

BOOTH LIBRARY ON-LINE CIRCULATION SYSTEM (BLOC)

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An on-line circulation system developed at a relatively small university library demonstrates that academic libraries with limited funds can develop automated systems utilizing parent institution's computer facilities in a time-sharing mode. In operation since September 1968, using an IBM 360/50 computer and associated peripheral equipment, it provides control over all stack books.

This article describes the history, analysis and design, and operational experience of the Booth Library On-Line Circulation System (BLOC). Since September 1968, when it went into operation, it has constantly been evaluated and modified to make it as perfect a system as possible.

Articles in library literature describing on-line circulation systems in operation at various libraries include Hamilton (1), Heineke (2), Kennedy (3), and Bearman and Harris (4). BLOC differs considerably from those reported systems and has some unique characteristics that deserve the attention of the library profession. It is one of the pioneering circulation systems in which on-line real-time inquiries are being made into the computer files by use of a cathode ray tube display terminal.

It is not a prototype or model system to be interpreted as the optimum circulation system, but rather it is a dynamic system which will and should

be modified to achieve the best possible system in accordance with the latest developments in computer hardware and software.

Its analysis and design were influenced by the needs of an academic library. However, with little or no modification this system can be adopted by public and school libraries.

ENVIRONMENT

Eastern Illinois University, a state-supported institution located in Charleston, has developed a comprehensive curriculum that offers programs in liberal arts, teacher education and other professional fields, and a graduate school. The enrollment for the academic year 1970-71 is 8,600 students, and the number of the faculty is 711. The goal of the University is to provide an excellent education in an atmosphere of high faculty-student ratio and generally small classes, characterized by intellectual dialog and daily contact among students, faculty and administrators. Instructors require heavy use of library materials.

Booth Library, the main library of the University, contains 235,000 volumes in its collection at present. It has just finalized a five-year development plan to keep pace with the growth of the institution and will increase the collection to over 400,000 volumes by the end of 1975. BLOC was designed to satisfy the Library's present and future requirements.

PLANNING

Analysis Phase

In order to improve services to its patrons through the utilization of modern technology, Booth Library started planning for library automation as early as 1965. Early experiments used unit record equipment in such areas as the ordering of Library of Congress printed catalog cards, acquisitions and serials control. Initial difficulties prevented these projects achieving full operational status, however, and subsequently all were abandoned.

The primary benefit Library staff gained from these early experiments was education in planning carefully for subsequent automation projects, one of which is the BLOC system. Initial planning for the latter began in 1966; however, the original plan, which was for closed stacks, had to be modified considerably to make BLOC compatible with more recent developments in Booth Library operations. The Library switched to open stack operation in 1967.

While the BLOC planning was going on, there were also plans underway to expand Booth Library's physical facilities and its resources to meet the needs of an expanding campus. The volume of circulation had already been increasing at the rate of 15% per year. The circulation staff had to be increased to cope with the situation, and even then quality of service had to be sacrificed to quantity demands. Furthermore, it was determined that the proposed growth in enrollment and the anticipated increase in library materials would increase the volume of circulation even more and

impose additional work on already overburdened circulation staff. The call-slip circulation system in use at that time no longer seemed adequate, and the file maintenance associated with the call-slip system had turned into a time-consuming and cumbersome task. Thus the need for an improved and simplified circulation system became evident to the administration of the Library.

The professional librarians held several informal discussions to identify and develop a circulation system that would adequately meet both present and future requirements of the Library. Several existing types of circulation systems were considered and comprehensively reviewed, but the librarians did not agree upon any of them. However, the review did result in the formation of a task force, consisting of representatives from the administration, the Data Processing Center, and the Library.

After thorough investigation, this task force recommended a computerized on-line circulation system as a possible solution to the Library's problem, and the administration authorized the task force to prepare a detailed analysis and design proposal.

Design Phase

In developing its detailed proposal, members of the task force took into consideration the fact that the new circulation system would use the existing computer facilities on the campus. They aimed at a system that would provide the best possible service at least cost in the long run, and one that would allow for incorporation of future developments in computer technology.

