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ABSTRACT

Activities to date are summarized in connection with a plan to establish an information research facility for the School of Education at the University of British Columbia. During an exploratory year, issues investigated included offering an experimental course in information systems in education; design and economic questions related to making searches of the ERIC Tape Data Base; the possibility of extending service beyond the university; and exploring the role of information in educational research and innovation and in preservice, inservice, and graduate training programs. Various alternatives for the project's future also are discussed. (SK)

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DEVELOPMENT OF THE INFORMATION KNOWLEDGE RESEARCH CENTRE (I/KRC)

WORKING PAPER

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Faculty of Education  
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February 1974

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It is true that what is settled by custom, though it be not good, at least  
it is fit . . . Whereas new things piece not so well; but, though they help by  
their utility, yet they trouble by their inconformity. Besides they are  
like strangers, more admired and less favored. (Sir Francis Bacon 1597)

As quoted in: Rogers, Everett M. and  
Shoemaker, Floyd F., Communication of  
Innovations: A Cross-Cultural Approach.  
The Free Press, New York. 1971. p. 134.

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## Introduction

Since May of 1972 various discussions have taken place within the Faculty of Education with respect to the possibility of establishing some type of information research facility. Early on an invited paper was also submitted to the Canada Studies Foundation which outlined preliminary thinking on the broader problem of the development of a Canada wide information system for Education. (1) A significant move was made within our own faculty in early 1973 when the decision was made to acquire the output of an existing educational information system, the ERIC Tape Data Base, and contract for programming and installation services which would allow for computer searches of the data base. (2) The data base is now being added to at the rate of approximately 20,000 documents per year. The UBC Library has, through continuous subscription, acquired the complete ERIC microfiche collection (now in excess of 70,000 documents) and the related abstracting journals and index publications. Our development of a computer search capability for the collection can add significantly to its utility as an information source.

In August of 1973, with the ERIC search program operational, a broad ranging discussion was held with the Dean and Associate Dean. A complete history of efforts to date was outlined with rather penetrating discussion of the pros and cons related to establishing an information research facility and the steps needed to explore the idea further. (3) From the outset, the intent has been to examine the feasibility of developing an information facility

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- (1) See: Summers, Edward G., Establishing the Canadian Studies Education Information System (CSEIS): Planning Phase. Canada Studies Foundation, Bloor Street. Toronto, 1972. 32 pp.
  - (2) Installation and programming services were provided by the UBC Computing Centre, the Faculty of Education Statistics Laboratory, and the Research Information Center of the University of North Dakota.
  - (3) A complete history is available.

within broad parameters, a facility which would look to information analysis and synthesis as well as collection and organization, and a facility more broadly conceived in scope and function than just one single computer data base.

The decision was made to engage in a year of exploratory activity to include:

offering an experimental course on information systems in educational research

probing the design and economics questions related to making searches of the ERIC Tape Data Base available within the Faculty of Education and the University community

analysis of resource needs in offering data base service beyond the University

exploring the issue of the role of information within educational research, innovation, knowledge production and utilization, and the change process

defining the role of an information service centre in pre-service, in-service and graduate training programs

experimenting with batch and individual searches of the data base

analysis of the parameters related to a thrust in information analysis and synthesis.

These key areas have constituted the general terms of reference for activities engaged in to this point in the exploratory year.

This working paper serves as a summary of activities to date as they relate to the general terms of reference. The major purpose of the paper is to provide a vehicle for discussion, evaluation and planning and to present - for consideration - possible alternative configurations for the continued work of the Faculty of Education in the area of information retrieval and analysis. The stress is on ideas and alternatives, goals and choices, and speculation and conjecture rather than complete synthesis.

## I. Some Broad Perspective

Over the last decade there has been a steady increase in activities and research which relate to what is labelled "research and development" in education. (4), (5) The net result of much of this inquiry suggests that

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- (4) Some elaboration of the concept may be in order here. Research and development involves both basic and applied research activities to produce:
- (a) knowledge about the learning process (For example, research related to improving our understanding of the fundamental psychological and linguistic processes underlying language comprehension.);
  - (b) knowledge related to the social context of learning (For example, the classroom or school as a social system, instructional technology and methodology, development of instructional materials.); and
  - (c) knowledge on the organization and administration of the educational enterprise.

A key aspect of the research and development concept is the allied demonstration of the feasibility of new material, processes or organizational forms.

It is also interesting to note the following definitions reported by the Education Division of Statistics Canada used to parcel capital expenditures and personnel costs for research and development.

"basic research" - regarded as being essentially work related to the discovery of laws which underlie the behavior and patterns of social development.

"applied research" - considered to be the study of clearly identified phenomena or situations through the application of theoretical concepts and models.

"development" - defined as the rational or conscious utilization of knowledge gained through research to prepare relevant plans and programs for various social situations, including the testing of new techniques and the means designed to carry out research and development in the various fields of the social sciences.

- (5) An interesting earlier exposition of the role of research and development in change and innovation in Canadian education is the CCRE publication by Fred F. Whitworth, On Organizing R & D in Education. CCRE, Ottawa, 1968. This analysis came out during the height of bulging enrollments et al. and at the time we rudely awakened to educational "change".

educational research and development is a far more complex business than was originally anticipated. Evaluation of the massive USOE efforts, spanning almost a decade, supports this contention. Very briefly, schools were viewed as "targets" for needed improvement. Research and development centres - utilizing research expertise and designed to explore specifically defined problem areas - were to develop the basic and applied research knowledge. Regional laboratories were to serve as disseminators, demonstrators and the like and act as the linkage mechanism to bridge the gap between research and practice. Thus, in this model, research activities precede and feed results into the development activity which in turn provides materials and programs for diffusion and adoption. The criticisms of the model are well known, the major one being that the research and development process is viewed as a linear array beginning with inquiry (research) and moving to development, dissemination, adoption and the like. The model appears simple and logical but anyone who has worked in research and development activities in education can readily pinpoint related social and communication problems and other hidden complexities. The linear model views the research and development process too narrowly and does not sufficiently emphasize the fact that the context for debate about research and development must be, essentially, a pragmatic/reality based discussion of the change process in education. Conditions forcing change do not necessarily begin with findings generated from research in the laboratory but initiate anywhere along the continuum. Practicing educators, and educational theorists, are beginning to objectively examine general changes in society over a period of time with an eye to developing analyses which can then be applied to contemporary educational problems. Thus, the current search for more relevant models for research and development in education in both Canada and the U.S.



In recent literature, discussions have been reported which suggest that we broaden the context of our research and development efforts through examination of the dynamics of both the production and utilization of knowledge and their interrelationships to one another. It has been suggested that what is needed in research, development and change activity in education is better conceptualization - and even institutionalization - of the dynamics of the knowledge production and utilization process. This approach would involve a change in paradigms and a more expansive phrasing of the old, frustrating research into practice dictum. The relation of research to practice involves a series of complex, interrelated stages still but vaguely conceptualized and understood and certainly little supported by empirical research. In short, the suggestion is being advanced that we discontinue the investigation of these stages and their validation and turn, perhaps more productively, to an examination of knowledge production and utilization as a researchable process. The suggestion is certainly worth examination.

In 1970 Short (6) reviewed studies on the general problem of knowledge production and utilization in education. The review considered related scholarship in three areas of interest: (1) the relation of research to practice; (2) the nature of knowledge production; and, (3) the nature of knowledge utilization. He concluded that little information is available on (1) and that if research is to make a difference in practice, more disciplined study of the needs of the practitioner must be undertaken. In terms of (2); knowledge production, whatever research is produced must still stand the test of critical review and organized synthesis. In reference to (3), the utilization of knowledge needs to be examined in broader fashion

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(6) Short, Edmund C., "A Review of Studies on the General Problem of Knowledge Production and Utilization". 1970. ED 055 022.



than just locating and retrieving information. In a later paper, Short (7) looked to knowledge production and utilization with application in the special area of curriculum. His recent AERA review synthesizes and adds to these two earlier papers. (8)

A series of reports from a recent project conducted by the Center for the Advanced Study of Communication at Iowa University extends and adds considerable interpretation to the work of Short: (9) In general, the project conclusions substantiate other reports in suggesting that there has been minimal direct use by practitioners of the data base of educational research findings. The report strongly recommends total reconceptualization of the process of knowledge production and utilization in education. Topics covered in the separate reports include:

operational strategies and philosophical/theoretical considerations on dissemination and utilization of knowledge

communicative characteristics of educators

reviews of research and theories related to knowledge production and utilization

educators and information systems

problem naming and problem solving capabilities of individuals within the education system

bridging the gap between research and practice

the role of communication channels in the propagation of educational innovations.

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(7) Short, Edmund C., "Knowledge Production and Utilization in Curriculum." 1971. ED 055 023.

(8) Short, Edmund C., "Knowledge Production and Utilization in Curriculum: A Special Case of the General Phenomenon." AERA Review Of Educational Research, 43. Summer, 1973. pp 237-301.

(9) The final report for the total project is titled, "Toward a Reconceptualization of Knowledge Utilization in Education" January 1973. ED 075 330. The related studies include: ED 075 331-Aug 1972; ED 075 332-Jan 1973; ED 075 333-Jan 1973; ED 075 334-Jan 1973; ED 075 335-Jan 1973; ED 075 336-Jan 1973; and, ED 075 337-Jan 1973.

Most of the issues related to innovation, change and research and development in education and the relationship of such efforts to knowledge production and utilization are touched on in the reports. (10) Other recent studies have also examined issues similar to those included in the reports. For example, Nelson's (11) study is typical of many which report analysis of the gap between research production and utilization in education. He suggests that the dissemination process is extremely long and little information reaches the general education and research and development community until too late in the process: Both formal and informal dissemination systems in education are still diffuse and it is difficult for researchers and practitioners to find the information they need.

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- (10) In considering knowledge production and utilization as a process, it is interesting to speculate about the changes that might be needed in our approach to graduate study if we shifted our perspective along these lines. Can one imagine, for example, a beginning integrative course for all graduate students introducing them to the process of disciplined inquiry as it relates to knowledge production and utilization in education? Or, a course on the role of information and information systems as they relate to knowledge production and utilization? Better yet, visualize the furor that a course titled, "Research and Statistics for the Practitioner in Education" would cause if it were suggested that it supplement our current offerings. (I daresay such a course would meet the needs of a good percentage of our graduate population.)

We could, perhaps, better communicate our own graduate work, professional development activities and field service needs if they were articulated within the framework of knowledge production and utilization. In such activities we are, in essence, in the business of developing individuals who can perhaps add to the knowledge base on a theoretical or applied level and producing leadership personnel who are capable of more intelligent use and application of knowledge in educational problem solving (within an inquiry process framework) as it relates to research and development in administration, curriculum development, supervision, provision of special services, and classroom teaching.

- (11) Nelson, Carnot E., "Scientific Communication in Educational Research. Final Report." Nov 1972 ED 073 793.

Much has of course already been written over the years about the educational research and practice gap. However, there seems to be even greater need for rapprochement between research and theory in education. The study of the production and utilization of knowledge has a close tie-in here. The plethora of educational research is often typified as being, "a mile wide and an inch deep". Theoretical and conceptual ambiguity are rife. Studies abound, but exist within a theoretical vacuum leading to the proverbial analogy that the application of educational research is similar to the drunk and the lamp post - used more for support than for illumination. Can we even talk about a "science" of education or of educational research as a discipline? In their recent text, Broudy, Ennis, and Kimmerman (12) organize readings on the philosophy of educational research. Their Preface states:

Such an important undertaking (education) should be founded on knowledge. What is needed is a science of education - a body of lawlike generalizations founded on facts about educational behavior, from which testable predictions can be made. How reasonable is the expectation that this need can be met? (13)

The authors are not too sanguine in their appraisal of the probability that the question they raise can be answered in the affirmative.

Can this lack of success be blamed on a lack of research? The volume of research in psychology, economics, sociology, and anthropology - to mention a few of the behavioural sciences - has been expanding rapidly. In the last half century a huge library of research studies in education has been accumulating, our faith in research has been stimulated and nurtured by sharp increases in financial support. And yet, the impact of this research on either theory or the practice of education is diffuse, episodic, and uneven. It is almost as difficult to arrive at a dependable generalization on the effects of educational research as it is to arrive at a reliable generalization about education itself. (14)

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(12) Broudy, Harry S., et al. Philosophy of Educational Research. John Wiley and Sons, New York, 1973.

(13) Ibid, p. v.

(14) Ibid.

(In my opinion, educational research suffers from having arrived at being "Big Science" in terms of quantity, but still being "Little Science" in terms of its theoretical base and conceptual development. (15)) The authors opt for improving the situation through better understanding of scientific inquiry as it relates to empirical research in education. Their chapters adumbrate the conditions necessary if educational research is to make good its claim of being scientific. They also provide readings on the theoretical issues involved in a science of education assuming, as they state, "that there can be such a science."

In educational inquiry, "mad dog empiricism" seems to abound - the gathering of data about minutiae giving little attention to generalization of results beyond particular respondents. (The volume of such research ebbs and flows in direct proportion to the amount of contract dollars available!) How many hundreds (thousands?) of studies lie buried in archives like Dissertation Abstracts on method x versus method y, using n's of one class-room, with the treatment lasting two weeks or less? A volume of such research exists in the field of reading and language alone. The researchers are to be commended for their energy and having passed the dissertation hurdle (and their sponsors perhaps roundly rubbished!) but they contribute little perspective on the real issues in education and their results suffer from lack of conceptual orientation. The grand "blue sky" theorist also holds forth - providing abstract speculations about education and social change, using "education" as the unit of analysis, but seldom providing translatable testable hypotheses. Such theorizing may sensitize us to the need for change, but the net result in actually effecting change or broadening our understanding

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(15) Price, Derek J. de Solla, Little Science, Big Science. New York, Columbia University Press, 1963.

of the change process is nil. We often end up with a flashy intellectual exercise in theorizing, but what is lacking is a system of propositions about education stated at a level of generalization that facilitates testing. Empirical investigation without a conceptual base becomes bogged down in irrelevant data while ignoring potentially fruitful objectives. The shortcoming of grand theory is just that - its grandness.

I must emphasize that I'm not suggesting that no research makes a difference or that all theory is blue sky. Rather, I am saying as others have that little research is unambiguous in providing generalizations that offer a high probability of permanence over time and place. For example, in their recent analysis of research on the effect of schooling, Averch and others (16) suggest:

We can view ourselves figuratively as being in a "flat" area. Movements in various directions from our current position do not seem to affect our altitude. Furthermore, we do not know whether this flat spot is at the bottom of a well, on a broad plain, or atop a tall plateau.

What then is the ground for disciplined inquiry in education? Most researchers, at least in their verbal behavior, would opt for the "middle ground" - relating theory to research and research to theory - suggesting that the theoretical base must be specific enough to be empirically testable, and data must test theoretical hypotheses.

One might legitimately ask at this point what the previous metaphysical ramblings and cursory speculation on topics such as research and development, change and innovation, knowledge production and utilization, philosophy of educational research, shortcomings in the science of education, research and

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(16) Averch, Harvey A. et al, How Effective Is Schooling? A Critical Review and Synthesis of Research Findings. Rand Corporation, Santa Monica, March 1972.

practice and research and theory anomalies, mad dogs and blue sky theorizing, the middle ground and drunkards and lamp posts has to do with the business of establishing an information research facility in the Faculty of Education. The answer is quite straightforward. Irrespective of what approaches we take in the identification and solution of educational problems throughout the spectrum of activities in which our faculty become involved, the effective location, organization, transfer and analysis of information is critical. Individuals concerned with decision making and delivery of educational services must of necessity acquaint themselves with the great variety of alternatives which are applicable to their responsibilities. The information needs of the serious researcher are even more obvious. Our theorizing, our attempts at creative synthesis, our research and development, our efforts at teacher education and continuing professional development, our curriculum building, our graduate program development, our field service activities, and our attempts to reach to the roots of educational practice for improvement will only be as strong as the information to which we have access in Phase II in developing our speculations and conclusions. What is needed is better utilization of the available information base including its analysis and synthesis as well as its location, organization and dissemination.

If our faculty wishes to do more in meeting the challenge of Phase II than just extending efforts on the basis of our own personal experience, or only within the perspective of our own parochial sphere, we must look to more productive rationalization and systematic utilization of available information. We can achieve greater return on our investment of effort and resources if we become increasingly au courant with the output from the rest of the educational universe and organize such information within the

broader perspective of the production and utilization of knowledge. Becoming aware of the work of others with differing points of view can negate the closed mind of narrow specialization. Bringing together references from widely scattered information sources can provide the accidental or incidental encounter with a fact or thought that provides new insight, leads to formulation of a new concept or theory, or is just plain useful in the day-by-day business of teaching, learning and managing education. We are all aware of the stimulation gained from talking to colleagues. This same stimulation is possible in browsing an information collection, a series of abstracts, or a well organized index. The new synthesis on the cutting edge, the idea for a more effective classroom lesson, the structure for more creative administration, the improved model for teacher education, or the broad insight which may negate some of the existing theoretical ambiguity of a field are all contained in the information of today. It is vital that such information be made available in a form that is convenient for the widest group of users. The development of an information facility within our faculty, organized to these ends, could be a decided asset, as we attempt in Phase II to provide leadership and serve as a resource to the educational community.

## II. Information Analysis in Relation to Knowledge Production and Utilization

In looking to the development of an information facility, an important trend in the field of information science should be borne in mind. Increasing attention is now being given to the organization and synthesis of information within the broader framework of what was referred to earlier as the process of knowledge production and utilization. Information analysis is the general rubric being applied to this process.



Little need be said to substantiate the fact that we exist in an era of information explosion and knowledge in general is increasingly cited as being a prime commodity. The so called "knowledge industry" represents vast expenditures of energy and resources in developed countries taking up a considerable proportion of their resources and total productivity. (Representing 25% of GNP in some areas.) Olson's (17) recent analysis, and the excellent chapter by Cooper (18) in the latest Annual Review of Information Science and Technology provide extensive review of reports on the economics of information. The report by Parker (19) is typical of those which attempt to analyze the relationship between social and economic trends and developments in information technology. He provides suggestions for meeting information needs in the short range - 1975 to 1980 - and advocates development of national information policies. A recent collection of papers from an information conference provides the international flavor of the problem. Authors from nine countries examined many of the critical problems in world information exchange. The need for generation of adequate analysis and synthesis of information was a key thread throughout the reports (20)

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- (17) Olsen, Harold Anker, "The Economics of Information: Bibliography and Commentary on the Literature." ERIC Clearinghouse on Library and Information Science, Washington 1971. ED 044 545.
- (18) Cooper, Michael D. "The Economics of Information." 8th Annual Review of Information Science and Technology, Carols A. Cuadra (Ed). American Society for Information Science, Washington 1973. 500 pp.
- (19) Parker, Edwin B., "Information and Society; a Report to the National Committee on Libraries and Information Science." March 1973 ED 073 776.
- (20) Chernyi, A. I. (Ed) "Problems of Information Science; Collection of Papers". Nov 1972 ED 075 030.

Raw information is without doubt the most valuable input in knowledge production and utilization. (21) A statement from the recent report

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- (21) No hazy and fast definition is made here of the terms knowledge and information. The manner in which they are differentiated in this working paper can perhaps best be indicated by a simple illustration. "There would be little argument that the world is now involved in an explosion or flood of information. There is some question, however, as to whether or not this can be considered a concomitant explosion of knowledge." I have found that this rather prosaic distinction has much common coinage and utility. For example, a 1973 conference sponsored by the Ford Foundation was titled: "Conference on Access to Knowledge and Information in the Social Sciences and Humanities." Everyone seemed to know what the group was up to without a lot of elaborate definition. For an overview of current thinking on information and knowledge, see the excellent book of readings: The Growth of Knowledge: Readings on the Organization and Retrieval of Information Manfred Kochen (Ed), John Wiley and Sons, New York, 1967. See also: Helvey, T. C. The Age of Information: An Interdisciplinary Survey of Cybernetics. Educational Technology Publications, Englewood Cliffs, New Jersey, 1971.

It is of interest also to note that the search for an integrated, comprehensive theory of information science is still on. Heilprin suggests that such theory building is difficult because of the large number of disciplines concerned with human communication including physics, biology, psychology, library science, several social sciences, applied logic and mathematics and cybernetics. The last is thought to underlie nearly every information science phenomena. See: Heilprin, Laurence B., Impact of the Cybernetic Law of Requisite Variety on a Theory of Information Science. Maryland University Computer Science Center, College Park, Md. March 1973, Report No. TR 236. Heilprin also discusses other aspects of information in social sciences and humanities. He cogently points out that the most critical processes in access to information occur in our minds and not in the data files. Access to knowledge involves completing an information path connecting two minds across a variable physical segment. See: "On Access to Knowledge in the Social Sciences and Humanities, From the Viewpoint of Cybernetics and Information Science." April 1972. ED 075 046, and "Impact of Cybernetics on Information Science and Vice Versa." Sept 1972. ED 075 043.

Scientific and Technical Information in Canada (22) is particularly pertinent.

Knowledge permeates all interests and areas of our lives. It is vital to our existence and must be effectively utilized for our development. A fundamental Canadian need today is to encourage the use and further the exploitation throughout all regions and all sectors, of the vast amount of world knowledge. It is the master resource.

In recent years the Science Council has provided leadership and strongly advocated more effective coordination and delivery of information in the science area. However, the Council also supports development of special information services in areas other than science. (23)

As the social and technical organization of man becomes more complex, communication plays an increasingly more important role. While the total exchange of information in such a process includes cultural, economic, scientific and technical components, this report concentrates on that part which involves organization and flow of scientific and technical information. (STI). Though no attempt is made to deal with information relating to the humanities and social sciences, the Science Council is fully aware of, and deeply concerned with, the need for action in these fields and is hopeful that its recommendations will have a favourable influence.

Thus, information systems have been developed to supplement traditional library efforts and to facilitate information organization and exchange. The recent significant trend in such systems is the shift to include information analysis. Hornig (24) suggests that every individual acts as a small information analysis center on writing a research paper or utilizing existing knowledge to solve or formulate a problem. However, the term is used more broadly than this individual effort. Information analysis involves deliberate, broadscale

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- (22) Science Council of Canada (Special Study No. 8), Scientific and Technical Information in Canada, Part I, Queen's Printer, Ottawa, 1969. P. 1.
- (23) Ibid, p. 1. The series of eight Science Council of Canada reports has the reputation of being perhaps the most comprehensive study available which makes a macro examination of information networks from a national point of view.
- (24) Hornig, Donald F. "Role and Importance of Information Analysis Centers". Proceedings of the Forum of Federally Supported Information Analysis Centers, COSATI, Washington, 1968.

attempts to bring some kind of order into the ever-increasing flood of information. Simpson (25) suggests:

The increasing number of information/data analysis centers represents not only a partial solution to the quantitative aspects of the information problem but also an increasing acceptance that to be able to stay current requires the formal establishment of a group of professionals committed, at least in part, to that assignment....

Information/data analysis centers, while seemingly costly, are not so expensive as the ESTIMATED cost of NOT KNOWING. Information analysis centers are, in a sense, intelligence centers, and must maintain a continuing aggressive acquisition program as well as a keen awareness of the user's needs.

Critical evaluation, according to Brady (26), is the key in information analysis.

The input material is examined by a specialist in the field, analyzed in appropriate ways, and conclusions are drawn that represent new knowledge that did not exist before. This creation of new knowledge is essential if an activity is to be designated an information analysis center. Reorganization of existing knowledge into new formats is not sufficient. The center must produce critical reviews, critically evaluated data compilations, correlations between various types of data, or some other product of intellectual effort that is recognized as a contribution to new knowledge....

The Committee on Scientific and Technical Information (COSATI) provides the following characteristics of an information analysis centre. (27)

The key activities are the analysis, interpretation, synthesis, evaluation, and repackaging of information for the purpose of enabling users better to assimilate the information or numerical data of a specific field.

