

Use of Computerized Bibliographic Search Services in North Carolina Libraries

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During the last five years there has been a sharp increase in the availability of computerized bibliographic search services to libraries. The adoption of these services has enabled libraries to conduct literature searches for a larger number of users with a degree of sophistication, speed, and specificity impossible to achieve with manual searches of the literature. The implementation of these services has required the consideration of a number of factors, such as the selection of the type of service to offer, staffing, training, funding, marketing, and the impact on other library services. The issues facing libraries considering expanding their services to offer computerized literature searches are described in an *ARL Management Supplement* by Gardner, et al.,¹ which focuses on use of off-line information processing centers, and in a recent article by Hock,² which deals primarily with the use of on-line bibliographic services.

Computerized bibliographic data bases typically are generated by the publishers of familiar indexing and abstracting tools such as *PSYCHOLOGICAL ABSTRACTS* or *CHEMICAL ABSTRACTS*. The data is stored on computer-readable media such as magnetic tape from which the data can be easily extracted and manipulated prior to its final publication in the hard copy format. The bibliographic data in a computerized data base may have the same content as that which is in the hard copy format sitting on the library's shelves. The primary differences are the versatility with which

the data may be retrieved and the speed with which even a highly complex search may be performed.

The scope of a computerized bibliographic search may be one of two basic types: it may be "retrospective" and cover the entire range of data available in a particular file, or it may be "current awareness" and cover only the most recent addition to the data base. The current awareness search serves to bring the user up-to-date on just the latest material added to the data base on his topic of interest.

Locally Developed Data Bases

In certain subject areas where there are no data bases available commercially, a few North Carolina information centers have developed their own computer-searchable data bases. This is the case, for example, with the Library of the Technical Information Service of the Carolina Population Center (Chapel Hill). In the early 1970s their own technicians and indexers created a data base which now consists of over 35,000 references to monographs, bibliographies, published and unpublished papers; and analyzed items from books, conference proceedings, and close to 600 periodicals. The reference librarians search the data using a combination of subject and geographic terms and free-text key word terms. The service has been available to anyone, including a number of overseas users, at a cost of about \$20.00 per search, plus an additional 5¢ per citation retrieved. The service was funded originally as a

special research project on automation; its future is in doubt now because of the uncertainty of the current funding situation.

Air Pollution Technical Information is another example of a data base which was developed "in-house" in response to a need felt by the Environmental Protection Agency (EPA) in the Research Triangle Park. The data base was invaluable to researchers at a time when there were no other major sources of computerized pollution information. Within the last several years, however, a number of data bases with pollution information have become commercially available. The librarians, by relying heavily on these outside sources of information, have found that the costly in-house production of the Air Pollution Technical Information data base can be discontinued.

Most libraries and universities have found that even where the equipment and technical expertise are available, the high costs either of developing one's own search system or of renting, purchasing, or creating relevant data bases is prohibitive. The most attractive alternative is for the library to contract the desired service either "off-line" from an information center or "on-line" from a commercial service.

Off-Line Information Centers

There are a number of "off-line" information centers which operate by receiving literature search requests from their clients by mail. The center then executes the search using its own computer facilities and mails the output back to the client. This type of service is easy and inexpensive for a library to support although the cost to the user can be rather high. The librarian may choose simply to inform the users of information centers which offer search services in subject fields in which he is interested. Directories of data bases such as the *ASIS Survey of Commercially Available Computer-Readable Bibliographic Data*

*Bases*³ are valuable sources of this type of information. More typically the librarian will want to engage in some promotion of the service to the users, and in some cases will provide assistance to the user in working out his "search strategy," which is a list of the subject terms relevant to his topic, arranged in such a way as to express the desired relationships of meaning.

The North Carolina Science and Technology Research Center (NC/STRC) in the Research Triangle Park is an outstanding example of an information center of the type just described. NC/STRC, an agency of the State of North Carolina, supported in part by NASA since its establishment in 1964, is one of the oldest and most experienced automated information retrieval centers in the U.S. Utilizing a combination of locally-owned data bases and data bases owned by other centers or commercial services available to NC/STRC by contract, it offers its clients access to a large number of data bases ranging in subject from child psychology to nuclear science.

The search analysts employed by NC/STRC are trained specialists with at least a Master's degree in a subject discipline, and preferably with two to five years industrial experience as a search specialist. Although their service is available to anyone, their extensive marketing and promotion efforts are concentrated on industrial and commercial organizations from which they draw 90% of their users. The cost of a search from NC/STRC differs widely; the average cost is around \$120, but it could be as much as \$300, depending upon the cost of the data base searched and the amount of staff time.

