AUTOMATED BOOK ORDER AND CIRCULATION CONTROL PROCEDURES AT THE OAKLAND UNIVERSITY LIBRARY

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Automated systems of book order and circulation control using an IBM 1620 Computer are described as developed at Oakland University. Relative degrees of success and failure are discussed briefly.

INTRODUCTION

Oakland University, affiliated with Michigan State University and founded in 1957, offers degree programs at the bachelor's and master's levels. By September, 1967, 3,896 students were enrolled and continuing growth is anticipated in coming years. The library had holdings of 86,755 volumes and 17,908 units of microform materials on July 1, 1967.

Although young, Oakland's library has already encountered a host of problems common to most academic libraries. In recognizing a need to automate or otherwise improve basic routines of handling book ordering and circulation control, Oakland is simply another member of a growing club.

The book order system developed at Oakland is noteworthy because of certain features which may be unique: a title index to the on-order file, a computer prepared invoice-voucher form, and a computer prepared voucher card which serves as input to the computer for writing payment checks. In logic the system is related, through parallel invention, to the Machine Aided Technical Processing System developed at Yale University (1). The system developed with unit record equipment at the University of Maryland is perhaps more directly related, particularly in the use of the purchase order as a vendor's report form (2,3). The Pennsyl-

vania State University Library design for automated acquisitions, which uses a similar purchase order, includes the capacity for an elaborate and variable method for reporting the progress of each item from initial order to completion of cataloging (4,5).

The IBM 357 circulation control system developed at Southern Illinois University, Carbondale, set the pattern followed by most subsequent systems (6,7). Oakland's circulation control system, a variation of the IBM 357 system, is more flexible than some because it uses trigger cards to control machine operations.

This paper, originally distributed to a relatively small group of persons and redrafted for a more general reading, presents a case study of how one institution in modest circumstances set about solving certain problems. It describes not systems to be copied but rather a learning process which will continue for many years to come.

BACKGROUND

During the winter of 1964/65, Oakland University Library laid out the plans and began work on a program of automation of the University Library. An initial four-phase plan was conceived: 1) book order, 2) circulation control, 3) serials acquisitions, and 4) a printed book catalog.

These housekeeping routines were felt to be the foundation for developing further automation in the library. Their automation would liberate the staff, clerical and professional, from such nonproductive and repetitive. tasks as alphabetizing and re-copying of bibliographic information. An early decision to learn by doing rather than attempting to design the ultimate system in advance was supported by the University administration. Consensus being that a larger computer to replace the IBM 1620 would be delivered within two years, computer programs were planned to be useful for twenty-four to thirty-six months.

Work on developing the book order system was begun in March, 1965; perhaps an all-time speed record was achieved when the system was put into use on July 1 of the same year. Work on a circulation control system was begun in August and on February 21, 1966, it too was ready. Phases three and four, serials acquisitions and the printed book catalog, were by then being held in abeyance until larger computer equipment should become available to the library.

At Oakland University all computer and related services are provided by the Computing and Data Processing Center. The computer system includes the following pieces of equipment:

IBM 1620 Computer, 40K with Monitor 1 and additional instructions feature (MF, TNF, TNS)

IBM 1622 card reader/punch (240 cpm/125 cpm)

Two IBM 1311 disk drives with changeable disk packs

IBM 1443 line printer (240 lpm)

Only one of the two disk drives is available for production use because the other is committed to monitor, supervisor, and stored programs. A disk pack on the IBM 1620 can accommodate two million numeric or one million alphabetic characters. The computer language used for most of the library programs is 1620 SPS (Symbolic Programming System); Fortran is used for some computational work.

Equipment within the Library consists of an IBM 026 printing keypunch which is used for the order system and an IBM 357 data collection device, including a time clock, with output via a second IBM 026 printing keypunch for the circulation system.