Main design objectives were to

- 1) eliminate borrower participation in the check-out process,
- 2) speed and simplify circulation procedure,
- 3) eliminate manual file maintenance,
- 4) permit identification of the status of any book within the system,
- 5) provide accurate and up-to-date statistics concerning use of library materials, including the number of times a given book is used,
- 6) provide guidance from the system in case of human error in conducting a transaction, and
- 7) relieve professional librarians from clerical chores.

DEVELOPMENT

Hardware

The computer system on the campus operates in a time-sharing mode, concurrently performing several on-line and batch processing jobs for the Registrar's Office, Business Office, Textbook Library and Booth Library. At the present time it is an IBM S/360 model 50 with 262K bytes central core and related peripheral equipment. It functions under the supervision of operating system OS.

Figure 1 shows a schematic of the system's IBM equipment and data flow among the various components, as applicable to BLOC. Among the components shown in the schematic, two 029 keypunches, one 059 verifier, two 1031 terminals, one 1033 printer and one 2260 cathode ray tube display

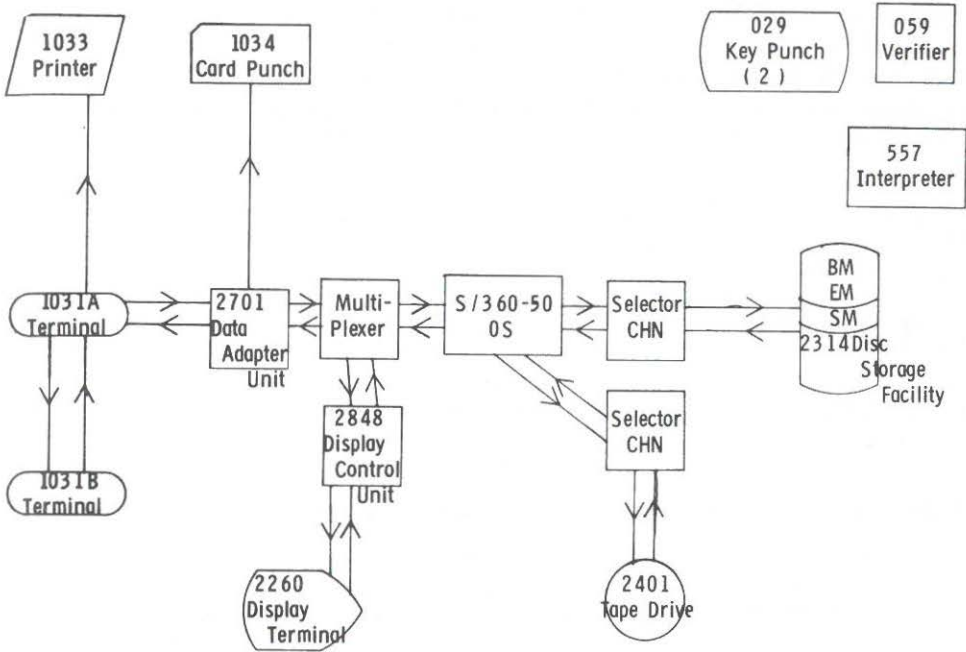


Fig. 1. Booth Library On-Line Circulation (BLOC).

terminal are exclusively used by BLOC and are located in the Library. The other components, located in the Computer Center, are shared by BLOC along with the other systems in operation on the campus. It should be pointed out also that this schematic represents only the equipment used exclusively or in a shared mode by BLOC and does not represent the University's total computing system configuration.

Software

There are 25 different applications programs written in PL/I (F level) to support the BLOC system. These do not include the system programs written in Assembler Language to perform certain basic machine functions.

There are two main data files that are required for the operation of BLOC. These two files are stored on a 2314 disk storage facility and are available to the system in an on-line, random-access basis. The programs required to process the BLOC transactions are also stored on the same disk storage facility, and these programs are loaded as needed by the operating system.

Of the two data files the first one is the Patron File, which contains identification data of persons eligible to borrow books from Booth Library. The second one is the Booth Master File, containing identification information for each physical volume located in Booth Library.