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- (25) As cited in Harold Wooster, "An Information Analysis Center Effectiveness Chrestomathy." Journal of the American Society for Information Science, 21:2 (March/April), 1970. p. 130.
- (26) Brady, Edward L. "The Information Analysis Center and Its Role in Processing and Transfer of Technical Information" as quoted in: Weisman, Herman M., Information Systems, Services and Centers. Becker and Hayes, Toronto 1972. p. 143.
- (27) Directory of Federally Supported Information Analysis Centers January 1970. Sponsored by Panel 6, Information Analysis Centers, Committee on Scientific and Technical Information Federal Council for Science and Technology, 1970. p. 71.

An information analysis center uses subject specialists to perform the analysis, evaluation or synthesis.

An information analysis center produces new, evaluated information in the form of critical reviews, state-of-the-art monographs, or data compilations and usually provides substantive evaluated response to queries.

An information analysis center provides assistance to a community of users and not just assistance to "in-house" personnel.

Etzioni(28) rightly views such centers as serving a gatekeeping role or as the quality filter in the information transfer process.

We would be remiss if we did not mention the definition of the information analysis centre as set out in the Weinberg (29) report. This definition has perhaps had more influence in structuring information analysis activities in the United States and Canada than any other statement. The information analysis centre is:

....a formally structured organizational unit specifically (but not necessarily exclusively) established for the purpose of acquiring, selecting, storing, retrieving, evaluating, analyzing, and synthesizing a body of information and/or data in a clearly defined field or pertaining to a special mission with the intent of compiling, digesting, repackaging, or otherwise organizing and presenting pertinent information and/or data in a form most authoritative, timely, and useful to a society of peers and management.

The bulk of effort in information analysis has taken place in the sciences, but such activity has spurred recently in the social sciences as well. What is needed is further development of the ability to take raw information and convert it into knowledge - the assembly of details and facts, in essence,

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(28) Etzioni, Amitai, "The Need for Quality Filters in Information Science Systems." Science, 171:3967. January 1971

(29) Science, Government and Information, A Report to the President's Science Advisory Committee. The White House, Washington, 1963.

into comprehensible, analytically ordered systems of coherent ideas. The case for increased information analysis in education was well put recently by Hayes. (30)

(Anyone who has been in the information business for long has learned that those with responsibility for decisions, while they need and want access to the data and published reports on which to base their decisions, need and want even more to have informed analysis and interpretation of those data. If this is so in science and engineering, based as they are on well tested theory and measurement, how much more is it so in education.

One of the most highly organized and creative information analysis efforts in the social sciences has taken place within the ERIC system. A recent catalog lists over 1,500 items representing a wide variety of information analysis genre. (31) These publications provide tangible evidence that analysis activity can be oriented to the needs of the lay public related to education, the practicing professional and the serious researcher. They illustrate analyses and syntheses of the results of research and practice, interpretation across widely diverse publications, and evaluation that provides focus and meaning to educational data and research and development results.

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(30) Hayes, Robert M., "Communicating Information." The ERIC Report, No. 2. Oct/Nov. 1973. p. 2.

See also:

Paisley, William, "Improving a Field Based (ERIC like) Information System". Journal of the American Society for Information Science, 22, Nov-Dec, 1971. 399-408.

Rees, Alan M. Contemporary Problems in Technical Libraries and Information Center Management: State of the Art, American Society for Information Science, Washington, D.C. 1973.

(31) Educational Resources Information Center (ERIC) Information Analysis Products 1967-1972. J. I. Smith and Mary F. McCord (Eds), Macmillan Publishing Co., New York, 1972.



This type of analysis activity exists currently in Canadian education but it is largely unsystematic, widely scattered and still not based on broadly organized information sources. Such efforts also tend to be focused on information processing and organization rather than effective analysis and synthesis. (32)

The following list provides explication of the range of activity possible in information analysis.

Review A general survey for the purpose of examining or inspecting the knowledge contained within a discreet category of documents.

Summary An abridgement, or compendium of a preceding discourse, a recapitulation.

Abstract Informative or descriptive narration which briefly summarizes the substantive content and its organization.

Annotation Explanatory notes or comments on the substantive content and organization of a document.

Interpretation A reordering rearrangement, or new view of material for the purpose of explaining.

Translation A faithful and accurate rendering of a document into another form.

Extrapolation A projection, extension, or expansion of the substantive content of a document by inferences based on assumed continuity, correspondence, or other parallelism in order to provide new knowledge.

Application The specification of ways that information in documents can be applied.

Synthesis The combination of the content of several documents in such a way as to constitute a pattern of structure not clear before.

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- (32) See for example: J. Thom and E. S. Hickcox, A Selected Bibliography of Educational Administration: A Canadian Orientation. Canadian Education Association, 252 Bloor St. West, Toronto, Ontario. October 1973. Developed to reflect work by Canadians, the bibliography merely lists books, articles, and other materials published since 1965. The materials are loosely classified under 17 broad subject headings. However, no additional aid is supplied to the reader, either in the form of annotations or abstracts, to help in making decisions about the substantive content of the sources. No cross referencing is provided although it is obviously needed. Nothing is included in the way of real information analysis, or even partial summary, interpretation, application, evaluation or synthesis. It is interesting to note that the Thesaurus of ERIC Descriptors was consulted in developing categories.



Analysis The separation of a document's contents into its component parts so that the relative hierarchy of ideas is made clear and/or the relationships are made explicit; to indicate its organization.

Evaluation Judgment about the value of the content of documents in terms of internal evidence and external criteria.

Some features of the list are worth noting. Information analysis may be engaged in for the purpose of achieving comprehension, application, analysis, synthesis or evaluation of information - basically a rough explication of levels in a cognitive taxonomy. The point needs to be stressed that information analysis and synthesis are different levels of inquiry than are description and organization of information. The list provides a possible model of activities in an information analysis program. Priority problems in the field can be "sensed" and, subsequently, related information organized and delivered to the reviewer (or team of reviewers) who then conduct the analysis activity at the appropriate level. Professional advisory groups of information service centres often serve the important role of determining topics needing analysis and the analysis treatment to be applied to the topics. Although related largely to discussions of information analysis in science, Figure 1. provides good illustration of the relationship between information analysis activities and the products emanating from such activity. (33)

If information remains confined to the community in which it originates, little impact can be expected on the larger audience for which it may have significance. Likewise, if information remains in raw, undigested form its impact is minimal. With increases in the quantity and complexity of educational information, and acceleration of the change process, the user needs organized assistance in obtaining results from work completed by producers of knowledge which may bear on the practical problems he faces.

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(33) As presented in: Weisman, Herman M., Information Systems, Services and Centers. Becker and Hayes, Toronto. 1972. p. 144.

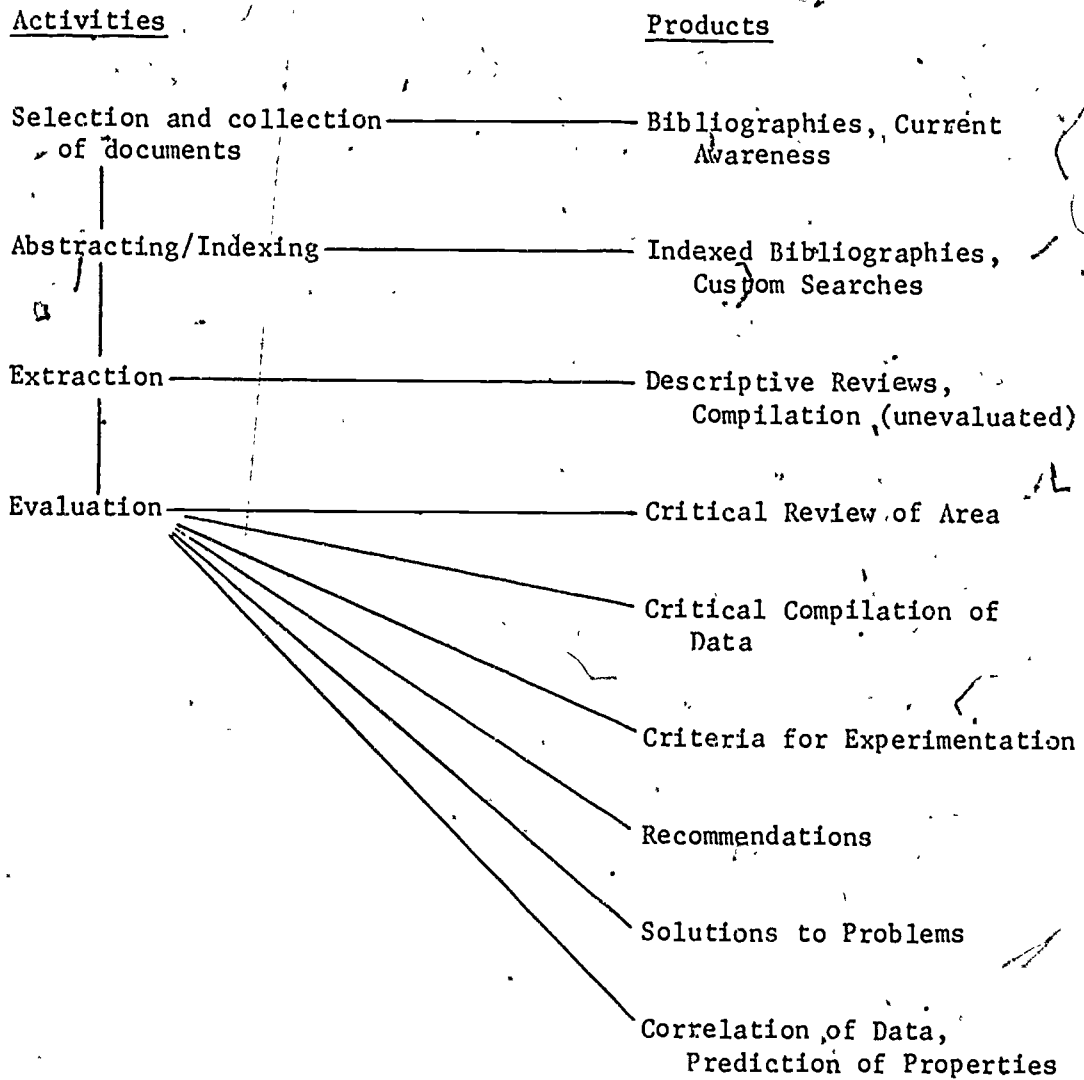


Figure 1. Information Analysis Activities and Products

However, it has also been frequently demonstrated that mere production of information, and even its availability for use, is not in itself sufficient reason to insure that it will be used. Vigorous service efforts are necessary. A review and synthesis of better than a decade of user service experiences, reported by information systems of all types, supports the contention that available information is not automatically assembled and used in research and development efforts. (34) In fact, studies have suggested the existence of a unique sociology of resistance to information if such information is not organized to interface reasonably with user needs. Moores' Law is often quoted, "An information retrieval system will tend not to be used whenever it is more painful and troublesome for a customer to have information than not to have it." (35) We might add, "The system will not be used whenever it is more troublesome to obtain information than to leave it alone."

If we are to maximize the ever increasing investment of funds spent on educational facilities, research and development, curricula and the like we must look also to how well the information products of that investment are disseminated and utilized in decision making. Too often critical judgments are made with respect to new concepts of learning, new curricula, new instructional and administrative support systems, and allocation of fiscal resources in an information vacuum. In ignoring the need to creatively rationalize our use of the ever expanding information base, we may be neglecting the master resource in dealing with educational problems. What is called for is re-examination of current institutionalized assumptions regarding the

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(34) ASIS, Cumulative Index to the Annual Review of Information Science and Technology, Volumes 1-7, American Society for Information Science, Washington, D.C. 1972. p. 162.

(35) Mooers, Calvin N., "Editorial Mooers' Law or, Why Some Retrieval Systems Are Used And Others Are Not." American Documentation. 11:3 July 1960.

role of information in educational endeavors.

The *raison d'etre* underlying our information efforts in Phase II must be two pronged including both the organization and the analysis of information. Our major beginning thrust in developing the Information Research Centre (IRC) should be toward facilitating awareness about information production and utilization in education - bridging the gap between the source and the user - organizing and retrieving information and seeing to its distribution to those who need and can use it. Continuing efforts should also include development of proficiency in "sensing" professional problem areas and generating a wide variety of analysis and synthesis activities related to knowledge production and utilization - in essence provide a means of transforming information into knowledge. (36) To accomplish these two objectives, we should focus immediately on developing a system to provide improved linkage between the available information sources and the user groups who need such information. The concept of linkage between source and user is a dominant one in the information science field. The major emphasis in such linkage is on the user as a problem solver who must interact with the resources and obtain information and knowledge relevant to the solution of his problem.

### III. Linkage Models in Information Transfer and Analysis

Linkage models of various types have been well described in the literature on information transfer in recent years. Three superimposed circles

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(36) Actually, the Information Research Centre might more aptly be called the Knowledge Research Centre (KRC). However, it seemed rather presumptuous to label it thus - at least initially anyway!

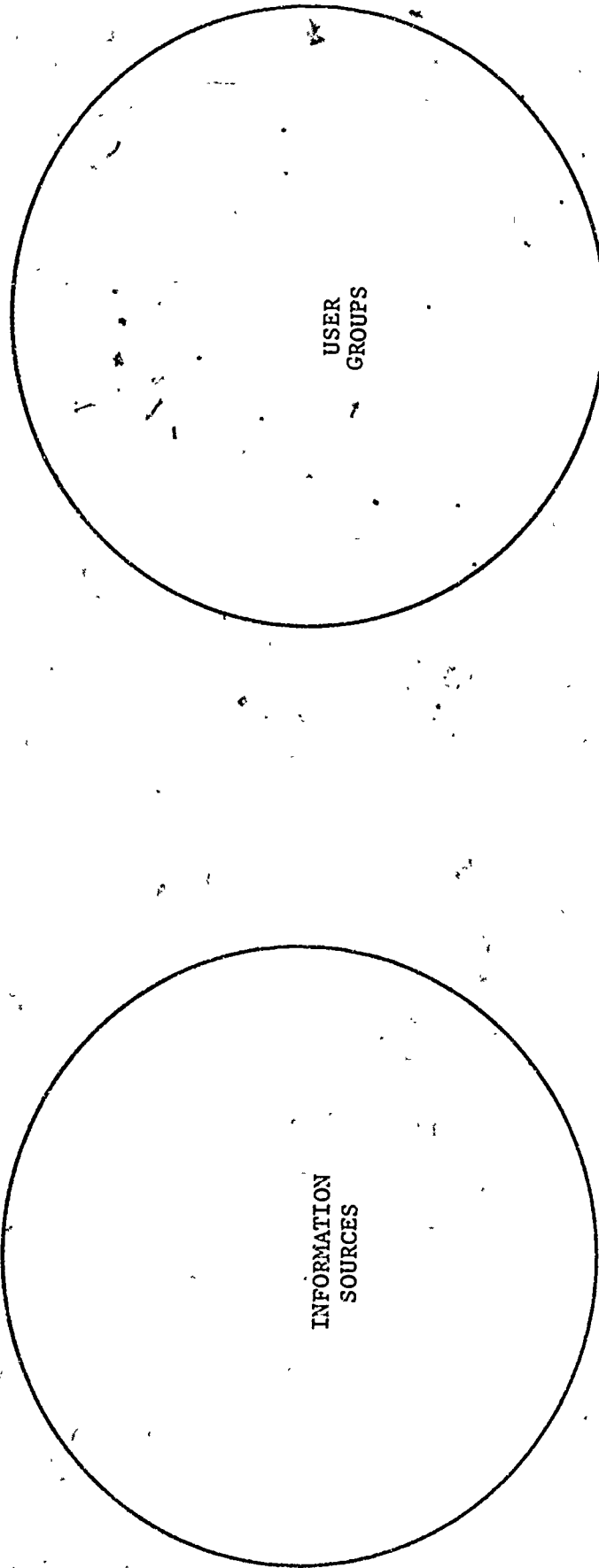


FIGURE 2 Polar Elements in the Information Transfer Process

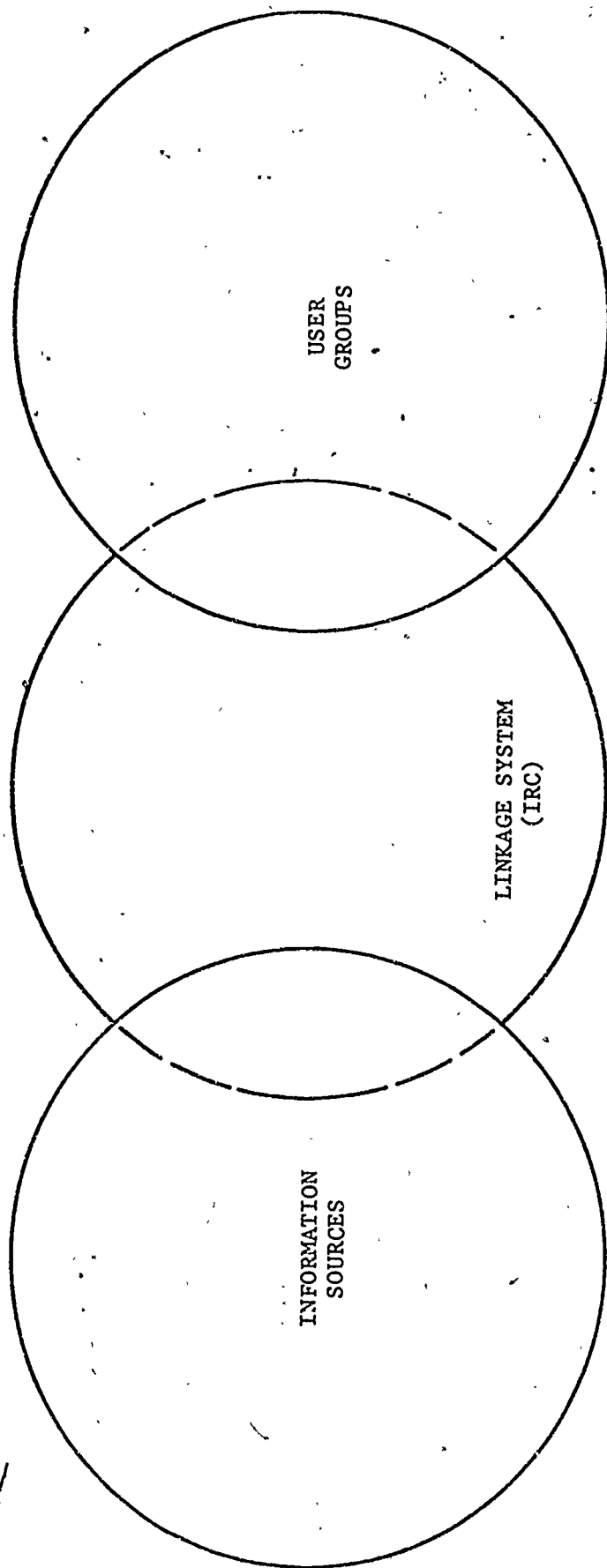


FIGURE 3 Linkage System (IRC) in the Information Transfer Process

can serve to illustrate the linkage concept. (37) Figure 2. establishes the two polar elements - Information Sources and User Groups. In Figure 3., the IRC has been added as the linkage unit. The linkage unit would bridge the gap and provide the switching element in information transfer between sources and users. A wide variety of information could be brought under control in the sources circle. The user group could consist of geographically limited users (i.e., just those within the university community) and users limited to particular reference groups (i.e., educational researchers). The user group could also be broadened to include the total universe of possible users who might have need for the service whether they be located within the university or elsewhere and irrespective of whether they are researchers, practitioners or laymen. Questions related to the breadth of the user group and the amount and type of service to be made available to them almost invariably become questions of funds, facilities, and to some extent, the felt need for improved information services within the reference group.

It is worth delving into some recent user studies before going on to the topic of linkage systems for information transfer. Fortunately in education the user reference groups, although diverse, tend to be well defined. There have been better than two decades of analysis on users and information needs in science and technology beginning with the first landmark study by Herner. (38) The methodological techniques developed through these studies are available for general use in attacking the problem of determining user information needs. Recent years have seen some application in education.

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(37) Apologies to Shannon and Weaver (1949) and their early communication model linking information source, transmitter, communication channel, message, and receiver. Any noise in our system cannot, however, be attributed to these two authors!

(38) Herner, S., "The Information Gathering Habits of Workers in Pure and Applied Science." Industrial and Engineering Chemistry, 46, 1954. pp. 228-236.



Fry (39) reported results from a complex, broad ranging study of the ERIC system - perhaps the most extensive user reaction study reported to date in the information literature. Results indicated that the ERIC system is organized and well thought of, but more attention needs to be given to specific user needs. The report by Paisley and others (40) outlines an excellent methodological study designed to tease out Who needs What Forms of information on What Topics for What Purposes in education. Five methods of collecting data were evaluated including: (1) State surveys of school personnel; (2) questionnaire follow up study of users of information services; (3) query of specialists in education information centres; (4) "hot line" study of educators who telephoned for information service; and (5) monitoring of the periodical literature to indicate trends in educational issues. Paisley concluded, "... if we had to recommend a single 'method of choice,' it would be the State survey. Our preference is based conceptually, on its systematic sampling procedures and, empirically, on its performance in the convergence test." Sieber and others (41) explored the application of the old county extension agent model to tease out the feasibility of using special agents serving as information sources for school personnel. Banathy (42) describes

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- (39) Fry, B. M. Evaluation Study of ERIC Products and Services: Summary Volume. Final Report, Indiana University, Graduate School of Library Science, 1972. (ED 060 922).
- (40) Paisley, William et al, Developing A Sensing Network For Information Needs In Education Final Technical Report, Institute For Communication Research, Stanford University, 1972.
- (41) Sieber, S. D. et al, Use of Educational Knowledge: Evaluation of the Pilot State Dissemination Program. In Vol I, Goals, Operations and Training. Bureau of Applied Social Research, Columbia University, N.Y. 1972.
- (42) Banathy, Bela H. The Education Information Consultant: Skills in Disseminating Educational Information, Final Report. USOE, NIE, No OEC 071 3950 (519) 1972.

a recent related project which was designed to train special Education Information Consultants to fill roles similar to those described by Sieber. Several training program modules are now in process. Auster and Lawton (43) report a recent Canadian evaluation of the commercial on-line bibliographic service for the ERIC system. Their study included a test of the system, analysis of Canadian content, service possibilities for various types of educators, comparison of machine based and hand searching techniques, and costing factors. User acquaintance procedures are described as well as the user-reaction questionnaire.

There is much ground yet to be covered in determining user needs and building adequate feedback mechanisms into information service centre operations. Suspicion and fear of the unknown often detract from perfectly viable efforts at improving information access. Few theoretical models are available for guidance in isolating variables in developing research in the classical sense. Controlled experiments involving all the components in a system environment are impractical, if not impossible, at this time. The best approach seems to be an empirical one. Set up an information service centre, develop reasonable linkage activities, provide services, and tease out the most effective techniques through extensive trial and error in multiple design iterations. The significance of what is still unknown should caution anyone who anticipates that an analytical model, predicting all user variables in terms of needs and reactions to service, is imminent.

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- (43) Auster, Ethel and Lawton, Stephen B., "Meeting Ontario's Need for Educational Information: An Evaluation of the SDC/ERIC On-Line Bibliographic Search Service." March 1973 ED 077 531.

Paradigms are available in numerous sources in the literature which explicate stages in a linkage system for information transfer. (44) In fact, such paradigms are now in the common knowledge or public domain stage in information research. A rough linkage model for the IRC is illustrated in Figure 4. The conceptualization consists of five functions or phases:

- I Negotiation
- II Retrieval
- III Transformation
- IV Communication
- V Evaluation (45)

#### I Negotiation

Once contact is made by the user (either through his own volition or as a result of targetted publicity) the IRC would respond by negotiating the request to specifically define the search topic and open a search case. The negotiation phase is of particular importance. (46) User feedback and evaluation of the forms and instructions used in the negotiation process is also solicited at this stage.