BOOK ORDER PROCEDURE

As may be inferred from a birdseye view of the order system (Figure 1), the initial input to the computer is decklets of punched cards. Output from the computer is a series of printouts: purchase orders, Library of Congress card orders, Oakland University invoice-vouchers, a complete
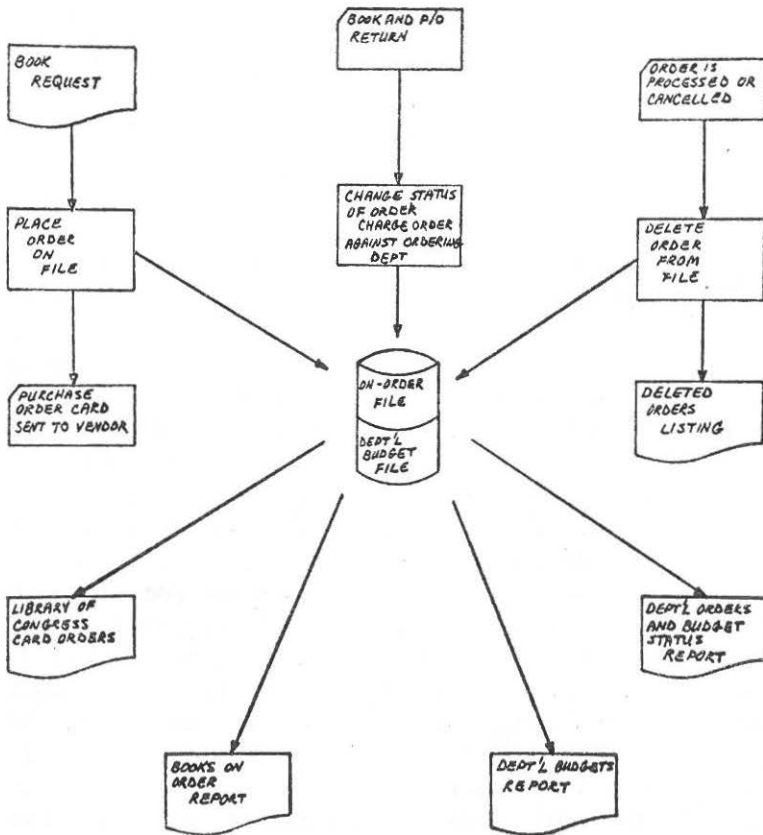

Fig. 1. *Flow Chart of Book Order System.*

on-order listing with title and purchase order number indices, departmental listings, and budget summaries.

Faculty and library staff submit requests for book purchases to the Acquisitions Department on a specially designed Library Book Request Form (Figure 2). The 5x8-inch size provides adequate room for notes, checking marks, etc., and makes for improved legibility, which in turn makes for easier, faster, and more accurate keypunching.

Kresge Library	LIBRARY BOOK REQUEST Must be Typed		Oakland University	Hldg.	Query
				BIP	Search
Author				CBI	
Title				PTLA	
				PBIP	
				Brit. BIP	
Publisher and Place					
No. Copies	Publish Date Mo. Yr.	Edition	Vol.	Part	Publ. Catl.
Requested By	Department		Cited in		Over
Price	Date	Dept.	Vendor	Class	LC Card Number	L. C.

Fig. 2. Book Order Request Form.

The request form calls for the bibliographic data customarily required for book purchasing, plus date of ordering, code number for the department originating the order, and vendor number. Oakland University utilizes campus-wide a five-digit vendor code system; since the Library's vendor numbers are a part of the University's vendor code, this interface is one of several points where the book order system ties in with other University records and procedures.

A tag number is assigned to each Library Book Request Form upon its arrival in the Acquisitions Department. After routine bibliographic identification is completed, decklet cards (Figure 3) are keypunched. The individual cards in each decklet are kept together by the tag number, punched into columns one through five. To keep the cards in order within decklets, column six is punched to identify the type of card as 1) author, 2) title, 3) place and publisher, or 4) miscellaneous information. Column seven indicates the card number within type of card. For example, code 11 in columns six and seven would be the first author card and code 12 the second.

