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ABSTRACT

This study examines the use of online bibliographic retrieval systems in a selected number of science and technology libraries chosen for their leadership reputation; it is limited to the use of online systems operated by a library staff member. Participating libraries included 12 academic, one government, and 10 research or institutional libraries in the areas of science and technology. The following issues are discussed: problems of initiation and administration to include procurement, equipment, accounting and centralization; publicity and user education; charges; analyst training and background; and organizational and broader implications. (RAA)

# USE OF ONLINE BIBLIOGRAPHIC RETRIEVAL SYSTEMS IN SCIENCE AND TECHNOLOGY LIBRARIES

A Report to the Council on Library Resources
on a Fellowship Project, 1977

Carolyn Brown

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The original aim of this study, as stated in the proposal for it, was to compare programs among science and technology libraries for the introduction and promotion of online bibliographic retrieval systems and to attempt to isolate factors contributing to success in attracting users and providing useful searches. The author's experience in four years of promoting systems use had been disappointing in terms of the percentage of library clientele educated and converted. It was proposed to assume a certain set of problems or issues and to interview searchers and administrators as to their perceptions of these problems and their effects in a particular institution. As expected, many problems were common to many of the institutions.

The study concerns itself with the use of online bibliographic retrieval systems in a selected number of science and technology libraries. The libraries used were chosed on the basis of their reputation, or the reputation of their institutions, as leaders. The study deals with the use of online systems within a library with a library staff member operating the terminal. It does not concern itself with the use of outside centers doing batch or retrospective searches. Some of the libraries studied have used such centers. Some of them are part of a system that may have centralized services, but the actual searching is done by staff connected with the library system, not by an outsider. The libraries studied provide all usual conventional services so that users visit them regularly for reasons other than online searching. They may, however, also deal with users at a distance. Some of

these libraries were among the earliest to be provided access to government-supplied data bases such as NASA, AEC RECON, and Medline. All, however, later added commercially-supplied data bases and so are familiar with problems of procurement, accounting, and training for miltiple data bases and systems. Commercially-offered data bases are one of the concerns of the study, since their costs produce reactions on the part of library staff and patrons.

Letters asking for assistance in the study were originally sent to 21 libraries. All but four replied. Of these four, two were later reached and interviewed. Two of the original addresses were never visited. In one case extreme pressure of work prevented any help; in the other the library was part of a system in which other, more experienced members were interviewed. Two of the libraries originally addressed had combined into one centralized unit.

Once the project was started additional libraries were included, upon the suggestion of some of those interviewed. Twenty-three libraries, one search center, and five vendors, two of which were also data base suppliers, were visited. In many of the libraries, especially those that were members of large systems, several of the search staff were interviewed, as well as managers and training coordinators. Extensive discussions on related problems and issues with librarians and administrators from all over the country also took place at two national meetings.

The libraries visited can be classified roughly as academic, government, and research laboratory or institute. The number

breakdown is: academic 12; government, 1; research laboratory or institute, 10. Of those classified as research laboratory or institute, five are connected with a university or government or both, four belong to a profit-making enterprise, and one is private non-profit. Four of the academic libraries are biomedical.

Some of these institutions are unique. They serve scientists of whom it can be legitimately said that they cannot read anything in their field, since they are in advance of it. These particular scientists thus have no need for online systems except to look at work outside their field. The range of searching is from a few searches a month (as low as 10 to 20) up to hundreds. Costs vary from less than $100 a month up to $6,000 a month on one system in one institution. Costs can be only indicative since some of the searching done is at no charge to the institution, and some systems are offered at very modest prices. A high rate of expenditure, however, must indicate a heavy load of searching.

Finding libraries whose work was confined to fields of science and technology proved very difficult. Science and technology were defined broadly as including the mathematical, engineering, physical, and health sciences. Only a limited number of biomedical libraries, however, were sought. The reasons for this will be dealt with in greater detail later. Briefly, the biomedical libraries were considered to have had a most fortunate climate for the development of online searching, and to have had very similar expereinces among the group. The scope of coverage in other selected libraries extended, as it turned out, to business, economics, education, public affairs, and even humanities. Multidisciplinary studies

are now common, and many libraries use a wide range of data bases, though not necessarily regularly. In some cases it was impossible to isolate the science-technology online bibliographic retrieval use because search services had been centralized over a system, with searches referred to a few analysts in a centralized area. Search statistics were often not separable by data base, so the search counts may include fields other than science and technology.

