overall task of this paper.

We can now move into the literature on information and communication systems used by educational decisioners.

Information Sources, Systems, and Communication Systems Utilized By Educational Decisioners

There are a number of writers who have put together material on information and communication systems available to educational decisioners. Prior to describing specific educational information systems, we will present a selection of statements philosophizing or speculating on the need and purpose of educational information systems as seen by these writers.

John Rich (Conflict and Decision. New York: Harper & Row, 1972, p. 3) comments on the abundance of information and criticalness of this condition:

"Critical issues abound in our institutions--and our educational systems have their share. Available information is voluminous and it seems to be increasing geometrically each year. To attempt to assimilate reams of information about each issue would be both time consuming and futile; the amount of existing data is too great and it is expanding far too rapidly. Since not all of the data can be mastered, some process of selection is needed. But even after criteria for selection are chosen, it is necessary to organize the material so that it is intelligible. Moreover, it is desirable to analyze and evaluate the organized material in order to arrive at supportable conclusions. Thus, it is not enough merely to read widely; one needs to be able to read selectively and to analyze and evaluate materials so that an intelligent position can be formulated.

"One way that this task may be accomplished is to establish a flexible framework for analyzing the issues."

Addressing himself to the limitations of the computer in educational decisioning, McGrath (Planning Systems for School Executives. Scranton: Intext Educational Publishers, 1972, p. 191) writes:

"A decision-making system provides for identifying, processing, storing and retrieving information. Obviously, this describes a computer system. However, most computer systems are relatively limited. This is to state that they are limited to quantifiable variables and limited to a mere binary language or code. Most of the events in the problem-solving and decision-making domains of school administration require a much more elaborate code in order to accommodate the nonquantifiable inputs. Our language is notoriously inadequate and subject to entrophy . . . ."

From a work cited earlier, Andrew and Moir comment on the need and purpose for information, among other aspects:

"In order for any information system to exist, there is usually a request or requirement for information.

"The primary purpose of an information system is to aid in decision making, either in the present or in the future, by one or more persons within the organization or in the hierarchy or organizations related to the organization's functions.

"There are three main phases in an information system--(1) the data collection or input, (2) the data manipulation or processing, and (3) the information dissemination or output.

"Presence of 'information' does not necessarily guarantee better decisions. This becomes apparent when the decision-making process makes erroneous use of the information. The tyranny lies not in the numbers which are by themselves amoral, but in the interpretation and extrapolation of information of doubtful validity.

"Information whose quality, comparability, and integrity are open to question may be worse than no information at all. As Will Rogers said, 'The trouble with most people isn't what they don't know, but what they know that isn't so.'

"In examining information systems in the educational decision-making process, we find that most of the information has a structural basis. In other words, most of the information is collected, manipulated, and disseminated primarily because the 'system' or establishment demands it.

"The maximum benefits of information systems accrue when the individual subsystems are properly integrated. The integration itself forces the systems designer to make some compromises but it also allows the association of information in such a manner as to yield better information at a lower cost in the long run."

In the final portion of this section, we will present specific information systems available in educational decision-making. The first system is selected from a book by Dr. Van Dusseldorp (et. al.) of the University of Iowa College of Education (Educational Decision-Making Through Operations Research. Boston: Allyn & Bacon, Inc., 1971, pp. 134-35). Dr. Van Dusseldorp writes:

> "PPBS (Program, Planning and Budgeting Systems) is in many ways more a decision-making process than it is an Operations Research tool. PPBS utilizes the mathematical analysis of Operations Research in the decision process, but PPBS is not a tool that can be applied to a specific problem situation. In this sense, it is more of a planning tool than a specific problem solution oriented tool."

A system named MAPS is described by Halpern ("The MAPS Way," Education Canada, 11:47-55, September, 1971), director of research at the Ottawa Board of Education. Halpern writes:

> "A Management Information System is simply the label applied to a data base which is deliberately developed to assist management decision-making. There are four aspects to such a data base:
>
> What decisions will be required?
>
> How shall the necessary information be obtained?
>
> How is the information to be stored?
>
> How rapidly and in what manner will the information be retrieved?

(Areas mentioned)

"1. predicting decision needs

2. information collection

3. information storage

4. information retrieval

5. primary mission boundaries

6. system analysis

7. identifying objectives

8. identifying alternatives

9. evaluation

10. sequential decision-making."

A concise booklet on information dissemination is one compiled and edited by the Iowa State Department of Public Instruction during the 1971-72 academic year. Entitled INFORMS (Iowa Network for Obtaining Resource Materials for Schools), the program is a new service of the DPI for school districts in Iowa in need of information for the planning of educational programs. A pilot project for information dissemination in Iowa, INFORMS may be described by the following exerpts which we have selected from the booklet referred to above.

> "In an effort to respond to the growing need of educators to have research information in usable form and available for planning educational programs, the Iowa State Department of Public Instruction is initiating a new service to school districts. This new program is made possible by a federal pilot project recently

granted to the State Department of ..lic Instruction entitled INFORMS (Iowa Network for Obtaining Resource Materials for Schools).

"The goal of the Iowa project INFORMS is to increase the level of knowledge of educational curriculum and instructional methods available as a result of research and development. This information will provide decision makers (local school personnel) with a number of alternatives so that local school personnel can select the curriculum and instructional methods that would best serve the needs of their school district.

"Research material will be retrieved from the data bank in the Educational Media Section, Department of Public Instruction. The majority of this information will include:

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Iowa's Regional Educational Media Centers."

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Education and its improvement are based on communication. To furnish leadership and support to strengthen educational communication throughout the country the Office of Education has established a NATIONAL CENTER FOR EDUCATIONAL COMMUNICATION (NCEC).

Although communication is as old as man himself, today we have new means and methods of communicating. NEW DIMENSIONS in educational communication have led to a NEW PROFESSION with NEW TERMINOLOGY . . . information transfer-networks-dissemination-utilization-installation-feedback . . . and NEW ROLES . . . disseminator-field/change agent-retrieval specialist-gatekeeper-knowledge linker. It is the goal of NCEC to give a NEW DIRECTION to educational communication and provide a unique national resource for American educators.

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Accelerate the spread of exemplary programs and validated practices.

Provide information nationally about validated exemplary programs.

Increase interpersonal communication about improved practices.

Achieve faster nationwide use of tested products from major educational developm[illegible].

Facilitate commercial marketing of ma[illegible] through the OE copyright program and the Publishers Alert Service.

Develop national communication linkages for effective application of knowledge and improved practices.

- Encourage State-Federal communication planning and liaison activities.
- Support pilot communication programs for serving local needs.
- Provide technical assistance for development of dissemination and application programs.
- Coordinate OE communication efforts with those of professional, commercial, and other private organizations.

Assure access to current educational knowledge.

- Maintain information storage, retrieval, and dissemination services through the Educational Resources Information Center (ERIC).
- Utilize the information resources of the OE Educational Materials Center (EMC) with its display of books currently available for schools and teacher education programs.
- Provide new services through the OE Educational Reference Center (ERC), a model one-stop information center with reference and demonstration services and on-line capabilities.
- Support pilot regional centers to provide computer searches of the ERIC report literature for local schools.

Make ERIC master ma[illegible]pe files available.

Disseminate interpreted infor[illegible]on priority educational topics.

Support information a[illegible]ctivities through interpretive summa[illegible]ibliographies produced by the ER[illegible]nghouse.

Continue the OE Target[illegible]lications Program for decision makers and [illegible]tioners with emphasis on Putting Research I[illegible]ducational Practice (PREP) for widespre[illegible]emination of information at low [illegible]

Develop and articulate OE comm[illegible]tion efforts.

Support Research and Deve[illegible]ment in educational communications systems.

Develop and test co[illegible]on models and strategies.

Coordinate planning a[illegible]evelopment of OE communication resour[illegible]s."

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Conclusion

In conjunction with the guiding question for this paper, we have presented research on various facets of educational decisioning. Decision theory in education seems vague. As Edwards and Tversky (Decision Making. Middlesex, England: Penguin Books, 1967, p. 11) indicate: "Decision theory is a complex body of knowledge developed mostly outside psychology by economists and mathematicians in an attempt to describe how decisions should be made." Based on our research to this point, we would recommend that public school educators look to other fields and disciplines (i.e., economics, mathematics, government and business) in an attempt to build and develop additional views of educational decisioning.

Decision-making in any field requires the use of data. In education, data abounds from all directions, so that what is needed by the educational decisioner is a means or criteria for data selection. One such criterion for the educational decisioner is to choose data

not only of the tactical or metho[illegible]re, but t[illegible] in searc[illegible] of data of a strategic nature. T[illegible] the user's criter[illegible]a in problem-naming needs to be includ[illegible] in [illegible] a system.

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Project: NCEC Knowledge Utilization Study

Research Memorandum #18

"How Friendly Are the Natives?: Reflections and Comparisons of Knowledge-Utilization-in-Education-Studies and Pilot Study #1"

Originator: Tom Deats, Research Assistant

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How Friendly Are the Natives?: Reflections and Comparisons of Knowledge-Utilization-in-Education-Studies and Pilot Study #1

by

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Introduction

The explorer can really never know in advance whether the natives are friendly--for, as Geoffrey Vickers once pointed out, the "friendliness of the natives is not a fact which can be stated or predicted but one which will be created by a unique act of communication in a unique context in the future." The educational "information" system builder is in much the same situation as Vickers' explorer: the "information" system builder would like to know whether the "natives" (educators) are friendly toward such systems. But although the attitude of educators to educational "information" systems and educational research at a particular moment in time is theoretically a fact which is knowable--no outsider (e.g., the system builder) can "discover" the empirical fact without altering it to some degree.

What the explorer and the educational "information" system builder want to know is how to elicit a favorable response from a particular population. For Vickers' explorer this depends

partially upon the "information" which the explorer's appearance will convey to the natives, and partially upon "the system of interpreting such appearances which the natives' past experience will have left on them at the time the explorer appears."[2]

So too is the educational "information" system builder faced with the empirical fact that the response of educators to any "information" he may want to disseminate is not only dependent on what "awareness" of the "information's" existence might convey, but also on the "appreciative systems"[3] educators have developed for interpreting such systems and educational "information" in a particular historical context.

One of the primary deficiencies in much of the existing work on educational "information" systems and "information" dissemination stems in large part from what Rapoport has called "premature theoretical attacks on pressing problems."[4] Such approaches have tended to lead to implicit or "explicit formulation of casual chains that one is impatient to establish in the solution of the problem . . . because the problem is obvious and pressing. it permits a verbally simple formulation."[5] Thus has the process of human communication often become conceptually linked in a casual chain of a priori "stages" or steps which are viewed by some as necessary and sufficient "causes" for "information" dissemination and utilization. This was particularly true in many of the early rural sociological studies on American agricultural practices.[6]

However, even though some of the developers of those early diffusion models have called for a re-evaluation of the basic premises

upon which the "stages" models were based,[7] much of the current educational "information" diffusion and dissemination literature still by-and-large accepts the older models and their assumptions as adequate.[8]

When the failure of a given population (e.g., educators) to utilize "information" from a particular system (e.g. ERIC) is viewed as a problem that needs immediate attention, it becomes all too easy to seek "causes" which will not only "explain" what the problem "is" but also how to "solve" the problem. It is likely that largely because so many of those involved in the educational "information" dissemination business have taken "the problem" of "information" utilization as an "obvious communication problem," that so many of the efforts to solve "the problem" have failed.[9]

As Thayer has pointed out, "The problem which we address ourselves to will be the one we have named, not the problem. If we say that the problem is one of 'knowledge utilization,' then this is the way we address the situation. If we were to say that the problem was that the 'producers' simply do not produce the 'knowledge' that the 'consumers' want, and ask for, then we would address ourselves to the situation quite differently."[10] In fact, one NCEC committee noted in 1970 that with changing conditions "what is today conceived of as a 'dissemination' problem would become instead an 'information seeker's' problem. That is, the question would then become 'How can we develop and deliver the information and products they are requesting?' rather than 'How

can we get them to use the information and products we are now developing and delivering?'"[11]

As noted in the Final Report on Pilot Study #1,[12] a review of the various newsletters, brochures, booklets, etc., of the Educational Resources Information Center (ERIC) system clearinghouses and their related regional laboratories, material centers, etc., indicated that many of those actively involved in the development and dissemination of educational research "information" assume or imply that increased "awareness" in the "target audience" is closely related to increased utilization.[13] It was to test the viability of such assumptions that Pilot Study #1 was undertaken.