Fig. 3. Book Order Decklet Card.

The record format requires that at least eight characters appear in the author field, but not more than 146. Title cards are coded from 21 through 25, the minimum title length being eight characters and the maximum 365. With these space provisions, it is rarely necessary to abbreviate authors and titles.

Maximum lengths of author and title fields were arbitrarily chosen after an informal survey of LC entries and titles on printed cards led to three conclusions: First, to allow sufficient space for all characters in the longest author entry and title would require an enormous space provision. Second, long authors' names and long titles can usually be abbreviated without loss of identity. Third, allowing a maximum of 146 characters for author and 365 for title permits about 95% of authors' names and titles appearing in LC catalogs to be transcribed without abbreviation. Experience indicates that the space allotments decided on provide for 98% or 99% of all books being ordered at Oakland University. The lengthy title field is particularly useful to the Acquisitions Department staff because it permits the inclusion of a variety of information: name of series, dealer's catalog number, notes to staff (example: "rush reserve for Biology 432, Spring Term"), etc. Place and publisher are limited to one card and remaining miscellaneous information to another.

The completed decklets are hand filed by vendor number and sent weekly for processing to the Computing and Data Processing Center. This sort by vendor number is done by hand rather than by computer for two reasons: First, the master vendor file which contains code number, name, and address for each vendor is kept on punch cards so that it can be used while data is being processed on the disk pack. Second, although a sort program could be easily designed, the disk space that would be required to store and execute the program is not available—an

instance of how the addition of one or more disk drives would enhance the efficiency of the system.

All programs for the order system are run once a month, and selected programs on a weekly basis. The Library receives three regular reports weekly: purchase orders, Library of Congress card order slips, and Oakland University invoice-vouchers. Voucher cards, punched by the computer while the invoice-vouchers are being printed, are retained in the Computing and Data Processing Center.

A separate purchase order (Figure 4) is printed for each title on a special form the size of a punch card. The original copy is on thin paper stock, the carbon on heavier card stock. The purchase order number appearing in the upper left-hand corner is computer assigned. At the end of each run the computer program records the last number issued; at the beginning of the succeeding run it picks up the next number and proceeds without operator intervention. The number of copies or sets being

Fig. 4.   *Purchase Order Form (recto and verso).*

ordered is printed prominently between the purchase order number and the author.

If a dealer is unable to supply the book ordered he is asked to check the reason(s) on the verso of the purchase order, a business reply mail form with postage guaranteed by Oakland. This convenience to dealers has improved their reporting when they are not able to supply materials ordered.

Library of Congress order slips, completely computer printed (including the symbols indicating the reasons for the Library of Congress's possible inability to supply cards, the account number, and formula for the number of cards), are printed in purchase order number, rather than LC card number, sequence. Again, a sort program was omitted for lack of sufficient space in which to store and execute the program.

When a book is received, it is routinely checked against the invoice and the outstanding purchase order. Then four items of information are keypunched into a "received" card: the purchase order number, the actual price of the book, the dealer's invoice number, and a two-digit code number meaning "received".

"Received" cards are sent to the Computing and Data Processing Center once a week with new decklet cards. A "received" card actuates the following sequence: the order status is changed from "on-order" to "in-processing", the encumbrance is returned to the book fund, the actual price is charged against the book fund, an Oakland University invoice-voucher is printed and a voucher card punched. The Oakland University invoice-voucher printed for each vendor includes purchase order numbers, costs, and totals. This voucher is returned to the library for auditing and approval, then forwarded to the University Business Office where it becomes a unit in the regular payment system, the only difference being that whereas voucher cards for book purchases are computer punched, other university voucher cards are hand punched. The voucher cards, along with the vendor master file, are the input data for a computer program which writes checks for payment.

Each book is accompanied by its purchase order card until it is cataloged and ready to be shelved. Then, the purchase order is separated and returned to the Acquisitions Department, where a final transaction card is keypunched with the purchase order number and a two-digit transaction code indicating that the book is ready for use.

