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ABSTRACT

Four case histories were studied in an on-going project to develop a method for user selection of purchased scientific and technical information services. The issues involved were: (1) the value of computer search services to a small branch of a company technical library; (2) the special decision-making factors used for selecting items of very high or low costs; (3) the judgement factors applied when purchasing expensive special topic bulletins; and (4) the differences in work environment and other variables between a university science library and an industrial research library. A survey of usage patterns for scientific and technical information services at the Exxon Research and Engineering Company Central Library was planned. (PF)

TECHNICAL REPORT

ON

GENERALIZED METHOD FOR THE USER EVALUATION OF PURCHASED INFORMATION SERVICES

Contract No.: NSF C-1027

Project: Improved Dissemination and Use of Scientific and Technical Information

Report No.: 3 - Monthly Report

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A Generalized Method for the User ~~Evaluation~~
Selection of Purchased Information Services

Objectives and Definitions

The definition of the term services as used herein has been considered further in the light of its functional significance.

A "simple searching service" is one in which the question is completely defined before the search is started, and any restatement of the question represents a new search. The distinction lies in how the service is used, not the mechanics of the system. Redefinition of the question during the search requires a much higher degree of skill and training on the part of the user. Such redefinitions are characteristics of information analysis. In terms of the present contract Phase I is addressed to simple searching services, and Phase II will add the parameters for information analysis.

This statement of the critical distinction between Phase I and Phase II is taken in part from the training principles for engineers used by IBM: statement of the problem to be solved is called input to the system, process operations are internal to the system, and output is tailored to meet predefined needs. Two guiding principles are recognized:

a) the more sharply input can be defined, the easier it is to define an acceptable output, and the less problem it is to satisfy the qualitative aspects of user needs;

b) any interaction between the customer and the system during processing changes the input no matter how slight the change.

This creates a new statement of the problem, and costs which may be ruinous, unless the changes are made by an expert who understands completely the language of the machine as well as the language of the problem. This may save overall costs or it may not, since it depends on whether the time of such an expert is available on call, as well as whether he can do the job in enough less time to more than balance his higher unit rate.

This definition clarifies our concept of services to be included in Phase I, since it says that when a complex (computerized) service is being used for routine operation, this may be a simple search, even though the same equipment can be used in sophisticated ways for information analysis.

The title of this report has been reworded on a trial basis as "a generalized method for the user selection of purchased services," changing a word to selection instead of evaluation. The term "evaluation of information systems" has been used extensively in the literature, but with different meanings. The most frequent meaning is apparently the evaluation of performance of an individual system, addressed to system design. Only a few references by comparison deal with the comparative evaluation of different systems, which is our problem, for the user selection between competing services. This questions will be considered further, and comments are specifically invited.

Case Histories Considered

Four potential case histories were considered this month, relating to the definition of S.T.I. service needs and cost factors in special situations. Each of these is being examined for factors in the selection of services:

a) A small branch or special library

The use of mechanized or computerized searching services is frequently resisted by the small branch library, which sees the new service as incomplete, regardless of cost. A clear example appears in an exchange of letters in the issue of Special Libraries for November 1975, page 6A: the librarian at the Marathon Oil Company research center (117 employees) points out the very high base cost of data management systems for a small user, and an author from Chevron Research (over 1,000 employees) replies that incremental use by branch libraries can be cheap and very useful, once the base charge is paid by a parent organization. The polemical tone of both writers makes it obvious that they are not speaking the same language.

A similar example is available for study within Exxon: the situation can be examined as a problem in the definition of needs, in a system which is considering a basic change. There may be strong hidden factors involved. The small branch or departmental library may be in essence an expansion of the personal library of the department manager, created as a service center and not just an information source. It operates in a closed market, which is not likely to be expanded regardless of any improvements. The special services it offers serve as a way of doing business, not just as a source of information. The most valuable parts of the system may be a browsing file of collected documents, abstracts or indexes, the skill of the staff indexer who creates this, and the familiarity of the department personnel with how it works. If the skilled staff could be replaced by a moderate to low-cost incremental information package, available from a parent organization, this would deprive the branch operation of its chief reasons for separate existence. Also, the minimum times required for the training or skill maintenance of staff users of a sophisticated new system are a larger burden, the smaller the operation.