The Patron File is a combination of employee and student files that were created to serve the usual business needs of a university. This file is arranged in the indexed-sequential method (5) by the patron's Social Security number. Each student record in this file is 408 bytes long and each employee record in this file 304 bytes long. At present this file contains over 19,000 records, including some inactive student records. To process the transactions BLOC borrows such information as name, address and telephone number of the patron from this file as needed. Updating of this file is done by the Computer Center with the aid of the University administrative offices.

The Booth Master File was created exclusively for the operation of BLOC. Creation of this file, which took one and one-half years, was done by converting the Booth Library shelf list into punched cards and then transferring the information from the punched cards to a disk file. One master card was punched for each physical volume in the library. After verification, information from these cards was loaded onto the disk file through the S/360. Layout of the master cards is given below:

<i>Field</i>	<i>Card Columns</i>	<i>Explanation</i>
Transaction code	1	A=new record C=change record D=delete record
Accession number	2-7	
Format code	8	Oversize, etc.
Call number	9-28	
Edition, year, series	29-31	
Volume number	32-35	
Part, index, supplement number	36-38	
Copy number	39-40	
Location code	41-42	Reference library, etc.
Author	43-52	
Title	53-79	
End of card code	80	12-4-8 punches

Any blank space in the above fields is filled in by a slash (/). Creation of book cards (those used in circulation transactions) from the master cards is explained in file updating procedure.

The Booth Master File on the disk is arranged in the indexed-sequential method (5) by the first ten characters of the call number and by the

accession number, which has a fixed length of six characters. Each record in this file is 124 bytes long. The layout for a record is given below:

<i>Field</i>	<i>Byte Positions</i>	<i>Explanation</i>
OS control	1	
Call number	2-11	First ten characters
Accession number	12-17	
Call number	18-27	Remainder of call number
Edition, year, series	28-30	
Volume number	31-34	
Part, index, supplement number	35-37	
Copy number	38-39	
Location code	40-41	
Author	42-51	
Title	52-78	
Control byte	79	
Number of check outs	80-82	Cumulative number of check outs
Status of book	83	In or out
Borrower Social Security #	84-92	
Borrower status	93	1=student, 3=faculty, etc.
Due date	94-99	
Format code	100	Oversize, etc.
Save Social Security #	101-109	SS# of the patron that requested save
Save type	110	1=student, 3=faculty, etc.
Save status	111	Is there a save or not?
Unused bytes	112-124	For future use

Average access time of a record from this file is 75 milliseconds. As a security measure, a copy of the Booth Master File is kept separately on a magnetic tape, from which the disk file can always be recreated.

OPERATION

Updating

The Booth Master File is updated nightly with records of the new books acquired by Booth Library. After processing in the catalog department, the new books go to the keypunch section, where a master card is punched and verified for each new book. The master cards are then sent to the Computer Center, where each master card is reproduced and interpreted into two book cards. The layout of the book card is identical to that of the master card with two exceptions. A "1" is punched in column one as a transaction code for the system, and the end-of-card code is moved

to column 19 to expedite transaction processing, accession number and class number being adequate for locating a book record from the Booth Master File.

The identification data appearing on the book card is similar to that on the master card. However, during the interpretation process printing on the book card is rearranged in a format more suited to visual verification (Figure 2)

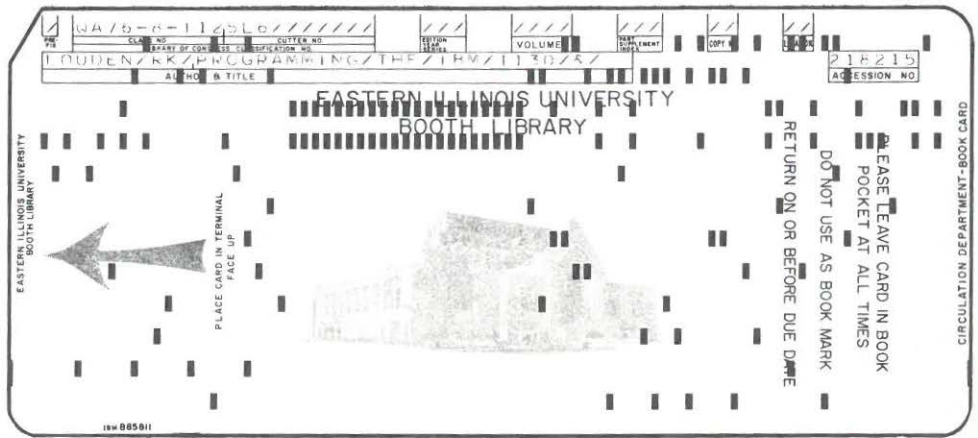


Fig. 2. BLOC Book Card.