The original plan of this study was to collect all forms used by the various libraries for search requests and statistical reporting and a record of statistics kept by each library from which a comparison could be made. This plan was abandoned in the face of difficulties that appeared. Although many institutions collect statistics in abundant detail, others keep almost nothing except a final count. Statistics are difficult to compare because of differing definitions of terms such as search. A few libraries keep their records online. A very few libraries asked that their records be kept confidential. It was therefore impossible to do an overall comparison. Samples of forms used, of promotional material, and of search records appear in the appendix.

This report will discuss the issues according to the outline given below. There is overlap in subjects to be treated under different headings, so that a point made under one heading may be just as applicable under another, or several.

OUTLINE OF ISSUES

1. Problems of Initiation and Administration: Procurement; Equipment; Accounting; Centralization or Decentralization
2. Publicity and User Education
3. Charges
4. Analyst Training - Analyst Background
5. Organizational Factors and Broader Implications

My original design intended to deal only with headings 2, 3, and 4. I now find that these need to be introduced with heading no. 1, and that further conclusions and implications can best be dealt with under heading no. 5.

1. Problems of Initiation and Administration

A large library may have one person who can be assigned to find answers to the questions that must be dealt with before one goes online. For the smaller library the problems can be formidable, involving hours of investigation, sometimes without much assurance that the answers are right for this particular case. Or they may be right today but wrong by the time they are implemented. In the early days of disorderly development, libraries got information from well-meaning computer people only to find themselves involved in incomprehensible details of hookup, or with a piece of equipment that would access one system but not another, equally desirable. Librarians trying to explain to contract officers what they were buying were subjected to probing questions, to delay, and to outright obstruction. The officer knew he was dealing with data-processing equipment but he couldn't make it fit any of the rules. Once the contract was through and the service received how to explain the bills to accounting? New data bases were introduced with alarming rapidity. A new name (data base) on the bills was not on the contract - so the bill couldn't be paid.

Fortunately, many of these problems can now be handled by using existing examples. Every librarian can refer a contracting

officer to someone else who has done it. Other questions still remain: one system, or two, or three? One at a time? How long in between? Equipment compatible to all systems that might be used in the future? Buy or lease equipment? The answers change with the differing situations. At least it is now possible to get advice from experienced associates as well as from vendors and manufacturers. One recent development helpful to many beginners has been the growth of regional networks or centers to handle the problems of contract and payment, often for a negotiated lower high-volume-usage cost and a small management fee. These centers will also advise on, and often handle purchase or lease of, equipment.

Small and large libraries may have available to them such centers to handle the worst administrative problems. The small library also may have a choice as to whether to do its own online searching or to have the searches done by some broker or central agency. Information brokers with fixed charges for services now exist in many parts of the country. In many library systems the decision must be made whether to do searches centrally or locally in the branches. Sometimes this is a central decision, sometimes left to the local librarian.

The arguments for centralization run as follows: The analyst has more practice and gains far more experience through constant searching. Expertise is built up and online costs cut. The user deals with an expert rather than one who may not have had the opportunity to develop skills completely. The analyst

can devote full time to keeping up with changes in data bases and systems, rather than having to squeeze this in while managing a full range of other duties.

The arguments for decentralization: The local librarian has a unique opportunity to know both user and organization and to apply this knowledge in the solution of a request. The search may be only part of a comprehensive response to a question. The local librarian can use the information gained in searching in collection development and in other services to the local library. One librarian said that searching is the last function that should be delegated elsewhere; such functions as cataloging or interlibrary loan can be far more advantageously farmed out. The local librarian who searches is alerted to the need for follow-up document procurement. Searching provides a method of building a cooperative relationship with the user.

As a practical matter, the decision is often taken out of the hands of the local librarian; sometimes neither the librarian nor the administrator who may make the decision is fully aware of the issues involved. One sad case (not one of the libraries in this study) was a system where the administrative decision to decentralize included the division of data bases and systems among branch libraries. The chemistry librarian was allowed to search Chemical Abstracts online on one system and nothing else. If Inspec or Scisearch or Compendex was also needed to answer the question, the patron had to go elsewhere in the library system. A wiser decision made in many systems allows the originating

library to finish the search, no matter what data bases are involved, to refer elsewhere, or to ask for help on some of the data bases, at the discretion of the searcher.

2. Publicity and User Education

Once the system is acquired, the library faces the problem of acquainting its users with system capabilities. Many libraries have approached this problem with timidity and hesitation. If they advertise widely, will they be able to keep up with the number of requests? To what level of the organization should they direct publicity? How should they introduce charges, if they are going to charge?