In order to make their service available to students NC/STRC has developed a special Library Search Service. Librarians from colleges and universities participating in the program are trained by the center to assist students in preparing their search

strategy. The search strategy is mailed to NC/STRC, which executes the search and returns it by mail to the library for a fee of \$15. This service is available only on files which the center owns and can process locally; these include *NASA, Government Reports Announcements, ERIC, TEXTILE TECHNOLOGY DIGEST, and FOOD SCIENCE AND TECHNOLOGY ABSTRACTS.*

Over 35 university and college libraries in the Southeast are currently participating in this program including the following North Carolina institutions: UNC-Chapel Hill, UNC-Wilmington, UNC-Greensboro, UNC-Charlotte, N.C. State University, Appalachian State University, North Carolina A. & T., and St. Andrew's Presbyterian College. For libraries that cannot afford the equipment required to perform on-line searches, or whose level of use for such a service would not warrant a full commitment to on-line searching, NC/STRC offers a method by which low-cost computer search service may be offered to students in certain subject areas.

The combined facilities of the Chemistry Department, the Chemistry Library, and the Computation Center of UNC-Chapel Hill are now offering off-line weekly current awareness searches of *CHEMICAL ABSTRACTS CONDENSATES* for a yearly subscription fee of \$100. The search system was developed as a research project in the Chemistry Department, and current awareness searches have been available to members of the Chemistry Department since May, 1974. The search service is now available to anyone by contacting the Chemistry librarian, who enrolls subscribers and arranges for technical assistance in profile construction when necessary.

On-Line Literature Searching

The services discussed thus far are available to the user off-line. An off-line search is characterized by mailing a profile to a remote center which executes the search

and mails the results back to the user for a fixed fee per search. Another type of search procedure—on-line literature searching — is being widely adopted for use by libraries in North Carolina and throughout the country. In an on-line literature search the user has direct two-way access to the data base via a telephone line which connects a local typewriter-like terminal to a computer in the center which has purchased or leased the data bases. The user submits the terms to be searched to the computer directly by typing them on the terminal. The relationship with the computer is "interactive," which means that the computer responds immediately to the query by telling the user the number of citations it has retrieved for each term or each combination of terms and by printing samples, if requested. If the results are not what was expected, the searcher may modify the original search strategy by entering new terms or forming new combinations of groups of terms until he is satisfied that the citations being retrieved fit his topic. He may then choose to have his results printed immediately at the terminal or to have them printed at the computer facility at a lower cost and mailed to him.

There are currently three commercial organizations which are actively promoting such a service: Lockheed Information Systems, System Development Corporation (SDC) and the New York Times Information Bank. The New York Times Information Bank has not yet become widely used in the academic community because of its relatively high subscription cost, although it is available to clients and contractors of NC/STRC and EPA.

The service offered by Lockheed's DIALOG system and SDC's ORBIT is quite similar; both these companies are acquiring a large number of data bases covering a variety of subject areas which they make available to their subscribers for searching on-line. There is no subscription

fee and no minimum charge; the users are charged only for the length of time they actually spend connected to a given data base.

More and more libraries and information centers are relying on one or both of these organizations for the bulk of their automated information retrieval services. The interactive capability of an on-line search and the immediacy of the results make it more attractive to the user than off-line searching. Probably the strongest selling point of on-line searching, however, is that a retrospective on-line search is typically far less costly for the user than one done through an off-line information center. The average search time is from 15 to 20 minutes, and the average cost is around \$15-\$20, as compared to fees of \$120-\$200 for an average off-line search.

The cost of an on-line search is based on three factors: 1) the price of the data base being searched (this ranges from \$25 to over \$100 per hour); 2) the number of minutes spent searching, multiplied by the cost per minute of the data base, plus the cost per minute of the telephone connect charges; 3) the number of citations printed at the computer facility to be mailed to the user, at a typical cost of 5¢ per citation or 10¢ for citation plus abstract. The telephone connection between the terminal and the computer may be achieved by dialing long distance direct to the computer or by using a time-sharing communications service such as Tymshare or Teletel and paying their hourly rate rather than long distance charges. In North Carolina there is a Tymshare node in the Research Triangle Park which one can use for \$10 per hour (or roughly 17¢ per minute).

A number of North Carolina libraries which are using one or more of the computerized bibliographic search services described above were interviewed as to how they have handled problems such as fund-

ing and staffing the new service and to determine its impact on their users and on their total library organization.

Funding

The first issue to be dealt with in deciding whether or not such a service can be offered is how much it will cost and how it is to be funded. The only major capital outlay required to access one of the on-line services is the purchase or lease of a computer terminal. Because the use charges are based on length of connect time to the computer, a terminal with a print speed of at least 30 characters per second is desirable; other features to be considered are noise level, legibility of hard-copy print, and availability and promptness of maintenance service. A number of satisfactory models are available in the \$2500 price range; National Cash Register (NCR), Texas Instruments, General Electric, and Hazeltine were the manufacturers of terminals used by most of the libraries surveyed for this article.