Often the low levels of immediate "information" system utilization by educators is viewed by the educational "knowledge brokers" as a simple communication problem which can be largely overcome merely by developing awareness of existing systems, programs, and services. In fact one clearinghouse administrator has suggested that the major failure of the ERIC system thus far has been the failure to create widespread "awareness" of the system among American educators.[14] But as other researchers have clearly pointed out, "Mere dispersal of concepts or sending of information to educators does not assure utilization."[15]

The primary hypothesis of Pilot Study #1 in the NCEC Knowledge Utilization Study was that even if educators were "aware" of the existence, services, and products of ERIC, this awareness would not "significantly" increase the utilization of the system by educators. In short, "awareness" of the ERIC system (as one

example) is not likely to be a sufficient condition for utilization of that system.

It is the purpose of this paper to briefly discuss the generic conceptual differences and simularities in "problem naming" between pilot Study #1 and other studies which have ostensibly dealt with the "same" problem(s).

Communication Problems

It was pointed out in the Interim Report of this knowledge utilization study that naming "the problem" in educational "information" and "knowledge" utilization studies may well be "the problem." In that report it was concluded that:

1) The key problem is not that of 'transfer' of information, but of certain fundamental paradoxes and inconsistencies between what we say vs. what we do in American education; and
2) It is illusory to talk about such things as 'communication' problems in 'knowledge' utilization in education, the 'cost effectiveness' of informational resource systems, etc., before certain basic strategic decisions have been made.[16]

In the study of "communication problems" it is important to determine what one wants to mean by "communication" and what will or does constitute a "communication problem." If it is useful to view a situation as a "communication problem" it then becomes

important to distinguish between tactical and strategic levels of analysis.[17] A major fault of many studies of educational "information" systems and "knowledge" utilization processes, is the failure to develop clear conceptual distinctions between communication systems and data systems, between tactical and strategic levels of analysis, and between organizational behavior and individual behavior.

Pellegrin, for example, has noted that "we have not traditionally distinguished with care between individuals or persons as sources of innovation and organizational sources, or between innovative or creative individuals and innovative or creative organizations."[18] Rogers wrote in 1962 that in educational research the main unit of analysis has traditionally been the school system, whereas in rural sociology, the traditional main unit of analysis has been the individual.[19] As Rogers pointed out in another context, "we have tended to view schools as if they were farmers, innovation-wise."[20] As noted earlier, the fundamental conceptualizations behind such U.S. Office of Education-sponsored projects as ERIC and the development of "knowledge linkers" as urged by Havelock and others, appear to have been adopted from the early rural sociological models developed during diffusion studies of American agricultural practices.

There is a general tendency in education literature to treat organizations as individuals rather than as organizations of individuals. Partially as a consequence of this, in much of the educational literature the individual human beings within social organizations such as school systems are conceived of as so many replaceable and

interchangeable "parts" which comprise the "whole" of the system. Also, partially as a consequence, the mechanical, linear, unidirectional models of human communication processes and information utilization processes which are utilized in many studies, tend to envision "information" and "knowledge" as products or commodities which can be transferred and/or merchandised not unlike soap or agricultural produce.[21]

In reviewing the literature on educational "information" dissemination and "knowledge" utilization it soon becomes apparent that there are several generally shared assumptions and conceptual orientations in most of the existing literature. These are outlined below:

1) There is, generally, a shared assumption that "information" is a rather stable commodity which can be transferred from person-to-person, from place-to-place, from system-to-system, across different temporal orders and be "utilized" by different people and organizations in much the same manner as physical artifacts.

2) There is a common conceptual confusion of data systems with communication systems which results in the assumption that the available technology and techniques determine the effectiveness and the design of communication systems; and the related conceptual failure to recognize that human communication systems are behaviorally inductive and are determined by the

generic process of communication rather than by the technology.

3) The assumption is fairly wide-spread that if "correct" information is available, "correct" (i.e., successful) decisions will be made.

4) It is generally assumed that "correct" information can be specified in advance for many if not most educational situations and activities within an educational system, primarily because one can establish "correct" goals and criteria for education.

5) There is a generally held belief that the failure of many educators to use much of the current educational research data is a communication problem which can be solved through tactical procedures such as repackaging "messages" in different media.

6) There is a general tendency in the literature to view "more" communication as intrinsically "better" than "less" communication "between" individuals in educational systems.

7) An assumption is often made that because a particular innovation or method was successfully adopted in one system, that "correct" decisions were made and hence, these can be used to ascertain the success or failure of similar methods or innovations in the same system at different times, or even in other systems.

8) There is a commonly expressed assumption that there are certain specific "variables" within a school system's environment which, regardless of the specific individuals in the system, would, if altered, make the system more "viable."

9) There is a general assumption which contends that planned alterations and modifications within educational systems "change" such systems in the "best" way rather than assuming that the "best" change might occur without or despite such planning and controlling activity.

10) And, perhaps most importantly, there is the fundamental assumption that the setting of specific and determinate goals or criteria for information and knowledge "utilization" is not only a virtue, but that it is possible to establish such criteria for others than oneself.

By comparing and contrasting some of these commonly shared assumptive qualities in the literature with those implicit and explicit assumptions of Pilot Study #1 it may be possible to indicate important strategic differences between the various approaches to "communication problems."

Strategic and Tactical Communication Competencies

Thayer has argued that there are "two levels at which a strategic decision must be made: first, that of determining whether

a given problem is a communication problem or not; and second, that of determining whether a given communication problem is a tactical or a strategic one."[22]

In this paper, as in Pilot Study #1, human communication competencies are conceived of as involving two generic levels: the strategic and the tactical. The strategic may be thought of as that level concerned with the ways and means of "seeing" the world, and the tactical as that concerned with the ways and means of operationalizing those strategic ways of "seeing." Thus the strategic level involves the conceptual-evaluative orientations of a communication system vital to that system's continued existence and growth; and the tactical level involves the development and utilization of various communication skills and techniques necessary for the growth and survival of a communication system.

Each level involves communication competencies necessary for the continued viability of a human communication system; but neither level of competencies by itself is sufficient for the continued viability of a communication system over an extended period of time. While a tactical incompetency may be compensated for to some degree by a strategic competency, a strategic incompetency cannot be overcome by tactical competence. In short, tactical "solutions" cannot "solve" strategic communication problems.

As noted earlier, implicit in many of the studies surveyed is the assumption that awareness of an "information" system is a necessary, and in some cases a sufficient, condition for utilization of the system. For example, in an early study of information systems

and "information transfer" undertaken for ERIC the authors of the study said, "We assume that one of the main reasons most people who need information fail to use these services, is that they do not know what services exist or how to use them. The ERIC Unit runs the same danger: its services may not be utilized because the client does not know the services exist or how to use them."[23]

In a more recent evaluation of ERIC products and services the investigator noted in his summary, "This study has produced widespread evidence of non-use of particular products and services which together with data from open-ended questions, site interviews, and panel members, suggest lack of awareness as the principal reason for non-use." Much of the "data" directly concerned with awareness of the ERIC system was in large part anecdotal comments gathered during "open-end" discussions where educators told interviewers they would have used the ERIC system if they had known about it. The author of the report concedes that the lack of awareness (and several other reasons) cited for non-use of ERIC products and services "cannot be determined conclusively from these data."[24]

In fact there is little if any "hard" empirical data which support the contention that "awareness" of an "information" system necessarily leads to utilization of its products or services. And yet such an assumption is implicit in many studies. As one investigator has written:

> This and other recent studies have convincingly demonstrated that large segments of the educational community do not make use of national information services

> including ERIC, and, indeed, are largely unaware of the existence of these resources. So educators, while aware of the existence of ERIC services and products, do not use them because of misconceptions relating to their true capabilities and do not exploit them to full advantage . . . . What is really needed are educational programs to teach users and potential users at all levels about ERIC and related information systems, their capabilities and limitations, and how to use these resources most effectively.[25]

This position at least hints at the suggestion that the non-use of ERIC and similar "information" systems may be a "control" problem, or a user "education" problem rather than simply a tactical "communication" problem. There is sound empirical evidence which clearly indicates that even when people are "aware" of "information" and "facts" they do not necessarily take these into account in the "correct" ways--i.e., in the way intended by the "information" brokers.[26] Indeed, Swisher and Hoffman's studies on drug information programs indicate that in such "information" programs awareness or "information" may well be "the irrelevant variable."[27]

Unfortunately, "awareness" or rather the lack of it, has come to be viewed by many researchers as a "cause" which "explains" the existing low level of educational "information" utilization by American educators. Seeking and finding the "cause" of the so-called "information" utilization "communication problem" in the concept of "awareness" is one indication of the weakness inherent in the

conceptual and descriptive frameworks upon which most current educational "information" studies are built. As Thayer has noted, "the notion of cause or causation is an irrelevant (or at least redundant) concept in science. Whenever the description of a phenomenon is adequate, the nature and direction of 'cause' is implicit in that description . . . ."[28] Part of the conceptual weakness of many educational "information" studies lies in their continued emphasis upon S→R "communication" models and the supposed effects of various media; a viewpoint which tends to overlook the transactional relationship which exists between media products, their "producers," and their "consumers."[29]

System Criteria, Communication and "Information" Systems

An important conceptual distinction can be made between those systems in the world which function primarily on the basis of energy transactions with their environments, and those systems which function primarily on the basis of information transactions. As Buckley, among others, has cogently pointed out "this difference makes all the difference."[30]

For living systems such as human communication and social systems a viable model appears to be the use of information utilization (e.g. transactions) as a measure or indication of systemic conditions and alterations. In such a development it is important, indeed imperative, that system criteria be as clearly established as possible. In short, when discussing human social and communication systems, one should attempt to determine what it is that any given system is for.

In human social and communication systems one important fact is that the very process of information utilization involves the in-forming[31] of the system--"information means what it says; that it can impart form."[32] What it is that any human social system is for develops out of the ways in which the human participants in-form and inform each other. "The capacity for mutual communication, through the medium of an enduring culture, attests the emergence of a new means of mediating change and a new media in which change can be mediated . . . ."[33]

If human social and communication systems are conceived of as self-organizing or self-regulating systems functioning on information "utilization" processes, it becomes easier to envision three main functions served by such processes: 1) the taking-into-account of aspects of the environment; 2) the evaluation of those data taken into account; and 3) action taken on the basis of the information created in light of system criteria.

The human communication process may be described as the process of human beings taking-into-account aspects of their environment toward some end or purpose.[34] System criteria may thus be thought of in terms of organizing or regulating: 1) what is or should be taken into account; 2) how this is or should be evaluated; and 3) what is or should be done about it. System criteria are largely communicational artifacts, invented, exploited, altered, and discarded through the processes of communication and intercommunication.

The categories by which we discriminate, the standards by which we value, the repertory of responses from which

> we select, and our rules for selection are all mental artifacts, evolved, learned, and taught by the cultural process and more or less peculiar to the culture which produces them. This process is a circular process, in which all these settings of the appreciative system are constantly being modified by their own exercise.
>
> . . . However complex be the process which constructs its representation of the actual and selects the strategy of regulation, neither is either possible or meaningful except in relation to the norm, the setting which the system is trying to maintain.[35]

From this point of view the sufficient condition for "information" utilization within any human social system always inheres in the salience of the "information" for a specific epistemic community in time and location. The traditional approaches to "testing" or "measuring" the impact or effect of "information" in or on an audience largely fail to take into account the ways in which people in a given epistemic community talk about what is important to them in that community context.

Human communicational realities (including appreciative systems)--are created through people talking to one another. Thus what it is that ERIC "is," and what its values may be, are created not by mass-produced "messages," but only in and through conversations within specific epistemic communities. A necessary condition for "awareness" of ERIC may be some mass media promotional "messages," but the sufficient condition inheres in the importance and relevance of

such "messages" for individuals in a given epistemic community. What it is that ERIC "is" can, and apparently does, differ between the ERIC system builders and operators, and different epistemic communities of educators, teachers, researchers, etc. What it is that ERIC "is" depends upon how individuals talk to each other in a given epistemic community with respect to ERIC and through their relationships to such a system.

