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## The Ohio State On-Line Circulation System

The Ohio State University (OSU) Libraries is a network of approximately twenty-three department libraries and the main library. The number is approximate because the question of which libraries classify as department libraries presents some problems. For instance, Ohio State University has a library on Gibraltar Island in the middle of Lake Erie, accessible only by boat, and open only during the summer months. It is, in fact, a subbranch of the Biological Sciences Library and is not counted as one of the twenty-three department libraries. The library in Perkins Observatory in Delaware, Ohio, is counted in the twenty-three department libraries, as is the library at Children's Hospital. There are certain libraries on the campus which are not a part of the university libraries system. The Law Library lists its material within the system, but does not have a terminal and does not use the system for charging or for access, but purely for information. Privately endowed libraries and libraries supported by certain departments such as the English Department Library and the Philosophy Library, which are primarily libraries for undergraduate reserve reading, are neither part of the university libraries system, nor are they under the jurisdiction of the libraries.

The library system contains approximately 2,500,000 volumes. The acquisition, cataloging, and serial recording are done centrally and the finished items are then sent to the various public service units. In 1972 the libraries will circulate approximately 1,500,000 volumes. They will purchase some 120,000 volumes and on a busy day 20,000 patrons may enter one of the libraries within the system. The campus is large and decentralized and the distance from the Veterinary Medicine Library to the Education or Commerce Libraries is well over two miles. The libraries serve approximately 70,000 patrons, as listed in the patron name and address file.

During the 1960s the Ohio State University Libraries became increasingly aware that library circulation was not increasing at the same rate that enrollment was. The analysis of this phenomenon seemed to demonstrate that the system itself was clogged, that is, the procedures that had been evolved over the previous century were insufficient to meet the demands and load level that the increased size of the institution was placing on the library. Newer methods of teaching and research were also placing heavier demands on the libraries.

To simply expand the staff and the concomitant files and checkout desks seemed to be both inappropriate and unlikely to receive funding from the University budget authority. Furthermore, due to inflation, the costs of personnel were rising at an enormous rate. The libraries therefore decided to design an automated circulation system in order to recapture some of the lost circulation and to provide a system which would be expandable in the future at minimal cost. As the requirements for the system were designed it became clear that the system should be one which would speak to the problems of its users rather than simply the problems of the library. The most common user complaint arose from attempts to borrow materials from the library only to discover that the materials were either not owned by the library or were checked out. Another common complaint was that to locate a spectrum of materials on such a large campus and in a library situation which was fairly decentralized was a frustrating and time-consuming operation; a trip from the main library where the union catalog (wherein all the books on the campus are listed) is located, to another library would often prove fruitless since the materials were either checked out or the patron had gone to the wrong library.

Although materials were available to patrons if they would go to the right library, people would often not try all the possible alternatives of libraries where a copy might be located when they discovered the copy located in the particular library they were using was out. Therefore, rather than a system which would keep records of "books out" only, it was decided that full inventory control was needed. Furthermore, we felt that we must design a system which would provide for remote access and the ability to display all of the libraries holdings at any of the libraries' many locations as a basis for sharing of resources rather than a buildup of duplicate libraries. A fair amount of duplication is necessary in a campus of the size of Ohio State University, but it was hoped that in the future one department library could forego the purchase of little-used material if another library on the campus had the material available and it was readily accessible by a patron in the first location. This kind of cooperation is just beginning and should increase in the future.

The next problem was the amount of data needed on the file in order to satisfy a large portion of the patrons' demands. At about the same time that

Ben-Ami Lipetz at Yale completed his studies on card catalog use in a major academic library, his findings were verified by findings at the University of Michigan which pointed to the fact that about 80 percent of the patrons who enter a library know the items they want and they are engaged in a known item search. Of the remaining 20 percent, a fair proportion are engaged in a subject search, and the others are engaged in a search by series, for a group of documents, or for bibliographic information only.