This study began with the assumption that certain factors could be expected to promote growth of online system use, and certain others could be expected to inhibit it. These factors can be listed as follows:

Factors expected to promote use:

Lack of fees or administrative transfer of funds (no fuss or bother);

Good advance publicity (user aware of capabilities of online systems);

Good introductory explanation;

Good beginning experience (question suited to certain data bases, well-constructed search, rapid retrieval of relevant citations, good backup document service);

Lack of ingrained habits on part of users - willingness to try something new;

Need for speed;

Well-trained analyst (in system, in subject background, in ability to discover real information need).

Factors expected to inhibit use:

Fees (including paper work if administrative transfer of funds involves this);

Unrealistic expectations of system (lack of education on part of user);

Poorly-trained analyst (who may fail to explain system properly, may expect too much, may use wrong data base, may use inefficiently, etc.);

Ingrained information-seeking habits - unfamiliarity with online systems as method of finding information;

Beginning disappointment related to any of above.

Only one library in this study was ever overwhelmed with requests at any point in online system use. Those that made large publicity efforts and those afraid to advertise have seen the same patterns of growth: A slow, sometimes back and forth, sometimes steady rise in numbers of searches. In some cases very strong promotional methods and involvement of numbers of analysts in a start-up effort have resulted in a later need to cut back on number of analysts when requests failed to reach the expected level. In other cases publicity has resulted in a jump in requests that proved only temporary. More than one analyst has reported that users' information needs seem to come in spurts, and no amount of publicity attracts someone who does not have a current need.

The National Library of Medicine's Medline data base, which is successfully used with a very high level of requests in nearly all medical libraries that have it, may present an instructive example. Its introduction was accomplished in a very few libraries at a time, accompanied by obligatory (and rather extensive) training of any librarian who was going to use it. Publicity was confined to a small group. News about it spread from librarians and scientists or M.D.'s who had used it. The system could not accommodate all libraries that wanted it, so for several years there was a waiting list. Medline has by far the highest level of requests of any data base encountered in this study, from which can be assumed a high level of user satisfaction. A whole generation of medical doctors has now been trained to expect information retrieval through online system use, and to have a fair idea of which requests can and which cannot be answered. This has been accomplished in about seven years time. Whether intensive publicity could accomplish more has not been established. It may even have a negative effect in some cases.

Fees are not inhibitory of use in many of the libraries studied. Some of these libraries have been accustomed to charging costs for information service support to projects, and fees for online services are simply an extension of this custom. Many organizations expect to pay for information, and have found online services very cost-effective. One institution's search service was marketing also outside the organization and had completed

projects with charges as high as $1500. Cost considerations are not primary in the minds of users in many of these organizations; they are willing to pay for an effective and rapid means of getting information. In other organizations, fees do become a matter of some importance, and information gained is subjected to close scrutiny with the cost in mind. In still another group of organizations, fees may distinctly exclude certain classes of users, and are the object of sometimes emotional debate.

In some of the organizations studied, an information support group, consisting mainly of subject specialists (or one specialist) in a particular discipline, had been maintained for a number of years before the advent of online services. Such a group or person performed manual searches for scientists working on a project, providing from any available resource the information needed. The resulting relationship led to reliance on the information group or person to answer a question. In such cases the information group introduced online services when it felt they were needed. The scientist may never have, or may have only gradually, become aware of the existence of online systems as a method of information handling. User education in such a case is unnecessary, or takes place as questions are asked to satisfy curiosity.

In other situations user education can be very important, and the introductory search in particular can be a means of explaining system advantages and limitations. Many analysts in the institutions studied insist upon having the user at the terminal with them if at all possible. They feel it is instructive

for both analyst and user. The question may be re-negotiated on-line, the user may find unexpected information by browsing, failures to find needed material may be explained. Other analysts did not have the user with them at the terminal but explained that this was only because written search requests were sent in from some distance away. One analyst said that the distant requests were always broader, that she always tried to telephone the requester in order to be able to narrow the search.

Still other analysts maintain that the requester simply gets in the way at the terminal and they don't have him there unless he insists. Most users aren't the least bit interested, they say. One library has such a rate of requests that they must be handled by having them written, stacked in a box, and taken for searching by the first analyst who has time. Search results are then mailed to the user. All of these methods seem to produce successful searches. In the latter instance the institution has been doing searches for some time and the requesters are probably very well educated to what can be expected from the systems. Some of these libraries have very detailed user-orientation classes. In academic institutions, these can be arranged through professors who see to it that a whole class attends. In institutions with information support groups, it often doesn't seem to matter whether the user knows system capabilities or not. He is not concerned with how the needed support is given.