In this situation, the consideration of needs suggests that the best use of auxiliary information services may be to upgrade the work input to the indexer; whose final selection and integration of new material into the files is one of the most valuable service the staff performs. The new information tools may be used to pre-select items to be considered for special indexing, drawing either from the total flow of current source material or as a secondary supplement from the less productive sources, which take more time to find pertinent items.

An acceptable definition of needs may become how to pre-select and feed to special indexing the type of items which have proved most useful in current operations. This may be based as much on operative terms (such as types of interaction effects) as on topical areas, or hierarchical relationships. Standard procedures are applicable to the analysis of current experience, to determine what specific files have been most powerful or most in need of improvement. Other aspects of the decision matrix can be considered from this same point of view.

b) Costs by range, not seriatim

Comparisons between competing services are not usually based on cost alone, but tempered to allow for differences in the service offered. The assumption is that market forces keep directly competing services close to each other in price, and that the service which costs more has something more to offer - if this feature is one you want to buy. To the extent that this is true, cost becomes a secondary factor in the selection between services, as long as they are within the same general range. This may be entirely contrary to the trade literature published by the vendors, who are highly cost conscious and anxious to use this point as a selling tool.

On this basis, there would be only three significant ranges of cost: on the market, too cheap, and too expensive. Differences within each range might be considered as relatively unimportant, although varying over as much as one order of magnitude including the average. Prices far below the average are suspect, because they suggest serious defects in the service offered. Prices within perhaps 50% of the average are assumed to correspond to desirable extra features or allowable omissions, and may not be questioned seriously as long as the user has made up his mind as to what he wants. Prices above this range bring in new questions of their effect on total budgets, of available alternates, and of the certainty of use sufficient to justify special purchase. Adjustments are also necessary for the number of customers, from a service which is cheap because of cost sharing at one end to a service which is expensive because it is proprietary, and distribution to other customers is rigidly excluded.

An example of this factor of costs by range is the decision of the central library at ER&E to cancel its standing order for continuing index volumes in series such as Beilstein, which are recognized as valuable tools for access to information. The problem is that Beilstein supplement IV has now reached the range of $400-500 per volume. Five such volumes appearing at unscheduled intervals in 1975 can ruin the book budget for the year, in even a fairly large library. Prices so far above the average force the consideration of alternative sources and procedures,

no matter how useful the item. In this case, each purchase must be considered separately on its merits, and a possible answer is that other sources such as Chemical Abstracts, with computerized access, may have to take the place of the rest of Beilstein.

The question of probable extent of use interacts with costs somewhat differently in different ranges. For average costs, even within budget, many libraries will insist that a single user must make the purchase recommended with his own funds, unless he can demonstrate that the service will enjoy multiple use by others as well. This requirement is most likely to be waived for requests of low or average costs, in a new field of interest, where there is a presumption that others will become users after the new service is made available.

c) Special Topic Bulletins

The opening of any new field of scientific and technical information is likely to be greeted by one or more new newsletters or special bulletin services, as soon as it can be expanded into a recognizable market. These bulletins may be aimed primarily at the small user who does not have his own information service. This may be an individual in even a large corporation; however, in a new field where interest is limited, or where the user does not know how to ask for information. Since these services are expensive and tend to become full of trivia, special quality factors must be applied, including such criteria as the following:

qualitative

- items come from primary sources, not just old material
- information cumulates, access routes supplied
- tied to known sources, improves access to other material
- suitable for browsing, organized by related ideas

judgmental

- reputation of publisher, probably a quality product
- importance to major company interests

quantitative

- priced within the current market range
- number of users, sufficient to justify central purchase

d) A University Science Library

Differences in the work environment and other variables between a University and an industrial research laboratory have a significant effect on the parameters applied to the selection of purchased information services. The following list was suggested in a preliminary discussion with the Librarian of a nearby University Library of Science and Medicine:

- The Library does no searching, as a regular service, for itself or for other people, but only provides tools for others to use.

- Semi-public use of the facilities by unskilled users creates serious problems of misfiling, as compared to the industrial library which enjoys a more protected environment and users of higher average skill. Thus, the University Library refuses to purchase card services, or loose-leaf with a steady flow of supplements, because they involve a block of time to get into business, interminable interfiling thereafter, and the constant hazard of items which are lost or misfiled.

- The Library is leary of highly specialized materials, and requires a minimum number of users, no matter who they are. Any individual research project or contract can be terminated, and leave an orphaned, broken file. An index or access system which is needed by only one man must be purchased and maintained by him, therefore, out of project funds, regardless of how valuable it is to him. Such a file may be transferred to the Library at a later date, but only after sufficient use by others has been established by experience.