With this information at hand it was decided that the system should involve an author-title and title search capability, but not subject search capability. There are so many unanswered questions about the "subject search process" that data are still being amassed about it. The university then selected the IBM Corporation to draw up the functional specifications for the system and to program the remote access and circulation system. This required 5 men for 15 months or 75 man-months, costing \$225,000. A vendor was selected to convert the library records. Records include: the call number, author, title, LC card number (in case subject information was added later, a link would be needed to other bibliographic records produced at other institutions), an internal identification number or title number, date of publication, a tag designating the item to be English or non-English or serial or monograph, and the holdings—that is, the volumes and copies of the particular title and where they are held. The average master file record is 100 characters in length. The OSU Libraries use the Library of Congress classification scheme with certain exceptions. The Education Library's juvenile collection is Dewey Decimal, the theses and dissertations are in an arbitrary sequential number contrived from the author's last name as well as the year and level of thesis. Microforms use simple sequential numbers and the Law Library uses another classification. Thus we have a mix of call numbers which demands a free and variable length field containing both numerical and alphabetical characters. The programs themselves are formed in approximately ninety-four separate modules and at any one time demand 186K of core of the IBM model 360/50. The "Fifty" seems to be the smallest machine which has the necessary channel speeds for the system. The system has approximately thirty 2740 typewriter terminals and approximately ten 2260 CRTs (fig. 1). The patron may telephone and request a search by author-title, by title, or by call number, and the library can respond as to whether the libraries owns the items, whether it is charged out, and in which library it is housed. It can also charge the book to the patron if he has a valid identification number. The system carries approximately 70,000 names and addresses with corresponding identification numbers as well as 1,000,000 titles comprising 2,500,000 volumes. Books may also be renewed by telephone. If a patron comes to a circulation desk with a book in hand, rather than do a search, the book can be charged by simply typing the call number and the patron identification number at that keyboard and the machine will respond with the author, title, date due, and date charged on a

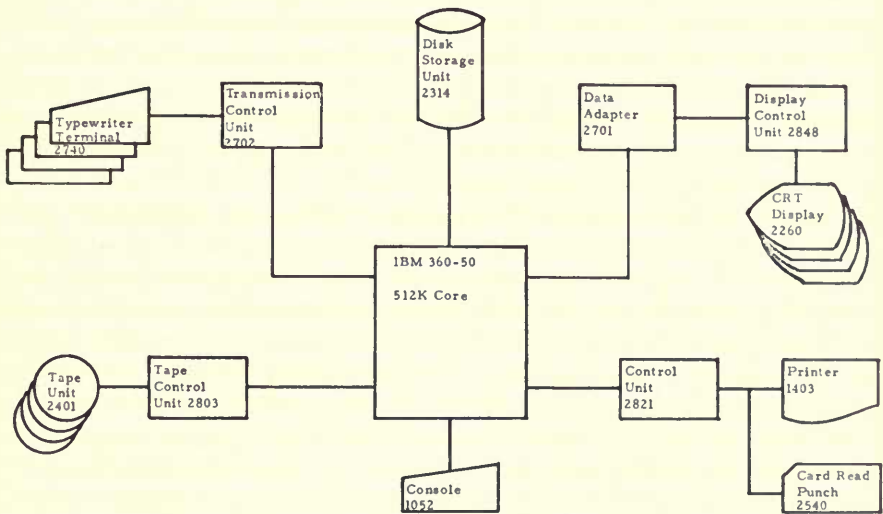


Fig. 1. Hardware

slip of paper which can then be inserted into the book. On a remote charge the same data appears in the library where the book is located; the book is paged and awaiting the patron when he arrives at the circulation desk.

Any library can charge any other library's books, but only the home library can discharge books. The discharge routine is similar to the charge routine except that the patron's identification number is not needed. Thus, the stock of each unit is protected and controlled by the discharge routine. The machine automatically generates "holds" or "saves," "recalls" from faculty members for books that have been out more than three weeks when requested by a student or other patron, and provides a lists of "snags," that is, books not on the shelf and not charged out which are searched to see if

they are misshelved or some other error has occurred. Bills for "lost" books or accumulated fines are also generated by the system.