After interpretation the book cards are run through a stamping process. In this process the machine reads the accession number from each card and stamps the number on the back of same card, across the $3\frac{1}{4}$ -inch dimension of the card and near the top. This allows the circulation staff to compare the accession number with the number stamped on the book pocket, to insure that the card is put in the right book.

After being stamped the book cards are sorted into two identical decks and sent back to the Library's keypunch section. One deck of the cards is put into book pockets and the books are shelved in the stack area ready for circulation. The second deck goes to the circulation department for interfiling in call number sequence into a duplicate book card file. Cards from this file are used as replacements for the original book cards in the book pockets as needed. Whenever a card is removed from this file, the information is noted on a special card, so that another duplicate can be punched and placed in the file for future use.

Late at night, after the Library is closed, the master cards received on that day in the Computer Center are used to update the Booth Master File before the new books are put into actual circulation.

Transaction Processing

Circulation transactions are processed through the IBM 1030 Data Collection System, whose configuration consists of two 1031 card badge

readers, one 1033 printer and one 1034 card punch. The entire 1030 system is controlled by a 2701 data adapter unit (Figure 1). If the computer is not in the on-line mode, the 2701 routes the transaction information to the 1034 card punch to be punched into cards that will be used later to update the disk files. The 1030 system transactions are monitored by a special program called "1030 Analyzer". This program is written in Basic Assembler Language (BAL) and has its own partition of about 50K in memory.

The 1030 Analyzer controls five overlay programs which actually process the transactions and make necessary file modifications. Each overlay is a segment of the transaction processing program and processes a specific routine, such as determining type of patron and loan period, calculating due date, etc. When the information for a transaction is transmitted to the 1030 partition, the 1030 Analyzer determines which overlays are needed to process the particular transaction and calls those overlays. The overlays access the required records from the Patron and Booth Master Files and do the necessary processing, then the master records representing the latest transaction information are written back in their storage locations. The 1030 Analyzer program and the associated overlays were written locally for BLOC.

Check-Out

Each person associated with the University who is eligible to borrow books from Booth Library is issued a badge by the appropriate administrative office. A patron is expected to present this badge, along with the books he wishes to check out, to the circulation desk. Though transactions can be processed without the badge, this is done only in exceptional cases. Into each badge are punched the person's Social Security number and a one-digit status code to indicate student, faculty, etc. The badge reader in the terminal reads the Social Security number and transmits it to the system, which interprets it as the record address for the particular person in the patron file and takes the necessary information from that address. The status code enables the system to determine the loan period.

After receiving the books to be checked out and the badge from the patron, the circulation attendant first compares the accession number stamped on the book pocket against the accession number stamped on the back of the book card. If the numbers match, she proceeds with the processing; otherwise she first pulls the right book card from the duplicate book card file before proceeding.

After comparison of accession numbers, the badge is inserted into the badge slot on the 1031 terminal. The reset switch is set to "non-reset" to charge out more than one book to the same patron. The book card is then fed into the card input slot, face down, notch edge first. If the terminal is not able to read the card the first time a "repeat" light comes on, in which case the card is taken from the exit slot and fed into the input slot again. If the "repeat" light comes on more than twice for the same card,

it is assumed that there is a punching error in the card and the transaction is completed by manually recording the necessary information on a special card that is later punched and used to update the disk files. If the terminal reads the card without any problem the "card" light comes on, indicating that the terminal is ready to process the next card. The attendant takes the book card from the exit slot and puts it in the book pocket, then stamps due date on the date due slip for a student check-out, or inserts a pre-stamped date due card for a faculty check-out. When all book cards for one patron have been run through the terminal, the badge control switch is set to "re-set," which releases the badge to be returned to the patron. If the transaction is not normal, the deviation is communicated to the attendant by the system on the 1033 printer with one of the following messages:

	Terminal Address	Message	Acc. #	Class	Patron Code
1)	#TERMINAL-5	NO MASTER RECORD	137335	9197	3233815871
	Class#	Acc.#			
2)	#DA428-H21	001253		Message	
		YOU JUST TRIED TO CHECK OUT—IS ALREADY OUT—CHECK IT IN AND TRY AGAIN"			

The first message is given for a book that got into circulation before its master card was loaded onto the disk file by the Computer Center; in this case the transaction is completed with a special card through manual recording. The second message is given for a book that has not gone through the check-in process upon arrival in the library from a previous check-out; here the attendant simply checks in the book, then checks it out again.

Check-In

At frequent intervals books deposited in return bins are placed on a truck and taken to a terminal to be checked in. The check-in badge is inserted into the badge slot and the reset switch is set to non-reset mode. When a book is taken from the truck the accession number on the back of the book card is compared with the accession number on the book pocket. If the card is the right one, it is then run through the terminal and replaced in the book pocket, which completes the check-in process for a book. If the book card is not the right one or is missing from the pocket, the transaction is completed using the book card from the duplicate file.

Circulation List

Each night after the library is closed a cumulative circulation list is printed giving all books checked out up to the closing hour of 11 p.m. Two copies of this list are delivered to the circulation department the next morning. One copy is placed at the card catalog to enable patrons to find out whether books they want are in or out. The second copy is kept at the circulation desk for staff use.

This list, printed in call-number order, shows the identification data of the book, its due date, the patron's Social Security number and his status. For faculty and special badge (mending etc.) check-outs, the transaction date is printed instead of the due date. At present a faculty member can check out a book for a whole academic year. However, the circulation librarian may recall a book from a faculty member after thirty days if it is needed by another patron. The transaction date helps the circulation librarian to recall books in accordance with this policy. Since the loan period for special badge check-outs can not be predetermined, the transaction date is printed for these check-outs. The circulation list acts as a back-up to permit circulation staff to answer questions when the system is not in the on-line mode. When the system is in the on-line mode the circulation list reduces the demand on the 2260 terminal inquiries during peak periods. The circulation list printing will be eliminated when two more 2260 terminals become available for the use of the system.

Transaction File

Each check-in and check-out transaction is recorded on a tape in addition to being on the Booth Master File on disk. This transaction tape is used to generate the circulation list. It also enables restoration of the disk file should something happen to the latter. The transaction tape is cumulated into weekly, monthly and annual tapes to generate a variety of statistical reports and also overdue lists.

Batch Processing

Most of the time this system operates in an on-line, real-time mode. Occasionally it has to operate in batch mode because of some mechanical malfunctioning. In this mode the computer system is not able to service the circulation system. Consequently the 2701 Data Adapter Unit routes the transaction information to the 1034 card punch (Figure 1) to receive data and punch this data into cards in a pre-designated format. For each transaction conducted in this mode the 1034 card punch punches one card with appropriate data; this is later used to update the transaction file. In this mode the circulation staff cannot make on-line inquiries and cannot get guidance from the system in case of errors. To alert them there is a light on the terminal that flashes whenever the system operates in this mode.

In case of a complete breakdown of the system, transactions are processed manually using special cards. Later, information from these cards is punched in 1034 card format and the files are updated. During the two years of its operation the system went into this mode only once for two hours because of engineering difficulties.

Overdues

A cumulative overdue list is printed once a week listing books overdue on that date. It shows identification data of a book and the address of its

borrower. For each overdue book a mail notification card is also printed, addressed to the borrower and containing identification data for the book. When an overdue book is checked in, the system prints out a message for the attendant. For example the message "LB1051-S62-131313 CHECKED IN BY 320-46-0785 1 WAS 20 DAYS OVERDUE" means that the book identified as "LB1051-S62-131313", brought back by a borrower whose number is "320-46-0785", was 20 days overdue. After check-in the overdue book is turned over to a clerk for necessary action.