- (44) See for example: Wilfried F. Lancaster, Information Retrieval Systems. Wiley, New York, 1968. An excellent newer text is that of Herman M. Weisman, Information Systems, Services and Centers. Becker and Hayes, New York, 1972. Weisman suggests Receipt, Validation, Definition, Processing, The Reply, Quality Control, Response Completion, Feedback and Record Keeping as major centre functions.
- (45) The Banathy report, cited earlier, was of particular value in explicating this paradigm. These stages also parallel the reference sequence paradigm familiar to libraries and stated in various forms: inquiry, search, report, and reply. See also: Celianna I. Taylor and Joel H. Magisos, Guide for State Vocational - Technical Education Information Dissemination Systems. Ohio State University, Columbus, 1971, for an analysis of linkage applications in dissemination and utilization of information.
- (46) See the attached paper, "Some Comments on the Negotiation Phase in the Information Transfer Process," for additional details of this phase.

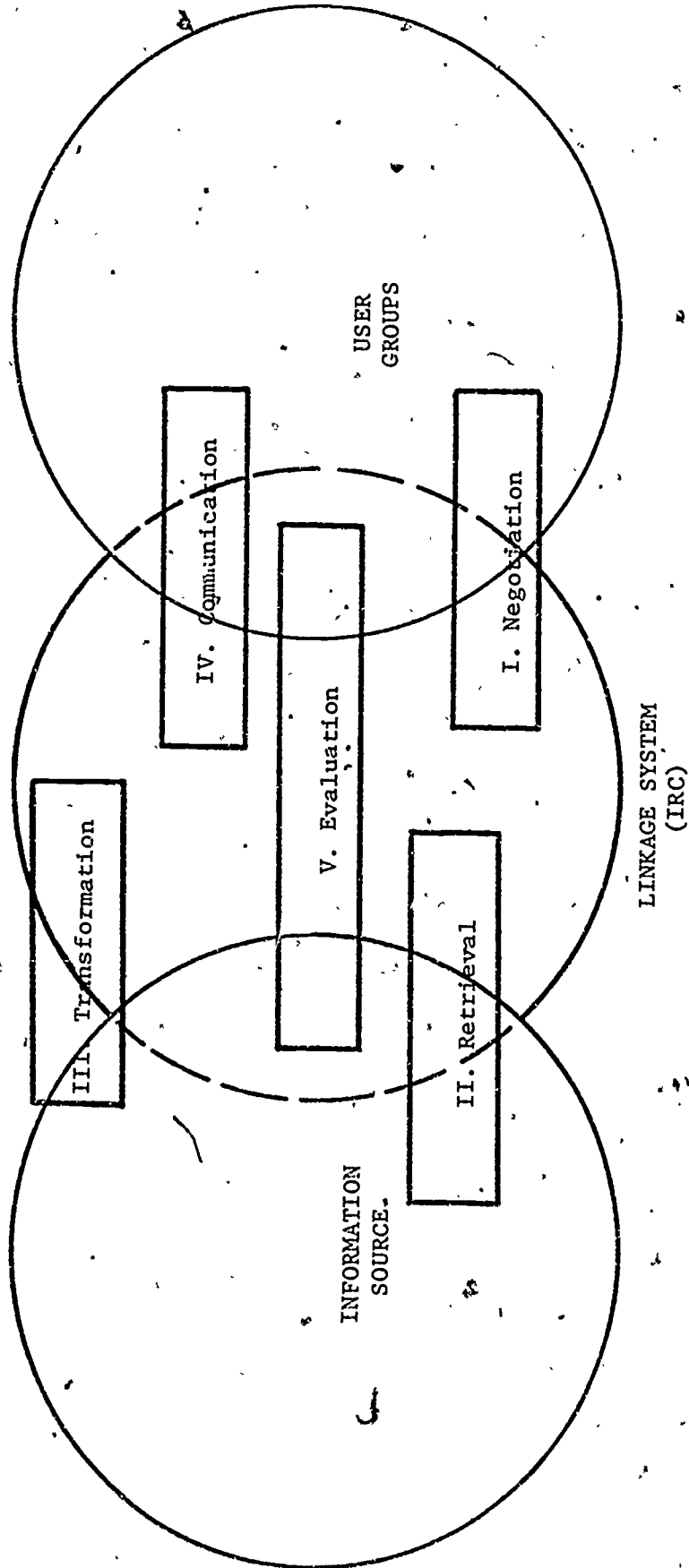


FIGURE 4 Process Model IRC Linkage System

## II Retrieval

Once negotiation is completed and the search parameters defined, the IRC would search the appropriate information sources. It should be noted that a wide variety of files, both computerized and conventional, could be searched to produce relevant information.

## III Transformation

The transformation phase would still be internal to the IRC and requires that the information retrieved be screened, collated, "packaged" for delivery, and otherwise organized for the user. Any necessary explanatory material is also added at this point.

## IV Communication

In the communication phase, the IRC again interfaces with the user. Delivery of the transformed package of information completes the linkage cycle. At this stage, user feedback is solicited regarding the relevance of the information supplied and perhaps the usefulness of the service as a whole.

V. Evaluation

Evaluation is an ongoing internal process related to all aspects of service, operation, management and systems efficiency. Cost/benefit analyses usually play an important part in such evaluation.

The details and phases of such a linkage cycle can perhaps be made more intelligible by use of a concrete example. Experimental searches of the ERIC Tape Data Base are currently being conducted as part of the terms of reference for the exploratory year. Figure 5. provides a rough sketch illustrating the several phases of the linkage model as they might be construed using the tape data base as the information source. (Assume that the CONTACT phase has already been completed on the part of the potential user.)

First, some brief background related to the ERIC Tape Data Base is in order. Two types of language are involved in searching the tape data base. The first of these we label the "systems language." This consists of the indexing scheme developed for organizing and manipulating the materials stored in the data file. In the ERIC system, an authority list of over 6,000 index terms (descriptors) has been developed for classifying the documents in the file for retrieval purposes. The index terms are published as the Thesaurus of ERIC Descriptors. All information files use some type of surrogate language in organizing and manipulating information about documents in the file. The Dewey Decimal Classification and the Library of Congress Classification are the most familiar of such surrogate languages. (The Universal Decimal Classification Scheme and the Colon Classification

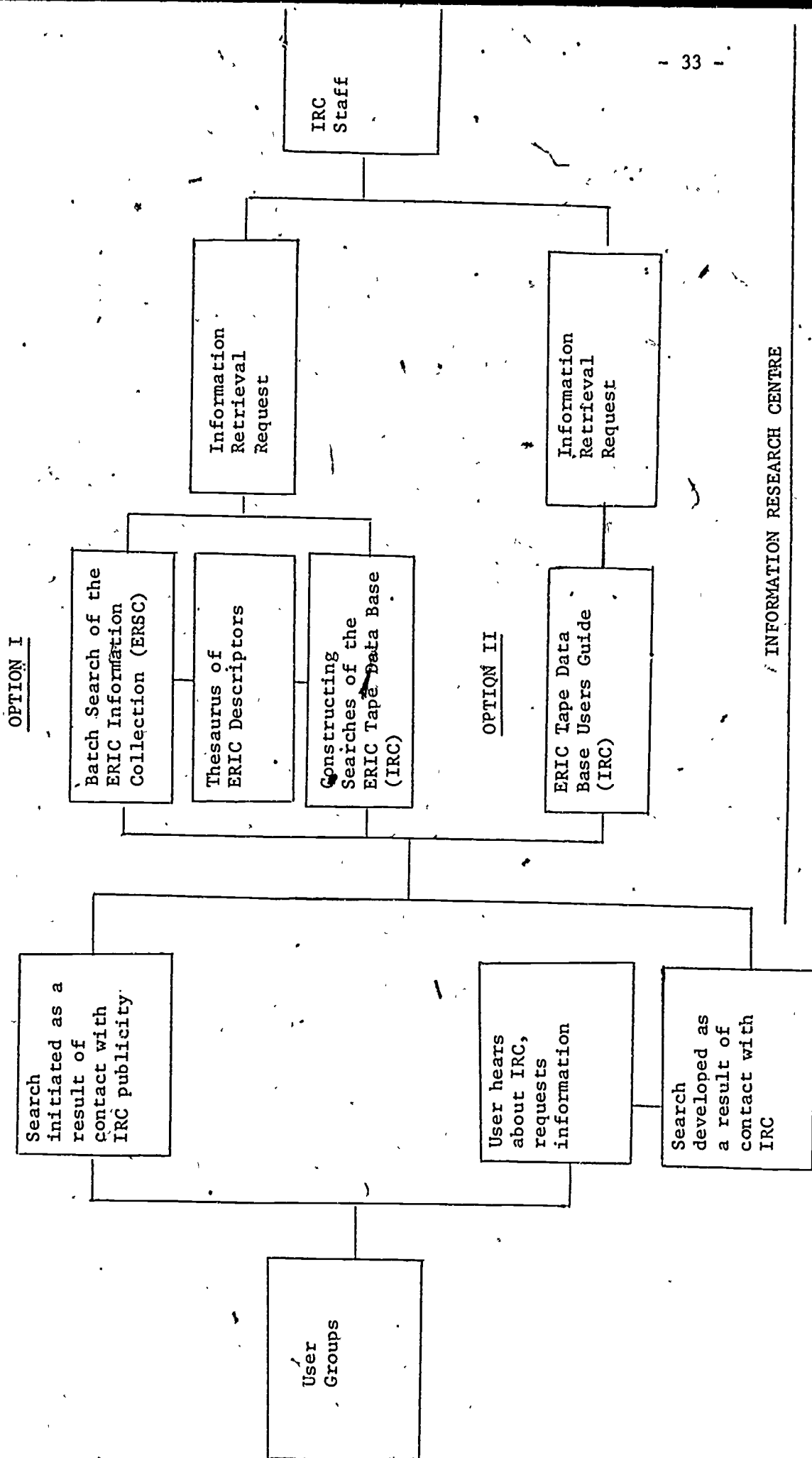


FIGURE 5. Phases in the Linkage Model - ERIC Tape Data Base



II RETRIEVAL

III. TRANSFORMATION

IV COMMUNICATION

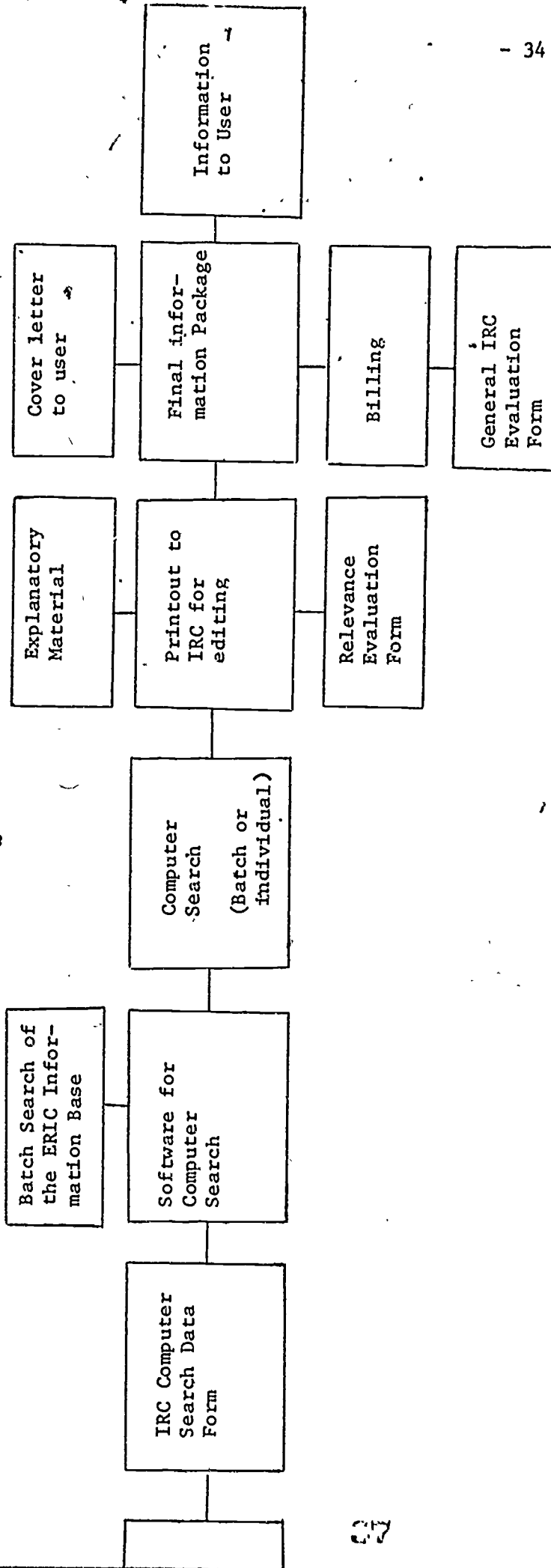


FIGURE 5. (Cont'd)

Scheme are also widely used.) With the development of computers, it is now possible to quickly manipulate a good deal more information about documents in a data base. Thus, in a thesaural based coordinate indexing system, the descriptors in the authority list can be used in infinite variety to describe the contents of documents and to retrieve relevant information about documents.

In developing a search of the ERIC Tape Data Base one descriptor or a combination of descriptors can be used. When combinations of descriptors are used they must be organized within the logic system specified for programming computer searches of the data base. In essence, the search program requests that the computer print information from the material stored in the file which has been indexed to a specified descriptor or a set of descriptors. (47)

The second language we label simply, "natural language." This is the ordinary professional language of the user. It is of course similar to the systems language described previously, but cannot be used directly to develop searches of the data base. The need, obviously, is to take the search topic phrased in the "natural language" of the user and translate this into the "systems language" and logic requirements necessary in developing the query formula for searching the data base. This is no mean task as few information systems have been developed which can predict all eventual user needs. In addition, such systems can only be sensitive in a general way to the vast semantic difference probabilities inherent in the language of any field.

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(47) In the program we are now using, Part I enables us to print out the identification numbers of documents that have been indexed, using a descriptor or combination of descriptors, and Part II enables us to print out abstracts and citation information for the documents identified.

Our two options, which begin the negotiation phase in Figure 5, emerge at this point. In Option I, the user can take his own natural language statement of the search topic and translate this into the systems language and logic requirements of the program to request a search. In Option II, the user develops his search request in natural language, requests a search, and depends on others familiar with the system (the IRC) to select descriptors and construct an appropriate search logic. It is perhaps useful to explicate both these options in some detail at this point to illustrate the I Negotiation phase of the linkage cycle.

### I. Negotiation

Actually, two alternatives are possible within Option I. These are labelled, "Batch Searching of ..." and "Constructing Searches of ..." in Figure 5. Note that both alternatives require access to the Thesaurus. The first alternative is the method early users have followed in conducting searches in the absence of any specified procedures or organization of a system for use of the data base. It is worth describing the steps followed in these early ad hoc search attempts as they illustrate, quite nicely, the inefficiencies and confusion involved in the absence of organized procedures for providing access to the data base.

In the ad hoc approach the user has usually selected descriptors from the Thesaurus to represent the search topic.

Such descriptors may have been selected with only a vague understanding of the organization and limitations of the Thesaurus and the systems requirements for conducting searches. It should be emphasized here that the Thesaurus is not a manual for conducting a computer search. As indicated previously, descriptors must be organized within the logic prescribed by the search program. The ad hoc user has for the most part been unaware of these requirements. The ad hoc search is thus extremely unorganized and difficult to handle systematically. If the user has been alerted to the need for developing a logic structure for the search, he has usually followed one of two approaches. He may have located someone in the faculty knowledgeable about the search logic and persuaded him to "tutor" out a structure for the search. In the second approach, he may have stumbled across the Statistics Laboratory write-up, Batch Searching of the ERIC

Information Collection. (48) This write-up was developed as a systems tool and was never intended to service as a tool for search development. The astute user could glean almost enough from the write-up to develop a search but, in any event, there is still substantial probability that he would follow the tutor/tutee pattern anyway. Once descriptors have been selected, and the logic developed, the user has made contact with the Statistics Laboratory and, with possible further revision, requested a search be run. At this point, he may also have been alerted for the first time to the fact that there are costs related to the search!

Thus, the ad hoc user, after considerable difficulty and related frustration, has managed to squeeze a search out of the system. Our early experiences with this approach reinforce the need for organization and systematic procedures for searching the data base - that is if we are concerned with maximizing our use of the system.

This systematic approach is incorporated in the second alternative to Option I. Procedures should be developed which will enable the user, with appropriate guidance, to carefully select descriptors, organize search logic, and complete a search with full understanding of the requirements of the system. To meet this need, a major tool is being developed titled, Conducting Searches of the ERIC Tape Data Base (IRC). (48) The manual will provide complete details on the ERIC system and take the user, systematically, through the steps necessary to develop a search and obtain results. A related piece of software, the Information Retrieval Request Form, (49) will organize the search data for IRC purposes. The form relates closely to the manual and provides for systematic organization of the search and collection of necessary systems data and information related to efficient search negotiation.

This takes us to Option II labelled, "ERIC Tape Data Base...." in Figure 5. In this option, the user would have access to two documents: the ERIC Tape Data Base Users Guide (IRC) and the related, Information Retrieval Request Form (50). These documents carefully program the user through the steps necessary to construct an effective natural language statement of the search topic. The IRC then takes the request, organizes the descriptors needed, develops the search logic, and completes the search.

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(48) Available in the Statistics Laboratory.

(48) Now being developed.

(49) Now being developed.

(50) Preliminary drafts of these items are complete. See the Appendix.

Although both options are viable, Option II would perhaps serve the needs of the majority of users. The average user does not have the time to become familiar with the Thesaurus, search logic, and the systems requirements necessary in developing a request in systems language. He wishes to frame his request (in natural language), submit it, and receive the related information. However, the user who wishes to conduct a search and also understand the systems language, logic structure, and systems requirements should also be accommodated. The two software documents, described previously, will provide the guidance needed to follow either the Option I or Option II approach efficiently. The final decision as to the function the IRC is to perform, and the groups it is to serve, will determine the alternatives made available in the negotiation phase. Neither Option I or II stand completely in isolation. Both require that aid be available, in varying degree, in developing an effective search.

### II Retrieval

The activities in this stage would be organized using an internal form labelled, IRC Computer Search Data Form (51). This form would be keyed to the information recorded on the two request forms related to Option I and II. The form would be a key tool in translating the search question into systems language (or checking the systems language as in the case of Option I) and developing the search logic. It would also serve as the key internal management form for system control options, billing instructions, expediting searches, and interface with the Educational Research Service Centre (52). In this stage, the IRC would initiate the search and the ERSC would follow through and complete the computer run(s). The ERSC would use the systems write-up, Batch Searching of the ERIC Tape Data Base (ERSC), in moving from the search data form, to keypunch worksheet, to punched cards, to computer run, to printout for Part I and Part II and, finally, delivery back to the IRC. (53)

### III Transformation

At this stage the user "package" would begin to take form. The computer print-out would be burst, edited and organized. Necessary explanatory material would be added including instructions for interpretation of the print-out, obtaining full text documents and the like. The package would also contain forms soliciting user feedback and evaluation of results.

- 
- (51) Now being developed.
  - (52) Currently the Statistics Laboratory.
  - (53) Given the necessary staffing, the IRC could perform all the service functions described here as being related to the Statistics Laboratory.

#### IV Communication

The final information package would be sent to the user with a cover letter. Billing arrangements would be completed as per the arrangements made during the Negotiation phase. A final form soliciting evaluation of the total service could also be included. This stage completes the search case.

#### V Evaluation

Evaluation would be built into each phase of the cycle taking place simultaneously or subsequent to each activity.

This detailed example, using the ERIC Tape Data Base as the source, perhaps serves to provide some insight into the internal processing activities of the IRC linkage cycle as they relate to one information source. Details would of course vary depending on the information sources brought under control and final decisions as to the exact service role of the IRC.

#### IV. The Use of Information in Problem Solving, Innovation and Educational Change

It is interesting to speculate on how information, once retrieved and delivered, might be used by educators and the actual effect on the problem solving and decision making process. The real "pay-off" in any information facility is in the ultimate use of the information supplied and its effect on problem formation and solution. Information utilization in problem formation and solution involves very subtle variables not yet completely understood. Activities in this area occur most often within a sensitive communication and social change paradigm. Explication of the user groups circle in Figure 3 would of necessity involve more detailing of the research arena related to social change, the diffusion process, communication theory and perhaps even anthropology. Mere sending of information will not assure utilization. There is little doubt that recent refinements in information retrieval have provided speedier access, but little hard data are available on the deficiencies or advantages of the process with respect to educational problem naming, decision making, and problem solving. Research is needed to tease out

effective social interaction models for the diffusion and utilization of information. Such model building is the key to our understanding of the utilization cycle. Recent studies in education have described attempts along these lines. For example, Jung and Lippitt (54) suggested that change and problem solving will follow a five stage sequence including: (1) identification of the problem; (2) diagnosis of the situation; (3) formulation of action alternatives; (4) testing feasibility of designated alternatives; and (5) adoption and diffusion of good alternatives.

Diffusion and problem solving in the development process have received considerable attention in research in other disciplines for the past two decades. Loosely defined, diffusion research is that body of literature within the field of communication which has to do with the transfer of ideas. Perhaps the best known recent analysis is the massive cross cultural report by Rogers and Shoemaker (55). They discuss a five stage social adoption process developed in the nineteen fifties by a group of rural sociologists which included: (1) awareness stage; (2) interest stage; (3) evaluation stage; (4) trial stage; and, (5) adoption stage. The stages are remarkably parallel with the Jung and Lippitt report. Literature of this type indicates little agreement on the exact number of such stages but almost all studies suggest that problem solving, diffusion and change efforts follow a sequential pattern and are not just random behavior. Rogers and Shoemaker discuss, three, four, five, six and eight stage change models. They make the following

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(54) Jung, C.C. and Lippitt, R.O., "The Study of Change as a Concept - In Research Utilization, Theory into Practice, 5. 1966. 25-29.

(55) Rogers, Everett M. and Shoemaker, F. Floyd, Communication of Innovations: A Cross Cultural Approach. The Free Press, New York, 1971. pp 100-105.



interesting observation:

Not only has there been great diversity in the number of stages used in past inquiries, but there has also been an entertaining variety of terms used for the stages. Among them are: attention, exposure, initial knowledge, information, application, acceptance, desire, conviction, and deliberation. (56)

They themselves add to the "entertainment" by opting for their own four stage model which includes: (1) knowledge; (2) persuasion; (3) decision; and, (4) confirmation. One of the obvious characteristics of all models of this type is that somewhere in the process, however it is defined, the information and knowledge base is resorted to in decision making. Thus, research and development is essentially decision making based on information. The information must be processed involving transmission, storage, analysis, summarization and reporting. The information system becomes the important ingredient in research and development efforts. An extremely useful appendix to the Rogers and Shoemaker text lists generalizations related to the communication of innovations and summarizes the empirical studies, pro and con, related to each generalization. Their extensive research is stored in a computerized information system located in the Diffusion Documents Center of the University of Michigan.

More recent studies in education are becoming change and diffusion oriented. A number should be pointed out here. Clark and Guba (57), working in the now defunct National Institute for the Study of Educational Change, analyzed the characteristics of research personnel needed in educational innovation and provided suggestions for the development of change agents.

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(56) Ibid, p. 100.

(57) Clark, David L. and Guba, Egon G., "An Examination of Potential Change Roles in Education", In: Rational Planning in Curriculum and Instruction: Eight Essays, Center for the Study of Instruction, NEA, Washington, D.C. 1967.



Havelock (58), (59) reported extensive work on utilization of knowledge in science and education and conceived of knowledge transfer and utilization as constituting a linkage process between a resource and a user. Simonds (60) utilized concepts from the Havelock linkage model and other sources in developing a paradigm to assist educators in determining the direction of change and identification of factors involved in instituting change. Owens (61) emphasized systematic aspects of the change process and suggested conceptual models for the practice of administration and the conduct of research in organizational change. Other related studies appear in sources such as Hensel's (62) bibliography of literature related to change, the works by Short cited earlier, and the eight volume report by the Center for the Advanced Study of Communication also cited earlier. Reports such as these should be analyzed in depth if the role of the IRC is to ultimately involve serving as a resource and providing linkage in change and innovation efforts in the organization, retrieval and analysis of information vis à vis areas such as administration, research and development, professional development activities, field services, curriculum development, teacher education and the like.