Methodological and Empirical Comparisons

Pilot Study #1 was based on the assumption that the failure of educators to utilize information systems such as ERIC is not just a tactical communication problem, but may be a strategic communication problem. This assumption was developed in part after reviewing theoretical and empirical studies on "information" utilization which clearly indicated that mass media marketing techniques for selling "information" often simply do not produce their intended and expected results.[36]

If there is one major thread of unity linking the multitude of "information" dissemination, mass media, and communication research studies, it is the generic empirical fact of human resistance. As one author has written:

> Of all the results of communication research, the central finding that ought to be kept before all would-be communicators is the fact of resistance. In general, people's beliefs, attitudes, and behavior

tend to be stable. Demands and arguments for change, uncomfortable new facts that do not fit neatly into accustomed categories, are likely to be resisted. Whenever communications attempt to change preexisting beliefs, attitudes, and habits that engage important goals and values, strong resistances are likely to arise at each stage of the communication process. Thus some communications are so strongly resisted that they fail to achieve even the first step of eliciting audience exposure to the message . . . .[37]

People are more likely to utilize those data and "information" systems which appear to be useful to them. Thus one can try to "match" the "messages" about ERIC (for example) with the existing communicational realities of teachers, or attempt to alter the strategic communicational realities of teachers to "fit" the existing "messages" about ERIC. The first might possibly be accomplished through the use of mass media techniques and mass produced "messages," but the latter--that of altering strategic communicational realities--can largely be accomplished only over relatively long periods of time (if at all) through the ways people invent to talk about their world and their relationships to that world.

Pilot Study #1 was designed to be a prototype of an "information" or advertising campaign directed toward educators, promoting various U.S. Office of Education information services and products and the ways in which these might be useful to educators. For purposes

of the pilot study, emphasis was placed upon the ERIC system partly because it is a functioning "information" system in the educational community which could supply requested "information" to educators responding to the "awareness" campaign. Various advertising and promotional techniques were considered for development in the study including direct mail, posters, and an 8mm animated color film for use in a film loop machine.

The major hypothesis was stated as a null hypothesis because such a formulation of a research hypothesis permits the researcher to, in general, establish some criteria as to what results can be expected if the null hypothesis is true. In short, it is possible, in advance, to agree on what will be taken as "reasonable" levels of significance for accepting or rejecting the null hypothesis.[38]

The research hypothesis was that even if they were "aware" of the existence and the services and products of ERIC, this awareness would not "significantly" increase the utilization of the system by educators. This was neither confirmed nor denied by the results of the study. However, in stating the hypothesis in the null form the consequences for a Type I or a Type II error become clearer and one can appreciate the fact that a null hypothesis "can never be 'accepted' by the data obtained; it can only be 'rejected,' or 'fail to be rejected.'"[39]

As Kaplan, among others, has noted, Type I and Type II errors "have very different consequences for our values."[40] Although Pilot Study #1 was not intended to be a statistical analysis, it was deemed important that the hypothesis be stated in the null form.

Unfortunately few if any of those studies which assume or state a relationship between awareness and "information" utilization state their hypothesis in the null form; such studies thereby implicity accept the assumption that there is some, no matter how small, dependency or relationship (e.g. "cause") of one variable on or to another (e.g. "awareness" to "information" utilization). A null hypothesis implies that there is no such dependency among variables, or at least "no significant difference between two measures of some parameter."[41] Studies in which the research hypothesis asserts that there is a relationship between "awareness" and "information" utilization are in effect, studies left only with the task of "proving" how much of a relationship exists without ever questioning if in fact such a relationship exists. Thus Type I error (mistakenly rejecting the hypothesis) is seldom even a possibility in those studies without a null hypothesis, and Type II error (mistakenly accepting the hypothesis), while a possibility, would seldom be "known" by those researchers who do not utilize a null hypothesis.

Printed material such as newsletters, booklets, and brochures have been rather extensively used by the ERIC system people to "explain" and "promote" the system, its products, and services. A portion of Pilot Study #1 was designed to attempt to "test" the "effectiveness" of brochures as a means of making educators "aware" of the ERIC system. Although the data gathered in the study did not permit either the rejection or acceptance of the research hypothesis, the low level of response to the brochure mailings

follows a rather widespread trend found in other studies. For example, in a recent study of ERIC products and services, Fry discovered[42] that the most frequent means of first learning about ERIC products and services among the 492 educators he surveyed were classroom instruction (39.4 per cent) and intercommunication with colleagues (21.4 per cent). Brochures and flyers were among the least frequent means (4.0 per cent) of first learning about the ERIC system (see Tables I and II).

TABLE I

FIRST MEANS OF LEARNING ABOUT ERIC PRODUCTS AND SERVICES BY MEANS OF COMMUNICATION

Means of Communication	%	(N)
Classroom Instruction	39.4	194
Brochures or Fliers	4.0	20
Professional Meeting	6.6	32
ERIC Clearinghouse Announcement	3.0	15
Reference in a Professional Journal	3.8	19
ERIC Column in a Professional Journal	1.6	8
Colleagues	21.4	105
Cannot Recall	3.9	19
Other	16.3	80
	100.0	492

Source: Bernard M. Fry, Evaluation of ERIC Products and Services, Vol. I of IV. Final Report, ED 060 923.

TABLE II

HOW INDIVIDUAL USERS FIRST LEARNED OF ERIC PRODUCTS AND SERVICES

First Learned About ERIC Products and Services Through:	Class-room Instruc-tion	Brochure or Flier	Profes-sional Meeting	ERIC Clearing-house Announce-ment	Profes-sional Journal Refer-ence	ERIC Column Profes-sional Journal	Colleagues	Cannot Recall	Other		(N)
Occupation											
Administration	14.8%	11.1%	16.7%	0.0%	7.4%	7.4%	22.2%	5.6%	14.8%	100%	(54)
Teaching	54.5	3.0	5.9	3.0	5.0	1.0	11.9	3.0	12.9	100%	(101)
Pupil Pers. Serv.	--	--	--	--	--	--	--	--	--		(4)
R & D	15.2	6.5	10.9	0.0	2.2	0.0	45.7	2.2	17.4	100%	(46)
Library	25.4	10.2	8.5	5.1	3.4	1.7	10.2	3.4	32.2	100%	(59)
Consulting	6.3	0.0	6.3	0.0	18.7	6.3	43.8	0.0	18.7	100%	(16)
Undergraduate	37.5	0.0	0.0	0.0	0.0	0.0	25.0	4.2	33.3	100%	(24)
Graduate	59.9	1.5	2.9	3.6	2.2	0.7	16.8	2.9	9.5	100%	(137)
Other	13.6	0.0	4.5	13.6	4.5	0.0	50.0	4.5	9.1	100%	(22)
Overall	39.3	4.3	6.7	3.0	4.1	1.7	21.4	3.2	16.2	100%	(463)

Source: Bernard M. Fry, Evaluation of ERIC Products and Services ED 060 923
*Where N<5, calculations have been omitted.
**Totals differ because response rates differed.

One of the most difficult problems in a study such as Pilot Study #1 is the development of a satisfactory test instrument which will give an indication of the "effectiveness" of promotional campaigns. As noted earlier, from the communication point of view of this study, the sufficient condition for "information" utilization always inheres in the salience of the "information" for a specific epistemic community in time and location. The traditional approaches to "testing" the impact of "information" in or on an audience largely fail to take into account the ways in which people in a given epistemic community talk about what is important to them in that community context.

At present it appears that the ERIC system people have a view of education and public school teaching which does not "match-up" with the views of education and teaching held by many teachers.[43] This, then, is a strategic difference in orientation, and is by and large not "solvable" by tactical communication programs such as advertising campaigns.

Conclusions

It is useful to view "information" systems such as libraries, data banks, etc., not as communication systems, but rather, as data systems. Communication systems are conceived of as living systems and may be thought of as being behaviorally inductive while "information" systems are logically deductive.[44] Thus, when an individual uses an "information" system (i.e., data system) such as ERIC the latter does not provide information, but rather, data which in turn are

developed (or not) by the individual into usable information. "Data become information when they are part of a model of explanation."[45] Only individuals are capable of developing and using models of explanation.

The implications should be clear for "information" system designers and users in the field of education. The data stored in such systems as ERIC will be useful to educators, teachers, students, etc., only to the extent that those systems users have the strategic and tactical communication competencies to create usable or consumable information out of the data. The usefulness of the data stored in "information" systems is thus a function of the system creators and the system users at both the "input" and the "outtake" stages.

The system users at the "input" end of the system may have communication competencies which permit them to construe particular data, as "useful," "good," etc., for whatever reason, while the system users at the "outtake" end of the system may have communication competencies which preclude finding the stored data "useful." The usefulness of data and stored "information" can only be determined by individuals using criteria developed in a particular communicational context or epistemic community. Thus to determine the usefulness of an educational "information" system such as ERIC, one should look not at the stored data, nor to some "objective" criterion outside the system, but to the criteria of the users.

If human communication is envisioned as a process, a primary aim of which is to develop organization and control of information and strategic ways of "seeing" the world, it can be seen that much

of what man "communicates" and how he "communicates" are basically conservative--i.e., operate to minimize not maximize innovation and change. People tend to hang onto those ways of viewing the world which have proven most useful to them in the past. New models, new ways of seeing threaten the old ways.

Some people are apparently satisfied with a few basic views of the world, while others, for whatever reasons, are satisfied only with diverse and changing viewpoints. If educators were good inquiring or information seeking systems, what kind of information would they seek--what kinds of data systems would best serve their needs and interests?

In order to answer such a question it is necessary to look at the communication and intercommunication patterns and practices of educators within epistemic communities and attempt to assess the implications that these might or might not have for the establishment, growth, and maintenance of the kinds of "information" systems USOE may want to operate. It would thus be necessary to study, among other things, the existing communication and intercommunication patterns and practices of educators in relation to the kind of educational "information" systems and "information" educators talk about. (The question of what kind of "information" system, and what kind of "information" educators ought to be utilizing is not, strictly speaking, a "communication problem." It may become a "communication problem" if and when the communication and intercommunication patterns and practices of educators are so mis-matched strategically and tactically with those of educational "information" system designers

or builders that neither can take each other into account in meaningful and useful ways. A "communication problem" may also result if the communication competencies of American educators are such that they cannot adequately deal with the existing paradoxes in the current differing views of what education and the educational enterprise are all about.)

An inherent difficulty in any study of the relationship between communication systems and data systems stems from the fact, mentioned earlier, that communication systems are behaviorally inductive and data systems are logically deductive. In short, human communication systems and information utilization patterns develop and evolve as functions and consequences of the human intercommunication which takes place; data systems are more or less rationally created to serve contrived, specifiable apriori goals or ends of social systems.

Generally, the more specifiable the ends or goals, the more "closed" the system--hence the more organized, predictable, and "efficient" the uses of data and "information." The less specifiable the ends or goals, the more "open" the system--hence the less organized, less predictable, and less "efficient" the "information" utilization. However, in order to become and remain a viable living system, an individual or organization must develop a communication system which exhibits traits of both "openness" and "closedness."

One must look to the functions of information utilization in order to find the sufficient conditions for system viability in human communication systems. The "openness" or "closedness" of any living system is not solely a function of the amount of information

utilized (although some data system designers would apparently have us believe so); for human systems especially, the quality of the created information and the functions served are of paramount importance.

It is possible to conclude that to the extent a system's information "needs" or requirements are specifiable and completeable the system is "closed" informationally. To the extent that a system's information "needs" or requirements are non-specifiable and non-completeable the system is informationally "open." Thus, to the extent that a particular task is viewed as having specifiable and completeable procedures and processes, the information requirements can be predetermined.

The question must be raised as to how much of what educators "need" to know is specifiable in advance. Any answer to this would appear to hinge at least in part upon how one conceives of the roles of educators and the process of education. To the extent that education is seen as a completeable and determinable task or process, educational "information" requirements would seem to be specifiable. But to the extent that education is viewed as a dynamic, evolving, open-ended, individual process--to that extent the information requirements of educators would appear to be non-specifiable in advance.

Given the above, it appears that the most effective use of mass media techniques and mass produced "messages" about educational "information" systems would be in those areas wherein the "messages" match or agree with the existing strategic views of the audience

rather than in attempts to alter or change those strategic views. At present mass media techniques are most likely to be useful in "changing" relatively non-strategic or non-vital viewpoints and thus could (and do) encourage change in fashions and fads. Thus, educational "information" dealing with non-strategic fashionable teaching practices might possibly be rather effectively "marketed" through mass media technology if such "information" does not deal with the vital questions of the "worth" or "value" that such practices may have for education.