When a dealer returns the purchase order card reporting that he cannot supply a book, this information is keypunched into the card: the purchase order number, a two-digit transaction code indicating the status of the book, and the dealer's action.

A complete alphabetical listing of all orders in main entry sequence is printed monthly (Figure 5); it includes the order status and purchase order number for each item. Two of the three copies printed are used by the Acquisitions Department staff for searching and to identify receipts

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                          BOOKS ON ORDER OR IN PROCESSING
HOLLANDER, JACOB HARRY 1871-1940
      ECONOMIC LIBRARY OF JACOB H HOLLANDER PHD COMPILED BY ELSIE A G MARSH **54-07**
         GALE RESEARCH CO                                            DATE PUB 00-0000
                                         1 COPIES ORDERED ON 04/19/68 FROM VEND 33335 FOR DEPT 54
      ORDER STATUS-ON ORDER                   ENCUMBRANCE-$ 14.50                 P/O 6707456
HOLLERER, WALTER 1922
      EIN GEDICHT UND SEIN AUTOR
         WALTER                                                      DATE PUB 00-1967
                                         1 COPIES ORDERED ON 04/19/68 FROM VEND 37567 FOR DEPT 12
      ORDER STATUS-ON ORDER                   ENCUMBRANCE-$ 3.00                  P/O 6707458
HOLLERMAN, LEON
      JAPAN*S DEPENDENCE ON THE WORLD ECONOMY THE APPROACH TOWARD ECONOMIC LIBERALIZATION
         PRINCETON UNIVERSITY PRESS (BAKER AND TAYLOR)              DATE PUB 00-1967
                                         1 COPIES ORDERED ON 03/22/68 FROM VEND  8674 FOR DEPT 07
      ORDER STATUS- TO CATG                ENCUMBRANCE-$ 7.50 COST-$     6.75     P/O 6706340
HOLLINGSWORTH, CHARLES A
      VECTORS, MATRICES, AND GROUP THEORY FOR SCIENTISTS AND ENGINEERS
         MCGRAW-HILL                                                 DATE PUB 00-1967
                                         1 COPIES ORDERED ON 03/08/68 FROM VEND 51831 FOR DEPT 09
      ORDER STATUS- TO CATG                ENCUMBRANCE-$ 10.50 COST-$    9.45     P/O 6705820
HOLLINGWORTH, LETA (STETTER) 1886-1939
      CHILDREN ABOVE 180 IQ STANFORD BINET ORIGIN AND DEVELOPMENT SUPPLY LIBRARY BINDING OP 6680
         UNIVERSITY MICROFILMS                                       DATE PUB 00-1942
                                         1 COPIES ORDERED ON 04/26/68 FROM VEND 81839 FOR DEPT 19
      ORDER STATUS-ON ORDER                   ENCUMBRANCE-$ 14.60               P/O 6708099
HOLMSTROM, J. AND LERNER L.
      GEORGE ELIOT AND HER READERS (CATL. 146-ITEM 938)
         INTERNATIONAL UNIVERSITY BOOKSELLERS                        DATE PUB 00-0000
                                         1 COPIES ORDERED ON 02/16/68 FROM VEND 97155 FOR DEPT 10
      ORDER STATUS- TO CATG                ENCUMBRANCE-$ 3.60 COST-$     3.60     P/O 6704924
HOL-HOL                             PAGE 338                                    HOL-HOL
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Fig. 5.   Example of On-Order List.

when purchase orders are not returned. A third copy is kept at the reference desk.

Two indices to the complete alphabetical listing are also prepared: 1) a title-author cross reference index which lists the first eight characters of each title in alphabetical sequence and indicates the entry under which the full citation can be found and, 2) a purchase order number-author index which lists purchase orders in numerical sequence and indicates the entry under which the full citation may be found.