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- (58) Havelock, R. G., et al., A Comparative Study of the Literature on the Dissemination and Utilization of Scientific Knowledge. March 1969. ED 029 171.
- (59) Havelock, R. G., "Utilization of Educational Research and Development". British Journal of Educational Technology, 2, 1971, 84-98. As discussed in Short, *op. cit.*, pp 280-281.
- (60) Simonds, Richard Shelton, Toward a Paradigm of Educational Change: The Role of Management Information Systems. Unpublished doctoral dissertation University of Southern California. January 1973. pp 290.
- (61) Owens, Robert G., "Conceptual Models for Research and Practice in the Administration of Change". Feb 1973. ED 075 907.
- (62) Hensel, J. W., "The Change Process in Education: A Selected and Annotated Bibliography, Final Report". Nov. 1970. ED 041 108.

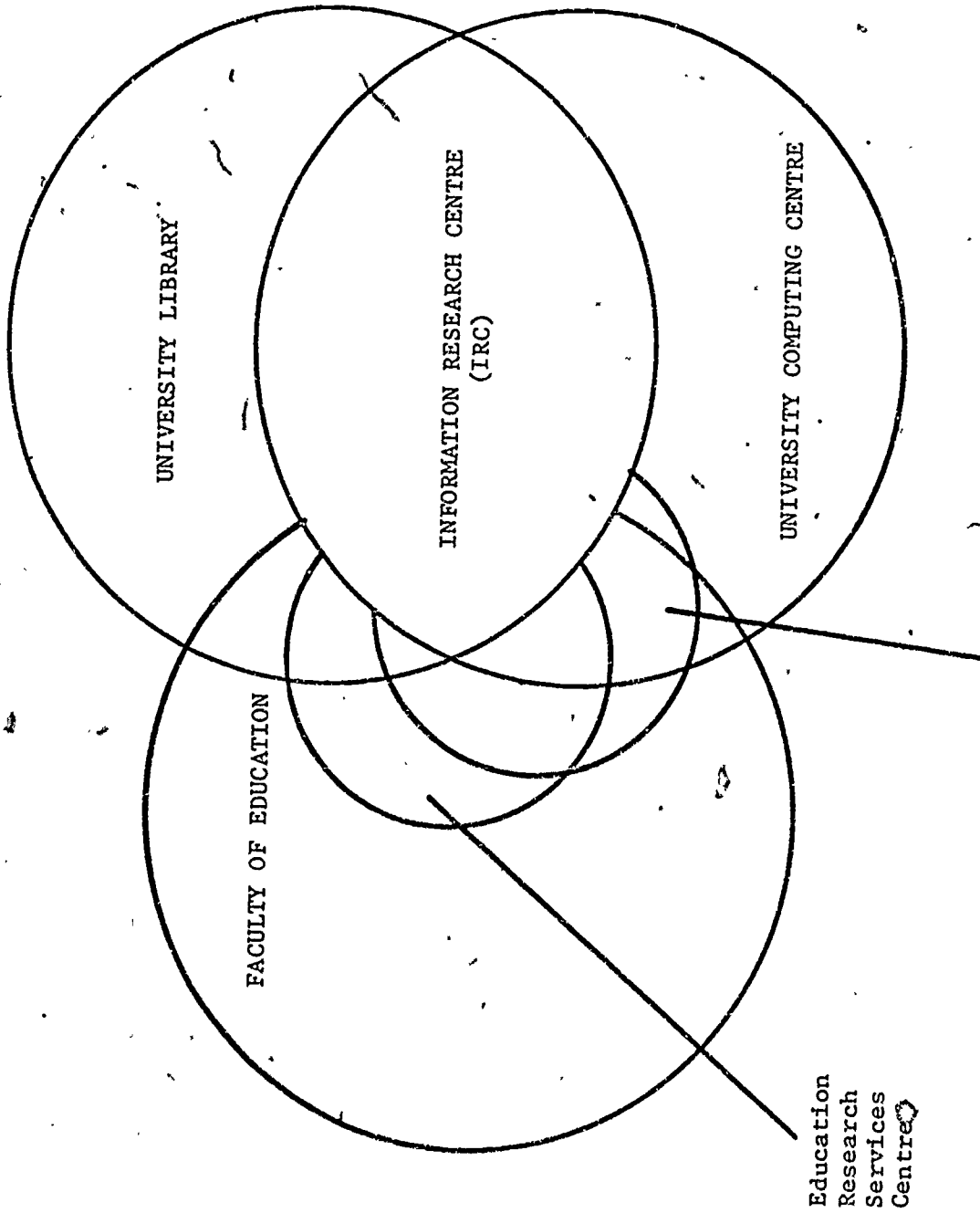


FIGURE 8. Information Research Centre Functional Relationships

Education Curriculum Laboratory

Education Research Services Centre

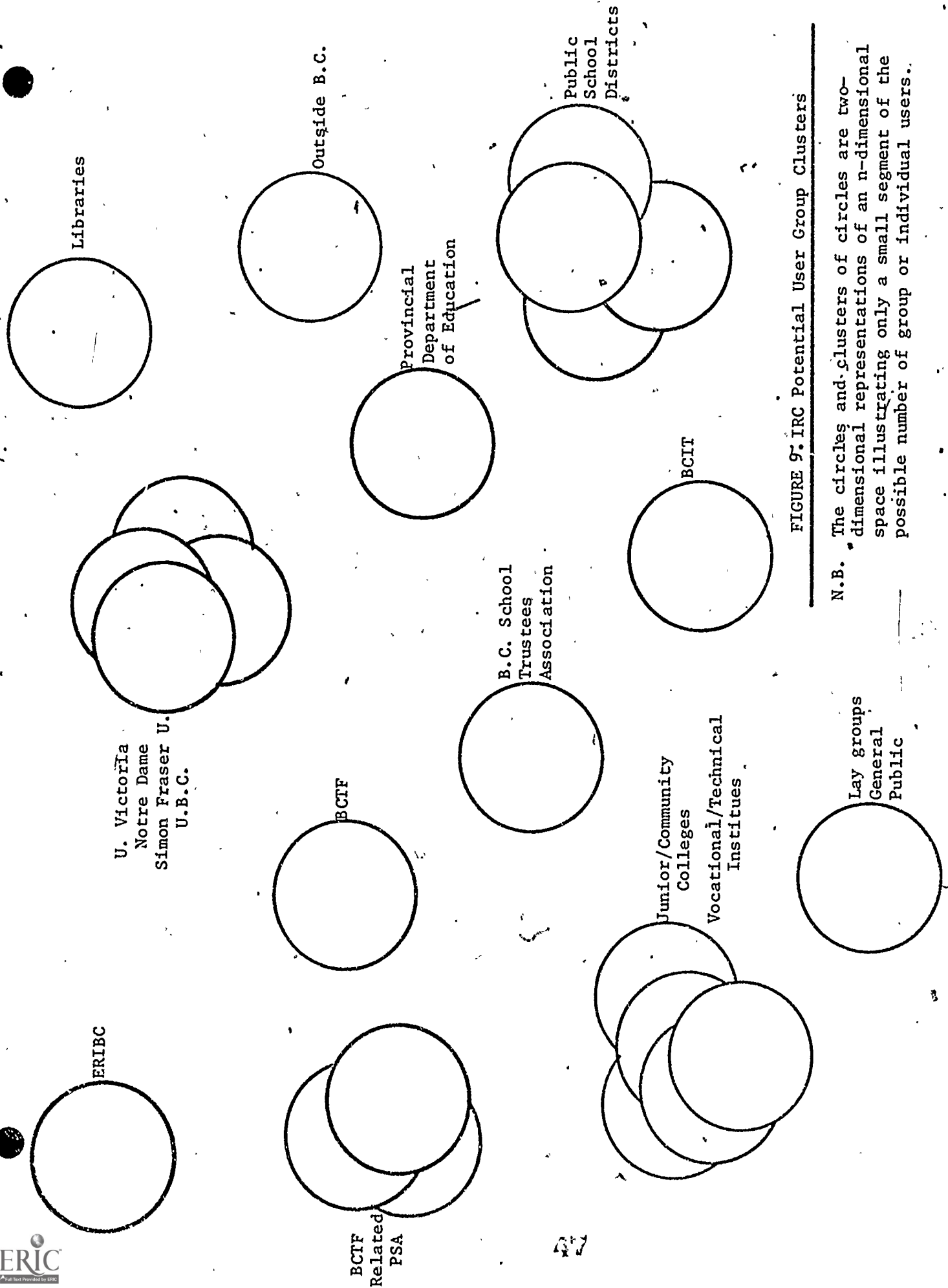


FIGURE 9: IRC Potential User Group Clusters

N.B. The circles and clusters of circles are two-dimensional representations of an n-dimensional space illustrating only a small segment of the possible number of group or individual users..

V. Definition of IRC Relationships with User Groups

In the development of any new unit within a faculty the size of ours, careful attention needs to be given to rationally fitting the unit into existing patterns of organization. This involves careful spelling out of functional relationships as soon as feasible in the development stage. Figure 8. provides a rough representation of some of the anticipated functional relationships of the IRC to existing units within the Faculty of Education and the University as a whole. Early on in the development stage, related units should be identified and specific details as regards liaison and coordination worked out. In essence, a "scope note" of IRC terms of reference should carefully explicate its broad boundaries of operation. IRC is projected as an information unit which would correlate with and support existing information services of the Faculty, the University and the province rather than supplant or compete with such services. The relationships established will relate directly to the specific functions eventually defined for the IRC.

A number of alternatives come to mind when considering the possible services the IRC might offer. Service could be restricted to users within the Faculty of Education and the University or broadened to specific users or user groups outside the university community. However, it would seem most reasonable to eventually project the policy that services will be available to anyone with a need for those services within, of course, any pricing structures that may be established.

Figure 9. illustrates the variety of user groups that might seek IRC services once they are developed and become known. Requests could come from individual units or individuals within or outside those units. Once IRC's functional relationships have been defined, the task then becomes one of

developing procedures for relating to potential users and user groups. The units identified in Figure 5 thus become "targets" for information about IRC services. The communication link from the user elements to IRC is fairly obvious. Normally, the user would hear about IRC, through direct publicity or other sources, (see Figure 5's CONTACT phase) and initiate a request for information or a specific search. Once the request is received, the mechanics of the linkage cycle go into operation ending ultimately in the information package being supplied to the user. However, it should be emphasized that in most cases the IRC would supply information about documents but not provide the actual documents themselves. The user would resort to commercial sources and library facilities for actual text or microform when desired. The complexity of plugging the user into hardcopy documents related to the results of a search should not be underestimated. The whole complex of available library services comes into play. Existing cooperative efforts and liaisons should be taken advantage of wherever possible in alerting users to hardcopy sources and providing service. For example, the excellent cooperative arrangements through TRIUL linking the university libraries in the province could provide excellent access. The task is to relate Figure 8. (the IRC and the services offered) to the user groups in Figure 9. keeping in mind the need for functional liaison and coordination between all elements.

Two interesting possibilities always emerge at this point in discussing the evolution of services in an information centre. The centre can be viewed as a central unit serving a reference group through direct contact. Or, the centre can be viewed as serving as more of a broker or coordinator, developing services and information sources, and servicing the reference group through a series of satellite cooperating units. Combinations of the

two are also possible. Various alternative service configurations should be examined early on in the project as to their advantages and disadvantages.

This discussion of user group relationships is based on a narrow front of initial operation for the IRC. If the role is projected on a broader scale, and a wide group of information sources is to be brought under control to provide multiple services to a broad reference group, then it will be necessary to explicate a whole series of complex functional relationships. Not an impossible task, but one which needs careful definition, coordination and execution. The organizational framework created depends in large degree on the eventual scope and function of the IRC.

#### VI. Alternatives in Pursuing Activities in Information Research

At this point it is appropriate to ask, "Where are we?" and "Where do we go from here?" Given the background, speculation and developments presented in the previous sections, two hard-nosed questions emerge:

- 1) To what extent should the Faculty of Education continue involvement in the areas of information organization, retrieval, synthesis, and analysis as they relate to undergraduate and graduate education, research, development, in-service, field services, and change and innovation activities in education?
- 2) What alternative plans can be put forth for such involvement and what resources - Information Resources; Software; Computer Dollars; Statistical Laboratory Support; Personnel; Professional Time; Clerical/Secretarial; Space/Equipment; and Supplies, Paper, Postage, Communication - need to be allocated to pursue the separate alternatives proposed?

Seven alternative approaches can be sketched out.

##### ALTERNATIVE I

Continue to subscribe to the ERIC Tape Data Base quarterly updates and develop an efficient system whereby students and faculty can conduct searches of the data base.

##### ALTERNATIVE II

Broaden the service so that students and faculty from all areas of the UBC community can conduct searches of the data base.

ALTERNATIVE III

Develop the system so that any interested individual or group can conduct searches of the data base.

ALTERNATIVE IV

Broaden the content of the information system and add other sources to the data base.

ALTERNATIVE V

Stimulate the analysis and synthesis of information as well as its collection, organization and dissemination.

ALTERNATIVE VI

Develop a program of research as it relates to: 1) functioning and operation of the IRC as a system; 2) user interface and satisfaction with the system; and 3) studies on knowledge production and utilization and the role of information in problem solving, change and innovation in education.

ALTERNATIVE VII

Develop standard courses, short courses, seminars and workshops related to the IRC and information systems in education.

The seven alternatives range from limited activity to an extensive program utilizing comprehensive information sources to provide a broad array of services to a widely based user group. Figure 10. illustrates the relationship between level of resource allocation, extent of the user group served and the comprehensiveness of the information base.

ALTERNATIVE I

Continue to subscribe to the ERIC Tape Data Base quarterly updates and develop an efficient system whereby students and faculty can conduct searches of the data base.

Following is a listing of the resource allocation decisions necessary to implement Alternative I.

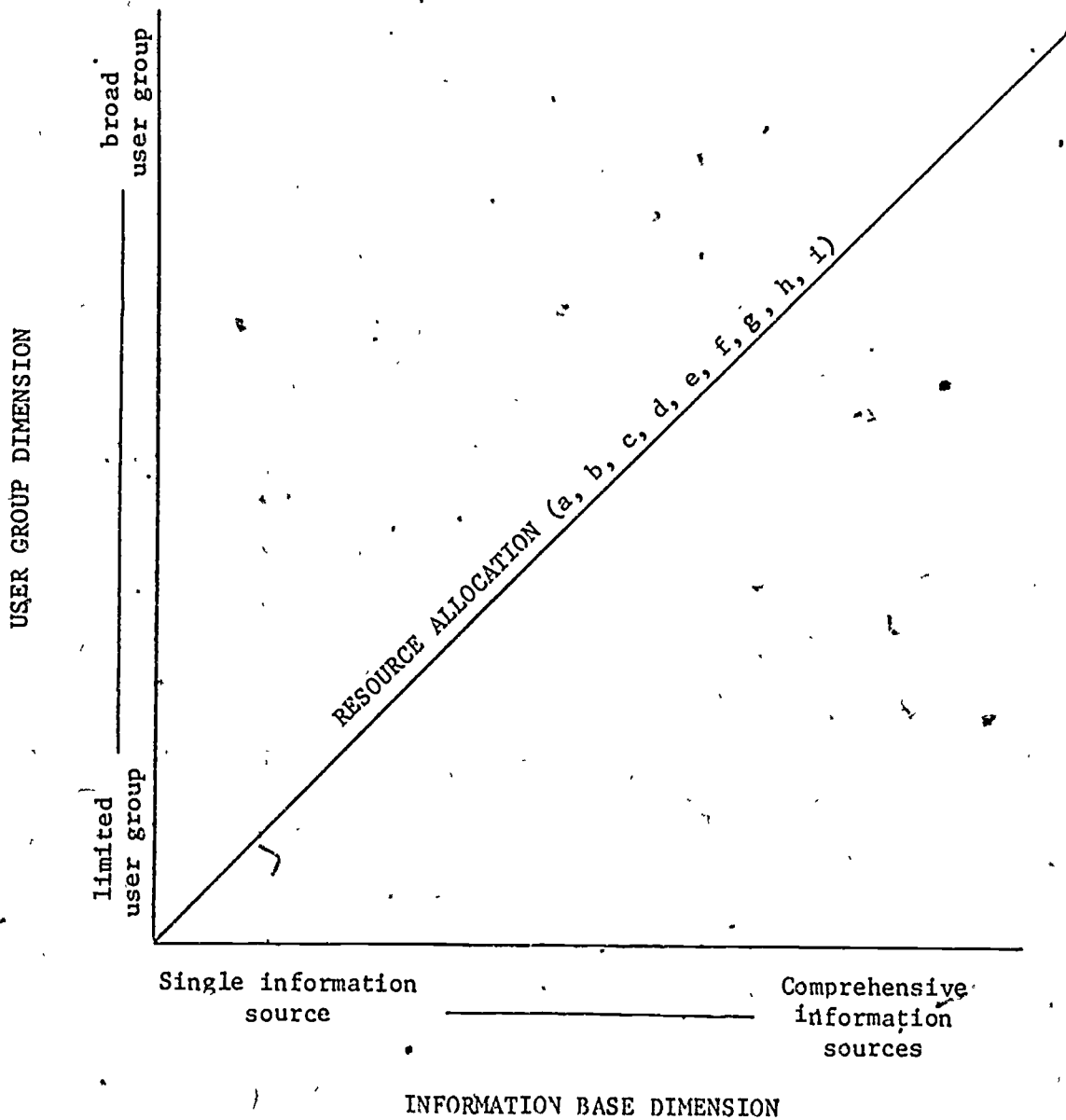


FIGURE 10. Relationship of Resource Allocation to Extent of the User Group and Comprehensiveness of the Information Base



a) Information Resources

Budget charges, on a yearly subscription basis, for quarterly updates to the tape data base would have to be allocated. (Approximate charge is \$950 currently for one year subscription to the tape data base.) A decision should also be made on the type of user negotiation procedure to be followed - Option I, Option II, or both. (Note: monthly updates are also available.)

b) Software

Budget should be allocated for software charges to supplement those items already purchased. Approximately \$250 would be necessary for purchase of new search tools as they become available and replacement of defunct tools. An ongoing subscription to RIE should be maintained for the IRC. (\$30) In addition, we should consider acquisition of a complete set of Volumes I through 9 of RIE, with related index tools, to be housed for general use in the Curriculum Laboratory. The only complete set now on campus is housed in the Social Science and Humanities Division of the UBC Library. A complete set, with related index tools, can be purchased for approximately \$350. The Curriculum Laboratory has maintained an ongoing subscription to CIJE including the related indexing tools. (In fact, two subscriptions are budgeted.) No funds need be allocated for the ERIC microfiche collection as that subscription is maintained by the UBC Library. (Current value of the collection is now in excess of \$10,000 with yearly subscription costs close to \$2,000.)

c) Computer Dollars

A computer dollar allocation should be made to the IRC - such allocation to be based on an estimate of the volume of usage by students and faculty next year and other computer dollar charges related to system maintenance. It is suggested that when proposals are drafted for funded research projects within the faculty, such proposals carry requests for computer dollars for searches of the data base where applicable. A rough estimate of the IRC allocation needed would be \$3,500 to \$4,000 in computer dollars for the coming year. Searches can be charged to a general account established for the IRC or to ID's related to individual projects.

d) Statistical Laboratory Support

An estimate should be made of the time Statistics Laboratory personnel devote to the tape data base project. Time devoted to servicing searches, trouble-shooting and maintaining the system, and time related to update activities and concatenation of tapes each quarter to the existing file should be included. Some consideration should also be given to the consulting time of Statistics Laboratory personnel related to systems maintenance and improvement, given to the IRC. Realistic load and cost figures for Statistics Laboratory commitments to the project should be reflected in their resource allocations.

e) Personnel

One graduate student assistant should be assigned to the IRC project. A complete job description would include duties related to maintaining the system; liaison with the Computing Centre and the Statistics Laboratory; library work; file and search organization; and, servicing searches of students and faculty through the related activities of search negotiation, retrieval, transformation, and communication of results. Under Alternative I, the graduate student also becomes involved in a certain amount of clerical work. The allocation would involve approximately \$2,400. Consideration should also be given to an allocation to maintain the graduate student through the summer session - approximately \$600.

f) Professional Time

Activity at the Alternative I level requires the continued involvement of one faculty member - time commitment estimated to be approximately 1-1/2 units of load per term. Consideration should also be given to providing an allocation for faculty time during the summer session. Faculty time commitment is crucial and relates particularly to organization, coordination and supervision of personnel and the ongoing system including the continued development and improvement of the system. A good portion of the faculty time allocation is given to research and planning and the important liaison activities of the IRC. Consideration should also be given to funding the faculty member to attend the annual conference now being held for the 100 plus users of the ERIC Tape Data Base. (Estimated cost: \$400 yearly for conference expenses.)

g) Clerical/Secretarial

It would be highly desirable to have a separate allocation for clerical/secretarial needs of the IRC. However, at the Alternative I level, such needs can perhaps be taken care of through the pool and the graduate student assigned to the project.

h) Space/Equipment

For space, the office in Hut 03 now assigned to the IRC should be allocated on a continuing basis. Additional file and storage equipment will be needed.

i) Supplies, Paper, Postage, Communications

No special allocations are needed for these items in Alternative I.

ALTERNATIVE II

Continue to subscribe to the ERIC Tape Data Base quarterly updates and develop an efficient system whereby students and faculty can conduct searches of the data base.

Broaden the Service so that students and faculty from all areas of the UBC community can conduct searches of the data base.

Adoption of Alternative II would make the services developed for our students and faculty generally available to the entire UBC community necessitating considerable adjustment in resource allocation for the IRC project. The exact degree of adjustment is difficult to predict. The following estimates are based on adjustments geared to a modest use of the tape data base beyond the Faculty of Education.

a) Information Resources

Needs here to remain essentially the same as Alternative I.

b) Software

Very clear-cut negotiation procedures, related to Option I and Option II search requests, would have to be established. Some additional software costs would develop to supplant the quantity of search tools available. Estimate \$100.

c) Computer Dollars

Computer dollar charges for services to the general university community could be handled through the standard ID procedures now practiced by the Computing Centre for all university users. Each user with an ID could provide the information needed for billing to the IRC in the negotiation phase. Some thought should be given to accommodation of university users who do not have access to ID accounts in the Computing Centre - a large percentage of this group would consist of students.

Consideration might be given to passing on some of the clerical/ personnel and materials/equipment costs of the project to the user group outside the Faculty of Education through levying of small service charges and the like. However, the return might be too small, or collection procedures too complex to warrant the effort. In any event, additional computer dollars (\$2,000) would be needed.

d) Statistical Laboratory Support

Some increase would of necessity occur in the time given to the IRC project by Statistics Laboratory personnel - particularly in servicing searches - if Alternative II is instituted.

e) Personnel

Any significant increase in volume of searching would require that additional graduate students be assigned to the IRC. In expanding service to the UBC community in general, IRC aid in the negotiation phase would be particularly critical to develop the most useful searches. Add one grad student - \$3,000.

f) Professional Time

Broadening services to the Alternative II level would necessitate that a larger proportion of faculty time be assigned to the IRC project. Added time would be needed for general supervision, the negotiation of searches, and the coordination of services. The greatest need would be in additional time for planning and organizing more extensive services and the liaison activities required to insure provision of effective searches. Careful liaison with the related units in Figure 8, would be crucial. Well coordinated procedures would be vital, in particular, in working with the UBC Library in meeting their search needs.

g) Clerical/Secretarial

Under Alternative II, a definite allocation should be made for clerical/secretarial services rather than operating under the ad hoc arrangement of Alternative I. Add 1/2 time secretary.

h) Space/Equipment

No new space for the IRC would be required under Alternative II other than that necessary to house additional graduate aid and secretarial help. Additional file and storage equipment would be needed.

i) Supplies, Paper, Postage, Communication

No increases beyond Alternative I.