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STATISTICAL METHODOLOGY OF INFORMATION SYSTEMS*

by

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In July, 1972, a new and marvelous information system was literally launched into space in the form of an Earth Resource Technical Satellite (ERTS). ERTS sweeps majestically and smoothly over the earth's poles, taking images of the earth's surface, area by area, every 18 days--if clouds don't intervene. At last man has learned that the most important planet to explore is his own! For it seems to be a fact that, despite our glorious science, we are incredibly ignorant about what exists or will exist on the earth, and especially ignorant of the resources which the earth holds for our welfare. We have sent a minor god into space, who will tell us where the minerals, water, forests, and arable deserts are, for our own good, and--more important for our survival--will tell us how our resources are changing.

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This first paragraph has been written intentionally with enthusiasm, the kind of enthusiasm that new information systems often generate. The enthusiasm, unfortunately, is based on fallacy, namely the fallacious assumption that our most critical problem is to find the right pathway that will take us where we want--or ought--to go. If you are lost in a strange city and ask a well informed native how to get back to your hotel, he will issue some "hard data" which will be all you need to find your way. But information systems that are to be used to help solve society's problems are not like direction-finding data banks. Indeed, the analogy breaks down completely: our main problem is to discover where we ought to be going. And where we ought to be going is not some specific place, but a complex of places. And if we concentrate on one pathway--because we are well informed about it--we may very well sacrifice the opportunity to follow other paths.

The federal government of the U.S. spends some considerable amount of money in supporting research and development projects which generate all kinds of information that is potentially useful for solving societal problems. ERTS is one example. Another, closer to the earth's surface, is NIH's effort in the biomedical area. Another is the Office of Education (now the National Institute of Education). It is only natural for congressmen and agency personnel to ask whether these expenditures are worthwhile or, more to the point, whether the findings of the research projects can be adequately "communicated" to

the people who manage resources, medical services, or educational systems. If the information generated by the research projects were of a direction-finding nature and the problem faced by management were a path-finding problem, then there would be little question that a communication network could be designed if the research were specifically directed towards finding the right pathways. But given the multiple goal problems of management, where correct policy depends so much on lost opportunity considerations, it is not at all obvious how an adequate information system can be designed.

Hence, the basic methodological or design issue, as I see it, is how we should think about and subsequently design information systems which presumably will help managers develop suitable policies. This is the methodological as opposed to the technical problem such as information systems; the technical problems deal with reliability, accuracy, and retrieval of the information, and are undoubtedly fascinating for the information scientist since there are so many tricky aspects. But the technical problem is embedded in the broader methodological problem of the design of the information system to best serve the multiplicity of the nation's--and the world's--needs.

Now the methodological problem may appear at first blush to be rather simple. Why not separate the total management problem into two parts? The managers, according to this scheme, determine the priorities--what needs to be done most urgently. They also determine the broad classes of data they require in order to accomplish the high

priority tasks. The information scientists--statisticians, retrieval experts, communications experts--then design the information system which will feed back to the managers the data they need.

It is very important to recognize that this suggestion is itself a proposed solution to a systems problem. It is a very attractive suggestion, especially for academic information scientists, because they can do their job "on their own," once the specifications are made. But the suggestion is not obviously correct, and in my opinion is dangerously wrong.

In order to understand this point, I'd like to invite you on a brief intellectual tour into something called the systems approach; after you've made it, you can of course forget it. But it will give you a perspective of information systems that you may never have experienced.

The systems approach is simply a convenient label for a large amount of research effort on social problems variously labeled operations research, management science, systems science, and so on. It's an attempt to look at a social system (community, hospital, university, whatever) in terms of its goals, hopefully quantifiable, in the expectation of choosing policies which will "maximize" the net benefit. No one who has worked in this area believes we can actually make social systems perform perfectly, but many of us do believe we can make them work better--even much better--than they have hitherto. In recent years the academics have become fond of talking about "bounded rationality,"

"satisficing," and "incrementalism," all of which are supposed to reflect the fact that decision makers do not strive to find the "global optimal." But this bit of common sense is strictly academic, in that the academics first defined rational man, and then more recently have recognized that what they defined does not exist. Meanwhile, back at the ranch, the decision makers are trying to do what they have always done: make the best of what's there in terms of time and resources. The practical systems approach, I have found, tends to follow the common sense of the manager rather than the more tortured logic of the academic.

Many of us who have worked a long time in searching for a suitable systems approach have come by quite different pathways to a common conclusion. We agree that it's correct to think about systems in terms of components (sectors, divisions, whatever), and that the main job is how to get the components working together so that the whole system works well. The conclusion we have come to is really very startling, in a way. It says that no matter what the system, all components are strongly interdependent, in the sense that the value of any components relative to the system purposes is very strongly a function of how the other components are working. Of course, this is no new idea; one of my favorites among ancient systems approachers, St. Paul, said the same thing quite succinctly: "We, being many, are yet one body in Christ, everyone members one of another" (Romans, 12).

Recently, a book by D. H. Meadows et al., The Limits to Growth, reflects the same idea in the language of simulation. The juxtaposition

of St. Paul with the simulators is intentional, because it indicates that the conclusion just stated can be interpreted in many ways, and indeed this paper adopts an interpretation that is neither Pauline- nor model-oriented.

Why is this conclusion startling? Because its implications with respect to the way we organize ourselves to accomplish societal aims are tremendous. We have tended to slice up the job-to-be-done in workable pieces, each sector more or less doing its own thing and passing its good works on to the others. Thus, we all recongize that the nation faces a health problem, and our legislators fund activities which hopefully will lessen the impact of disease and mental illness. The health care sector then delivers health service to others who are working on education, or production-distribution, or research, and so on. But if our systems conclusion is right, this way of organizing our society is seriously wrong. Suppose, for example, that the oft-repeated criticism of public education in the U.S. is valid: that it creates vast mediocrity in a society which rewards the high achievers. In other words, suppose the educational sector is working badly. One consequence may very well be an epidemic of mental disorders, drug-addiction, breakdowns, etc. Even if the health care sector is doing its best, it will be doing very poorly under these circumstances since it may not be able to cope with the mental health problem. Hence, just how well the health care sector works is a strong function of how well the education sector is performing; education is an important aspect of health care.

This argument need not have convinced you, since it is based on some "what if's." But it may help you to see that the systems approach conclusion I gave above is at least plausible, and that if it is plausible, then there are serious grounds for doubting the existing organization of our society.

One more example may help. One blessing that ERTS may provide is detection of pests in agricultural areas. This, however, is a blessing to that sector of society which is trying to maximize agricultural yield. There is another sector, the farmers, which is trying to maximize profits. If a great quantity of peaches is produced because of very successful detection of blight, then the individual farmer's profit may be lower in a glutted market. Indeed, it seems actually to be the case that some farmers regard a modicum of infestation to be a blessing. Thus, the sector which is trying to control pests and which does very well at it may play havoc with the sector which is trying to maximize profits.

I realize that these examples may not win you over to the seriousness of my systems approach axiom, because you may very well say, "Of course, second-order effects take place, we all know that. The main thing is to be alert to them and take action when you detect them." That remark suggests a kind of patching process in our societal organization; if you see how faulty education raises serious problems for health care you go to the Office of Education and urge them to do some developmental studies to alleviate the situation. Or, you try to put agricultural-yield and personal profit under some more general social

utility. This is certainly what is happening today in more enlightened programs, but many of us suspect that it is not nearly good enough, because doing a good job on second-order effects may itself create some serious third-order effects, and so on.

Now I'll stop arguing for my conclusion and, inviting you to accept it for the time being, I'll consider some of its implications with respect to information systems, and specifically the "obvious" design discussed earlier. This design seems to have been borrowed from the empirical sciences. One component of the system attempts to define the need for specific types of information: in the case of science, by identifying significant hypotheses; in the case of society, by identifying significant problem areas. The work of this component ends with a list of data specifications which are passed on to the data collection component. This second component has the task of collecting the data in as accurate and reliable a form as possible; above all, the hopes of people should not influence the data, else that horrible virus called BIAS occurs. The results obtained by the second sector are then transmitted to a third, which stores and retrieves information for those who need it--to test hypotheses or solve social problems. (This, of course, is an overly-simplified version of the real thing.)

We all recognize that in such designs of information systems the sectors are very strongly coupled. If the information need is poorly specified, the second data-collecting component has a lot of trouble, and if this component does badly, the whole information system may be

useless. But the way in which the sectors are coupled is much more complicated than a mere concern about quality of performance within each sector.

In order to understand the depth of the problem of designing societal information systems, it will be helpful to concentrate for the moment on one function, the statistician's, especially because statistics plays such a central role in information system design.

The statistician of the past century has worked primarily at the interface between the data-collecting component and the storage-retrieval component. His task is to transform data collections into a form that will be useful to those who have the need. Statistics, as a discipline, has shown a relatively keen interest in what systems scientists call its measure of performance. I'd be inclined to trace the history of this effort back a century to Galton, who inspired Karl Pearson's brilliant contribution. In his Grammar of Science, Pearson argued in effect that the statistician's role is describing large data masses in compact form; "mass" is the appropriate word, since Pearson makes the analogy with the physicist's description of masses in terms of moments. Thus, if I give you the type of distribution and the moments, you can recreate from this very compact information the entire set of data.

Starting with Student, the statistician's interest became concentrated on the measure of uncertainty. Through the concept of variance, the statistician's role was seen to be one of estimating the needed

information so as to minimize a specific kind of uncertainty, of either the hypothesis-tester or the social problem-solver, Walter Shewhart's way of handling the statistician's problem was one of the nicest designs of its time, since it appeared to establish just the right kind of relationship between the sectors of the information system. The production people need to know whether to fix their machines or ship out a lot, and they tell the data collectors what is important; according to Shewhart, the statistician should specify the two familiar risks (doing it when you shouldn't, not doing it when you should), and attempt to minimize the probability of one of these for a fixed probability of doing the other. The Neyman-Pearson design did much the same thing in the area of empirical research.

But what is interesting to the systems approach about Shewhart's design is that the statistician's role was defined almost entirely in the language and concepts of probalility theory, while the production manager's role is of course defined almost entirely in the language of management. The statistician often thought of his role in terms of applied mathematics, whereas the manager thought of the statistician's role in terms of good sound organizational principles. As I said earlier, the systems scientist is strongly inclined to agree with the manager, since he like the manager is trying to understand the whole system.

In other words, from the viewpoint of the systems approach, Shewhart--as well as Neyman-Pearson--were inventing an organizational design, and the justification of their design is to be found in how well the

organizational design works, and not in applied mathematics. To put the matter bluntly, theoretical statistics is a branch of organization theory; applied statistics is a branch of applied organization theory. The test of whether a statistician is doing well in an organization is not whether he minimizes the probability of a specific set of errors, but whether his talents are being utilized most effectively relative to the whole system goals.

If you feel negative at this point, it may be because you wonder, So what? One response is that if the conclusion just reached is correct, it says a whole lot (to me) about how we should teach statistics. Every "technique" should be explained in terms of its organizational significance and not solely in terms of its probability theory meaning. Thus, the cost of applying a technique and the method of evaluating its contribution to the system are essential aspects of the "teaching" of statistics. To indulge for the moment in the snide, I'd love to see a study of the large waste of human resources that has been spent in computing "significant differences" in the social sciences, or the distress that has been created for Ph.D. students over such organizational trivia as the "significance level."

The same remarks apply, of course, to any teaching of numbers ("quantitative methods"). For most students, the valuable thing about numbers is that they enable us to make fairly refined decisions and the dangerous thing about numbers is that they can be thoroughly deceptive. Only the academic types are really interested in the set-theoretic foundation of

arithmetic; the "new math," based on logic, was a novelty, all right, but like the Charleston should take its place in history.

To rephrase the discussion thus far, we can say that an applied statistical methodology, as well as any design of an information system, is a specific strategy for using information to aid in social decision making. The "validity" of the strategy is to be measured in terms of its contribution to the whole system performance. This way of putting it seems to bring the statistician back in at a very high level. After all, what I just said implies that the validity of any organizational strategy depends on a test, and statisticians are experts in testing.