Once a month, a listing of books on-order for each department is run and a copy of each departmental listing forwarded to the appropriate departmental library coordinator. In appearance it is quite similar to the complete author list except for two features: cost information is omitted from the individual items, but a summary of the departmental book budget is included. The latter indicates the initial budget allocation, payments made to date during the fiscal year, outstanding commitments, and the remaining outstanding balance against which further order requests may be made. Items listed as "In-Process" may be secured on request. Cataloged items are listed as "shelved" and appear only once; thereafter they are deleted from the computer disk file and listed in a separate printout.

A complete budget summary is also printed once a month. It presents, department by department, fund by fund, the complete book budget picture: total allocation, payments to date, commitments, and outstanding balance for each fund and/or department. This document, produced in a few minutes, previously required the equivalent of a full month's work each year by the head of the Order Section. One other printout, a listing of the disk file addresses for each purchase order, is made each

month. It is a file maintenance tool used when it is necessary to make corrections in the files.

It is, of course, sometimes necessary to void an Oakland University invoice-voucher. This requires not only voiding the physical printed voucher itself, but also altering the budget files within the computer, as otherwise the budget summaries would no longer reflect a correct total. "Dollar-sign" cards, so called because the cards begin with two dollar signs, are used for corrections. They permit the addition, subtraction, or replacement of budget information in any specific departmental allocation, encumbrance, or payment total. The correction cards also provide space for pertinent and explanatory comments. Necessary budget alterations, including new budget allocations at the beginning of each year and "bonuses" during the year, can be made effectively and with complete documentation using correction cards.

The order system was originally designed to handle monographs and other one-time purchases; periodicals and standing orders were not included. Subsequent provisions have been made for all book funds to be channeled through the system in order that a single unified record of book funds may be produced by the computer on one document, and to permit payment for periodicals and standing orders without listing periodicals on any of the printed reports other than vouchers.

Periodicals are paid without the presence of a purchase order on the computer file. The initial input to the computer is a variant "received" card, flagged for identification as a periodical, which briefly cites the periodical title in hand. The computer accepts the variant periodical "received" card as a legitimate demand for payment, subtracts the amount of payment from the periodical funds, prints an invoice-voucher, and punches a voucher card. Subsequent steps in the payment routine are the same as for books.

Late in 1965 a special program was developed which permits the inclusion of standing orders in the complete alphabetical listing of all orders. Standing orders are listed in the form of purchase orders complete with purchase order numbers so that they can be entered in the computer file. As each item on standing order is received, a decklet of cards and a "received" card are keypunched. Thus, a standing order can remain on the file over a long period of time, individual items received on that standing order can be separately listed on the file, and payments are accomplished within the system itself just as for any separately listed item.

All files for the order system are maintained in disk storage except the University's vendor file (vendor codes, names, and addresses) which is kept on punch cards in the Computing and Data Processing Center. Maximum capacity for the book order system is estimated to be about 5,000 orders at any one time depending upon the length of individual orders. Similarly, it is estimated that in a year about 7,500 purchase orders could be processed, depending upon delivery and cataloging time.

The book order system is made up of 21 programs. All are written in 1620 SPS and utilize 40K storage. With only minor modification, they could be made to work with 20K storage. The individual programs are described in Table 1.

Table 1. Book Order System Programs

Operating

LIB 001 To add new book orders to the books-on-order/in-processing (OO/IP) file and to print a purchase order for each ordered book.

LIB 002 To prepare Oakland University invoice-voucher and voucher cards for payment of books received.

LIB 003-4 To change OO/IP file records of received books to in-processing status.

LIB 005 To change OO/IP file records of affected books to appropriate status: order cancelled, delayed, processed and shelved, etc.

LIB 006-7 To list the complete OO/IP file in author sequence.

LIB 008-9 To list the OO/IP file in ordering department sequence; to update the departmental budget file against received books; to show the current budgetary status of each department at the end of that department's book orders.

LIB 010 To delete and list completed (processed and shelved) orders from the OO/IP files.

LIB 011 To list the current departmental budget file in department sequence.