ALTERNATIVE III

Continue to subscribe to the ERIC Tape Data Base quarterly updates and develop an efficient system whereby students and faculty can conduct searches of the data base.

Broaden the service so that students and faculty from all areas of the UBC community can conduct searches of the data base.

Develop the system so that any interested individual or group can conduct searches of the data base.

By adopting Alternatives I and II we can develop an organized, well articulated mini system to serve the Faculty of Education and student and faculty needs across UBC groups quite nicely. However, the real challenge is to play a leadership role within the total educational community of the province in providing information services related to education. Can our faculty generate an information facility that can serve as an effective resource: For the BCTF? For the Provincial Department of Education? For the School Districts of the Province? For the post secondary institutions including the Universities? And, for the many other groups and individuals who could benefit from improved access to educational information?

The following resource needs have to be considered in broadening the scope of IRC services to the Alternative III level.

a) Information Resources

No increases beyond Alternative I and II.

b) Software

An allocation should be made for printing and publicity related to services which would become available, and descriptive information for the user groups configuration as set out in Figure 9. (Add \$800 for such needs) Channels of communication should be established to link the components in the system in an efficient operating network. Again, questions related to all aspects of effective search negotiation become particularly critical. An analysis should be made to determine existing software components now available to users. (The Thesaurus, CIJE, RIE, et al.) within the province. For example, the only complete microfiche collection is now housed in the UBC Library although other partial sets exist in various locations. Availability of microfiche readers and journal literature collections in education should also be pin-pointed. The UBC Library has recently made fiche to fiche reproduction available which is a significant step in providing service on documents facsimile in the ERIC system. Careful coordination would be necessary, with close tie-in with the existing library network in the province to implement Alternative III services.

Consideration should be given to the possibility of establishing a system of satellite centres, as discussed previously, to coordinate with the IRC in establishing user needs and providing user services.

c) Computer Dollars

The question of user charges for services should be carefully explored. Related cost factors in maintaining the system and offering various services should be analyzed with an eye to the possibility of users bearing a share of the costs. If users have access to University Computing Centre ID's, services for computing charges could be billed as in Alternative II. However, the typical user would not fall in this category. Two major types of expenses are involved in offering search services - those related to Computing Centre charges and those related to clerical aspects of service and maintaining the IRC as the linkage unit between the user and the information source. The demand search on a specific topic would undoubtedly be the major search activity under Alternative III. However, other type services could be offered related to the tape data base. For example, continuous updating of new material on a completed search is often necessary. Development of user profiles and search and update on such profiles is another possibility (more commonly referred to as SDI in the information jargon) that should be explored. "Canned" searches on broad topics of continuing interest is also a viable routine. Whatever services are developed, institution of a workable paradigm related to the cost factors to support the system is a primary task in developing Alternative III activities. (Add \$2,000 in computer dollars for Alternative III.)

d) Statistical Laboratory Support

As in Alternative II, an increase in searching would involve an increase in Statistics Laboratory time devoted to the project. If Alternative II is instituted, it is recommended that consideration be given to providing IRC with the resources and personnel which would enable us to switch most of the routine of search servicing from the Statistics Laboratory to IRC functioning - with the exception of necessary support services related to updating the collection, troubleshooting problems and the like. With a large volume of searching, and related user contact, it becomes necessary to reconsider the role of the Statistics Laboratory and view their functioning as backup and support rather than operational service on searches.

e) Personnel

With increased search volume and services, consideration must be given to the overall personnel needs of the project with an eye toward operating on a permanent, ongoing basis rather than an ad hoc basis. It is strongly recommended that if Alternative III is instituted, more permanent staff be added to the IRC to supplement the itinerant graduate aid incorporated under Alternatives I and II. This can be handled through creation of a technician level job - that of Information Specialist - filled by an individual with Masters level qualifications, hopefully in the areas of library and information science, data processing, and some knowledge of education and the literature of the field. (Estimated salary \$7,000) Such positions are extremely common in the staffing patterns of existing information retrieval and analysis centres. The job



description would encompass duties related to the overall organization, administration and day-by-day supervision and operation of the IRC.

f) Professional Time

An increase in faculty time commitment would be necessary in pursuing the broadened functions of Alternative III. However, with increased graduate student aid and the development of the Information Specialist position, faculty time would be related, increasingly, to needed research, planning, liaison and coordination for the IRC. In broadening services to the general community of educational users, numerous issues related to policy will develop. It is recommended that an advisory group for the IRC be formed at this stage. Membership of the group should be developed to reflect potential users of IRC services and the various segments of the UBC community and the Faculty of Education involved in its operational aspects. Such advisory groups perform extremely important functions in information systems particularly as relates to development of products and "sensing" user needs. A major function of the faculty member related to the project would be the organization and coordination of this policy body for the IRC. Add \$500 for conference expenses.

g) Clerical/Secretarial

With increased volume of activity, additional clerical/secretarial help would be necessary under Alternative III. At this point, the services of one full time person would most likely be needed with perhaps additional part time aid on call during peak periods or for special projects. It would be ideal if the person had key punch experience and some knowledge of computing centre operations.

h) Space/Equipment

Space for additional personnel would be needed and file and storage equipment supplemented. Consideration should be given to housing the personnel of the IRC in three to four adjacent rooms somewhere within the Faculty of Education for convenience of operation.

i) Supplies, Paper, Postage, Communication

Budgeting for \$500 should be considered for this item in Alternative III.

ALTERNATIVE IV

Continue to subscribe to the ERIC Tape Data Base quarterly updates and develop an efficient system whereby students and faculty can conduct searches of the data base.

Broaden the service so that students and faculty from all areas of the UBC community can conduct searches of the data base.

Develop the system so that any interested individual or group can conduct searches of the data base.

Broaden the content of the information system and add other sources to the IRC data base.

As was pointed out in the early portion of this paper, the intent in pursuing exploratory work in information research is to develop an information service system within broad parameters and to organize, for retrieval purposes, the resources from a variety of available information systems. The real advantages accrue when the information resource circle in Figure 3 is supplemented to include more than any one discrete data base. Three types of additional information sources could be included in the IRC: machine readable bibliographic data bases, machine readable quantitative data bases, and referral services utilizing library holdings catalogued under traditional systems and special bibliographic reference publications. Particular attention should be given to the inclusion of unique Canadian sources. The trend in development of information services is now away from "do-it-yourself-on-a-narrow-collection" and toward cooperative, broad ranging services which give access to combined information sources. We are moving from the corner grocery to the supermarket.



Machine readable bibliographic data bases. In his recent chapter in the 7th Annual Review of Information Science and Technology, Gechman (63) suggests:

The advent of the machine readable data base is one of the most significant forward steps in information retrieval. Currently, the creation and application of these data bases are in a period of very rapid growth.

His chapter is a first-time review devoted exclusively to machine readable bibliographic data bases. The chapter is restricted to those data bases utilizing machine readable bibliographic records including document surrogates and indexes to the literature and data but not the raw data itself. Time and resources should be made available under Alternative IV to analyze the potential of additional machine readable data bases to our faculty, and to identify those which might prove feasible additions to the IRC information base or those which could be linked for user services. Canadians have become increasingly involved in the development and use of machine readable bibliographic data bases. A large proportion of the papers given at the 1970-1971 annual meeting of the Western Canadian Chapter of the ASIS dealt with machine readable bibliographic information. Perhaps one of the most widely known machine readable services in Canada is the CAN/SDI project developed to alert scientists to current information in specific fields of research. (64) CAN/SDI, linking with the National Library, now searches nine tapes and develops 4,500 profiles per month. The project is an

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- (63) Gechman, Marvin C., "Generation and Use of Machine Readable-Bibliographic Data Bases." Carlos A. Cuadra and Ann W. Luke (Eds) Annual Review of Information Science and Technology, Vol. 7, ASIS. Washington, 1972. pp. 323-378.

See also the recent UNESCO report which analyzed existing barriers that prevent the fullest world-wide utilization of machine readable social sciences data. David Nasatir, Data Archives for the Social Sciences: Purposes, Operations and Problems. UNESCO, P. O. Box 433, New York. 1973. 128 pp.

- (64) Mauerhoff, George R., Smith, Richard G., "A MARC-II Based Program for Retrieval and Dissemination". Journal of Library Automation, 4:3. Sept. 1971.

excellent application of the MARC II (Machine Readable Cataloguing of the Library of Congress) data base procedures. Most importantly, the system is contemplating adding social science and humanities sources to the data base.

Many users of single bibliographic data bases in education, and a number of the current subscribers to the ERIC Tape Data Base, are now looking to the development of broader searching capability by addition of other bibliographic sources in machine readable form. The trend in the state-of-the-art in information science in general is certainly in this direction. Heaps, (65), of the University of Alberta, has recently analyzed some of the systems aspects related to conjoining across data bases and suggests criteria to be followed for maximizing effectiveness. Promising developments along these lines should be followed up. It should be borne in mind that each data base has its own developmental history, its own systems parameters, its own indexing language and its own acquisitions and service policies. Even though problems in integrating across systems can be great, nevertheless, the increased access to information warrants determining the feasibility of a combined systems approach. (66) Some work along these lines is developing in education. The recent paper by Prevel (67), of the National Institute of Education, summarized a survey of machine readable data bases relevant to

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- (65) Heaps, H.S., "Criteria for Optimum Effectiveness of Information Retrieval Systems." Information and Control, 18:2. March 1971. See also: Keenan, Stella Ed., Key Papers on the Use of Computer-Based Bibliographic Services. American Society for Information Science, Washington, 1973.
- (66) A significant move was made recently in alleviating uniformity problems in bibliographic format. See: American National Standards Institute Committee, "American National Standard Format for Bibliographic Information Interchange on Magnetic Tape." American National Standards Institute, New York. 1971. Some work has been started on the problem of developing uniformity of classification for machine readable quantitative data bases as well. See: Byrum, John D. Jr., Rowe, Judith S., "An Integrated User-Oriented System for Documentation and Control of Computer Readable Data Files." Library Research and Technical Services, 16:2, Spring 1972.
- (67) ERIC Tape Data Base Users Exchange, "Fall Users Conference Report". No. 4, ERIC Processing and Reference Facility, Bethesda, Md. Sept 1973. p. 3.

the field of education. Marron (68) reports a study of six university based information systems which operate as retail information centers serving campus communities by accessing large commercially-available data bases using third generation computers. Recent deliberations by the International Council of Scientific Unions (69), on the marketing of secondary information services, are also pertinent here.

The work of Gluchowicz (70) of the Royal Institute of Technology (Sweden) should also be examined. She has developed an internationally known search system which makes use of numerous data bases including the ERIC tapes. Patrinostro et al, (71) summarizes 100 available data bases and Schneider et al, (72) provides detailed information on 81 data bases available as of November 1972 in North America and other countries. Membership lists of ASIDIC (Association of Scientific Information Dissemination Centres) should also be scrutinized to identify education related machine readable data bases. ASIDIC consists of 76 member organizations representing business, government and academia in the United States, Canada and other countries. Members search at least two machine readable data bases and some members list as many as 18 sources. The National Science Library of Canada was an ASIDIC

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- (68) Marron, Beatrice et al, A Study of Six University Based Information Systems. National Bureau of Standards Center for Computing Sciences and Technology. Washington, D.C. June 1973.
- (69) International Council of Scientific Unions, Proceedings of the Full Board Meeting. ICSU, Paris France. June 1972. 264 pp.
- (70) In: Tell, Bjorn and Gluchowicz, Zofia, Progress Report of Computerized I and D Services at the Royal Institute of Technology, Stockholm. Royal Institute of Technology, Stockholm. October 1972.
- (71) Patrinostro, Frank S. et al, "Available Data Banks for Library and Information Services". Jan 1973 ED 076 219.
- (72) Schneider, John H. et al, Survey of Commercially Available Computer-Readable Bibliographic Data Bases. American Society for Information Science, Washington. 1973. 184 pp.

the field of education. Marron (68) reports a study of six university based information systems which operate as retail information centers serving campus communities by accessing large commercially-available data bases using third generation computers. Recent deliberations by the International Council of Scientific Unions (69), on the marketing of secondary information services, are also pertinent here.

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- (71) Patrinostro, Frank S. et al, "Available Data Banks for Library and Information Services". Jan 1973 ED 076 219.
- (72) Schneider, John H. et al, Survey of Commercially Available Computer-Readable Bibliographic Data Bases. American Society for Information Science, Washington. 1973. 184 pp.

charter member. (73) It would also be vital to coordinate with the National Library of Canada (74) and the Science Council of Canada to tie-in with their recent developments in computer generated data bases that are education oriented.

Apropos to the possibility of conjoining several data bases for user services, it should be kept in mind that the CANUNET (75), (76), (77) project is still perking on the back burner so to speak. The intent is to join universities into a Canada-wide sharing of computing centre facilities and programs. Thus, our information files could ultimately be utilized by educators across Canada who have access to a node in the CANUNET system.

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(73) Williams, Martha E. and Stuart, Alan K., ASIDIC Survey of Information Centers. June 1972. From the Association.

(74) The National Library is one of three current Canadian subscribers to the ERIC Tape Data Base. They are still becoming operational and contemplate largely profile type servicing rather than demand searches. See: "National Library Increases Services", University Affairs, April 1972. p. 10.

Significant developments, related to the interests of IRC, are now taking place within the National Library. Progress is being made on the development of the Canadian application of MARC. The Canadian Union Catalogue (listing books in 329 libraries) Task Group is now studying a machine readable format. A recent extensive study of the National Library recommended establishment of a unique computer centre for use by all government libraries and information retrieval centres. The national bibliography, Canadiana, is also on the verge of automation utilizing the MARC format. For details of developments see: Annual Report of the National Librarian 1972/1973. Information Canada, Ottawa. 1973. 67 pp.

(75) Katz, L. et al., A Trans Canada Communication Network, Science Council of Canada, (Report No. 13), Queen's Printer, Ottawa, March 1972.

(76) Twyver, D. A. et al., A Network Design For CANUNET, University of British Columbia Computing Centre, March 1972.

(77) Kennedy, J. M. "CANUNET - A Canadian Universities Computing Network", University of British Columbia Computing Centre Newsletter, Vol. 4, No. 5, May 1972.

Heaps and Cooke (78) discuss the growth of scientific and technical information networks in Canada as a whole and raise interesting questions related to the feasibility of networks, their social purposes, and the question of economics. Sylvestre, (79) the National Librarian for Canada, indicates that there is greater potential for national uniformity in information networks in Canada than in the U.S.

In joining, or tandeming, data bases in our system, in some instances the physical machine records could be acquired with update services subscribed to where possible. Programs could also be acquired or done in-house. However, some data bases are set up within their own servicing parameters and do not usually make their tapes or programs available for purchase. The IRC could service as a central source for faculty and students who wish to plug into services of this type. Thus, the IRC would again provide the linkage between the user and the information source. Several possible linkages come to mind. DATRIX (80) provides retrospective service based on a file of over 150,000 doctoral dissertations. The Lockheed Corporation now provides telephone and TWX service to PANDEX files including 250,000 journal articles per year in the sciences and TRANSDEX files covering 30,000 articles per month in the social sciences. Developments in the CAN/SDI project, mentioned earlier, should be monitored for announcement of PANDEX/TRANSDEX availability. The American Psychological Association

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- (78) Heaps, Doreen M., Cooke, G. A., "National Policies, National Networks, and National Information Studies in Canada." In ASIS Annual Meeting, Philadelphia, October 1970. Greenwood Publishing Corporation, Westport, Conn. 1970. pp. 199-203.
- (79) Sylvestre, Guy, "The Prime Mover: The Role of the National Library." In: Canadian Library Association Annual Conference, Into the Seventies - Challenge and Change. CLA, Ottawa. 1970.
- (80) XEROX DATRIX, Direct Access to Research Information. University Microfilms, Ann Arbor, Michigan. (brochure).



described three ways of accessioning Psychological Abstracts in 1971. (81) The PASAR tape provides retrospective service; the PADAT service is on line; and the PATELL service is distributed quarterly with in excess of 20,000 abstracts per issue. Two companies now provide search service for Psychological Abstracts on a commercial basis - CCM Information Services and the Lockheed Corporation.

Data base and programming costs for some files are high. However, those that have been produced through government support, or through the efforts of professional associations, tend to be very reasonable. For example, the IRC is receiving the ERIC Tape Data Base for the approximate cost of the magnetic tape plus a small service charge. Our costs for plugging into the necessary programming were about one fifteenth of the actual development costs as the initial programming was supported through government funds.

It is estimated that 150 data bases will be available by 1975 with the greatest growth outside the U.S. On-line interactive services will become increasingly more common. Data compression techniques, mass storage devices, natural language processing, output on microform and direct searching of microform collections by computer are all predicted features that will add to the popularity of machine readable data bases. Automatic speech recognition may not be too far off. Gechman (82) makes the following interesting observation in the concluding section to his chapter:

If the current trend continues, libraries will cease to relinquish to computer centers the responsibility of providing information services from machine-readable data bases (including both bibliographic and digital data tapes). These services should become and are becoming natural extensions of the other graphic and hardcopy most libraries now provide. Some libraries have resented large bibliographic data bases because of their potential for by-passing the library; however, progressive librarians are now making machine-readable data bases a vital part of the library's program.

To this we can only add "Amen".

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(81) APA Tape Data Service: PASAR - PADAT - PATELL, American Psychological Association, Washington, 1971. (brochure)

(82) Gechman, op. cit., p. 361.

Machine readable quantitative data bases. In recent years social science data banks and archival service growth in Canada have been rapid. Activity has already commenced to develop a clearinghouse to handle information on quantitative machine-readable data bases related to the social sciences. This work has gone through the feasibility stage and is in the pilot project phase. In the feasibility study the steering committee noted:(83)

Within universities, government departments (at all levels), and other organizations, numerous data files of interest to social scientists are proliferating. The individual scholar needs assistance in finding and obtaining access to data of interest to him. The scholarly community as a whole cannot afford the duplication and the waste of time and effort inherent in research conducted without the assistance of a clearinghouse.

The clearinghouse will organize and disseminate information about quantitative data bases - serving as a broker - but will not provide service on any data base. The areas of investigation are limited to those branches of the social sciences holding membership in the Social Science Research Council of Canada - educational needs were, however, given only cursory consideration in the feasibility study. The study developed a partial inventory of available quantitative data bases for use in social sciences. (84) The activity of the new clearinghouse should be monitored and an analysis made of their holdings that have utility in education - particularly those generated by universities, professional associations and federal, provincial and municipal governments. The recently established machine-readable Data Library Catalogue service on the UBC campus should aid greatly in locating such sources. IRC could also serve as a linkage to other existing quantitative data sources relevant to education - i.e., those related to Canada Council and the Education Division of Statistics Canada.

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(83) Campbell, H.C., A Feasibility Study: Data Clearinghouse for the Social Sciences. Social Science Research Council of Canada, 151 Slater, Ottawa. 1972.

(84) Toronto Public Library, Inventory of Social Science Quantitative Data Sources in Canada. Toronto Public Library, Toronto. August 1971.



Library catalogs and special bibliographic references. As was pointed out previously, the trend in development of information service centres is toward collating and retrieving information across broadly based collections including machine readable bibliographic data bases, machine readable quantitative data bases and traditional library information sources. Is it possible to envision a unit within our own faculty which would provide broad ranging linkage service across all three sources, on a demand basis, and across a spectrum of users both within and outside our faculty and the university community? Could we, for example, view the subject headings of the Canadian Education Index (85), and the documents listed under those headings, in the same fashion as we view the thesaurally oriented machine readable bibliographic data base? Could we view the book collections organized under LC and the Dewey Decimal Classifications in the same manner?

(86) What about indexes to nonprint and AV sources (87) and the special

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(85) Sirois, Gray J. and Perrier; Monique (Eds) Subject Headings for the Canadian Education Index. Canadian Council for Research In Education, Ottawa. Nov., 1972. 119 pp. The introduction states that the index is moving toward a format which will allow the introduction of a computerized system of educational information in Canada.

(86) The LC and Dewey systems are currently undergoing much scrutiny. Work is now underway on the 19th revision of the Dewey Classification. Canadians sit on the policy commission overseeing the revision. See: "Decimal Classification Editorial Policy Commission Report". Library Resources and Technical Services. 15:4, Fall 1971. It is significant to note that the 19th revision will be computerized! See also: Richmond, Phyllis A., "LC and Dewey: Their Relevance to Modern Information Needs." ALA Preconference on Subject Analysis of Library Materials. ALA, Washington, 1969. 28 pp.

(87) Bibliographic control of nonprint and AV sources is now moving out of the dark ages. Recent cataloging discussions include: Association for Educational Communication and Technology, Standards for Cataloging Nonprint Materials Rev. Ed. AECT, Washington, 1971, 56 pp. The Canadian counterpart is: Riddle, Jean; Lewis, Shirley; and McDonald, Janet, Non Book Materials; the Organization of Integrated Collections. Preliminary edition. Canadian Library Association, Ottawa. 1970. 58 pp. Recently, the CLA and ALA developed cooperative arrangements to produce an international cataloging standard for AV material. See: Sullivan, Thomas E., "Cataloging and Classification Second Report". Library and Technical Services, 15:4 Fall 1971. pp. 537-539.

bibliographical reference tools such as Ryder's (88) excellent recent publication? There are other collections and related access devices that could be listed. When a faculty member, or student, has an information problem are we now organized to provide efficient, comprehensive coverage and response to that problem across all possible sources? Should we consider the development of new resource and information service configurations within our own faculty? What about the educator outside our faculty - where does he go for comparable service? Where does the local school district turn for educational information in studying and solving problems? Does our Curriculum Laboratory view itself as serving the total educational community or only those related directly to the faculty? Should we develop integrative services to assume this role?

Could we look to the total information services of the university in the development of a broader information service role? A recent article in UBC Reports describes a concept of information service we would do well to emulate. (89)

The library, in addition to meeting the daily needs of some 25,000 students and faculty and staff members, is proving to be an increasingly important resource for thousands of professionals and non-UBC students locally and in other parts of the world and for the general public of the lower mainland.

Can our faculty assume a leadership role in providing information from a wide variety of sources to all those with needs wherever they are located within the province? Education is the largest business in the province - is it not time that we developed services commensurate with the size of the operation? Surely, if we can provide books on the social aspects of blindness to a faculty member in an Eastern Canadian university for a course he is

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(88) Ryder, Dorothy E., (Ed), Canadian Reference Sources: A Selective Guide. Canadian Library Association, Ottawa, 1973.

(89) Banham, Jim, "Specialists Get Help From Campus Library". UBC Reports, Vol 20-No. 2. January 1974 pp. 6-7.

teaching, we can develop techniques to supply needed information to the school district in the northern part of the province that is struggling with the problem of developing a curriculum geared to local needs and conditions. Many resources are available, but have we given the necessary attention to organizing them in creative fashion so that they can be used widely and to best advantage in educational problem solving? Figure 11. provides a rough illustration of components as they might be organized if the information sources circle of Figure 3. is broadened beyond a single data base.

The mind boggles! But, the types of services described are exactly those that are now being offered throughout North America by information services centres serving both the sciences and the social sciences. Our wildest projections are easily within the state-of-the-art at this point! Some of the most notable centres have been developed in education in recent years. For example, the recently published Banathy (89) report, discussed earlier, presents a "Search Referral Form" for user services which includes the following broad search categories: General Reference Books in Education; Indexing and Abstracting Publications; Guides to Media and Curricula Products; Guides to Human and Institutional Resources; Information Research Services; and, Machine Readable Data Bases. Each category lists the extant book, media and computer data sources available for searching. In essence, the user is ultimately supplied with an analysis of the materials on his search topic that have been gleaned from the total listings.

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(89) Banathy, op. cit., p. 92.