3. Charges

In libraries accustomed to charge research projects for such things as journal purchases or the time of information analysts, charges have presented no problem. Administrative paperwork has already been reduced to a minimum. In some libraries studied, the librarian simply asks for a charge number to put on the search, and the transfer of funds is handled in the accounting office.

In libraries where no charges have previously been made, even if a paper transfer can be set up, a new form of user (and institution) education begins. The method of charge must be explained to the user, who has to explain it to his administrative assistant or division secretary, who has to get the right information from the accounting division, where the account numbers have to be set up and explained to a number of people. Users can expect to face annoyances with the system at least for a number of months. Division secretaries who don't want to handle an extra chore may deny that an account exists; numbers may be misapplied.

When a charge to the actual user is instituted, and it cannot be covered by research or other funds, requests are fewer in number than if searches were free. Many examples exist of sharp reduction in search numbers when institutions began to charge after first offering free searches. One institution reported a drop in searches per year from 2812 to 1759 after a charge was instituted for services that had previously been free. Another institution reported a drop from 1166 searches during a 6-month subsidized period to a total of 511 in the following full year after charges began. A searcher at this institution said that

charges definitely influence use, and the higher the fee, the less the use. The same researcher remarked on the fact that even totally free searches cannot attract everybody.

Many analysts and administrators are concerned that fees mean service to an elite and especially denial to students. Some university libraries do not even send announcements to students or direct publicity to them, on the theory that they cannot afford the charges made. Others ask for subsidies from departments for student searching. One imaginative library got a certain sum for student searching, put flyers in student mailboxes asking students to sign up, and then took the first on the list until they ran out of money. The remainder of the list was saved for end-of-term money that might be given by the deans. This is the one instance encountered in this study where a library search service was overwhelmed by demand. Requests were accepted only from students authorized by departments so as not to include those who might have had access to grant money. A hold-over list of about 20 people still remained.

Some searchers feel that some charge to the user is desirable. A totally free search, they argue, leads to laxity in search methods and to frivolous requests. An analyst who is conscious of costs will be much more likely to construct a good search strategy and to turn away a less-than-suitable inquiry.

There is much discussion of the fee versus free issue, which gets more emotional as it gets into the traditionally all-free library. Some librarians in this study were deeply concerned at possible discrimination against certain classes of users. Others felt that users should expect to pay if a certain amount of the

library's funds and/or personnel time must be committed to a task for one individual or one part of an organization. The only concern is at what point a charge is justified, and whether charges should then be considered for other services. More than one person commented that service not allocated according to fees paid will be allocated in some other way. An individual who is personally appealing to a reference librarian will get more attention. An overworked reference librarian may be obliged to keep people standing in line until they give up and leave, may give an insufficient answer, or may simply discourage requests by curt answers and rude behavior. At some point when any user is being served some other user (or some library function) is being denied or short-changed. Online systems often provide services not available previously, since manual searches could not be done, and the user should be willing to pay for the extra resources devoted to his needs. One analyst turned administrator remarked that clientele can be limited by charging, or by not advertising the service. Every library, this person remarked, sets limits to what it will do.

4. Analyst Background and Training

The earliest searchers had little or no formal training. They learned largely on their own, reading manuals. Detailed knowledge came from intensive practice online and analysis of search results. Earlier searchers in an organization trained the later ones.

Vendor training is now available to all, at a fee. Introductory training usually lasts one-half to one day, of a sort to get the beginner over actual fear of the terminal and through a few of the rudiments of logic and search contruction. Training thereafter has often turned out to be a self-help effort with searchers in different parts of the country finding independently the same solutions to their learning needs.

Searchers frustrated at their lack of knowledge of the files and how they are put together have formed groups to exchange experiences. They have brought in speakers, listed experts on data bases, systems, and equipment, and shared knowledge. The realization that they needed not only the expertise of the system vendor but also that of the data base suppliers struck many searchers simultaneously, and seminars were arranged at which both vendor and suppliers could be present. Searchers have been the movers and instigators in efforts to improve the amount and quality of training. Formal training in library or other schools has mostly followed models set up by practitioners. Material developed and written by searchers makes up the user manuals of some of the vendors. It is notable that the same ideas struck searchers independently at certain stages; such developments as the formation of user groups began spontaneously in different parts of the country, originated by people in apparent total isolation from each other. There are now a number of online user groups and at least two journals devoted to information sharing.