Suppose we daydream a little before coming back to reality. If you want to "test the validity" of a specific information system, just take some organizations which have implemented the design, and compare them with some organizations which have not implemented the design, with respect to the organizational measure of performance, and there you have it. Incredible as it may seem, there are a number of respectable professors who believe that this is how one should test an organizational strategy, e.g., a specific design of a management information system, and try to insist that Ph.D. candidates follow these steps. It's no wonder that we have so many theoretical theses in management science; a "good" empirical thesis is just plain impossible if we require the candidate to test in this manner. There are so many reasons why this is so that I hesitate to bore you with them. But I can refer

to the systems approach conclusion I made at the outset. Because any organizational strategy becomes so strongly interlocked with other system components, no specific organization can even remotely be considered as drawn at random from a population. The point is that the real test of a strategy--for the manager--is whether, if he adopts it, he can expect that it will pay off handsomely. Even if we succeeded in testing five organizations with the MIS, and five without, and even if we could measure the system performance of each, and even if the sample mean of the with's were significantly above the sample mean of the without's, we'd still be making a logically fallacious step to conclude that the MIS causes good performance.

What then? Does it follow that we have no way of testing information systems, and that we're just going to have to take them on faith? Not at all, if we view the problem of testing to be itself an organizational strategy, and not merely a logical set of steps. All I've said, really, is that we cannot test an organizational strategy by means of random draws and relative frequencies. More to the point, the test cannot be performed in terms of probabilities of the classical or modern Bayesian sort.

The strategy of testing strategies which sometimes seems to work is strictly anti-academic. We begin by sticking our necks out and making some very strong guesses. Many texts in system science tell the student that the first guess is a model of reality. This is not so. The first guess is a guess about what reality is.

One of the most marvelous, humorous, and dangerous frailties of our human nature is our own personal conviction that each of us knows what's really going on. In the private sector in recent years top managers have been startling their staffs by asking, "What business are we really in?" Some railroads wake up of a morning realizing they are "really" in the real estate business. Bankers are "really" in the information business. Insurance companies are in the housing business. And on it goes. A bit of this creeps into government now and then; recently, we have learned that the U.S. defense department is in the employment business, since opponents to a cut in the DOD budget argue that it would increase unemployment. I've already indicated that ERTS may get into the regulatory business.

But perhaps the most courageous effort at conceptualizing reality occurs in education and health. What is the real business and world of education? We used to think of it in terms of knowledge-transmittal, of course--teachers, buildings, tests, and grades. The challenge to this view of educational reality is that for the mass of students the courses were real enough, but not educationally real; their education--such as it was--had to be obtained outside the school. And health used to be thought of in terms of medical services--doctors' offices, hospitals, clinics. Now many of us suspect that ordinary community life--its joys and hangups--has a great deal more to do with our health--both physical and spiritual--than all the medical services put together.

Much research has been done on education and health in the past decades, and there is naturally the design question of putting together an information-communication systems that can be "tapped" by administrators, faculty, and students in order to improve the educational process. My impression is that a great deal of the so-called solid research was based on results (achievement scores, for example.) If we adopted the view that education is "really" a knowledge-transfer (which includes skill-transfer), then there may be some real possibility of designing data-banks for educators. But if we adopt the view that education is a unique process of self-learning, then the design is no longer obvious at all. In my opinion, the real criticism of many information system proposals is that the proposers have never considered the issue: what is the basic reality of the system the information is supposed to aid? There is a real challenge to building information systems where the information was collected under what we take to be the wrong view of reality, but the challenge can be met. After all, Tycho Brahe contributed some of the most significant data in the history of astronomy, even though he did not have the "correct" view of planetary orbits. The point is that we have adequate ways in adjusting for error in this case.

In the case of education, health, ERTS, etc., there are, then, significant challenges to the traditional way of viewing the reality of an organization. Philosophers would say that the questioning top executive is raising a metaphysical problem--a problem of ontology--and

that the reply he gets to his question is a Weltanschauung--a specific world view of reality. But you don't have to use the philosopher's language; you can just say, "What the hell's going on around here?" instead. To be sure, facts play a very important role both in building the world view of reality and in accepting one, but not in the sense of "testing" it against alternative views of reality in some inductive manner. An astute mind has no difficulty in transforming any "fact" into evidence for one's own world view as any of you know who have argued against a paranoic's view of an evil world.

We stick our necks out and guess what reality is. We are deeply uncertain if we reflect critically on our guess. We cannot "measure" this uncertainty by any universally acceptable strategy. Even the meaning of our uncertainty is obscure, but (to me) it is abundantly clear that the meaning of our uncertainty is not even vaguely approximated by existing statistical (probabilistic) measures. Perhaps more to the point for the academic mind is that no existing set of axioms for decision making describes this essential step of defining reality, because they all assume that the step has been made.

I believe that one sensible strategy we're going to have to follow in systems science is building in depth alternative world views of reality, in order the better to understand our own world view and to appreciate our enemies'. Thus, the main task in evaluating ERTS is not merely to do a cost-benefit study, based on the view that ERTS is really in the business of improving the economy, but rather to understand

that it's in the prestige-building business, the regulatory-spying business, and so on. We should be studying alternative views not just in a loose advocacy mode, but rather in a deep and penetrating analytic mode.

One important function of our world view of reality is to legitimize some causal relationships, which is done by a model. I call to your attention the difference between an objective function in systems science and a regression equation. Sometimes we can use traditional methods to correlate "output" with various "inputs," by estimating the appropriate parameters. But the resulting equation by itself does not permit us to say that if the manager "inputs" so much in a given region he can expect to raise the output by so much. The objective function, on the other hand, says exactly this. It is "justified" in doing so only by the world view of reality which the system scientist dared to make.

Since the model--based on the heroic action of the investigator in creating his view of reality--contains causal relations, then within the model we can "test" whether a specific organization strategy is effective relative to what the world view says are the system objectives. If simulation is used as part of the strategy of testing, then we can even employ some of the traditional and modern methods of statistic which the student learns from his texts. Some of this testing gets to be very tricky, as many of you know who have tried it, but the uncertainties are not nearly so deep and profound as the uncertainties arising from creating a world view of reality in the first place.

Perhaps this conclusion needs to be stated in an opposite way. Managers--and scientists--are incredibly certain about some of the aspects of reality, without an academically respectable basis for their certainty.* Is there some way in which we can come to understand the nature of this certainty? For example, most scientists believe unquestionably that mechanics is an ateleological science and that God's existence is irrelevant in their findings, though neither of these views of reality has been even remotely demonstrated to be right.

Should we end in a pessimistic mood because today we have no well established way of measuring our fundamental certainty or uncertainty? I hope not, primarily because I so like to take the viewpoint that we are really historical people, not just living in an immediate year of 1972 of complexity and doubt. I like to imagine that Galton a century ago must have wondered what the future of statistics was to be, and must have rejoiced in the hope that great things would be done to cast light on his muddles. So we have much to hope for in the design of information and communication systems, and even some good grounds for expecting great things to come in the next century.

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*My thanks to Max Woodbury for reminding me to speak positively.

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"The Role of Communication Channels in the Propagation of Innovations: Changes in the Course of Five Diachronic Processes"

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The Role of Communication Channels in the Propagation of Innovations: Changes in the Course of Five Diachronic Processes

by

Herbert Menzel

What are the different roles that communication channels can play in the propagation of an innovation? What characteristics make them most suitable for each role? What circumstances will call for different characteristics?

This paper will provide a framework which will order a number of known answers to these questions and will suggest a few others as plausible hypotheses. Since a number of comprehensive reviews of the innovation literature exist (Rogers, 1962; Havelock, 1960; Rogers and Shoemaker, 1971), we will not attempt a synthesis of the findings, or even a summary of all of the ideas, on the subject.

The first part of the paper will call attention to the diversity of communication institutions that are available for innovation messages, and will discuss their pertinent differentiating characteristics. The second part of the paper will consider how the relative importance of these channel characteristics changes in the course

of time, as certain processes alter the relationships between the proffered innovation, the individual decision-maker,[1] and his community and culture.

I. Channels and their Characteristics

A. The Diversity of Channels in the Propagation of Innovations

The channels of communication through which messages concerning innovations can reach decision makers are very diverse, and a glance through even a few of the published diffusion studies produce a bewildering array. The following are only a few of the channels mentioned in studies of agricultural innovations alone: radio broadcasts, technical journals, salesmen, demonstrations

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[1]Throughout this paper, we speak of the potential adopter of an innovation as an "individual." We are, for the time being, leaving out of account the question whether each decision to adopt is to be made by an individual or household, or requires concerted action by an organization (the adoption of reading texts by a school system), or by an entire community (water fluoridation). Organizational decision-making requires action in concert by individuals occupying different positions, who are accessible to diverse kinds of channels, and must reach their individual decisions in proper phase with one another before organization-wide action can result. Community decision-making involves, in addition, a political and public-opinion process. (Cf. Havelock, 1969, pp. 2-19/31 and Chapter Six.)

and exhibits, colleagues and neighbors, magazine ads, agricultural extension agents, farm association meetings, and so on.

The conceptual schemes available for bringing order into this rich array suffer from three interrelated insufficiencies.

1) General sociological writings on communication institutions are dominated by the mass communication- face-to-face communication typology. As usually interpreted, this typology makes no place for a vast array of communication arrangements which often play vital roles in social processes, which are institutionally provided and "there" as repeatedly accessible channels, but which fit neither the model of "mass communication" nor that of "face-to-face communication." Examples are luncheon-club circuit riders, corps of door-to-door salesmen, store-front information centers, selective dissemination services and the agricultural extension service. Although some of these may qualify as "face-to-face communication," leaving the matter go at that disregards the network aspects of each of these arrangements.

In this paper, by contrast, we will call "communication channel" or (interchangeably) "communication institution" any facility or arrangement for communicating that is reliably there, outlasting any particular transaction or campaign, and providing at least one of three kinds of audience access: a) giving a sender repeated access to a large number of receivers, or b) giving a large number of information seekers repeated access to a source, or c) providing linkages, for repeated use, among many senders and many receivers. In this sense, a postal system, a public library,

an information utility, a broadcasting system, a corps of political-party canvassers and a network of church missionaries are all "communication channels" or "communication institutions."

2) In view of the just-sketched failure of general communication sociologists to furnish an adequate conceptual apparatus, innovation researchers have been constrained to come up with their own lists of the characteristics which make communication channels efficacious in the diffusion process. A few of them have been successful in conceptualizing characteristics at an appropriately abstract level to allow generalizations and cross-channel comparisons; they speak, for example, of local and cosmopolite channels, of channel credibility, of feedback capacity, of responsiveness to feedback. In doing so, however, they tend to focus on events at the interface between channel terminals and recipients, to the neglect of the characteristics of the networks that stand behind these terminals.

3) Although the best of the innovation researchers do pay some respect to the extent to which the efficacy of communication channels changes with the changing phases of a number of accompanying processes, they do not go far enough (see Part II of this paper).

B. Some Important Channel Characteristics

Let us now look at a list of eleven characteristics which, according to one or another of the writers, makes a communication channel more efficacious in promoting the diffusion of innovations.

Since our purpose is to provide materials for a discussion of

the complementarity of these characteristics, and of their possible dependence on certain ongoing processes, we have not attempted to make this list exhaustive. It is, however, intended to be representative of the most important channel characteristics enumerated in the innovation literature, even though some new terms have been coined in the interest of brevity.

1. Reach. The size of the audience that a channel reaches is of obvious relevance. Equally relevant is the reach per unit of investment.

2. Speed. How long does it take to "get through" to 25%, 50%, or 75% of a target audience through a given channel? Greater speed means more rapid diffusion, and sometimes wider diffusion as well.

3. Fidelity. How sure can one be that the message will be delivered at the terminal points exactly as intended by the sender, or by the campaign strategists? This might be called "downward fidelity." The literature has remarkably little to say about "upward fidelity."

4. Range of reach. Will the reach of this channel extend to publics that are separated from the source by noticeable gaps--to those spatially far removed, for example; to those partaking of different class membership or sub-cultures; to those in different kinds of communities; and, most significantly, to those not already "tuned in" to the issue in question. When the focus is on the recipient, "range of reach" appears as the answer to the question,

"which channels will bring messages from the world outside?" From this point of view, "being cosmopolitan" is another word for "range of reach."