- Uniqueness of a given service on the market compared to its competitors comes before cost, in deciding which to keep and which to discard, although both factors must be considered.

- Statistics on the use of different data bases are available for study from on-line billings for different user groups: faculty, graduate students, and undergraduates, and by University Section for each. These can be examined to look for shifts and patterns.

This discussion will be followed up in due course, by an interview and an examination of the statistics available.

Cost vs. Benefits

Strong contributions to the recent literature on system evaluations have been made in the field of air pollution control. The data available here (or missing) have been studied intensively in the effort to balance the costs and prospective benefits of different alternatives. In a critical review of the "Systems Approach to Air Pollution Control," Bibbero recognizes that the choice between control strategies can be approached by either cost-effectiveness or cost-benefit analyses: cost-effectiveness refers to the choice between all feasible alternatives as a least-cost strategy, for reaching a predetermined goal, while cost-benefit attempts to rationalize the goals themselves, by relating an optimal benefit level to the marginal costs of both benefits and controls. Cost/effectiveness techniques are in fairly routine use, but the effort to quantify cost/benefit requires seemingly impossible inputs such as the dollar value of sunshine or aesthetic scenery (p 506). As a result, the conclusion has been stated that cost/benefit evaluations are too complex to enforce (in air pollution control) and too sophisticated for our legal system (Bibbero p 14, Mandelker; Krier pp 207, 213 in Atkison).

A direct parallel appears between the three basic types of constraints recognized in a cost/benefit analysis for air pollution controls deemed possible or desirable over a 10-year term, and the dimensions of choice we have proposed for a matrix of factors in the selection of information services (p 202):

System Constraints in Air Pollution Controls	Dimensions of Choice in Selection of STI Services
Social motivation reflected in legislation	Management decision (motivation) is it our way of doing business
amounts and source of power to be produced	amounts of information to be used, rather than doing work instead
population, transportation	customers, communication policy
allocation of costs	policy on costs
Medical/health interactions (continuing need for research)	Personal choice factors (subjective rankings)
Cost/effectiveness analysis more nearly routine	Quantifiable factors costs, resources, capabilities

This is an instructive comparison: in both situations there is an initial group of factors involving motivation or management strategy which are hard to define but often decisive, regardless of other variables. The whole gamut of costs and quantifiable factors may be easier to handle, by data or by analogy, but they come at the other end of the selection process. Cost effectiveness alone carries little weight unless the basic questions of need and liking receive affirmative answers. The statement that cost/benefit evaluations are too complex to enforce legally is in line with this conclusion, since "enforcement" implies an adversary system which inherently seeks to minimize factors of independent judgment. With even fragmentary data, the balance between increasing costs of controls and decreasing costs of effects (increasing benefits) with an increase in degree of control may be enough to compare present status with future possibilities and tell which direction to move, in the search for further benefits.

Current Strategy

a) Survey of Usage Patterns

Disparities between the evaluations which different users give to the same group of information services are familiar, and disturbing: a first conclusion is that there are very few services on which all users would agree. Disagreements just as strong can be found in the comparative rankings assigned by a single user searching different questions. This was indicated in the quarterly report, Table 2. As the inverse of this it is easy to construct "test questions" which will intrinsically favor one service over another in a direct comparison, (such as Ringdoc, API Literature, or Biosis). It is the thesis of this project that these

disagreements are not random, and that they can be analyzed systematically to detect predictable patterns.

Regular users of purchased information service at the ER&E Central Library include 15-20 people who spend an average of 50% or more of their working day in searching the literature. A third of these are library staff, half of them information analysts or searchers who have special areas of interest, and the others include scientists who are strongly oriented toward the use of the literature. All of these groups comprise individuals with different levels of training, skill, and responsibility - including the freedom to decide which searches are most worth while, and what information will actually be used. Preliminary information developed to date, including conclusions from Tables 1 and 2 in the quarterly report, has led to the postulate that certain types of users, in certain situations, will select certain types of services.