Searchers express some skepticism about the quality of training provided in schools and on small test files. Time to practice on real data bases is necessary to see the problems presented by size. All welcome, however, the prospect of having students with some introductory background when filling positions.

All of the analysts interviewed in this study admit that there are many problems in maintaining skills. Systems change, new data bases are added, new vendors on new systems arise. Cost-conscious administrators force the use of certain systems for certain kinds of requests. The tendency of the analyst is to stick to one system unless requirements demand a change; it is easier to use the language to which one is most accustomed. The proliferation of data bases and systems has led in some institutions to an informal kind of specialization; searches on certain systems and data bases will be referred to a particular staff member known to use them with ease. In other, and usually smaller, organizations, a library user may develop rapport with one analyst and tend to return to that one for any information request. The analyst may then ask for help from a colleague on an unfamiliar data base. In smaller organizations where one staff member has to keep up with all searching, help from colleagues in other institutions may deal with the unfamiliar data base.

Some institutions have developed very formalized in-house training programs. One institution has the learner spend 4 hours a week with an experienced searcher for 8 weeks, with an equivalent amount of time studying or practicing alone. Actual searches

are kept for instruction. In other institutions an experienced analyst checks search strategy before a beginner goes online, and monitors search results before they are released.

Some in-house training has been modelled on that offered by the National Library of Medicine in its training classes for Medline. Many analysts mentioned that they felt their Medline training had been invaluable. The influence of this training has spread far beyond the medical field, since many of those who had it have later moved into administrative positions or into other subject areas.

What kind of background and abilities should the online searcher have? Opinions differ. In this study the institutional choice for searcher ranged from subject specialist with a doctoral degree in the discipline to librarian with little or no science background. Some of the subject specialists had no library or information training. To a question as to whether the analyst needed a background education in the subject to be searched (bachelor's degree major) the answers ranged from, "It's vital" through "It helps" to "Not necessary." The amount of education needed in the subject is a matter for argument among those who think it necessary. One institution hires only Ph.Ds. One institution says it will not have a Ph.D. as an information specialist but insists on a Master's if at all possible. One institution in a major research laboratory mixes specialists with Master's degrees in chemistry and physics and those with Master's in library science on its searching staff.

One searcher (with a Master's degree in physics) said that the most necessary qualities are intelligence, the ability to think associatively, and knowledge of what is in the data base searched, not detailed subject knowledge. Many searchers emphasized the need for curiosity and verbal ability. Several felt that subject background was not necessary because of the increasingly interdisciplinary nature of most information requests. One analyst with a degree in English has been a searcher in medical subjects for years and has felt no handicap. This person had undergraduate courses in physiology, however. Another analyst in scientific subjects with a degree in history has not felt any serious lack in background. Chemical terminology has presented the only problem. Those most insistent on a science degree for the searcher have been chemists searching the chemistry files.

An administrator who insisted on a scientific background for beginning searchers said that this is at least a safeguard in trying to select for greatest competence. Scientific education also, this person felt, would command immediate respect from users who are scientists or engineers.

One analyst felt that searching was very similar to indexing. This person pointed out that a Project INTREX study had found no difference in quality of indexing in materials science between that done by materials scientists and that done by librarians. Many of the analysts interviewed emphasized the qualities of mind necessary. One said that doing crossword puzzles was good training. Others said that the crucial problem is the reference interview, to get a real understanding of the information needed. One

analyst felt that too much in-depth education in a discipline might be a disadvantage, because it cannot be used. This person emphasized strongly that a good general educational background was necessary, however, and the ability to understand (or to grasp quickly) the terminology.

Several searchers said that knowledge of manual searching is an absolute prerequisite. Particular emphasis was given to detailed knowledge of the printed form of the indexes to be searched online. One recommendation was that an analyst have several years of experience in use of printed indexes for answering requests before attempting online searching. In another situation online searching began after 4 to 6 months of close instruction in use of the printed form.

One searcher said that some mechanical ability is needed to deal with the terminal. It is possible from the context that the real point was that some manual dexterity is necessary.

It appears that a good online searcher needs the qualities that any good information specialist or reference librarian must have: Background education, intellectual curiosity, persistence, the ability to deduce the real information need from the request (or to help the requester to find it), imagination. Additional characteristics seem to be high verbal ability (a knowledge of language roots and stems may help) and a lack of fear of mechanization.