Personal Reserves

A patron wishing to obtain a book that is checked out places a reserve on the book at the circulation desk. Reserves are placed in on-line, real-time mode in the BLOC system. The circulation attendant merely keys in the identification data of the book and the requestor, along with the reserve code, using the 2260 display terminal. This information is sent to the system in the following order:

- 1) Start symbol indicating the beginning of an inquiry.
- 2) Inquiry code "BR" (for Booth Reserve).
- 3) Identification data of the book (call and accession numbers).
- 4) Identification data of the requestor (Social Security number).
- 5) Requestor's status code (No. 3 for faculty members, etc.).
- 6) End of the message code ("—" underscore).

When this information is entered, the system places the book on reserve for the requestor and displays the necessary information on the screen for the attendant's visual verification.

Whenever a book on reserve is checked in, the system prints a message such as "QA76-5-F34-182929 IS SAVED FOR 138-32-0044 3." Alerted by this message, the attendant places the book on the reserve shelf and notifies the requestor, usually by telephone. Meanwhile, if another person inadvertently tries to check out the book, the system prints the message as "QA76-5-F34-182929 IS SAVED FOR 138-32-0044 3 DO NOT CHECK OUT."

If the requestor cancels his reserve on the book, it can be taken off reserve status by sending the appropriate code and identification data of the book via the 2260 terminal.

On-Line Inquiries

One of the main advantages of BLOC is that it enables the Library to obtain answers to a variety of questions in seconds. The circulation staff can tell easily the status of any book, and can obtain the list of books borrowed by a patron. On-line, real-time inquiries can be made on this system using the 2260 display terminal.

The 2260 inquiry processing is controlled by a special program called the 2260 Analyzer. This program is written locally in PL/I and has its own partition (about 95K) in the memory of the computer. Altogether it

services thirteen terminals located at various places on the campus. Only two of these terminals accept the circulation inquiries: the master terminal in the Computer Center and the terminal at the circulation desk. The rest are used in connection with the other computer applications on the campus.

When a circulation inquiry is transmitted to its partition, the 2260 Analyzer determines the type of inquiry and calls in the appropriate overlays (at present there are 20) to access the needed records from the files and to process the inquiry, and then send the response back to the inquiry originating terminal. After processing, the records representing the latest modifications, if any, are written back in their previous storage locations. Inquiry response time is less than a second.

To know how to make a certain type of inquiry all one has to do is key in the letters "IN" onto the screen and enter them into the system, then the system displays formats for various types of inquiries on the screen. This feature enables new operators to make inquiries on the terminal with minimum training. The reserve and clear inquiries have already been explained. The other circulation inquiries include: name, student or employee master file, book display, book scan, and unclear.

Name Inquiry

The Social Security number of a patron may be obtained by keying in his last name preceded by code letters "NA"; if unsure of the spelling of the desired last name the operator merely keys in a part of the last name. When either a name or segment thereof is entered, the screen displays twelve names in alphabetical order (beginning with the last name or part of the last name entered) along with corresponding Social Security numbers. If the desired name is not within these twelve, the operator can get the next twelve by pressing the "next" key. This procedure may be repeated until the desired name and corresponding Social Security number are located. She can then select that Social Security number and enter it into the system to get the address of that person.

Student and Employee Master File Inquiries

These inquiries are being made to find the addresses and telephone numbers of patrons as needed by the circulation department. Whenever a person's Social Security number, preceded by code letters "SM" (for students) or "EM" (for employees), is entered into the system, it displays his campus and home addresses and telephone numbers.

Book Display Inquiry

This inquiry enables the circulation staff to know the status of any book within the system. When the call number and accession number (which is usually obtained from the duplicate book card file at the circulation desk), preceded by code letters "BD", are entered through the terminal, the system displays the following information on the book: call number; acces-

sion number; copy number; author and title; status, as checked in or checked out; if checked out, when; how many times it has been checked out so far; if checked out, the name and address of the person who has it; if on reserve, name and address of the reserve requestor.

Book Scan Inquiry

Through this inquiry the books in a given class can be scanned, one after another. Whenever a class number, or part of it, preceded by code letters "BS" (for book scan), is entered into the system, it displays the information about the first book in that class; then, by pressing the "next" button on the terminal keyboard, the operator can have displayed information about the next book in that class. This procedure may be repeated as many times as necessary.