The problem of how to finance an individual search has been handled variously. Industrial or federally-funded research institutions such as Burroughs Wellcome, the Environmental Protection Agency, and the National Institution of Environmental Health Sciences, all located in the Research Triangle Park, often regard it as they would any other library service and provide it to their employees free of charge. The librarians also benefit directly from the service, using it to verify requests for interlibrary loan or for other quick bibliographic questions.

Offering the service free to the users of more tightly budgeted college or university libraries is usually just not economically possible, even if it were desirable. Most academic libraries adopt a policy of recovering at least the direct computer costs of the service. The D. H. Hill Library of N. C. State University began computerized literature searching sev-

eral years ago in cooperation with NC/STRC by offering low cost searches to students. In 1972 through a grant awarded by the U. S. Department of the Interior the D. H. Hill Library was able to offer low-cost searches of the Water Resources Scientific Information Center's data base (WRSIC). In 1974 under a grant from the National Agriculture Library (NAL) they began offering free searches of NAL's CAIN data base. In 1975 the D. H. Hill Library contracted with Lockheed to search the data bases available through DIALOG. While planning to underwrite the cost of searching on a limited basis as a means of promoting the service, they agreed on a policy of a charge for search service based upon the costs directly assignable to the individual search: computer time, telephone charges, and citations printed at the remote facility. In addition a fee of 10% of the direct costs for each search is added to cover certain other costs associated with the searching such as billing forms, paper, telephone monthly service charges, etc.

The Health Sciences Library at UNC-Chapel Hill and the Duke Medical Center Library offer searches through SDC and through the National Library of Medicine (NLM). The heavily subsidized NLM files are available to the user at a fraction of their actual cost. The Duke Medical Center Library offers all NLM files (MEDLINE, TOXLINE, CANCERLINE, etc.) to the users at the rate of \$2.00 per 10 minutes, with an additional charge of 3¢ for each citation printed at the remote facility. For searches on *CHEMICAL ABSTRACTS* Condensates, ERIC, and the Smithsonian Science Information Exchange file they attempt to recover all direct computer costs. The Health Sciences Library bases their charges on connect time, raising the cost per minute slightly in order to cover some of their indirect expense as well as the direct computer costs.

The Institute for Research in Social

Science at UNC-Chapel Hill has been offering DIALOG searches to Institute affiliates and other members of the UNC academic community since 1973. They charge their clients only the direct computer costs, absorbing all related costs. The Business Administration/Social Science Reference Division of the UNC-Chapel Hill Library and the Math/Physics Library began offering DIALOG searches in the spring of 1976. Their policy is to charge the user for direct computer costs, plus an additional fixed fee of \$1.00 per search to help defray the cost of maintenance, supplies, etc.

Staffing

Once a funding policy has been established, a library must decide how it is going to delegate the responsibility for this service among its staff, and whether new staff positions will be needed. These decisions depend primarily on the demand placed on the present staff by use of the service.

The experience of the libraries surveyed seems to indicate that those libraries offering an on-line search service for the longest period of time now have the greatest level of use, although the cost to the user is also a significant factor in quickly building demand for the service. The Health Sciences Library and the Duke Medical Center Library began offering low-cost on-line searches of MEDLINE in 1972. The Health Sciences Library currently performs around 400 searches per month, 95% of which are on the NLM data bases. They have created a full-time professional position for the librarian who has primary responsibility for offering the search service. She is backed up by three other librarians who assist with searches on MEDLINE and TOXLINE.

The Duke Medical Center Library staff execute approximately 200 searches per month. They see the service as an integral component of their total reference service;

as such, the responsibility for it is divided equally among the three reference librarians.

Burroughs Wellcome and the EPA promote use of a large number of data bases. Their service is free to their employees, and the level of use is high. Burroughs Wellcome has four librarians with responsibility for executing the 140 search requests they receive on the average each month. They have divided the responsibility for searches so that certain people are in charge of certain data bases. There are two librarians at EPA who process 50 to 60 requests for information from employees each month; a single request might be searched in a number of different data bases to be sure it was answered completely. Their responsibility is divided according to subject speciality, rather than by specific data base. In addition to the internal requests, EPA receives from 40 to 50 requests for information each month from EPA contractors and from some members of the general public.

The D. H. Hill Library attempts to divide the responsibility for computerized searching among its five reference librarians according to competence in subject areas. During a 10-month period in 1975-76, they performed 70 searches on the files available through DIALOG and 56 SWRSIC searches. To accommodate this increased use of their reference department, two non-professional positions were added to the department and the pattern of staffing the reference desk was altered. Instead of having everyone on call all the time, the desk is now staffed by only one professional and two non-professionals at a time on a rotating schedule.