5. Interactiveness and Individualizability. Can the channel respond promptly to feedback? And does it have the capacity to tailor-make messages to the measure of each recipient?--These two closely related characteristics are better known in their negative form, as the mass media's incapacity to disseminate messages other than "broadcast," i.e. in a uniform manner "to whom it may concern." For the mass media's audiences are ideal--typically too large and heterogeneous, contacts too fleeting, and feedback too slow and categorical, for messages to be tailored to the interests, language requirements, and pre-existing attitudes of particular recipients, or to be responsive to the initial reactions of particular audiences. (Wright, 1959, pp. 11-16)

6. Unflagged transactions. In some channels, such as daily newspapers, the topic and tenor of a given message is heralded and recognizable in advance, and contact (reading) is typically brought about with the transaction as the main agenda item. Where that is the case, those who are apathetic or antipathetic to a given view promptly "tune out". In other channels--outstandingly, in all communication through the "grapevine"--transactions on any given topic "happen to come up" unflagged, and during encounters which were entered for other purposes. Because of the

well-known phenomenon of selective attention and inattention, the latter condition is of considerable advantage in the propagation of messages to those initially apathetic or opposed. The former condition is an advantage in reaching those who are interested to begin with, who are perhaps, anxiously waiting or eagerly seeking for information on the given topic--as is the case with many of the innovations regarded as "technical." (Lazarsfeld and Menzel, 1963, pp. 96-97; Menzel, 1969)

7. Capacity for detail. The printed word is generally given the edge over most other forms of communication in its capacity to transmit detailed and complex messages, since it enables the recipient to receive at his own speed, "look again," double back, and check. Some other media, however, have begun to develop corresponding capacities.

8. Searchability. The extent to which a channel allows the recipient, at the appropriate time, to ask his own questions, really consists of a number of features. Does the information continue to reside in the channel after the initial tranmission? (The answer is "yes" for newspapers, "no" for radio and television.) Is the channel accessible to the recipient over an extended period--and is it so at times of his choice? Are the recipient's language and the channel's search language compatible? Can the recipient address himself to the channel without a sense of shame at the revelation of his ignorance? Traditionally, books

have been given higher marks on all these traits than most other media and channels. But agricultural extension agents, for example, are close runners-up.

9. Keeping tabs. Some channels will take the initiative to contact the recipient at various intervals after an initial transaction, to provide "follow-through" information or search capacity for questions that may have arisen in the interim. The agricultural extension agent again is an outstanding example. Occasionally, similar services are provided by public health nurses and by certain salesmen.

10. Perceived trustworthiness. The importance of "source credibility" to the diffusion of practices is probably self-evident. More subtle is a vital distinction in "credibility" recently pointed out (Rogers and Bhowmik, 1971): trustworthiness (or "safety credibility"), and expertise (or "qualification credibility").

11. Perceived expertise, then, is the other half of "source credibility".

Before proceeding with the discussion, we recapitulate the list, so the reader can see it at a glance (Fig. 1).

Fig. 1 - Recapitulation of Some Important Channel Characteristics

1. Reach
2. Speed
3. Fidelity
4. Range of reach
5. Interactiveness and individualizability
6. Unflagged transactions
7. Capacity for detail
8. Searchability
9. Keeping tabs
10. Perceived trustworthiness
11. Perceived expertise

C. System-Span Characteristics and Terminal Interface Characteristics

It is hoped that the reader, after inspection of this list, is at least vaguely disturbed by the recognition that these characteristics have several different loci. It is not too difficult to come up with a threefold distinction: The first four items describe the operations of the channel as a whole, looked upon as a system or network, from the point of view of a centrally located sender: how far will his message reach, how rapidly, how "accurately", and into how "foreign" a landscape. These are all questions describing the total span of the network. Characteristics 5-9, by contrast, focus on the transactions that take place at the interface between the recipients and the channel terminal points. What has gone on or will go on "further up" the pipe line, is for the moment left out of account when one examines interactiveness, searchability, and the like. Characteristics 10 and 11, finally, describe the recipients' perception and acceptance of the channel.

To call attention to this distinction is by no means to deny their frequent interdependence. Some price in fidelity must be paid in order to achieve higher interactiveness, for example. Perceived expertise is typically accorded to channels of wide range of reach, while perceived trustworthiness tends to be higher for channels of narrow range of reach. (Rogers and Bhowmik, 1971). But these interdependencies cannot simply be tacitly assumed. We wish to call attention to them as problems for investigation.

Most of the existing literature appears to concentrate on only one of these sets of characteristics for serious investigation--

either on the network-span characteristics (1-4 in Fig. 1), or on the terminal interface characteristics (5-9), or on recipients, perceptions of channels (10-11). The other sets either disappear from sight, or are assumed to be automatically derivative from the set that is analyzed.

In this vein, analyses of communication systems customarily focus on the network-span characteristics. If a channel measures high on these, reaching large audiences at high speed, with central control over message content, and bridging sub-cultural gaps, it is labelled "mass communication," and it is taken for granted that it must be near the zero point on interface characteristics like interactiveness, searchability, keeping tabs, and unflagged transactions. Now this is approximately valid for the traditional mass media, considered by themselves. What is all too often forgotten in these analyses is that there are other institutionally accessible communication systems besides the mass media. And sometimes it is also forgotten that the mass media themselves do much of their work as components of larger systems, involving interpersonal linkages after their own terminal points.

An opposite, but complementary, neglect characterizes most analyses of communication forms not considered "mass"--especially those involving interpersonal linkages, whether they be "change agents," salesmen, social workers, or health professionals. These analyses concentrate on one or more of the channel characteristics which, like Nos. 5-9 in Fig. 1, characterize transactions at the terminal interface. (Havelock, 1969, Chapter Nine is a particularly

sensitive example of an analysis of these interface characteristics.) What is all too often lost sight of in these instances is that, more often than not, more or less complex institutional networks stand behind or "upstream from" these interface transactions. Their activities therefore constitute communication institutions in the sense defined above, accessible--at least intermittently--for message input, and having their own characteristics of high or low reach, speed, range, fidelity, and so on. In fact, the multi-tiered nature of most of these institutions of "quasi-mass communication" means that all of the questions--those of range of reach, fidelity, etc., on the one hand, and those of interactiveness, searchability, and so on on the other--may have to be raised separately at each transition between tiers (e.g., from campaign strategist to local coordinating committee, from local coordinating committee to party canvassers, from party canvassers to voters). There may be instantaneous feedback at the terminal point of delivery--between canvasser and occupant, for example--none of which reaches back up to the sender who employs the canvasser; or, on the other hand, inability at central headquarters (say the denominational board of missions) to anticipate the diverse vicissitudes that proselytizing will encounter, while the missionary in the field can--with luck and skill--tailor and phase his "campaign" in response to such contingencies.

D. Quasi-Mass Communication

This opens up both the problems and the opportunities furnished by the possibility of diverse patterns of combination, com-

promise, and trade-off between characteristics operating at the different transition levels. The diffusion strategist can consider "buying into" favorable combinations, where they exist, or constructing them, where they do not.

As an example of such a "quasi-mass communication" arrangement as I have called it elsewhere (Menzel, 1969, 1971), think of the corps of salesmen sent out by a company to potential customers. From the point of view of central headquarters, this is a channel into which messages can be inserted. Between the terminal points of these channels and the intended audience, between the salesman and the prospect, there is a certain amount of leeway and discretion; the salesman can tailor his message to the particular person he is talking to, he can respond to the feedback that comes his way. Now the man at the company headquarters is not there; he cannot do that; he cannot control it; he can only allow for it. Thus he pays for this flexibility the price of a certain loss of control. Other kinds of door-to-door agents, canvassers for political parties, or solicitors for contributions, constitute similar apparatuses if you look at them from the point of view of a central organization.

For another example of quasi-mass communication, think of speakers addressing groups. Think of this activity not merely from the point of view of the one interaction that takes place while a person is in a hall talking to a group, but think of it as an organization, as a planned activity, whereby speakers are sent out on a circuit to talk to service clubs or parent associations or neighborhood houses. (A very important variant, would not send

speakers out but would rather encourage and mobilize local people to address their own groups, their own organizations, and their own neighborhood people with materials that are in part furnished them.) With this communication apparatus, the terminal point flexibility to tailor-make messages to each individual is more limited, since the speaker is addressing a whole group of people. And yet he will know what kind of a group it is, where these people are from; he will know, for example, something about their educational level, what is relevant in their lives, or what language style they use.

A third kind of example is provided by salesmen to the trade, detail men going to physicians, or union organizers going from plant to plant. They differ from what was discussed previously because the kinds of groups or individuals they address are already selected in terms of some specialty, some special interest. The persons addressed have know-how about the topic being discussed; they are not laymen; they have their reasons to be interested in that particular topic, and they have some of their own expertise to counterpose to that of the communicating agent.

There are yet other forms of quasi-mass communication; you can provide your own examples. They all differ from the operations through the mass media, but also from each other, along some of the dimensions known to be crucial to the success of the persuasive efforts. Did the contact come about for the purpose of discussing the given topic? This could be a disadvantage if the topic is in controversy, and the receiving audience is initially on the other

side. Or is this the kind of get together that comes about for other reasons, such as the monthly meeting of a luncheon club, or the meeting of a parent group at a school, where people have other reasons for paying attention, and a topic can probably reach initially opposed people better and in a more hospitable mood. But whether that really is better or not will depend on various things. Do you have reason to believe that the audience in that neighborhood that you are trying to reach is initially opposed to your point of view, or is it perhaps eager to get some help or get some guidance or get some suggestions on how to solve some of their problems in their own lives? Again, the preference between sending speakers or mobilizing local or homegrown speakers depends on the extent to which there is a common sub-culture that ties together the speakers and the audience, and on other circumstances. I say "speakers," but they may be people who present films, who make up handbills, etc. Whether the price of loss of control from central headquarters over the transaction at the terminal points is too high to pay will again depend on circumstances. Is there an understanding, is there a corps of people to draw on who will deliver messages in whatever way seems most effective at the terminal points, or is this not the case, so that they may become persuaded away from the original goal? The extreme of that is perhaps the fabled missionary who goes native.

In sum, the communication institutions which may be available for periodic inputs extend considerably beyond the "mass media" as traditionally conceived; the characteristics which make channels efficacious in the propagation of innovations operate at different

points of the pathways of which each communication institution is constituted; and an awareness of these two facts allows one to consider, and occasionally to construct, communication systems embodying a variety of combinations, patterns, and trade-offs between these characteristics.[1]

II. Changing Importance of Channel Characteristics in the Course of Five Diachronic Processes

Nevertheless, the diffusion strategist faces a formidable, if not insurmountable, task if he seeks to maximize all of the characteristics which make channels efficacious in the propagation of innovations with no more discrimination among them than has entered our discussion so far. Inevitably, he will have to set priorities among these characteristics. In this task, he can be helped by an awareness of the contexts and circumstances which will affect the relative importance of these channel characteristics. To this end, the remainder of this paper will outline the manner in which the

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[1] In this paper, we are limiting ourselves to the perspective of a centrally located disseminator or communications planner. Attention is called to this "Implicit bias in much communication research" in Rogers and Bhowmik, 1971, fn. 2. For a few questions about quasi-mass communication from the points of view of recipients, of information-seekers, and of the larger society, see Menzel, 1971.

For a more detailed consideration of the information seeker's or "problem solver's" perspective, see Havelock, 1969, pp. 10-53/69.

relative importance of channel characteristics will be affected by five processes operating through time:

1) the decision process of each individual[1] vis-a-vis a given innovation; 2) the diffusion process through which a given innovation percolates through a community; 3) the secularization process, through which a community comes to define issues as "technical" that earlier were considered value-laden or "sacred"; 4) the status-transition process through which an individual becomes more responsive to communication channels of certain kinds at some points in his life than at others; and 5) the societal regroupment process through which conditions of "status transition" occasionally come to affect whole groups of individuals simultaneously.

A. The Decision Process

Effective communication demands the performance of several different functions, which are often best served by different channels. This insight first emerged among communication researchers when it was found a) that decisions to alter a previous habit pattern (e.g., to adopt an innovation) were typically not made until inputs from several channels rather than just one had been received; b) that in any one decision area, there were typical combinations of channels (e.g., one "commercial" channel and one "professional" channel) that had affected those individuals who had made a new decision; and c) that the various channels had affected these individuals in certain

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[1] See fn. 1, p. 1.

typical sequences over time. (Summarized in Lazarsfeld and Menzel, 1963).

These findings led easily to the notion that an individual's deciding on a new issue is a process consisting of several distinct phases. What are these phases in the case of decisions about proffered innovations, the "innovation-decision process"?