This class access method is a very important feature of the BLOC system; through it, one may discover rather quickly what books are available in the Library on a given subject, and simultaneously it can be found whether a book is in the Library or checked out. In this inquiry mode the system also keeps track of how many books are scanned for a given class and displays this information on the screen. The difference between the "BD" and the "BS" inquiries is that the "BD" inquiry is made when information about a specific book is needed and when its unique record address (call and accession numbers) is known. The "BS" inquiry is made when only part of the record address (such as class number portion of the call number) is known and when browsing through a given class is desirable.

Unclear Inquiry

The University Library has to clear withdrawing or graduating students, and leaving employees. This is very easily accomplished through this system, by the operator's merely entering the patron's Social Security number, preceded by the code letters "BU" (for book unclear), into the system.

If the patron has no books out as of that minute, the system displays "PATRON XXX-XX-XXXX HAS NO BOOKS CHECKED OUT." Otherwise the system displays the call and accession numbers for books checked out and not yet returned by the patron. The system can display up to ten titles at a time; if the patron has more than ten books out a "continue message" appears at the end of the top line on the screen, and otherwise a "final message" appears.

DISCUSSION

Benefits gained by the circulation department have already been discussed. Following are benefits gained by Booth Library as a whole:

1) Booth Library can now provide subject listings, arranged in call-number order (sorting and printing takes only a few hours) as required by various academic departments. The listings have been extremely helpful in pointing out the Library's resources to various accreditation committees.

2) Physical book inventory taking was greatly facilitated by printing the Booth Master File in segments and with indication whether a book was in or out at that time.

3) Periodic listings of books charged out to special badges, as Binding, Lost, etc., have been printed to facilitate follow-up activities by the respective departments.

4) The Booth Master File acts as a security back-up to the shelf list. Should something happen to the shelf list it could be recreated from the Booth Master File within two days. Similarly, if need arises, the departmental shelf lists can be created overnight.

5) The Library Committee can now make book budget allocations on a more scientific basis by reviewing the annual statistical reports, which give more accurately than before the volume of circulation in various subject fields.

In addition to the above benefits there are interesting possibilities for doing a variety of things, of which only a few are mentioned below:

1) Periodic listings of new books received, on the basis of area of interest, can be printed to provide selective dissemination of information service.

2) Since both students' and circulation records are in machine readable form, a variety of research tasks could be undertaken with readily available data to find out the reading habits of students at academic level and at age level. These reading habits could be correlated to academic achievement with the aid of data in the student records.

3) When the Booth Library MARC implementation project is completed, most book cards can be generated directly from the MARC tapes. Punching of master cards will be necessary only for those books not entered on MARC tapes.

4) The Booth Master File can be used to create data bases (partially or completely, depending on the size and characteristics of a library) at other libraries for similar applications.

Costs

Booth Library does not differ from other libraries when an attempt is made to collect data on costs. There are no figures available on planning cost, system design cost, or on writing and testing the programs. BLOC was developed through the collaborative efforts of Library and Computer Center staff. Many people have devoted time to the planning and development effort, working for BLOC on an additional duty basis. Only two people were hired to work full time for the project: one keypunch operator and one IBM machine operator; their combined annual salary was \$9,000.00 in 1968 and in 1969. The machine operator position was terminated at the completion of the basic file conversion in 1969.

Present operating costs of the system are not yet available. Since all programmers' and operators' time is devoted to maintaining and operating a number of systems, it is difficult to determine how much the operation

and maintenance of BLOC costs. So far staff members have been busy improving the performance of BLOC and have not had time to do an in-depth cost study.

However, there are some costs which can be directly charged to BLOC. At present the full time of one keypunch operator and 270 hours of student help, at a total cost of \$745.00 per month, are exclusively devoted to BLOC. The breakdown listed in Table 1 gives an estimate of the percentage of use on each of the items of equipment used for Library purposes and the monthly cost calculated from the percentage of use. Terminal cable and magnetic tape costs are not included in the total.

Table 1. Equipment Use and Cost.