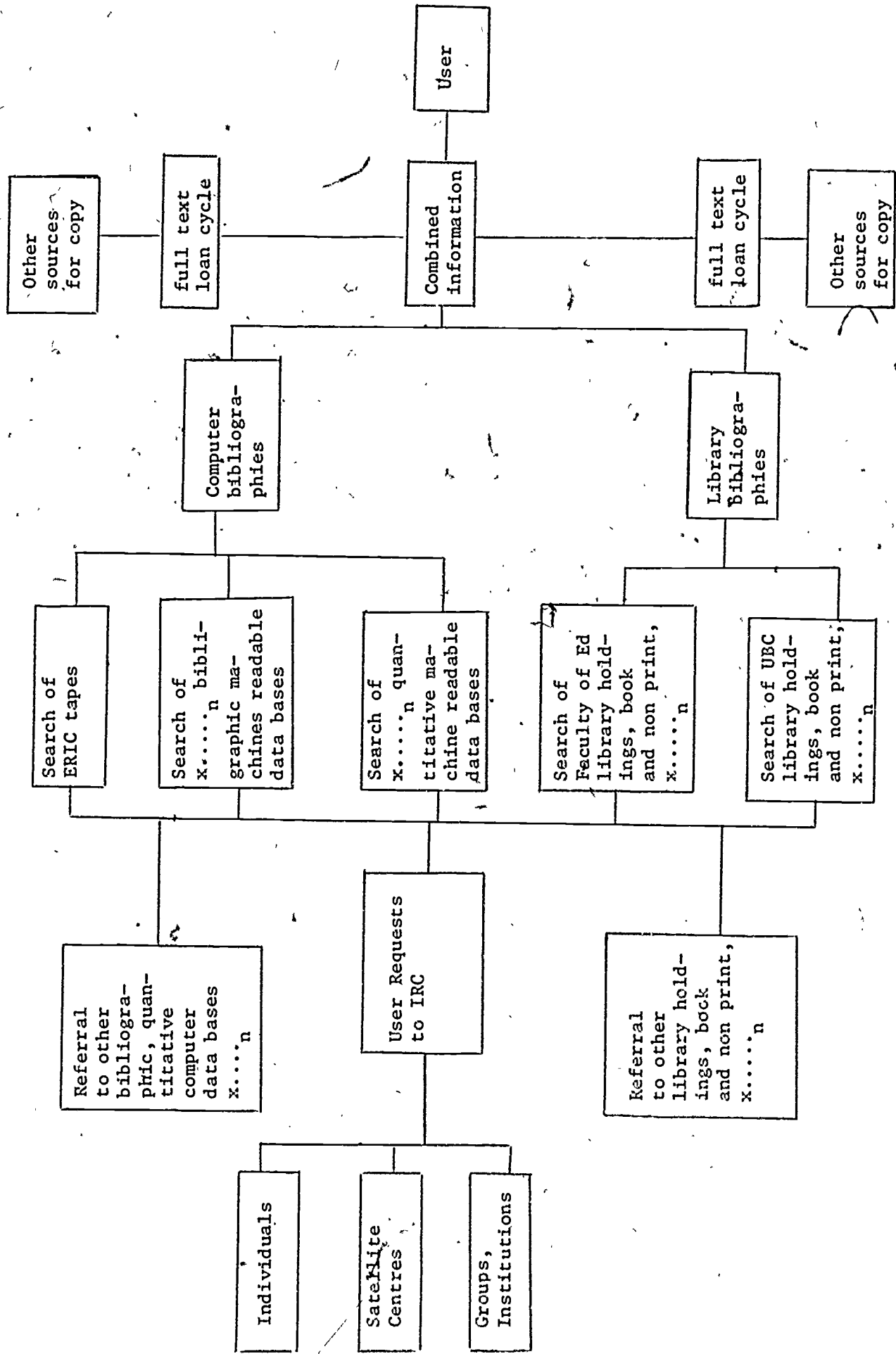


FIGURE 11. Components of a Comprehensive Information Base

An interesting conference was reported in 1972 - the National Conference of Educational Information Centers. (90) The conference brought together representatives from scores of existing information service facilities now organized for educational users. The report of the conference includes a compilation of related software used across centres such as center resource lists, reports, field agent information, job descriptions, request forms, information flow paradigms, organizational charts, and service agreements. The 224 pages of the report provide a rich source of materials on the current state-of-the-art in education information service centre organization and operation. An earlier publication by Systems Development Corporation (91) is also a useful source of information and models related to education information centre operation. Key factors to consider in developing such a centre include: planning, determining the parameters of the collection, defining the user group characteristics, processing the collection, organizing services, and consideration of related staffing and administrative matters. Weisman's (92) text, cited earlier, is an excellent source of information, which collates data and procedures from the general area of information science and technology as it relates to information centre development. A good deal of literature is also available for determining needs and organizing services related to machine readable quantitative and bibliographic data bases. Factors to be considered include:

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- (90) National Conference of Educational Information Centers, A Collection of Materials Currently in Use by Educational Information Centers. Research and Information Services for Education, King of Prussia, Pa. September 1972. 224 pp. (Also appears as ED 076 222.)
- (91) Sherman, Neil C., Lewis, E. Raymond, and Wenger, Judith, The Educational Information Centre: An Introduction. Tinnon-Brown, Inc., Los Angeles, 1969.
- (92) Weisman, op. cit. See also: Watson, Peter G., "Center for Information Services, Phase II - Detailed System Design and Programming, First Report on Public Services". April 1970 ED 072 822. and "A Guide to the Use of the SRS Research Information System: Instruction Manual," 1972 ED 076 199.

design and programming details for the software system, acquisition of selected data bases, development of operational systems, hardware configurations, operation of experimental retrospective, current awareness and demand searches, and staffing and management procedures .

While the information base continues to grow exponentially, users keep up their complaints that the information they need is lacking and what they do find is irrelevant. More creative efforts are in order. Research in human communication may provide some conceptual clues in isolating factors generating information needs. (93) Users are constrained by spatial, social and mass communication networks and relationships within these networks generate their information needs. Examining such network dimensions is a fruitful research area. We do know that users in education are not automatically aware of what is available nor do they always know precisely what it is they are seeking. Thus, the sheer availability of information often stimulates use. People try services because they are there and have become known to them. Allen (94) reports a project designed to estimate the effect of availability and promotion on the use of information services. In a well designed study, the SUPARS (Syracuse University Psychological Abstracts Retrieval Service) service was made available and heavily promoted. Use increased markedly - largely because availability was extensively advertised and promoted.

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(93) Lin, Nan, The Study of Human Communication. Bobbs-Merrill, Minneapolis, 1973.

(94) Allen, Thomas J., Piepmeier, James S., Cooney, S., "The International Technical Gatekeeper", Technology Review 73:5, March 1971. pp. 2-9.

A study of social scientists in the INFROSS (Investigation of Information Requirements of Social Scientists) project in England also revealed that "availability of stock and services appears to have a considerable effect on demand and use of information." (95), (96) We are just scratching the surface in understanding information needs and usage in education. Is the need for abstracts less critical for the practitioner than the researcher? Is information avoided unless it is properly packaged? If so, what are the optimum packaging variables? Do basic researchers require more complete and up-to-date information than educational practitioners? These questions, and others like them, will continue to go begging unless the first step - making information more widely available - is taken.

Pursuit of Alternative IV involves broadening the dimensions of the IRC to considerable degree. The first question relates to the issue of what users should be served - our faculty, the university community, the broader group of educators in the province - and the second relates to the type of service to be provided to those served; services based on a single bibliographic data base, a number of bibliographic and quantitative data bases, and services encompassing non-print, AV and traditional library holdings. Resource allocations depend on specific answers to these two questions. Increases are difficult to predict exactly, but the following rough estimates give an indication of minimal increases.

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- (95) Line, Maurice B., "The Information Uses and Needs of Social Scientists an Overview of INFROSS." Aslib Proceedings, 23:8, August 1971. pp. 422-434.
- (96) Line, Maurice B., Brittain, J. Michael, Cramer, Frank A., "Information Requirements of College of Education Lecturers and School Teachers: Investigation Into the Information Requirements of Social Scientists." Feb 1971 ED 049 775.



a) Information Resources

We should look immediately to adding two existing machine readable bibliographic data bases to the IRC information file - the Psychological Abstracts machine readable bibliographic file and the TRANSDEX file based on the social science literature. (These files may become available through the National Library and CAN/SDI.) Research into related costs should be undertaken immediately. There is substantial probability that acquisition, or tie-in, to such services could be supported by grant funds of some sort. We have some advantages here in that we can already demonstrate expertise in this area by our work to date with the ERIC machine readable bibliographic data base. Other data bases should also be added as they are identified. Work should be begun as soon as feasible in analyzing and locating candidate machine readable bibliographic and quantitative data bases.

b) Software

Additional funds will be needed for programming and software charges, related to making additional data bases operational, and software costs such as index, announcement and service publications related to use of the data bases. Again, these charges are indeterminate at this point. Cost figures related to the microform and hard copy support system for bibliographic data bases should also be investigated.

c) Computer Dollars

The question of user charges for services would again have to be considered in pursuing Alternative IV. Such charges would be related to the same factors as outlined for Alternative III. (add 2,000 to computer dollars.)

d) Statistical Laboratory Support

An increase in tape data base files would of necessity require additional computer dollar allocations for searching, maintenance of the collections, file management, development et al, as outlined previously. An allocation for computer programming in initial set-up of the files, and for continued operation, would be required. At this stage, with two to three data files operational, the IRC would require the services of at least a half-time programmer on a continuous basis. (Estimated cost, \$3,000) A flexible person would be needed who could get involved in planning and service aspects of the system as well as meeting the programming needs. Other costs related to the Statistics Laboratory involvement would also increase somewhat. Key punch costs would of necessity have to be given serious consideration in Alternative IV.



e) Personnel

The duties of the Information Specialist, as outlined in Alternative III, would of necessity encompass additional supervisory/administrative dimensions. A key role for this person would be supervision of the coordinated services across the varied files of the IRC. A particularly important role would be the supervision of services as they relate to the library and nonprint AV sources. Additional graduate student to serve in a support role for the information staff, and to handle duties related to increased information processing and service, would be needed. Aid in developing services and support systems would be a vital role for such personnel. (Add \$3,000,)

f) Professional Time

At this stage, a faculty member would be devoting almost full time to the development of the IRC project. Activities related to liaison, policy formulation with the advisory group, planning, research, supervision and development would increase markedly. The advisory group is of particular importance in Alternative IV. Serious thought should also be given at this point to assigning faculty time from other departments that relate to the IRC - particularly, AV and Communication, library and the Curriculum Laboratory and ed psychology. Funds should also be allocated for attendance at related professional meetings.

g) Clerical/Secretarial

Additional secretarial/clerical time would be needed in Alternative IV. One full time clerk/typist should be added in addition to the Alternative III personnel. It would be ideal if the additional person also had key punching experience and knowledge of computing centre operations. A half time clerk for file maintenance would also be necessary.

h) Space/Equipment

Staff offices for additional personnel would be needed - probably two to three rooms in addition to those assigned in Alternative III. File and storage equipment would also need to be supplemented.

i) Supplies, Paper, Postage, Communication

An estimated increase of \$500 over Alternative III funds would be needed.

ALTERNATIVE V

Continue to subscribe to the ERIC Tape Data Base quarterly updates and develop an efficient system whereby students and faculty can conduct searches of the data base.

Broaden the service so that students and faculty from all areas of the UBC community can conduct searches of the data base.

Develop the system so that any interested individual or group can conduct searches of the data base.

Broaden the content of the information system and add other sources to the IRC data base.

Stimulate the analysis and synthesis of information as well as its collection, organization and dissemination.

Not much need be said at this point to further illustrate the concept of information analysis and synthesis beyond what was developed in the previous sections on this topic. It is crucial that in stimulating such analysis activity in Phase II we be extraordinarily sensitive to educational issues and concerns, focus on a broad constituency, and develop quality information publications related to: the practitioner, administrator and other personnel involved in the educational delivery system throughout all levels; those segments of the lay public providing direction to and support for education; those involved in teacher education, graduate study and professional development; the various professional bodies with interest and involvement in education; the academic community; and the serious researcher. The concept of information analysis is an established one in information service work. Can we make useful application of the concept in an organized way in education?

For example, the recent brief on Curriculum Development (97) submitted to the Minister of Education by the BCTF is an instrument which raises significant issues and concerns related to decentralization of educational authority, local involvement in curriculum development and the pre-service and in-service training aspects of curriculum development. Implementation of the proposed recommendations would necessitate broader access to the extant information and knowledge base in education. What unit now exists which could provide effective access to the books, journal literature, reports, guides and the like so necessary to aid planning and explicate the current state-of-the-art in curriculum areas chosen for scrutiny and improvement? What crucial issues will obviously emerge as the shift to a new curriculum development system for B.C. unfolds? Would it not be in order to identify these issues and begin the development of effective information and analysis publications to provide the needed guidance and direction at the local level? Could planning be instituted to continue development of such publications as new concerns and problems emerge? Can we improve on the limited, traditional manner of providing the synthesis and analysis of information and knowledge necessary in educational problem solving? If all agencies in the province with involvement in education are to look to the working out of a general, coordinated provincial plan for in-service education and curriculum development, then the organization of a rational system to feed needed information into this effort - including the generation of synthesis and analysis activities on crucial issues - would likewise seem a vital necessity for the success of the total endeavor.

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(97) BCTF, Curriculum Development. The B.C. Teachers' Federation, Vancouver. September 1973. 10 pp.

In Phase II, can we serve as a resource and provide the necessary expertise and leadership in this area? Much information and knowledge related to our needs now exists and the amount multiplies daily. We need to give systematic attention to the definition of our concerns and organize activities that will aid in extracting from the world knowledge base the data and findings that are applicable to the Canadian milieu and our own idiosyncratic educational needs within this province.

Some effective information synthesis and analysis could be accomplished using the data base of Alternative I, but the most significant work would build on the comprehensive information base as outlined for Alternative IV. Once information centers have built significant collections à la Alternative IV, and established viable procedures for organizing and using those sources, the addition of the information analysis dimension becomes largely a matter of policy, professional input and focus within the terms of reference for the centre. Following are tentative estimates of the resource allocations related to beginning the information analysis activity.

a) Information Resources

Maintain at the Alternative IV level.

b) Software

Maintain at the Alternative IV level.

c) Computer Dollars

An increase in computer dollar allocation would be necessary for searches related to information analysis activity.

d) Statistical Laboratory Support

No major increases would be needed in statistical laboratory support.

e) Personnel

One additional graduate student should be added for support activities related to information analysis searches, work with authors engaged in analysis, et al. (Estimated at \$3,000)

One person should be added to the project with editorial qualifications and experience. (Estimated salary \$6,000) The primary role would be working with the advisory group, professional staff, support staff and others in all matters related to identifying analysis topics, working with authors and bringing information analysis products to the publication stage.

f) Professional Time

Adding activities related to information analysis and synthesis would add significantly to the professional time commitment for the IRC. The advisory group and the director would play a major role in determining areas in need of analysis, the type of analysis to be done, the details related to actually developing the analysis author or team, and bringing the project to fruition. Authors could be drawn from within our own faculty or from other sources where expertise is available.

g) Clerical/Secretarial

An additional typist, with experience in manuscript typing, would be needed.

h) Space/Equipment

Staff offices for additional personnel would be needed - two additional rooms and an additional secretarial station.

i) Supplies, Paper, Postage, Communication

Increases in supplies, paper, postage, communication et al. would also be necessary to support the information analysis activity. (Add \$500.)

ALTERNATIVE VI

Continue to subscribe to the ERIC Tape Data Base quarterly updates and develop an efficient system whereby students and faculty can conduct searches of the data base.

Broaden the service so that students and faculty from all areas of the UBC community can conduct searches of the data base.

Develop the system so that any interested individual or group can conduct searches of the data base.

Broaden the content of the information system and add other sources to the IRC data base.

Stimulate the analysis and synthesis of information as well as its collection, organization and dissemination.

Develop a program of research as it relates to: 1) functioning and operation of the IRC as a system; 2) user interface and satisfaction with the system; and 3) studies on knowledge production and utilization and the role of information in problem solving, change and innovation in education.

The foregoing sections of this paper have discussed various aspects of information in the modern world in terms of its generation, collection, organization, storage, retrieval, dissemination and analysis vis à vis knowledge production and utilization in education. Adoption of Alternative VI would involve adding research and evaluation activities of various types as a further dimension of the IRC. Figure 4. provides a basic framework for generation of such activities under three categories: functioning and operation of the IRC as a system, user interface and satisfaction with the system, and studies in the broader environment of knowledge production and utilization as related to problem solving, change and innovation in education. Some possible topics for evaluation and research for each category follow.

Research and evaluation under the first category would involve various aspects of file management, quality of input, indexing and classification schemes, equipment utilization, costing of services, operating efficiency

and the like. Although this kind of evaluation may appear to have an aura of objectivity because we are dealing with computers and programs, few absolutes exist in the evaluation of such factors. Wooster's (98) excellent review of the literature on the effectiveness of information analysis centres supports this contention. Analysis of the more subjective factors related to user services and satisfaction is even shakier. Thus, we are left with few absolute guidelines in evaluation and can exercise considerable leeway in developing our own pragmatic analyses.

A useful immediate topic for focus of our research efforts and funds would be an analysis of the problems users have with the systems language and logic requirements for moving from stating an information problem to development of a query formula for a search of machine readable data bases. Even in the most sophisticated, carefully designed systems specific instruction in use of such tools is needed. Query formulation, using Boolean procedures, is essentially an algebraic model based on set theory. This approach gives great power to bibliographic searching but engenders confusion because set concepts are unfamiliar to most searchers. However, some minimal set theory understanding is essential for any sophisticated manipulation of the Thesaurus in developing a query formula. Kugel (99) suggests that the confusion in use of terms for the meaning of union (OR), intersection (AND), and relative complement (NOT) may cause unnecessary difficulty. He suggests (PLUS), (OVER) and (MINUS) as more operationally

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- (98) Wooster, Harold, "An Information Analysis Center Effectiveness Chrestomathy." Journal of the American Society for Information Science, 21:2 (March/April) 1970 149-159.
- (99) Kugel Peter, "Dirty Boole?" The Journal of the American Society for Information Science, 22:4 (July/August) 1971, 293-294. See also: D. G. Clarke, "Query Formulation for On-Line Reference Retrieval: Design Considerations from the Indexer/Searcher Point of View." In: AGIS Annual Meeting, The Information Connection, Society, Greenwood Publishing Corp., Westport, Conn. 1970.

meaningful terms. This problem should be researched and the results incorporated either as a separate software training program or as part of the manual, Conducting Searches of the ERIC Tape Data Base.

Another research problem needing attention is the development of an on-line, interactive capability for use with the ETDB inverted file in query development. Recent on-line developments using the ERIC files could provide fruitful models. (100), (101) The issue here is essentially one of on-going controversy over batched vs. interactive programming. Because of the cost effectiveness aspects, this is becoming one of the most thoroughly analyzed areas in the field. (102) Licklider (103) looks ahead and makes the interesting suggestion that by the 80's or 90's almost all serious intellectual work will be done "on-line" in an interactive environment.

Development of an iterative search program, utilizing feedback information supplied by the system in the early stages of query formulation,

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- (100) Lockheed Information Sciences, ERIC/DIALOG. Lockheed Palo Alto Research Laboratory. Palo Alto, California. (brochure) See also: Roger K. Summit., ERIC On-Line Retrieval System - Use of the DIALOG On-Line Information Retrieval System with ERIC RIE Files. Final Report (#OEC-9-9-140161 -0028), USOE, Washington, 1970. Reports an interesting evaluation of on-line access and includes pertinent references on the general topics of question formation, batch and on-line processing, interactive displays and user reactions.
- (101) Olson, Tom and others, "WISE-ONE Systems Description". March 1973 ED 075 988. (WISE-ONE allows nesting of the search formula to a depth of 15 parenthetic levels.)
- (102) Sackman, Harold, Man Computer Problem Solving: Experimental Evaluation of Time-Sharing and Batch Processing. Auerbach Publications, New York. 1970. 272 pp.
- (103) Licklider, Joseph C. R., "A Hypothetical Plan for a Library Information Network." 1972, LD 057 876.



would be extremely helpful in our present search activities. For example, if we wish to frame a search to obtain information on available documents that tell us something about admissions requirements that relate to graduate programs we must now go through the following process. First, look up the descriptor ADMISSION CRITERIA in the hardcopy issue, ERIC Descriptor and Identifier Usage Report. There we find 387 ED and 255 EJ postings for the descriptor. Then, under GRADUATE STUDY we find 599 ED and 385 EJ postings. We also note the descriptor GRADUATE STUDENTS has 240 ED and 201 EJ postings. In addition, the descriptor GRADUATE SURVEYS has 184 ED and 42 EJ postings. Through this process we have obtained relative frequencies on the descriptors related to our general topic of graduate admissions criteria. Our search logic would be: ADMISSION CRITERIA AND GRADUATE STUDY OR GRADUATE STUDENTS OR GRADUATE SURVEYS. At this point we have some useful information but still have only a vague idea of the relative number of documents on this topic. We could do a laborious hand tabulation of all the ED and EJ numbers under ADMISSION CRITERIA that have also been posted to at least one of the descriptors: GRADUATE STUDY, GRADUATE STUDENTS OR GRADUATE SURVEYS. However, this is far too time consuming. At this stage all we can do is run the search as stated and Part I of our program will provide a listing of the relevant ED and EJ numbers.

With an on-line interactive capability using the inverted file we could, in essence, read in the descriptor ADMISSION CRITERIA and have the hits displayed. Then we could have the postings for the additional descriptors displayed. Finally, we could ask for the postings based on the search logic and obtain the number ED and EJ documents available. (Incidentally, 39 ED and 19 EJ hits occur.) This has been a rather transparent example and represents just one of the advantages of the on-line interactive

capability in search formulation. The major advantage is in being able to form a question, with immediate feedback, based on file contents during the questioning process. This approach optimizes the capability of the system. The efficiency goes up, the search quality increases but so do the costs.

The issue becomes one of trade-off. Interactive on-line processing means more computer time and less man time. Batch preparation means less computer time and more man time. It would seem that our function should be to conserve precious man time and optimize the machine. Thus, the on-line approach has the edge. Developing this capability is simply a matter of providing programming time to develop the software and computer dollars for using the system. The IRC should move as quickly as possible to develop the on-line interactive mode, utilizing the CRT display, as a viable query formulation option for the ETDB. As part of this development, careful analysis of cost factors in general should be made.

The second category for research and evaluation is the area of user interface and satisfaction with the system. We can extrapolate from a long history of experience in this area in stating that the IRC should be viewed as a tool which will exist exclusively to aid the user population in satisfying information needs. Thus, the overriding criterion of effectiveness is the ability of the system to satisfy the user. Cleverdon (104) suggests six main criteria relative to the evaluation of user satisfaction.

1. The COVERAGE of the collection, that is, the extent to which the system includes relevant matter.
2. The TIME LAG, that is, the average interval between the time the search request is made and the time an answer is given.
3. The form of PRESENTATION of the output.
4. The EFFORT involved on the part of the user in obtaining answers to his search requests.

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(104) Cleverdon, C.V., Identification of Criteria for Evaluation of Operational Information Retrieval Systems. Cranfield College of Aeronautics, England, Nov 1964. As discussed in: Gerard Salton, Automatic Information Organization and Retrieval. McGraw Hill, New York, 1968 pp 282-284.

5. The RECALL of the system, that is, the proportion of retrieved material that is actually relevant.
6. The PRECISION of the system, that is, the proportion of retrieved material that is actually relevant.

User studies are essentially studies in human behavior and become a vital dimension in the evaluation and research efforts of the IRC. Determining information use habits and needs of the educational reference group is a prime area of activity. How can we best "chauffeur" users to the desired information? What are optimal search negotiation procedures? How do we define the most effective "information package?" How best can the information output be organized? (Many searches result in a large bulk of references or abstracts that are not conveniently organized. How do we aid the user to sort and evaluate the bulk to find the items of interest?) What are the most critical factors in development of viable information analysis activities? What kind of synthesis and analysis activities would be of most value to users in the reference group: State-of-the-art reports? Bibliographies and special literature searches? Abstracts of current literature? Timely review articles? Continued surveillance of subject fields? Quick response about contents of current literature? or, Compilations of references for personal and course use?