The system was first started in November of 1970. Circulation has risen over 40 percent in the eighteen months the system has been operating. With the rises in wages, circulation costs are now about the same as before installation of the system, about \$0.43 or \$0.44 per circulation. About one-half of the circulation is still done manually—almost all of this is from the reserve rooms, since the old system of writing one's name on the end of a long card is still faster for controlled access materials than keyboarding. The university does not have a machine-readable identification card. If such an identification card is issued, manual circulation for reserve materials will be switched to the 1050 terminal or some other terminal which can read both a Hollerith card and the borrower badge in a very short time. The library encouraged the university to switch to such a machine-readable identification card and it appears that some action may soon be forthcoming.

In January of 1973 an automated acquisition and serial system will be initiated. Much of this data will reside in the Ohio College Library Center's Sigma 5 XDS machine, but will utilize the OSU Libraries' terminal system and circulation system. In essence an acquisition will be dealt with in the same way a circulation is dealt with; i.e., it will be treated as a book that someone has checked out of the stacks which must be returned; much in the same way that someone who has charged the book owes the library a book. In effect we will create a record on the file and charge it to a vendor with a date due, just as if he were a patron. It will display on the system with perhaps a prefix "V" for vendor identification number and a date due. The vendor, if he does not supply by the date due, will receive an overdue notice, only we will call it a "claim." To a patron or a user of the system the books on order will look the same as the books already owned by the library except that rather than a call number, an order number or an invoice number will appear. A book may be reserved when it comes back from a patron even if the patron is a vendor. The libraries will then be able to circulate uncataloged books and defer cataloging for items which are needed immediately until after the initial use. The system has the ability to expand to 200 to 300 terminals before degrading the response time.

Some of the more interesting phenomena that we had not realized when we did the original design and programming are:

1. On-line systems should, in fact, have on-line maintenance. We had anticipated that batch maintenance would be the most efficient and easiest method of updating the system. This is simply not true. When a system is running as many hours as ours is, it becomes feasible to "time-slice" and do maintenance routines in between circulation transactions. The batch routines take an enormous amount of time at least once a week, and do not have the instantaneous need for updating that an on-line system does.

The process of backing up the system, doing the batch maintenance, and then re-backing up the new file is extremely expensive and time-consuming. It is not in any way cheaper or more efficient than an on-line system. We hope to have the on-line programming finished by August 1972 so that we can stop doing batch processing of updates. We now have the ability to maintain the name and address file on-line, but the master file of books and journals is far more complex; there are problems such as identifying or holding from maintenance the change to records of books which are in circulation.

2. We had set up the on-line system believing that some of the smaller department libraries could share lines into the computer. This proved to be untrue—queuing problems quickly occurred and soon became intolerable. Furthermore, we discovered a large amount of unforeseen traffic of department libraries searching for added copies or added editions of materials held in those libraries, but which were either checked out or not available at the moment. The interdepartmental traffic is a very large portion of the total system traffic.
3. We discovered that certain kinds of unforeseen reference operations have played an important part in the reference services using the computer. The checking of standard reference books, especially bibliographies, for those items which we hold is now being done on a large scale. The reference librarians use the terminal provided in the reference department not only for such housekeeping routines as charging to themselves the latest volume of those series labeled “latest volume in Reference,” but also for answering catalog information questions. Since so much of reference work is the matching of bibliographic sources against library holdings, there is extensive use of the terminal in that department, although very little actual “charging” and “discharging” is performed.
4. We are beginning to be able to limit the number of duplicate copies being provided in the system since all of the copies of a book are available throughout the system. We are not forcing this particular issue, but are discovering a tendency among the various department librarians to “stretch” their book budgets by cutting down on the duplication of material that is used heavily a few times a year, but sits idle the rest of the year.
5. We are exploring the possibility of using the system as a sort of sub-standard cataloging by providing limited entries on a permanent basis for the kinds of materials that are duplicated in many copies—sometimes hundreds of copies—for the History 101 courses, for general undergraduate reading, and for the browsing room. No definite decisions have come from this, but we have received the recommendation that added copies of popular items be listed only in the computer and never fully cataloged.

The system also sends certain statistical reports to the library as well as purchase alerts to the acquisition department for items for which there are more than two "saves" and reduces the circulation period to one week for all books when more than three "saves" are present on a given title. We expect that the circulation will continue to increase, and by displaying the on-order file with the circulation file, we will be able for the first time to have full control of the materials both on the shelves and in the pipeline to those shelves.