A number of somewhat different answers have been suggested to this question by researchers investigating the diffusion of innovations of different kinds and in different contexts, and it may well be that different settings call for somewhat different phasings of the process. (Havelock, 1969, pp. 10-30/38) (To some extent, in fact, this will be suggested in the later sections of this paper.) More generally speaking, passage through the innovation-decision process may be depicted by the familiar S-shaped "learning curves" of the psychology of learning, if progressive increments in involvement in a given innovation are regarded as special instances of increments in learned material (Havelock, 1969, pp. 10-4/7).

One of the most widely used set of phrases was expressed by Rogers (1962) in the following terms: if adoption is to occur, an individual must first gain awareness of the existence of an innovation, then develop interest in it as applicable to his situation, then evaluate the pro's and con's he has learned, then try it out tentatively, if that is possible, and finally reach the decision to adopt it as a regular practice. More recently Rogers and Shoemaker (1971) have replaced this set of "stages" with the following set of "functions or stages," which make it even clearer that there are a number

of different things to accomplish by communication inputs if an adoption is to occur:

Knowledge: the individual's exposure to the existence of the innovation and his acquisition of some understanding of how it functions; persuasion: leading to his formation of an attitude toward the innovation; decision: inducing or enabling him to undertake activities (such as trials, or soundings of colleagues) which lead to a choice to adopt or reject; and confirmation of an adoption-decision once made. It is plausible enough that channels of different characteristics will be best able to perform each of these functions, even though the particular channels and sometimes even the particular characteristics may change depending on the more general setting.

In terms of the channel characteristics enumerated earlier (Fig. 1), one may surmise that the first four characteristics--reach, speed, range, and fidelity--have their greatest importance during the "knowledge" phase of bringing an innovation to the awareness of the relevant public; that interactiveness and individualizability, unflagged transaction, and perceived trustworthiness are outstandingly important during the "persuasion" phase and also during "confirmation"; that capacity for detail, searchability, and perceived expertise count for most during the "decision" phase, when the individual needs "how to" information for his trials and adaptations; and that these same traits, plus "keeping tabs", have considerable importance during "confirmation." This, at least in general outline, seems to be what most of relevant concrete findings add up to (Rogers, 1962,

pp. 98-105; Rogers and Shoemaker, 1971, Chapters 3 and 8; Havelock, pp. 10-37/38).

B. The Diffusion Process

If one defines diffusion as the successive adoption of an item of practice by the members of a given community, group, or society, then it is clear that communication channels play a role in the history of most innovations even prior to the onset of diffusion proper; for the gestation of most innovations, even prior to diffusion, also requires the successive involvement of more and more institutions, organizations, or status occupants. As an example, one may mention the career of new methods of teaching children to read, from their inception among reading researchers, down to their embodiment in teaching programs and materials ready for adoption by schools and teachers, involving, along the way, schoolbook publishers, publishers' representatives, teachers college professors, school reading specialists, and others (Barton and Wilder, 1964).

Such a complex, cross-status and cross-institutional gestation history of innovations is especially frequent in a highly technological culture like ours, where the gestation of innovations is often deliberately facilitated and planned, and where institutions or agencies (such as "research and developments" are officially charged with this mission.)

Here one may expect a "rational sequence of phases by which an innovation is invented or discovered, developed, produced, and, finally, disseminated to the user," and it is not surprising that

communication facilities have their distinct role to play at each of these phases (Havelock, 1969, pp. 9-37/39, 10-28/29 and 10-39/53).

On the one hand, the mere fact that more and more "neighbors" know about the innovation, have had experiences with it, and have (in the successful case) themselves adopted it, means that communication with colleagues and neighbors can take over more and more of the necessary communication functions, correspondingly attenuating the role of other channels.

Secondly, as diffusion proceeds, there occurs a reduction in the significance of some of the phases of the decision process; or more precisely, a reduction in the communication inputs required to bring that phase to fruition. Thus, for example, the awareness that numerous colleagues are using an innovation makes further "legitimation" through outside messages less important. This is indicated by the reduced time taken up by some of the decision phases among those for whom the decision process began at later stages of the diffusion process: the total amount of time from first "awareness" to "adoption" is likely to be somewhat reduced, but the share of that time taken up by the "persuasion" stage (intervening between awareness and first trial) tends to be reduced more dramatically. (Rogers, 1962, p. 114). A similar shift is also indicated by the less tentative or "gingerly" way in which later adopters try an innovation, once they get around to trying it (Coleman et al., 1966, p. 32).

Thirdly, even insofar as a given communication function does remain to be performed, some of the characteristics that earlier were required before a given channel could perform that function lose

in importance. Thus, for example, the same degree of perceived trustworthiness of a channel is probably no longer required to make it efficacious in persuasion, once a given innovation is already fairly widely used, since this reduces the risks of blame in case of failure.

As a joint result of all three forces, the significance of channels of given types, even for a given phase of the decision process, changes with stages of the diffusion process. Rogers and Shoemaker (1971, p. 261), for example, summarizing a number of studies, report that the role of interpersonal channels at the knowledge-awareness stage is low early in the diffusion period and high for those who only become "aware" late in the diffusion period; at the "persuasion" stage, on the other hand, interpersonal channels play a very small role for those who reach that stage when diffusion has barely begun, but a very important role for those who reach that stage later than most of their local colleagues.

As diffusion proceeds, different kinds of interpersonal contacts become important further adoptions (Coleman et al., 1966, pp. 130-132).

In terms of our list of channel characteristics (Fig. 1), the following may be plausibly hypothesized, and is by and large in line with the available research summaries (Rogers, 1962, pp. 178-82; Havelock, 1969, Chapter 10).

As the diffusion process proceeds, the system-spanning characteristics--speed, reach, range of reach, and fidelity--wane in importance, since the basic message is now available locally. Because of

the lessened, at least in its "perceived trustworthiness" version, risk and the lessened need for legitimation, the importance of credibility also wanes. Interactiveness and unflagged transactions probably also lose in importance, since the wide adoptions that have already occurred among colleagues or neighbors tend to move the innovating item further from the "value-laden" into the "technical" category. Capacity for detail and searchability may gain in importance precisely because most of the remaining doubts are now "technical."

C. The Secularization Process

Here we are no longer concerned with the status of a particular innovation either vis-a-vis an individual (as in the decision process) or vis-a-vis a whole community (as in the diffusion process), but rather with shifts in the stance of the given culture toward innovations in the area of activity under consideration, or, perhaps, toward innovation in general.

As history progresses, it often happens that an area of life that was once considered "sacred," in the sense that change in it was unthinkable, moves into the realm of the "sacred," where decisions about change are made in deliberate terms. But even within the realm of matters where change is acceptable, there often is a further progression. At one stage the decision to change, although acceptable, is felt to constitute a shift in commitments, a resolve to revise deeply held beliefs; and such decisions are, where necessary, made in consideration of the counsel of elders, priests, poets, or others

regarded as generally "wise" in the ways of living. At later stages, the area of life may have become a "technical" one, in which decisions to change or not to change are made in cool deliberation of the pro's and con's, on presumably technical grounds, and often with the help of "experts" in relatively narrow fields. In our own time, this is happening with regard to child-rearing practices and marital relations. In many "developing" countries of the world, it is happening with regard to agricultural practices. Whenever it happens, change in the given area of life is going to occur more often; innovations are going to propagate more readily; and the role of communication channels in this propagation will shift accordingly.

Thus Rogers and Bhowmik (1971, p. 534) write:

> "A shift. . .credibility from more homophilous individuals to more heterophilous individuals (i.e. from individuals who are sharing the way of life of the target audience to individuals whose way of life is quite different) may occur as a social system modernizes. . .in a traditional Indian village, peasants attached greatest credibility to their fellow villagers. As certain changes) transformed it to a more open system, qualification credibility (i.e. perceived expertise) shifted to agricultural scientists, extension agents, and radio, but safety credibility (i.e. perceived trustworthiness) remained with homophilous peers. Eventually, the (peasants) might even perceive. . .change agents and mass media as having safety credibility."

While secularization, strictly speaking, is a process running through time, differences similar to those just commented on can also be expected when one compares, one and the same time, two communities of different degrees of "secularity" with regard to a given area of life, or perhaps with regard to life in [illegible] this form, such comparisons have been made by students of agricultural innovation-flow in the United States for some time. Of particular interest are findings concerning the differential roles of local opinion leaders in the diffusion process as it occurs in relatively conservative and progressive agricultural communities (Marsh and Coleman, 1956). Corresponding comparisons between different areas of behavior which have attained different degrees of secularity in the same community have also been made (Menzel, 960).

Turning once again to our list of channel characteristics (Fig. 1), we hypothesize that the process of secularization will leave the role of the first four system-spanning characteristics intact, will raise that of the importance of perceived expertise and of the "technical" capacities for complex messages and for searchability, while lowering the importance of unflagged transaction and perhaps also of interactiveness and individualizability, in view of the lessened resistance to change as such.

D. The Status-Transition Process

We return once again to a process concerning the individual decision-maker; this time, however, characterizing him not in relation to the particular decision of interest, but rather by his

standing in the general life-cycle, career, or similar process. This is believed to have an important bearing to his general responsiveness to various communication channels.

In order to explain why this is believed to be so, it is necessary to consider some of the obstacles that usually stand in the way of mass-media effectiveness in bringing about changes in an individual's behavior that would challenge values deeply held by him, or norms defended by groups in which he is deeply anchored (Klapper, 1960). In the ordinary course of events, the individual protects himself from message intake which might disturb deeply held values, or the norms of groups with which he identifies strongly, by selective attention, selective perception, and selective retention; i.e. potentially disturbing messages are avoided if possible, misinterpreted if avoidance is impossible, and forgotten if misinterpretation is not possible.

This apparent stranglehold of conservatism is, however, relaxed insofar as two or more of the values held deeply by the individual, or the norms of two or more groups with which he identifies strongly, give contradictory dictates with regard to a specific issue. The individual then must make a choice. This can happen only when the issue is new enough so that it has not already been settled which of the several simultaneously held values, or which of the several simultaneously identified-with groups, should govern. While it is difficult to change deeply held values or group loyalties, it has been shown to be much easier to change the relative saliencies of several simultaneously held values, or of several simultaneously

identified-with groups.

It follows that there are certain junctures in an individual's life when he is more than usually susceptible to appeals for significant change, even if they come over the mass media, which usually have low efficacy in this regard. We refer here to the transition points between statuses, for it is then that the individual faces many issues for the first time while he is also in transition between an old and a new set of values, and between an old and a new network of group affiliations. Examples are individuals who have recently moved into a new social stratum; recent migrants to the suburb; recent entrants into a career; and students returned from abroad. Under such conditions, perceived trustworthiness, individualizability, and unflagged transactions are not as crucial to the propagation of innovations as they are at other times.

E. The Societal Regroupment Process

There are, however, severe limits to the facilitation described above. This is largely due to a second set of protective mechanisms, a second line of conservative defense, so to speak, that is ready to go into action in those instances where the individual's own selective attention, perception, and retention have not censored out messages favoring deep-going change. When this happens, the groups to which an individual belongs, or aspires to belong, will normally "bring him back into line;" for these groups, acting variously as networks through which messages are filtered, as sounding boards on which interpretations of messages received are tried out, and as

models of conduct in response to the messages, normally act so as to keep things in line with long-held views and norms (Klapper, 1960).

This situation changes dramatically, however, when whole groups of individuals who are in interaction simultaneously experience the kind of "status transition" which was previously sketched for individuals in isolation.

This is the case, for example, during mass migration waves, during times of rapid social change such as the industrial revolution, and during breakdowns of social systems. Corresponding examples of the extraordinary influence of communication media at such times are the trust placed in the immigrant press as a guide to one's daily life by newly arrived ethnic groups in this country early during the century (Park, 1922), the proliferation of etiquette books and other how-to-live literature among the newly risen bourgeoisie of 18th century England and France, and the effectiveness of Nazi mass propaganda in the waning years of the Weimar Republic.

Many groups in today's Americas find themselves in situations not unlike those sketched above, although partly for different reasons. When you have a whole group migrating, a new ethnic group going into the suburbs, a new race having access to different kinds of occupations, women having access to different walks of life than they used to have before, then you have a whole group of people simultaneously facing issues for the first time in their lives and having to decide under what rubrics and values they will judge them. It is here that leverage points for change offer themselves. Today in America we have whole new population groups becoming activated,

whole population groups, in that sense, in the market for new ways of life and ideas, and organizations and social movements in the market for causes and tactics. The doors are open for good causes and bad.