The third category of research and evaluation involves studies that are particularly suited to widely based multi-disciplinary action relating communication, sociology, information science and the like. Objective data are useful here but one of the great needs is to develop more sophisticated, unobtrusive measures to monitor and gather data. Intriguing questions abound. Will information use increase if the services of the IRC are developed and widely advertised? What is the real effect

of timely information on the problem naming and problem solving parameters in educational development mentioned earlier? Can effective analysis aid in transforming information into knowledge? Will the users behavior change as he exploits new problem solving powers through better access to information sources? What are the optimum configurations among the related units in developing a viable education information service? Is there great resistance to use of microforms in education? What readiness has to be developed to prepare educators for an active thrust in information organization, analysis and synthesis?

The research listed just samples the full range of possible topics that could be included if Alternative VI is supported. As in most information services, once the initial start-up development is complete, research and evaluation become almost an automatic part of the on-going operation. With support at about the Alternative III level this type of research could begin to take place. However, significant research would only take place after the base of operation has been built to the personnel and support level of Alternative V and VI. The following resource allocations are recommended to support beginning research and evaluation activities.

a) Information Resources

No increase.

b) Software

No increase.

c) Computer Dollars

As needed for software development, research projects, on-line activities and systems evaluation.

d) Statistical Laboratory Support

No increase.

e) Personnel

One graduate student added to aid in research, evaluation, systems improvement and the like. (add \$3,000)

f) Professional Time

Some time commitment would have to be made for faculty devoted to research activities.

g) Clerical/Secretarial

No increase.

h) Space/Equipment

No increase except for hardware related to research activities which would require special funding arrangements.

i) Supplies, Paper, Postage, Communication

No increase.

ALTERNATIVE VII

Continue to subscribe to the ERIC Tape Data Base quarterly updates and develop an efficient system whereby students and faculty can conduct searches of the data base.

Broaden the service so that students and faculty from all areas of the UBC community can conduct searches of the data base.

Develop the system so that any interested individual or group can conduct searches of the data base.

Broaden the content of the information system and add other sources to the data base.

Stimulate the analysis and synthesis of information as well as its collection, organization and dissemination.

Develop a program of research as it relates to: 1) functioning and operation of the IRC as a system; 2) user interface and satisfaction with the system; and 3) studies on knowledge production and utilization and the role of information in problem solving, change and innovation in education.

Organize standard courses, short courses, seminars and workshops related to the IRC and information systems in education.

Development of the instructional dimension for the IRC would include organizing courses, seminars and workshops to be offered at varying levels and to varying degree of intensity. There is a need to focus, specifically, on our graduate program and offer intensive course work on information and knowledge production and utilization as they relate to all aspects of education. In addition, an understanding of specific information tools, such as ERIC, should be developed. Other workshops and seminars, providing information on IRC functioning and use of information tools, should be developed for various groups as needed. Several requests for such instruction have already been received. It would perhaps also prove fruitful to examine the whole issue of information as it relates to knowledge production and utilization in the development of our undergraduate program. Experience thus far in offering our wide ranging experimental course suggest that we can meet a real need in offering this type of instruction. Professional staff included under any of the previously discussed alternatives could assume a teaching role. Adoption of Alternative VII would add a dimension of crucial importance to the IRC. In fact, irrespective of what alternatives we eventually adopt, we should look to organizing and supporting instructional activities related to development of an understanding of information systems as they relate to educational research, knowledge production and utilization. Optimal utilization of information hinges on the adequately informed user who possesses competencies which allow him to effectively manipulate the information store in relation to his own problems and needs. As was pointed out in an earlier section, the most critical processes in access to information occur in our own minds and not in the maze of the data files themselves. Well designed instructional programs, aimed at development of competent producers and consumers of

information, will go far in optimizing what is increasingly being identified as the key element in effective information utilization - the human factor.

Minimal resource allocations related to IRC involvement in instructional activities follow.

a) Information Resources

No increase.

b) Software

Add \$200 for additional software tools for instruction.

c) Computer Dollars

As needed for student searches and computer activities in instruction.

d) Statistical Laboratory Support

No increase.

e) Personnel

No increase.

f) Professional Time

Faculty time assigned to teaching.

g) Clerical/Secretarial

No increase.

h) Space/Equipment

No increase.

i) Supplies, Paper, Postage, Communication

No increase.

Alternative and Related Resource Allocations. Table 1 provides a summary of the estimated resource allocations under the headings (a) through (i) needed to implement each level of activity for the IRC. It should be noted that each level cumulates from the previous alternative. (No dollar figures are included for the Clerical/Secretarial, Professional Time, and Space/Equipment categories.) The estimated funds for each alternative level



of operation are "guesses" although they are undoubtedly fairly close to the mark of actual costs that would be involved for each alternative. The figures do provide "ball park" estimates for developing specific proposals for the scope and operation of the IRC.

#### VIII. Some Further Comment

As this paper has developed it has been difficult to resist the temptation to go far afield in somewhat related areas - such is the all pervasive nature of the concept of information and knowledge production and utilization. However, further comment should be made on two items which appear to be more than tangentially related to the emerging ethos of Phase II - the concept of linkage and the process of communication.

Thinking in terms of linkage models for future developments may be particularly germane in a faculty that has often publically stated its intention to provide leadership and serve as a resource to the educational community. For example, as we look to needs in the area of continued professional development and in-service education, the linkage paradigm (with obvious modifications) may prove useful. Consider our constituency "out there" as the user group possessing various in-service and professional development needs and our faculty as the agent providing the linkage between the users and the means to satisfaction of those needs irrespective of whether the resources for such need satisfaction exist within our faculty or in other locales. Can we develop a workable format which identifies the relevant phases in a cycle beginning with need identification and carrying on from "negotiation" through to provision of curricula, consultation, special instruction and the like to final satisfaction of the need? What type organizational structure is needed in accommodating this area of endeavor? How do we rationalize new efforts

Table I. Alternatives and Related Resource Allocations \*\*

ALTERNATIVE	(a) Information Resources	(b) Software	(c) Computer Dollars	(d) Stat Lab Support	(e) Personnel	(f) Professional Time	(g) Clerical/ Secretarial	(h) Space/ Equipment	(i) Supplies etc.
I	ERIC Tape Data Base @ \$950.	\$630	\$4,000 depend- ing on use	service searches, trouble shooting, systems maint, consult, file up- date	1 grad asst, ac yr & sum, @ \$3,000	1/3 fac load \$400 conf exp.	ad hoc through sec pool & dept	1 rm Hut 03, file and stor- age for cards and printout	ad hoc
II	No increase	\$100	\$2,000 depend- ing on use	increase in Stat Lab time	1 grad asst, ac yr & sum, @ \$3,000	1/2 fac load	1/2 time sec	1 ad rm Hut 03, file & storage for cards and print- out	ad hoc
III	No increase	pub, print- ing @ \$800	(user charges?) \$2,000 depend- ing on use	increase in Stat Lab time	F1 time Info Spec @ \$7,000	\$500 conf exp	1/2 time sec part time help	1 ad rm in Hut 03	\$500

\*\* All items are cumulative from one alternative to the next.

Table I. Alternatives and Related Resource Allocations (Cont'd)

ALTERNATIVE	(a) Information Resources	(b) Software	(c) Computer Dollars	(d) Stat Lab. Support	(e) Personnel	(f) Professional Time	(g) Clerical/ Secretarial	(h) Space/ Equipment	(i) Supplies etc.
IV	Costs for addl data bases?	Software tools related to addl data bases?	(user charges?) \$2,000 depend- ing on use	increase in Stat Lab time	1/2 time programmer @ \$3,000 1 grad asst, ac yr. & sum @ \$3,000	Full time faculty load faculty time assign from rel depts. \$600 prof mtg.	1/2 time clk typist, key punch	2 addl rooms	\$500
V	No increase	No increase	\$2,000 for inf analysis searching	No increase	1 grad asst, ac yr & sum @ \$3,000 editor @ \$6,000	addl time of related faculty	1 typist, ms exp	2 addl rooms	\$500
VI	No increase	No increase	As needed for research activities in file impv, interactive on-line etc	No increase	1 grad asst, ac yr & sum @ \$3,000	Faculty time devoted to research	No increase	No increase	No increase
VII	No increase	\$200 for software subs etc	As needed for student searches	No increase	No increase	Faculty time assigned to teaching	No increase	No increase	No increase

such as these within the current operating constraints of our faculty? What relationships have to be identified and worked out? Should we add an additional unit replete with the needed support paraphernalia or scotch tape the function onto an existing portfolio? Given certain in-service and professional development goals, what alternative paths could lead to their accomplishment, ranged in order please from those requiring modest to those requiring Herculean efforts. What resource allocation decisions - short term and long term - relate to accomplishment of each alternative? The linkage paradigm analysis could also be used in other areas now under consideration for upcoming development - field service activities for example.

The concept of communication as it relates to leadership, linkage and the resource reservoir is also of interest. How do we provide for consistent communication with our broadly based constituency? Just as EDFACS is now serving a vital communication function within the faculty, could we not broaden the concept and develop a print communication link with our constituency? Is it not time the faculty had a highly communicative journal, perhaps a quarterly? A key thread in the development of such a journal could be the reality of information needs as they relate to knowledge production and utilization at all levels. Could we develop a unique publication with the avowed editorial policy of being all things to all people involved in the educational enterprise? Why continue to legitimize professional fragmentation? We do need specialized subject journals but why not also foster a unique effort that serves to cut across specialization, encourages synthesis and provides space for the theorist, the researcher, the layman, the teacher and even the student to rub print shoulders with one another in joint communication and expression of the mutual endeavor that is education in this province? The journal could serve ideally in dissemination aspects

related to the flood of information that is upon us by providing space for timely bibliographies, mini synthesis articles, research reports, current awareness activities, reports of practice, speculation, and serious theoretical and conceptually oriented pieces. What's wrong with having a journal where within one cover you have a variety of writing aimed at a variety of audiences and geared to the whole panorama of the educational scene? Why not.....? If there is no single vision or future New Jerusalem as to what education should be, and we are to study the wide variety of innovative practices emergent in pragmatic humanism, organize creative techniques for development of new curricula, and foster acquaintance with extant educational research and theory, then why not condone editorial plurality and look to the development of a communication vehicle par excellence as the keystone of Phase II?

VIII. In Addition.....

One is tempted to end this paper with a homily such as, "Remember your decisions are only as good as the information on which they are based." Perhaps the foregoing has leaned too much to the "hard sell" in proposing the development of the IRC. One tends toward enthusiasm when dealing with issues and projections in an area which appears to have promise of filling a need and which is easily within the current state-of-the-art of the field. However, the balanced view should be opted for - the "middle ground" - in our projections for IRC development. Adapt the proven and workable, readily build on the experience of others, cautiously examine the emergent trend, provide reasonable services, and whenever possible, move the state-of-the-art ahead a bit while avoiding the obvious pitfalls. The experienced and informed among the ranks in library and information science will readily attest to the awesome pitfalls in the development of

information services. Wright's (105) failure theory, which follows in its entirety, says it all and seemed a fitting end piece to our diverse speculations.

ASSURED FAILURE IN INFORMATION  
CENTER OPERATIONS

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Recent literature in the information science field has called attention to the fact that although information centers come and go, there is no consistent theory concerning information center failure.<sup>1</sup> While the combination of factors - ranging from financial disaster through managerial hysteria is admittedly complex in any information center failure, we ought not to be satisfied with a totally pragmatic failure concept. Instead this paper suggests a set of theoretically related rules for "Assured Failure in Information Center Operations (AFICO).<sup>2</sup> None of the materials herein presented would have been discovered without the experience of working in a variety of complex bureaucracies and closely observing their information systems. In addition, much of this theoretical development arises out of a careful reading of confidential operational reports on private and governmental operations.

The ten basic operational concepts are presented in two columns: Negative Operation Concepts, and Positive Operation Concepts. Depending upon the local situation, an information center manager may find avoiding certain actions is a better course to follow than insisting on certain actions. This double column approach allows free choice of alternatives.

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1 Wooster, Harold. "An Information Analysis Center Effectiveness Chrestomathy." ASIS. 21:2, March-April, 1970. pp. 149-159.

2 Although full programming for AFICO is lacking, certain sections of the model have been experimentally programmed.

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(105) Wright, Keith C., "Assured Failure in Information Center Operations." The Journal of the American Society for Information Science, 22:4 (July-August) 1971. pp. 294-295.

OPERATIONAL CONCEPTS

Negative Operation Concepts (NOC)

Positive Operation Concepts (POC)

1. Never begin information center operations on a pay-as-you-go basis. Ignore pilot studies and developmental processes entirely.
2. Never offer services which are in any way familiar to management such as book reviews, reference services, selective bibliographies...
3. Never admit that one of your services advertized has failed or that an expensive service has proved useless to management.
4. Never provide "backup" services for your computer produced and maintained files. When machinery breaks down, blame the company that sold it to you.
5. Never analyze the functioning, value, or utility of previous information sub-systems in your organization.

1. Always begin operations on a full service basis with SDI, abstracts, index services, and 24 hour reference service. Offer full coverage of two technical fields and two areas of social science or education.
2. Always be highly critical of 'library' type services such as reference, bibliography, pamphlet collections. Call such devices old-fashioned and pre-technological. Offer the same services under new names on computer print-out paper.<sup>3</sup>
3. Always advertize a series of "brand new" services in attractive brochures including computer pictures, diagrams, flow charts. If any service fails, be ready with two replacements.<sup>6</sup>
4. Always invest in top, level personnel and the most expensive hardware configurations. Ignore support staff needs, software needs, etc.
5. Always insist that previous information activities were totally inadequate at best, and probably wicked at worst. Demand a "clean sweep" of these totally inadequate, suspicious sub-systems.

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<sup>3</sup> The need for actual computers and equipment can be overdone. You may actually produce typed, all capitals, sheets that look amazingly like computer printout without any equipment but a typewriter.



6. Never allow a systems or operations analysis of your operations of the information center.

6. Always keep informal, unwritten staff assignments. Do not reduce your staff responsibilities to a chart! View any attempt at quality control or cost/benefit analysis as an attack on intellectual freedom. Be sure that your brochures (in No. 2 above) are vague enough to avoid analysis.

Never refuse to offer new services suggested by anyone in your management. Take all suggestions and start services to meet the suggestions within a week.<sup>4</sup>

7. Always assume that your staff, budget, and equipment can be infinitely divided over an exponentially increasing work load.

8. Never take into account the operations of "institutional homeostasis" or "organizational schizophrenia."<sup>5</sup>

8. Always assume that what management says is what management means, and that the organizational chart of responsibility, delegation is the actual chart of power flow in your bureaucracy.

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<sup>4</sup> A solid silver, engraved computer card (miniaturized) was awarded to Dr. S. Q. Smuntizy for his efforts in this field. He once started 13 new services in 8 days, involving 64 staff persons and 15 different kinds of output - all with a staff of three.

<sup>5</sup> "Institutional homeostasis" means the tendency of an organization to make radical adjustments, in order to stay essentially the same. Formally stated: "The tendency of organizational forms to remain essentially the same even while appearing to undergo radical external changes." "Organizational schizophrenia" refers either to the tendency to do two diametrically opposed things at the same time - thereby creating institutional homeostasis - or, as in clinical schizophrenia, the tendency to do the same thing over and over again regardless of rewards (profits) or punishments (losses).

9. Never recognize the functioning of "Wright's Law."<sup>6</sup>

9. Always assume that your information sources from the field and lower level offices in the bureaucracy are totally reliable and that funds and personnel time spent developing extra-bureaucracy source are wasted.

10. Never entertain any doubts about the value of information. Of course people make decisions on the basis of information; how else could they possibly act?

10. Always promote the idea that "information is \$\$\$\$" and that everyone will be willing to trade \$\$\$\$ for information. Any evidence to the contrary should be branded as subversive obfuscation.

FINAL NOTE: Naturally the application of these concepts can not guarantee organizational failure of information centers. The combined force of the operation of "institutional homeostasis" (see concept 8) and Wright's Law (see No. 9) will cause great difficulty if attempts are made to create failure in already existent centers.

Although these operational concepts have been tested in several organizations, their general application in terms of a full systems model has not been attempted. Reports of efforts at such systemic application would be welcomed.

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<sup>6</sup> "Wright's Law" states that in organizations of sufficient size, negative information does not flow uphill. A less formal interpretation might be that lower level offices and field offices will send nothing to the central office that might result in, (1) a change of the local institutional homeostasis - like closing a branch office, or (2) the curtailment of funds for local operations.

Obviously the larger the organization, and the more geographically dispersed, the more complex the actual organizational power structure and the more operational Wright's Law becomes.

APPENDIX

Some Comments on the Negotiation Phase in the Information Transfer Process

ERIC Tape Data Base Users Manual

Information Retrieval Request form

## Some Comments on the Negotiation Phase in the Information Transfer Process

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Negotiating a question with an information system is a process which can be structured and analyzed within the dynamism of communication. Work by Taylor (1), Belnap (2) and Simmons (3) suggests that this type of question negotiation is one of the most complex acts of human communication with one person trying to describe for another person not something he knows, but rather something he does not know. Ignoring for the moment the fact that a number of decisions have brought the user to the point of seeking information, let's pick him up on arrival at the information system where he specifies what he hopes to find out. "Arrival" can mean any of several modes: face to face interview, letter, or telephone. At this point, the negotiation phase begins. Sharpening of the question to be asked can be viewed as moving through a number of stages. (4)

- Stage 1 the conscious, or unconscious, need for information which is outside the remembered experience of the user (visceral need)
- Stage 2 conscious mental description of the area of indecision (conscious need)
- Stage 3 qualified and rational statement of the question (formalized need)
- Stage 4 recasting the question in terms of what the information system can deliver (compromised need)

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- (1) Taylor, Robert S., "Question-Negotiation and Information Seeking in Libraries," Key Papers in Information Science, A.W. Elias (Ed.), American Society for Information Science, Washington, 1972.
  - (2) Belnap, N.D., Jr., An Analysis of Questions: Preliminary Report, Doc TM 1287. System Development Corporation, Santa Monica, California, 1963.
  - (3) Simmons, R.F., "Answering English Questions by Computer: A Survey." ACM Communications, 8 January, 1966.
  - (4) From Perry, James W., Defining the Query Spectrum - The Basis for Designing and Evaluating Retrieval Methods, 1961. As discussed in Taylor, Robert S. Op. Cit.

Stage 4 is the main business of the information system. However, input provided at Stage 3 certainly facilitates the representation of the user's need within the constraints of the files and indexing language of the system and the translation to a productive search strategy. A skilled information consultant may even work back to Stage 2 with some users. Francillon (5), Mount (6), and Goggin (7) all suggest that certain key characteristics aid the individual who assumes the role of question negotiation in the information transfer process. These include: empathy, sense of analogy, subject knowledge, and knowledge of files, clientele and the collection.

It is useful to examine negotiation as a communication act. Figure 6 represents a conversation between two friends over time as one tries to informally determine the interest of the other. The dots represent communication acts while the circled acts represent communication relevant to the topic. Figure 7 approximates the communication act as it might take place in the negotiation process. The boundaries of the interview and the time span are compressed and a higher proportion of relevant communication has to occur. The information specialist has to develop techniques to quickly filter certain relevant items from the user. Among these are: the limits and structure of the subject; why the user wants the information, background on the user, time constraints in completing the search; relation of the user's question to the file organization; determination of the type and quantity of information needed; and a host of items related to delivery of the information, billing, and internal system

- (5) Francillon, M. "Information Retrieval: A View from the Reference Desk", Journal of Documentation, 15, 187-198, December 1959.
- (6) Mount, Ellis, "Communication Barriers and the Reference Question." Special Libraries, 57, 575-578, October 1966.
- (7) Goggin, Margaret K., "Current Trends in Reference Services", Library Trends, 12, Whole Issue January 1964.

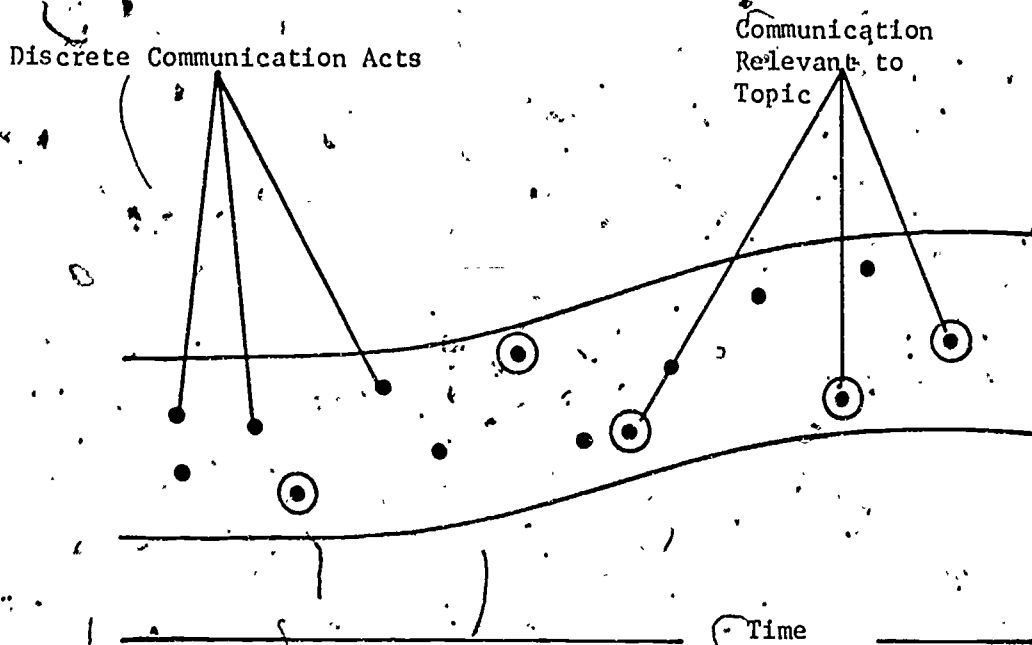


FIGURE 6. Communication Between Two Friends Over Time

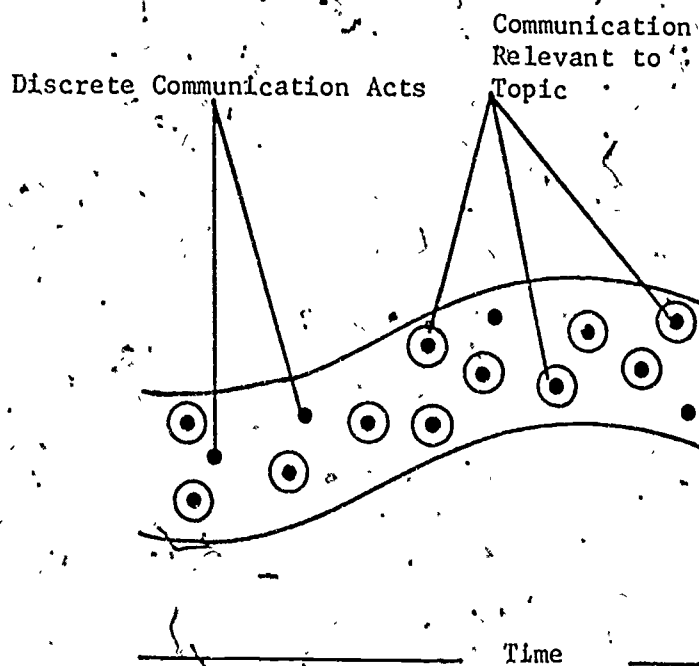


FIGURE 7. Communication in the Negotiation Process

operations. The questions will differ depending on the file and the type of service offered, but they are generalizable across systems. The negotiation process can be accomplished by software alone, by face to face interview, or a combination of the two. The IRC approach is to develop highly relevant software forms and descriptions to filter the needed information from the user in the negotiation phase. Face to face contact (or phone to phone!) can be resorted to when there is confusion in using the forms or descriptive software. This type of contact is initiated by the user after interface with the forms and descriptive material from IRC. Many phases of the negotiation process just discussed have been considered in the approach suggested for IRC. For example, all sections of the Information Retrieval Request form, and the related Users Manual, have been carefully developed to elicit maximum useful information for a search while placing minimal burden on the user. Rosenberg (8) has suggested that ease of access to an information system is more significant in information utilization than either the amount or quality of information retrievable. Ease of access is related to matters such as availability of the information service and publicity about the service. However, it is also particularly germane to the negotiation phase in the information transfer process.