<i>Qty.</i>	<i>Item Number</i>	<i>Item Description</i>	<i>Percentage of Use by BLOC</i>	<i>Proportional Monthly Rental Cost Charged to BLOC</i>
2	029	Card Punch	100	\$117
1	059	Card Verifier	100	58
1	083	Sorter	1	1
1	088	Collator	1	4
1	519	Reproducer	1	2
1	557	Interpreter	1	1
2	1031	Input Station	100	159
1	1033	Printer	100	76
1	1034	Card Punch	67	206
1	1052	Printer Keyboard	5	3
1	1403	Printer	2	16
1	2050	Central Processing Unit	10	1,188
1	2260	Visual Display	100	41
1	2314	Disk Storage Facility	13	689
1	2316	Disk Cartridge	100	17
1	2401	Magnetic Tape Unit	50	138
1	2540	Card Read/Punch	5	28
1	2701	Data Adapter Unit	67	157
1	2821	Control Unit	5	46
1	2848	Display Control Unit	13	96
		TOTAL Monthly Cost of Equipment:		\$ 3,043
		TOTAL Yearly Cost of Equipment:		\$36,516

It should be pointed out that the costs shown in Table 1 are averaged on the basis of total number of units rented and the amount paid in connection with all computer applications, and not on the basis of equipment used by BLOC alone. If the above-listed equipment had been rented for utilization by BLOC alone the rental costs would have been much higher. Moreover, the costs in Table 1 do not include salaries of computer personnel.

Utilization of the BLOC system has not produced any payroll savings. No library position was eliminated by installing it, but it is a certainty that more personnel would have been needed to discharge all duties at the circulation desk in the future without this system. Using the computer allows a 20% increase in loans to be processed without increase in personnel cost.

Expansion

The capacity of BLOC has by no means been exhausted; its flexibility allows for more innovations, so that every possible circulation need can be met. The utilization of the BLOC system is limited only by the ingenuity of its users.

Two new features are to be added to it in the near future. One of these is the installation of an IBM 2741 communications terminal to generate date-due slips, so that the present method of stamping the due date in a book can be eliminated. The 2741 terminal was decided on for the reason that it can be operated in either on-line or off-line mode, enabling the circulation staff to type date due slips manually when the system is in off-line mode.

The second new feature will be installation of an additional 2260 terminal for public use near the card catalog. This terminal will accept only "BD" and "BS" inquiries, and the "BD" inquiry on this terminal can be made by call number alone, which is readily available in the card catalog. Privileged inquiries, such as placing books on reserve, etc., will continue to be the prerogative of the terminal at the circulation desk. This new feature will provide patrons with up-to-the-minute information concerning the availability of library materials.

Design phase for these new features has been completed and the programming effort is underway. It is expected that these new features will be added to BLOC by the fall of 1971.

CONCLUSION

It can be said that a relatively small University library with limited funds can start and develop automated systems if the parent institution obtains a computer for instructional and administrative purposes. This was the case in Booth Library's circulation system. To keep pace with Eastern Illinois University's anticipated growth, it was decided in 1964 to develop a data processing center. It has grown rapidly in terms of services rendered to the University. Its main purpose initially was to serve the academic departments, but its services have spread to several administrative functions, such as admissions, student records, registration and personnel services, just to name a few. It was not difficult for the librarians to convince the University's administration of the necessity and usefulness of the computer for library purposes. Relatively little extra expenditure for hardware was needed. Understanding and cooperation from the staff of the reorganized

Computer Center helped to develop the Library's circulation system. What was the dream of the librarians a few years ago is now an actual operation, is working well and giving better service to the Library's patrons.

The major advantage is the saving of time on all necessary operations. The system also freed the staff from routine manual work. It eliminated the large call-slip files and inevitable human errors in that file. Patrons were freed from filling out call slips, and the circulation staff was freed from the tiresome task of decoding the unreadable "scribbling" of many patrons. Check-out and check-in of books was speeded. There is no longer a line of waiting students at the circulation desk and, on the average, it takes less than five seconds to check out a book. A variety of reports containing computer analysis of circulation records are available at regular intervals. They are an aid to ordering additional copies for heavily used titles and to surveying the collection for weak spots.

After more than two years of operational experience, it can be said with confidence that the BLOC system has fully satisfied all its design objectives and even exceeded them by providing some additional benefits that were not in the original planning.

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