In general, analysts in this study are drawn from the library staff, most from the reference staff but some from cataloging.

All of the librarians (as opposed to the non-librarian subject specialists) have MLS degrees as well as undergraduate subject degrees, so can be expected to possess general skills in information handling. Some of them have worked as reference librarians long enough to have developed substantial knowledge of subjects other than their undergraduate majors or minors. Many of the searchers interviewed emphasized the necessity to keep learning on the job. Some have taken part in extensive information projects that required a considerable educational effort. All agree that they must be constantly alert to new information and spend a good deal of time in maintaining and upgrading their skills. This in itself is probably indicative of the qualities needed.

5. Organizational Factors and Broader Implications

The organizational types have been broadly categorized as academic, government, and research laboratory or institute. Sizes vary from large university libraries in large systems to institutions with a total staff of a few hundred persons. In the research institutions it is possible to identify the staff for whom service is intended. An analyst may be expected to deal with a primary user group (scientists and technologists within the organization) of from 200 to 500 or more persons. These institutions have the best library service but also the largest number of potential users whose work may be of such an advanced nature that they seldom call on the library for searches. The demand in these institutions may be for rapid service on information requests including a demand for rapid document delivery. Information analysts work at times under considerable pressure.

The large university libraries may serve a potential user group of the entire faculty and student body. Some will also serve outside groups, usually with an additional administrative charge added. The possible user group per analyst may be well into the thousands.

These institutions are very different in purpose, funding, and operations. It is noticeable that some of their libraries have had comparatively few problems in getting online searching started, in finding the money or in making charges, or in building their services. Others have faced many administrative difficulties and feel that they have done little more than manage to maintain the existence of a search service. The reasons for these differences would be very interesting to analyze, but this study can do no more than give a glimpse at what they might be.

Some of these institutions were noticeably looser in administrative controls and in delegating purchase authority to levels such as the administrative head of a library. The library administrator was in these cases much freer to make the decision to begin use of online services. One very important consideration in making such a decision is the amount of time that must be spent acquiring the service. Through how many layers of authority must the papers go? To how many people must the entire service be explained? How many hours must be spent in writing justifications? How confident is the administrator that his efforts will be repaid with understanding and support? Does he hesitate at the thought of the commitment of time, and therefore put off the

move until he is no longer in the leading group but at the head of a somewhat backward library?

Organizational structure plays a very important part in the ability to respond rapidly to change. Organizational rigidity may affect personality features of employees, who may learn by repeated failure to find rapid support from the organization that certain kinds of effort are wasted and certain ends very difficult to attain. The organization itself exerts a powerful influence, molding its members in an even stronger fashion than it is molded by them.

In some institutions a search service that originated in a special section outside the regular library framework later found problems in absorption into the library's ordinary duties. Librarians who felt they had been ignored in the beginning were resistant at first to taking over the service, or they resisted using any of the personnel associated with it. In one case an outstanding analyst and teacher was passed over for a library search position in favor of a librarian already in the system who had much less experience. Some search services have had support from higher levels in the organization but have failed to establish relations with library personnel that would insure referral in the proper circumstances. The result is that they have very few requests.

Search service users and analysts have a great interest in the number of projects now under way that deal with standardization of search language, development of an interface language, and

construction of online training data bases and of a data base selector, to mention only a few. They also have a vital interest in the economics of online systems and in the viability of several search systems to assure competition.

There are broader implications for the future of online bibliographic retrieval systems. Studies made by Donald King* in connection with the new copyright law have led him to conclude that there are basic problems in science publishing that will lead to necessary changes (mainly curtailment) in the future. Use studies in large libraries made possible by automated circulation systems are showing that huge percentages of books and journals bought by the library receive no use at all.° When these results become known, libraries may be forced to cancel journal subscriptions. Online access to certain materials would mean that they could be paid for only if used. Online use payments could possibly make up to the publisher for subscription money loss. Documents themselves as well as citations and abstracts might be stored for use if needed. Such far-reaching considerations as these will play a major part in future developments.

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* King Research Inc. "Library Photocopying in the United States: With Implications for Development of a Copyright Royalty Payment Mechanism." October 1977 Available through the National Commission on Libraries and Information Science.
King Research Inc. "Systems Analysis of Science and Technology Communication in the United States." April 1978 Report to the National Science Foundation.

° See Thomas J. Galvin and Allen Kent "Use of a University Library Collection: A Progress Report on a Pittsburgh Study." Library Journal, November 15, 1977.