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(8) Rosenberg, Victor, "The Application of Psychometric Techniques to Determine the Attitudes of Individuals Toward Information Seeking." Studies in the Man - System Interface in Libraries, Centre for the Information Sciences, Lehigh University, Bethlehem, Pennsylvania, 1966.



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ERIC TAPE DATA BASE  
USERS GUIDE  
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September, 1973

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PRELIMINARY DRAFT

The Information Knowledge Research Centre (I/KRC), Faculty of Education, University of British Columbia has been established as a linkage service to connect users seeking information to various education information sources now available and to stimulate analysis, synthesis and use of educational information. The I/KRC has recently assembled the components necessary to provide computer searches of the ERIC Tape Data Base. This manual describes the ERIC data base and outlines the steps necessary to initiate a computer search.

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Figure 1 REPORT RESUME, JOURNAL ARTICLE RESUME . . . . . 14

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GENERAL DESCRIPTION OF ERIC AND THE ERIC TAPE DATA BASE

In 1966 the Educational Resources Information Centre (ERIC) was established by the U.S. Office of Education to provide a national educational information system. ERIC now provides ready access to the ever expanding flood of educational information including results of exemplary programs, research and development efforts, journal literature on education and related information that can satisfy the "need to know" in developing more effective education programs at all levels. Information processed by ERIC is of interest to education research specialists, classroom teachers, counselors and administrators, students, government agencies, professional associations, school boards and other education related organizations and individuals.

ERIC consists of a central processing unit and 18 related professional clearinghouses (1). Through the network of specialized clearinghouses current significant information relevant to education is acquired, evaluated, abstracted, indexed and announced in ERIC reference publications. The central ERIC facility, located in Washington within the National Institute of Education, coordinates the processing of information by the separate clearinghouses and develops and makes available reference publications through government printing sources and commercial publishers.

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- (1) Each Clearinghouse serves one of the following areas: adult education; counseling and personnel services; disadvantaged; early childhood education; educational management; educational media and technology; exceptional children; higher education; junior colleges; languages and linguistics; library and information sciences; reading and communication skills; rural education and small schools; science, mathematics and environmental education; social studies/social sciences; teacher education; tests, measurement, and evaluation; and vocational and technical education.

Since its inception, ERIC has assembled a dynamic information file of over 150,000 educationally related documents. Approximately 25,000 accessions are added to this data base each year. New documents are indexed through use of a carefully controlled thesaurus of educational terminology (2) and announced monthly in the two ERIC reference publications: Research in Education (RIE) and Current Index to Journals in Education (CIJE) (3). Most of the documents announced in RIE can be purchased in their entirety in microfiche or hard copy facsimile from the ERIC Document Reproduction Service (EDRS) (4). (Exceptions are those documents restricted by copyright or other limitations.) Microfiche is a four inch by six inch sheet of microfilm on which up to 80 pages of standard size text can be reproduced. A special reader is needed to read microfiche. Figure 1 illustrates a sample entry from RIE, labelled REPORT RESUME, and a sample entry from CIJE, labelled JOURNAL ARTICLE RESUME. Note in particular the two six digit accession numbers, ED 013 371 and EJ 012 586, to the upper left of the two resumes. ED 013 371 is the sequential ERIC accession number assigned to documents processed for RIE. EJ 012 586 is the sequential ERIC accession number assigned to documents processed for CIJE. Note also the list of Descriptors related to both resumes. These are the terms selected from the Thesaurus of ERIC Descriptors by the clearinghouse staff to represent the contents of the document for indexing and retrieval purposes. The REPORT RESUME also

- (2) Thesaurus of ERIC Descriptors, CCM Information Corporation, New York, 1972.
- (3) Research in Education, Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Current Index to Journals in Education, CCM Information Corporation, New York, New York, 10022.
- (4) ERIC Document Reproduction Service, P.O. Drawer 0, Bethesda, Maryland, 20014.

indicates microfiche and hard copy available from EDRS. Documents announced in CIJE are available in the journal literature related to education. This publication is now processing the articles from over 500 education related journals on a monthly basis..

#### I/KRC COMPUTER SEARCHES OF THE ERIC DATA BASE

Limited manual searches of the ERIC data base can be conducted by using the individual issues of RIE and CIJE or the related cumulative indexes. However, those interested in educational information find it increasingly necessary to conduct fairly comprehensive searches of the total data base. As the data base grows, the problem has literally become one of matching the diverse information needs of hundreds of users with thousands of documents. The problem is further complicated by the fact that it is possible to select from over 6,800 educationally related terms in indexing documents. Thus, matching the user's information needs with the total data base becomes a job for the computer. Through computerization it is possible to reduce costs associated with information retrieval, handle large files of indexed information and keep the user up to date on new material being added to the data base. The Information Research Centre of the Faculty of Education has recently brought together the elements necessary for programming computer searches of the ERIC data base. Three types of searches are offered.

Current Awareness Searches (CA). The general current awareness search has been developed for the user who desires an introductory/overview look at the recent material available on a particular search topic. The printout consists of up to 50 of the most recent references from RIE and CIJE. A sample of the printout from a (CA) search is included as

Figure 2. Recent analyses conducted by various operating information systems reveal that it is most often sufficient to provide 25 to 50 references for current awareness purposes. With this as a starting point, the user has a "handle" on the topic. Through the process of "chaining" references and bibliographic sources in these documents, the user is led to the interconnected recent information on the search topic. The (CA) search often serves as a "look see" or pilot search. It can also serve as a trial of the search logic preparatory to a more in-depth search. After analysis of the (CA) results, the user can then decide to terminate the search or proceed in more depth. Very reasonable cost factors are possible in batched (CA) searching. Many users need not go beyond this stage depending on their purpose in conducting a search.

Retrospective/Historical Searches (RH). For the user who wants a search of the complete data file, the (RH) service is available. In response to specific requests, searches of the entire data base of 150,000+ documents can be programmed. These searches can also be updated as new information is added to the file. The printout from the (RH) search is the same as that for the (CA) search illustrated in Figure 2.

ED and EJ Searches (ED/EJ). IRC programming allows for searches which produce only the relevant ED and EJ numbers from RIE and CIJE related to the search topic. The user can then use the printout results to obtain bibliographic information and abstracts from relevant issues of RIE and CIJE. This type search is extremely economical and provides a useful step which enables the user to gauge the amount of information available on a topic and develop his own abstract and citation file rather than paying for computer production of these. Because of the low cost factors, all ED/EJ searches are done as (RH) searches using the complete



data base.

Limitations of ERIC Searches. While ERIC provides a powerful tool in location information on education, it is not the end-all of educational resource searching. One major limitation to all information systems is that they do not provide explicit solutions to problems but only information related to problem areas. ERIC is no exception to this limitation. Computers do not think nor are they mind readers. ERIC data base searches do not produce "cookbooks" that tell the user what to do in given situations. In seeking information on a topic it is often necessary to combine results from several sources to meet a given need. ERIC does not replace all other education information sources but should be viewed as an addition or enhancement to existing sources. Even though the data base is huge, it is not a comprehensive file of all the information related to education.

The system often does not supply a precisely relevant or comprehensive search on the first attempt. Searches may have to be recycled after analysis of the initial printout with a change in descriptors or search logic. However, careful negotiation of the initial search with the IRC staff can minimize recycling. There is a common assumption that ERIC has all the answers and disappointment among users may occur when the system fails to supply specific enough responses. Failure to obtain appropriate, specific response is often attributed to the indexing system. However, it cannot be expected that even 150,000+ documents will cover the millions of possible permutations among educational interests and requirements. There may often be few or no reports at the intersection of combinations of descriptors. At times, only a few somewhat relevant documents may surface. This happens even in well worked areas. Even when "hits" occur some may be too old, others too simple, or others too complicated to meet the needs of the particular user. Matching need specificity with response

specificity is a complex task worthy of continued research in the information field.

With these caveats in mind, the ERIC system can serve as a valuable tool for locating information and keeping informed on recent developments. In essence, upon completion of a well thought out search, the results provide the user with a good deal of recent, often very difficult to locate information. And at considerable savings in time, effort and money, compared to other methods. Even the indication that there are few references on a topic can be useful data in meeting information needs. A search often helps shape an idea in the formative stages of a project through the information provided.

ERIC is a reference system and the results of the computer searches provide information about documents but not the documents themselves. Every ED (RIE) reference on the printout that results from a (CA) or (RH) search will give the source for the full text document. Every EJ (CIJE) reference will give the citation information necessary for locating the full text in the journal literature related to education. (See the sample printout in Figure 2.) A large percentage of the ED (RIE) documents are available in either microfiche or hardcopy form through the EDRS. Some libraries, local education agencies, professional associations, state and provincial departments of education and information centres now subscribe to complete collections of the ERIC microfiche file on a monthly update basis. Increasingly, facilities are also becoming more widespread for reading microfiche, reproducing copies of specific pages, and even reproducing microfiche cards themselves.

In Summary. In using the computer search services provided by the I/KRC.

- (1) You supply the search topic and select a (CA), (RH), or (ED/EJ) search.
- (2) The I/KRC staff negotiates your search, transforms the topic into the system indexing language and develops the search logic.
- (3) I/KRC conducts the computer search, screens and evaluates the results, bills, and delivers the printout to you.
- (4) You analyze the printout, THEN
  - . if desired, obtain full text documents (as indicated on the printout) from a library, commercial source, or the EDRS,
  - . complete the search evaluation form and return to I/KRC, and
  - . request follow-up or additional searches from I/KRC.

#### WHAT ARE THE COSTS FOR THE I/KRC COMPUTER SEARCH SERVICES?

Costs are based on charges related to the various personnel and computer services required to complete a search. Costs may vary somewhat over time depending on the volume of searching done by the I/KRC.

- . Users pay a flat fee of \$25.00 for a (CA) search on one topic.
- . (RH) searches are billed at cost based on the size of the output. Minimum charge is \$25.00 with additional charges scaled to the number of references on the printout.
- . (ED/EJ) searches are billed at actual cost (minimum charge \$5.00). These searches seldom exceed \$10.00 per search except in special cases.

#### INSTRUCTIONS FOR COMPLETING THE INFORMATION RETRIEVAL REQUEST

The manner in which the user phrases his search topic has considerable effect on the results obtained. Users searching for information, and the author reporting information, have many words in common and the trick is to get the two together. The user knows what he is looking for but usually know little about the contents of the data base or the

indexing language used to extract information from the system. The I/KRC approach utilizes a human interface in converting the raw search topic, prepared by the user, into the formal search used for computer retrieval.

The user can use words familiar in the ordinary language of the profession but should be alert to synonyms, related terms or other information which help to broaden or narrow the search. The eventual matching of the formal search with the data base is done through concepts represented by terms and combinations of terms. The user needs to describe his topic carefully. Poorly thought out searches will result in voluminous and/or irrelevant information. A simple 10 step process should be followed in completing the INFORMATION RETRIEVAL REQUEST form.

Step 1: Provide Information About Yourself

Fill in the spaces in Section 1. Any special instructions for mailing, billing or the like should be included in the space provided. IRC searches are batched on a minimum two week schedule. Indicate any special time requirements in the space provided.

Step 2: Define the General Area of the Search

In the space in Section 2 make a succinct statement which accurately describes your search topic. It is helpful to think of this section as the title of your search. Sample titles might be:

Flexible and Modular Scheduling

Mathematics Education

In Service Training - Multimedia Methods

Environmental Education Activity Materials

Self Concept in Relation to Academic Achievement

Community Schools

Team Teaching

Student Motivation K-12

Educational Management by Objectives

This search title is not used directly for computer retrieval, but rather to facilitate subsequent steps in selecting appropriate descriptors and developing the logic for the search.

Step 3: Provide Detailed Information on the Search

In the space provided in section 3 elaborate and provide more detail on the title you developed for Step 2. Write a clear, concise statement of the search problem breaking it down, if possible, into distinct concepts or ideas.

EXAMPLE: I am a faculty member in a teacher education institution and we have become increasingly interested in devising a better means of screening students seeking admission to our programs. Our interest is motivated by the increased emphasis on teacher accountability and current prospects of over supply of teachers for the next decade. What information can IRC provide related to screening practices for admission to teacher education programs?

EXAMPLE: Our school district is interested in industrial arts programs in elementary schools. A committee has been formed to explore this area and look in particular at instructional materials designed for use at the elementary school level. Help!

EXAMPLE: I am an elementary school principal and our district is planning to implement the open schools concept in our elementary program. Can you provide any information on the building design aspects of open area type schools?

EXAMPLE: I am a graduate student developing a thesis proposal. My general area of study is the problem of dialect as it relates to developing elementary programs in multi-racial settings. Can you provide recent references on this topic?

EXAMPLE: I am on the local school board in our district and we have formed study committees to look at several aspects of our school operation for the coming year. Can you provide information on the topic of discipline as it relates to achievement - particularly in large secondary schools?

EXAMPLE: I am the research director for a large urban school district. Our emphasis for the coming year will be centered on three areas of experimentation: (1) instructional programs for students who have learned English as a second language, (2) the effect of open area organization plans on the academic achievement of Grade 8 students entering the secondary program, and (3) developing reading improvement programs for junior and senior secondary grades. Would it be possible to get a brief search in each of these areas and then perhaps follow up with an in-depth look later?

Step 4: Provide Related Information

Keep in mind that a thesaural approach is used in indexing the ERIC data base. Once the user defines his search, descriptors are selected to represent the concepts and ideas of the search topic. A number of descriptors often relate to a single topic. Thus, synonyms, related terms, and other descriptive information becomes very important input in formulating the search. In Step 4 indicate synonyms, related terms and other descriptive information if applicable to your search topic.

Step 5: Indicate the General Purpose of the Search

In section 5 you are asked to indicate a general purpose for your search. This is useful for IRC internal purposes but is also helpful in formulating a search.

Step 6: Define the Level of the Search

Fill in the appropriate level related to your search in Section 6. This is extremely useful information in determining the focus of your search.

Step 7: Indicate the Type of Search Needed

In Section 7 check the type search desired. If nothing is checked, requests are automatically run as (CA) searches.

Note the space for QUESTIONS in Section 7. If this space is checked, it indicates to the IRC staff that you want further negotiation before the search is run. IRC will contact you by phone (long distance, collect) to clear up questions related to your proposed search if you so desire. A cover letter can also serve to communicate questions on your search.

Step 8: Check the Information Retrieval Request

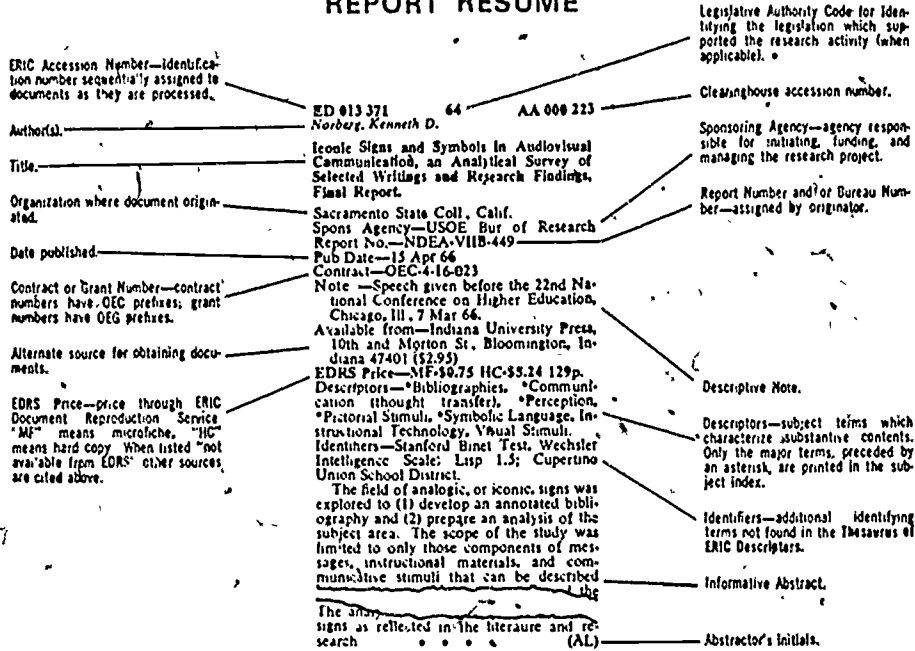
Check all entries in Steps 1 through 7.

Step 9: Mail the Completed REQUEST

Step 10: Complete the IRC Evaluation Form, Mail

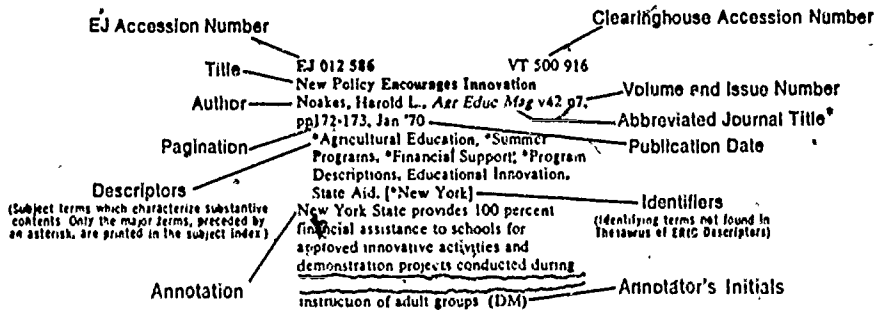
IRC consistently seeks user feedback and evaluation related to all phases of its operation. Will you help by completing the form for evaluating the ERIC TAPE DATA BASE USERS GUIDE and mailing it back to IRC?

## REPORT RESUME



\*The key to these codes appears in Research in Education

## JOURNAL ARTICLE RESUME



\*A list of these with full titles appears in Current Index to Journals in Education

Figure 1 Report Resume, Journal Article Resume



PUBLICATION DATE.. 72

TITLE.. The Impact of Teaming and the Visibility of Teaching on the Professionalism of Elementary School Teachers.

PERSONAL AUTHOR.. Marram, Gwen, D.; And Others

DESCRIPTOR. ✓ \*Elementary School Teachers; Evaluation Methods; \*Inservice Teacher Education; Open Plan Schools; Participant Satisfaction; \*Performance Based Teacher Education; Performance Specifications; \*Student Teacher Relationship; \*Teacher Evaluation; Team Teaching (

EDRS PRICE.. EDRS Price MF-\$0.65 HC-\$3.29

DESCRIPTIVE NOTE.. 65p.

ABSTRACT.. A major aspect of professionalism is a desire for collegial evaluation. The data presented came from responses to a questionnaire given to 244 teachers in 15 elementary schools. This study showed that elementary school teachers had little respect for evaluations of their teaching by other teachers. The teachers had a low estimation of the value of professional knowledge, skill, and training. There was also a lack of visibility of teachers' work to each other. An increase in the visibility of work, brought about by team teaching and open schools, increased the perceived soundness of evaluations of that work. The visibility of teaching per se had an independent impact on the importance of evaluations, and the desired influence of evaluations. Team teaching was also associated with greater collegial control. Among teachers who were members of teams, a higher level of visibility of teacher's work was associated with an increase in the desired influence of and importance accorded evaluation by colleagues. It was suggested that the increased use of open schools and teams may lead to a more professional organization of teaching. Fourteen tables of statistical data are presented. The appendix includes the teacher questionnaire. (Author)

\*\*\*\*END OF ABSTRACT\*\*\*\*

Figure 2 Sample IRC Computer Printout  
for ED (RIE) and EJ (CIJE) Hits

PUBLICATION DATE.. May 72

TITLE.. Developing Alternatives in Education

PERSONAL AUTHOR.. Edwards, Conan S.

DESCRIPTOR.. Dropout Programs; \*Educational Innovation; \*Educational Needs; Experimental Programs; \*Experimental Schools; Open Plan Schools; \*Program Descriptions; Special Schools

ABSTRACT.. Pressure today is exerted upon school officials for alternatives. The author presents several programs his school system has initiated, with frank appraisal of their success or failure.  
(Editor)

JOURNAL CITATION.. NASSP Bulletin; 56; 364; 132-139

\*\*\*\*END OF ABSTRACT\*\*\*\*

\*\*\*\*\*  
IRC EVALUATION FORM  
\*\*\*\*\*

ERIC TAPE DATA BASE USERS GUIDE

(1) Is the Guide easy to follow? Yes \_\_\_\_\_ No \_\_\_\_\_  
If not, comment on those sections that were hard to follow.

(2) Should the Guide contain additional information about IRC, the ERIC  
Tape Data Base, or the ERIC system? Yes \_\_\_\_\_ No \_\_\_\_\_  
If so, list any suggested additions.

(3) Is any of the information in the Guide irrelevant, unnecessary?  
Comments. Yes \_\_\_\_\_ No \_\_\_\_\_

(4) Were there any problems in using the INFORMATION RETRIEVAL REQUEST  
form? Comments. Yes \_\_\_\_\_ No \_\_\_\_\_

(5) Additional comments or suggestions.

MAIL TO:  
Information Research Centre  
Faculty of Education  
University of British Columbia  
Vancouver, British Columbia



Information Research Centre  
 Faculty of Education  
 University of British Columbia  
 Vancouver, British Columbia  
 (604-228-5334)

INFORMATION RETRIEVAL REQUEST

Search of the ERIC  
 Tape Data Base

NOTE: The most important factor in obtaining relevant information is effective communication of your problem to the IRC staff. Please think your request through carefully and provide all the information on this form. Care taken at this point will aid in developing the search for your topic and will have considerable effect on the quality of the information you receive.

Section 1

Name \_\_\_\_\_ Date of request \_\_\_\_\_  
 Position or title \_\_\_\_\_ Telephone \_\_\_\_\_  
 Address \_\_\_\_\_ City \_\_\_\_\_  
 Province \_\_\_\_\_ Information needed by (date) \_\_\_\_\_  
 Special instructions \_\_\_\_\_

Section 2

What is the general area of your search?

Section 3

Write a detailed statement describing the topic for which you require information. Be as specific as possible. Use back if necessary. (Submit one request per form).

Section 4

List descriptive terms, synonyms and any other appropriate information which may be helpful to the IRC staff in formulating your search.

Section 5

What is the general purpose of your information search? To what use will you put the results?  
\_\_\_ proposal preparation \_\_\_ use in teaching \_\_\_ use by lay public  
\_\_\_ thesis or course work \_\_\_ administration/management \_\_\_ "brushing up" in an area  
\_\_\_ personal information \_\_\_ curriculum development \_\_\_ other (please specify)

Section 6

Which of the following levels apply to your search topic?  
\_\_\_ preschool \_\_\_ intermediate \_\_\_ senior secondary \_\_\_ college/university  
\_\_\_ kindergarten \_\_\_ elementary \_\_\_ junior/community college \_\_\_ graduate level  
\_\_\_ primary \_\_\_ junior secondary \_\_\_ vocational/technical \_\_\_ adult  
\_\_\_ other (please specify) \_\_\_ institute

Section 7

What type search do you need?

\_\_\_ CURRENT AWARENESS \_\_\_ RETROSPECTIVE/HISTORICAL \_\_\_ ED/EJ only  
(Up to 50 of the most (search of the complete data base since 1966)  
recent references on the topic)

QUESTIONS \_\_\_\_\_  
Phone \_\_\_\_\_