Training

The skill of the librarian performing the search is an important factor in providing effective searches. Familiarity with the subject area and the data base being searched is important. In addition, there

are a number of written aids with which a search librarian should be familiar. Both Lockheed and SDC provide manuals which explain their systems to some extent; they also provide brief descriptions of the make-up of each data base within the system. Some data bases use a "controlled vocabulary," which means that citations can only be retrieved by a select list of specific terms. Other data bases offer access through a combination of specific subject terms and "free-text" searching. There are thesauri for a number of these data bases which are very useful in suggesting synonyms and related terms for a subject.

NLM, Lockheed, and SDC all provide training courses which are extremely helpful in supplementing their written guides. Practice time at the terminal itself with the guidance of an experienced searcher is often an adequate substitute when a tight budget prohibits attendance at a training course. It has been found that from 3 to 4 hours training and practice time is sufficient to train a competent searcher.⁴

Promotion

The idea of vigorously promoting a service is one that is foreign to many librarians, but it has been demonstrated that there is a direct relationship at least initially between the level of use of a system and the extent of a library's promotional effort. Gardner recommends a combined approach using many media rather than relying on one or two. He says that in a survey of 50 first-time users at M.I.T. "it was determined that 12 learned of the services through direct mailings, 10 through word-of-mouth, 9 through displays in the library, and 7 through newspaper advertisements. The remaining 12 learned of the services from library staff or from demonstrations."⁵

Of the North Carolina libraries and information centers surveyed, NC/STRC conducts the most vigorous marketing effort by far. They employ two full-time market-

ing representatives to promote their services to segments of industry which are heavily dependent on research and development. They rely heavily on mass mailings of brochures and personal contacts; 20% of the center's entire labor budget is devoted to the marketing effort.

Most of the libraries surveyed rely on fliers, on in-house demonstrations, and on word-of-mouth to publicize the service. Several librarians met with faculty and research groups to inform them about the service and answer questions. The Math/Physics Library and the D. H. Hill Library sent letters to individual faculty members and graduate students describing the service.

Impact on Library Service

The use of on-line bibliographic search services has had a significant impact on library services and in many cases on the users' attitudes toward the library. A survey taken by SDC in 1974-75 of subscribers to on-line services summarized the major benefits as speed and comprehensiveness of service to the users, together with improved self-image and morale for the librarians.⁶

In the North Carolina libraries recently surveyed the attitude toward the service was enthusiastic. Libraries which had previously offered thorough manual searching of the literature as a service to their users find that now they can serve a much larger number of users with even greater precision. Most university libraries had not previously had the staff time to offer in-depth literature searching; due to the speed of on-line literature searching they are now able to offer this as a completely new service.

Small libraries appreciate the service for the access it gives them to indexes and data sources to which they could not afford to subscribe in the hard copy format. A library subscribing to Lockheed or SDC's

system has access to around 30 different data bases, but instead of paying an expensive subscription fee for the hard copy text, one pays only when the index is actually consulted.

The use of on-line literature searching often serves to enhance the professional relationship between the librarian and the user. It often affords the librarian an opportunity to learn in greater detail the research needs of the user. Many times the librarian is able to suggest other useful sources of information in addition to or instead of the computerized search.

Conclusion

Computerized literature searching through off-line information centers has been available to North Carolina libraries for a number of years, but a radical increase in the level of use of computerized searching has occurred with the availability in recent years of on-line literature search services to libraries. On-line literature searching is a highly visible service which is enthusiastically received by both librarians and their clients. Its speed, flexibility, and economy make it attractive to the user. The relatively inexpensive equipment and modest level of technical expertise required of the library indicate that it is a service that more and more libraries will be prompted to adopt.

Footnotes

¹Jeffrey J. Gardner, David Wax, and R. D. Morrison, Jr., "The Delivery of Computer-Based Bibliographic Search Services by Academic and Research Libraries," *ARL MANAGEMENT SUPPLEMENT*, II (September, 1974), 1-6.

²Randolph E. Hock, "Providing Access to Externally Available Bibliographic Data Bases in an Academic Library," *COLLEGE AND RESEARCH LIBRARIES*, XXXVI (May, 1975), 208-215.

³Survey of Commercially Available Computer-Readable Bibliographic Data Bases. (Washington: American Society for Information Science, 1973).

⁴Hock, *op. cit.*, 213.

⁵Gardner, *op. cit.*, 6.

⁶Judith Wanger, Mary Fishburn, and Carlos A. Cuadra. *On-Line Impact Study Survey Report of On-Line Users, 1974-75 (A Brief Summary Report)* (Santa Monica: System Development Corporation, 1975).