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Project: NCEC Knowledge Utilization Study

Research Memorandum #21:

"Creativity and Knowledge Utilization"

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Creativity and Knowledge Utilization*

Malcolm S. MacLean, Jr.

Creativity, like communication, is a term that thrills some and chills others. And perhaps for the same reason. Different people mean such different things by it.

Only recently have psychologists and communication specialists given the concept much considered attention. One psychologist whose work holds great promise is Dr. Irving A. Taylor, major perception theorist and researcher.

For this project, Dr. Taylor visited us in Iowa City as one of our major consultants. Later, Drs. Talbott, Costello and I visited Dr. Taylor and his colleagues at the Creative Leadership Center near Greensboro, North Carolina.

There, we experienced the Sensorium he developed. This is a room equipped with strobe lights, reclining chairs with heaters and vibrators, hi-fi equipment with individual earphone sets, etc. Mylar, a heavy foil, hangs draped in folds as a circular wall which reflects the many flashing lights. Rhythmic music building to a

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*This research memorandum is related to paragraph e on page 6, under the heading "Plan of Work" in the original Proposal of this NCEC contract, dated May 19, 1971.

great crescendo fills the ears. One's whole body vibrates and is warmed. Perfumes invade the nostrils. A wafer in the mouth provides a distinct flavor and finally bursts with a fizz. In effect, this is an opposite to the sensory deprivation room and equipment developed by D. O. Hebb. The Center also has one of those. And a theater with an audience response station at each seat. And much else.

We examined tests of creativity that Taylor and his research team are developing. One of the most imaginative and promising of these uses colored magnetic chips. Persons taking this test try to develop the most interesting pictures they can. Observers score these mosaics on variables assessing novelty, variety and unity. The team is also developing a number of paper-and-pencil tests, one of which taps attitudes towards creativity, tolerance for ambiguity, etc.

We talked with several of Taylor's colleagues who are charged with creative leadership training at the Center. We found that they, like us, use simulation as a major instructional tool (see Pilot Study #7, this report). They use a futuristic (25th century) setting with participants taking a variety of roles in working out diplomatic relationships between two planets occupied by Earth people. They repeat the game so as to rotate participants through the roles.

I have briefly described the Center's work because I believe Taylor and others there could, as contractors or sub-contractors, contribute greatly to developments I understand NCEC and NIE to be

interested in. More about this later. Now, back to the concept of creativity.

Taylor has clarified this concept a lot by suggesting that we think of different kinds or levels of creativity:

1. Expressiveness, perhaps best exemplified by young children's open expression through spontaneous babbling, singing, body movement, etc.

2. Technical Skill, shown at the extreme by the fine and refined craftsmanship of persons like Stradivarius.

3. Inventiveness. While this may bring the names of persons like Edison and Bell most immediately to mind, there are ingenious and inventive minds in the field of education, say, probably much less noticed.

4. Innovativeness. Close to and depending on inventiveness, this would include flexibility and eagerness to try new things, techniques and strategies.

5. Emergentive Seminal leadership. This points to Einstein, Freud, Buddha, Marx, Christ, Picasso and others who originated and led whole new schools of thought.

Taylor says that we all have such qualities to some degree. Relatively few of us have much of the last level. One reason we do not find many persons high in the kinds of creativity Taylor outlines may derive from the tendency for parents and teachers to curb spontaneous expression in the young.

Taylor develops a model of what he calls transactualization. In this, he synthesizes the notions of transaction and self-actualization.

At his best, a transactualizer is a highly creative person who strongly impacts his environment, both social and physical. At the same time, he gives others a chance to impact their environments in ways they think may be beneficial to them. Instead of going along with the crowd or blindly following a leader or letting himself be pushed around, a transactualizer strives to adapt his environment to himself and to those he cares about.

Writing about the nature of creativity, Taylor (1959) says:

> Thus far, however, studies, despite the newly gained enthusiasm, are still too frequently limited by antagonistic social attitudes and confusion with other psychological interests. Many of the characteristics associated with creative personalities--sensitivity, temperament, gullibility, openness, lack of concern with details, involvement with self, and the ability to resist premature decisions--are largely viewed with displeasure in our culture. Our society has tended to favor individuals who are quick at making decisions, who are rather afraid to express "wild" imagination and who prefer to display "safe and sound," even though mediocre, products. Studies have shown, on the other hand, that this is the very antithesis of creativity which, especially during preliminary stages, requires much time, freedom to learn and express through abundant exploratory errors, and a strong

motivation to cope with basic and highly abstract problems such as time, space, form, energy and conscious experience itself.

Taylor warns us not to confuse creativity with "the scientific method" as put forth by John Dewey: That is, the scientist's job is to collect all pertinent data, draw reasonable hypotheses, test and verify. A highly creative person rarely follows such a model. Instead, he lets his mind wander freely. Then, he may suddenly, unexpectedly burst forth with an unusual way of seeing the problem and related problems. And solutions usually follow quickly.

He also differentiates creativity from "intelligence," as it is defined and assessed in Western culture. We tend to measure intelligence on the basis of how quickly persons can come up with correct answers to many trivial questions. In another culture, "intelligence" might be thought of as how well a person can solve important problems, making errors in the process and taking his time. This latter view would be closer to the advanced levels of creativity Taylor describes.

A creative person is sensitive and an avid consumer of his environment. A non-creative person's thinking is cluttered with hardened categories and stereotypes which heavily constrain his observation.

A creative person often seems naive and gullible. His opposite may be a smug know-it-all.

A highly creative person can tolerate lots of ambiguity, can keep things tentative. Yet he can involve himself, move into things wholeheartedly with great gusto, and make decisions.

But he doesn't succumb easily to the pressures most of us feel to get issues decided quickly and neatly.

He organizes and reorganizes his thinking. He plays thought games. In a relaxed and often unconscious way, he allows ideas to bump up against each other, flowing from one pattern to another like a kaleidoscope.

This kind of thought play often seems to bring sudden insights relevant to the problem, sometimes when the creative person is not even aware that he is thinking about the problem.

A final stage, according to Taylor, involves implementation. Many lovely ideas may die for lack of skill or other resources in execution. The person who created the idea may not be able to carry it out himself nor explain it clearly enough to somebody who can.

What, you may be asking, does all this creativity business have to do with knowledge utilization in education?

A great deal, I think.

I'll suggest some applications which seem promising.

First, assuming adequate support from the President and Congress, NIE or NCEC could develop a direct program within present educational institutions. This program would involve the identification and instruction of creative teachers and school administrators.

One of the major themes of this whole report is that knowledge utilization--that is, the use and development of ide[illegible] sources--depends heavily on the quality and energy of the communication systems of the individuals and agencies involved. Even the best

conceptualization and research may wither in the absence of fertile and active minds among practitioners.

In such a program, it seems to me that the Center for Creative Leadership Center could provide a great deal of help. If the program is to develop on a large scale, then Taylor, Farr and others at the Center might help in its planning. Also, they could instruct those who are to do the further assessment and instruction. Thus the Center for Creative Leadership might become the generative and inventive hub of the program.

Within a school system, agents of the NIE might help to locate and instruct the more creatively oriented and interested students, teachers and administrators. With cooperation, they might help administrators to reorganize the system in such a way as to bring persons so identified together into a learning group. This might provide the kind of social reinforcement which would help to sustain whatever innovations develop. Even more important, by building such a subsystem above "critical mass" might provide the sort of ambient which facilitates inventive and innovative thinking and activity.

An example of what might develop is St. Mary's Center for Learning in the heart of one of Chicago's ghettos. The students, teachers and administrators of this high school were not picked and trained in the manner described above. Still, there appears to have been a self-selection and self-training process similar to that mentioned. In any case, it is a school anyone interested in educational creative action ought to observe.

[illegible] for a few [illegible] still [illegible] and a few [illegible], the teacher[illegible] as cas[illegible] as most [illegible] students. Jeans and sweatsh[illegible] popular. And often [illegible] to distingui[illegible] some of t[illegible] young teachers from their [illegible].

[illegible] classes, I found n[illegible] dreary stillness suggesting auth[illegible]itarian discipli[illegible] rowdiness of young people in a brief [illegible]ape from dull cl[illegible] [illegible]tead, I saw students eating snacks an[illegible] [illegible]ing with each [illegible] some keen things that had happened [illegible] the last class.

I watched a young teacher [illegible] she [illegible]signed a black girl to do narra[illegible]ion for a videotape the students were making. They discussed what directions the narration might ta[illegible] The girl tried to ad-lib it, but decided she would have to write it down. While another student learned some camera techn[illegible] practiced with the student director, she sat down and wrote very quickly several pages of narra[illegible]on. I learned later that this girl had had a great deal of trouble with English composition i[illegible] [illegible]her schools. Here, with the focu[illegible] on using it as a tool for [illegible] own purposes, she seemed to have no trouble at all. I'm sure she [illegible]n't think of it as English composition.

In another class, I watched Star Trek on a color TV monitor with the teacher and pupils. After the program, he got them discussing the feelings and relationships [illegible] the characters in the program. Then he asked them to think and write about how their own feelings and rela[illegible]onships might be [illegible] [illegible] or different fr[illegible] those they had o[illegible]erved and [illegible] [illegible]. Again, I feel sure

that, when those students wrote about their [illegible] and relationships, they were unaware that they were doing English composition.

I talked with Sister Ann Christine and Ms. Elizabeth Conley, two teachers at the center. From them I learned that St. Mary's has a student-faculty council with real decision power and with a majority of students. This may help to account for the apparently relatively trusting relationships between students and faculty. Sister Ann and Ms. Conley have probably read more educational research than most high school teachers. While they do not discount it all, they did not seem to find much in it of help to them and others in their innovation and development.

Sister Ann Christine had developed a proposal for applied research in vocabulary improvement. I think it has considerable merit.

A similar program might be developed with the more creative futurists and researchers.

In both cases, we will need appropriate reward and appreciative systems to nurture the growth of creative thought and action.

The basic notion is to locate and instruct people in such a way that when they work individually or together they provide the most fruitful knowledge utilization possible. In Pilot Study #7, we have suggested how simulation and games might be used to help such people elaborate and try out alternative ways of thinking and doing the education bit.

So much for my suggested direct programs with current institutions.

On our trip East last fall, Costello, Talbott and I also visited the Interpretive Design Center of the National Park Service at Harpers Ferry, West, Virginia. We did so at the suggestion of people in NCEC. We also attended a conference on simulation and games in Baltimore.

The concept and work of the Interpretive Design Center for the National Park Service tied in beautifully with something this NCEC project seemed to be leading toward.

You can see in the conclusions and recommendations of this report a suggestion to put a much smaller proportion of federal funds into existing educational institutions and a much larger proportion into more direct informational systems. These systems would be purposely designed to tie in more directly with the communication systems of young and adult learners. The Park Service Center provided an intriguing model of how this might be done.

For one thing, the Center has a group of highly creative planning and production people. These people also have connections with high quality consultants and production experts to whom they can contract some of their projects. They work in an atmosphere which seems to stimulate concentration and creativity.

More than any other practitioners I have met, the people at the Center seem aware of the kinds of problems we have highlighted in this report. That is, they continually design and redesign their information systems to tie in as closely as possible with the communication systems of the greatly varied consumers they seek.

Without using the term, they consider carefully the epistemic communities they are producing for. They consider levels of interest and knowledge, from those consumers who want to take in only a swift, casual glimpse of a park to those who want to learn all they can about the insect life there. They use new and old information technologies, singly and in combination, in most inventive ways.

Would it be possible for NIE, say, to support the development of similar centers in other areas of useful and appreciative learning? I think of such areas as health, applied economics, communication, etc. These could take advantage of some of the technologies and distribution systems we have already, and perhaps invent and develop new ones.

If we consider the basic learning functions which might be served, such production/distribution centers could become increasingly important. If we think of learning as fundamental to coping and to enjoyment and remember that learning occurs any time, anywhere then developing such centers might make a great deal of sense. Surely, it would be worth some pilot experimentation.

Moving in this direction would put the NIE more in people's learning business and less in the institutionalized education business. That involves risks, some of which we can't predict. But the payoff just might be worth the trouble.