A survey of usage patterns for these regular users is being organized, to provide a data base and check points to confirm or change these postulates and conclusions. The present plan is to conduct this survey for a month, after completing plans during December. The first step in the survey is to conduct an initial interview with major users, based on their records of past experience, to determine what information services each one uses most and about how often. This may be extended to the whole group. The results will determine what questions are worth asking, and what services should be added or removed from the previous lists (Tables 1 and 2), which were based on the opinions of four people. Present indications are that many users may have one or two favorites, which this individual uses more than all other services put together (CA, Derwent, company reports file). If this is correct, the survey for each individual may be greatly simplified by identifying this pattern, getting enough data to confirm it, in an initial few days, and concentrating thereafter on incremental uses of other services. The approach being considered, subject to confirmation in further initial interviews, could be to ask each user to identify by a hash mark on a tally sheet each use of the services selected (except possibly those used most often and already documented), with a special marking for those uses found most valuable in a given search. These sheets can be collected and analyzed daily, or at a suitable interval, and serve as the basis for follow-up interviews to check out items of special interest. It is desirable to use an approach which involves an absolute minimum of record keeping, to elicit the continued cooperation of a large number of persons. The frequent collection of data and regular follow-up by phone or by visit, for items selected because they represent success, will serve as a stimulus for continued cooperation. Various parts of this survey can be checked against a variety of previous internal surveys of patterns of use.

b) Literature Review

The literature available and collected to date has been studied primarily to consider the basic philosphy of the selection matrix proposed, and the semantic problems in the definition of key terms such as "user" or "service." The term "evaluation" has as many aspects as others: it is frequently addressed to the problem of how to improve the operation of a single system rather than how to compare it with others, which is the object of this program.

It is time to return to the literature, as these concepts become clarified in our own thinking, to look for additional input. We are particularly interested in data which provide comparisons in simple searching, of a pre-defined question, which may employ complex tools but which does not permit re-definition of the question during the searching process. We consider this definition of simple searching as the critical distinction between the present Phase I of the two year project, and the information analysis type of operation to be covered in Phase II.

Our literature review will be directed at specific data, showing comparisons between different services, and incremental references pertinent to patterns or dimensions in the selection matrix proposed. Additional personnel for this review has been provided by Dr. Kirshenbaum, as previously discussed with you. Our searcher will be Dr. Walter Herbst, a consultant Senior Research Associate, recently retired, who has been working with Dr. Kirshenbaum as an information analyst. Background information has been supplied to him, and he will work with us part time, starting in December, for a period to be determined by what he finds.

c) Special Interviews

A "unique" service, one for which there is no substitute, is not necessarily limited to a large and expensive operation. Since this category has been chosen for special study, it is useful to examine the factors which apply to the users of a "unique" system which is very small, compared to the major indexing/abstracting services listed in Table 1 and our proposed usage survey.

Preliminary discussions have been held with the Director of "Accent on Information," a special service of "Accent on Living" for handicapped individuals. This service answers their questions regarding technical procedures, equipment, or background data available for physical, economic and social needs. In such a small sytem, as in others, one key to success is "question negotiation" before the start of a search, to translate it from user language to system language. User motivation is exceedingly high; this has been capitalized on to upgrade the operation by publicizing to the users any question which the system could not answer from its files. The result has been 100% answers provided, by data or by the closet analogy available. This feedback is augmented by an in-depth study and special monographs for most-frequent questions. Technical information monographs in this series have included the design of kitchens to be used from a wheel-chair, and the sexual problems of paraplegics. These titles have regularly sold several thousand copies within 6 weeks, among a total membership of 15,000, because there is no other source for such information.

Factors which apply to this type of "unique service" include the concepts of reputation, factuality, feedback and responsiveness, which are quite similar but not always identical to the way these factors apply to larger systems. Further discussions will be held to clarify any differences or apparent shifts in emphasis due to changing parameters of size, user acceptance, or others which can be identified.

A follow-up conversation has been held with Mr. Ben Luberoff, Editor of the ACS Journal ChemTec, regarding a possible general interest article in his journal based on our Interim Report. He is favorably inclined at this time, and is tentatively reserving space for a mid-summer article, possibly July, based on text which we could supply as a first draft in February. His readership includes many of the research managers or executives who are decision-makers for the purchase of information services, and a very desirable audience for us to reach. The timing proposed to him and tentatively accepted would put the article in print at a time which is good to direct attention to our forthcoming final report, to be available as of July/August or shortly thereafter.

This arrangement does not constitute a definite commitment either on our part as author or on his part as publisher, but it is necessary for it to be outlined and agreed upon now if it is to be available as an option when we want it.

Respectfully submitted,

Homer J. Hall
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