LIB 012 To list the Title-Author cross reference index in title sequence.

LIB 013 To list the Purchase Order Number-Author cross reference index in title sequence.

LIB 014 To prepare Library of Congress card orders for new book orders.

LIB 015 To equalize encumbrance and paid fields of departments 71 + 72, and 73 + 74 (accounts with matching funds.)

LIB 016 To read $$ cards and alter the departmental budget file on their basis.

LIB 017 To place signposts (constant information in purchase order form) on file.

LIB 018 To maintain total for postage and miscellaneous charges.

LIB 101 To print and punch vouchers for department 49 (periodicals) and to update totals into budget file.

Utility

LIB 901 To list a Purchase Order Number-Physical File Address cross reference of the OO/IP file in P/O number sequence.

LIB 902 To allow, through reading "change" cards, alterations to be made to the records in the OO/IP file.

CIRCULATION CONTROL

The circulation control system (Figure 6) is less complex than the order system but more conspicuous, because the IBM 357 data collection device is located near the front door of the Library. The circulation system is designed to provide maximum flexibility in terms of machine requirements and types of materials which can be charged out.
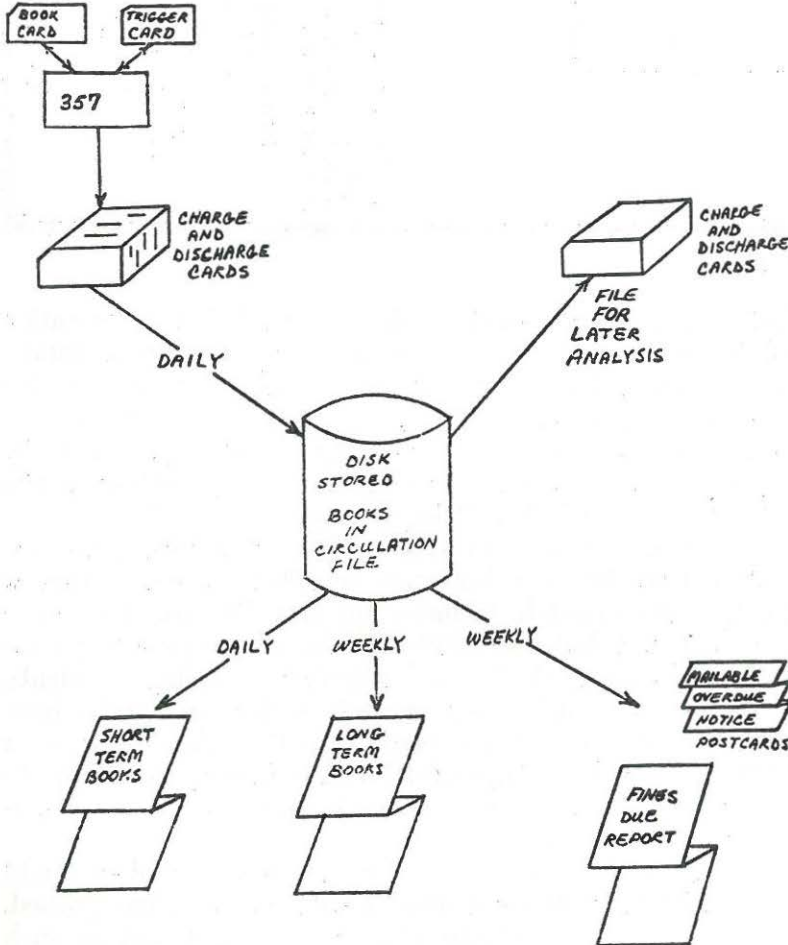

Fig. 6.   Flow Chart of Circulation System.

Each book has a machine readable book card (Figure 7). The period for which the book normally circulates is indicated with a letter code punched into column one; column two identifies the collection within the library from which the material came; column three identifies the type of material. The call number and/or other identifying information is punched into columns four through forty-one. Column forty-two is punched with an end-of-transmission code.
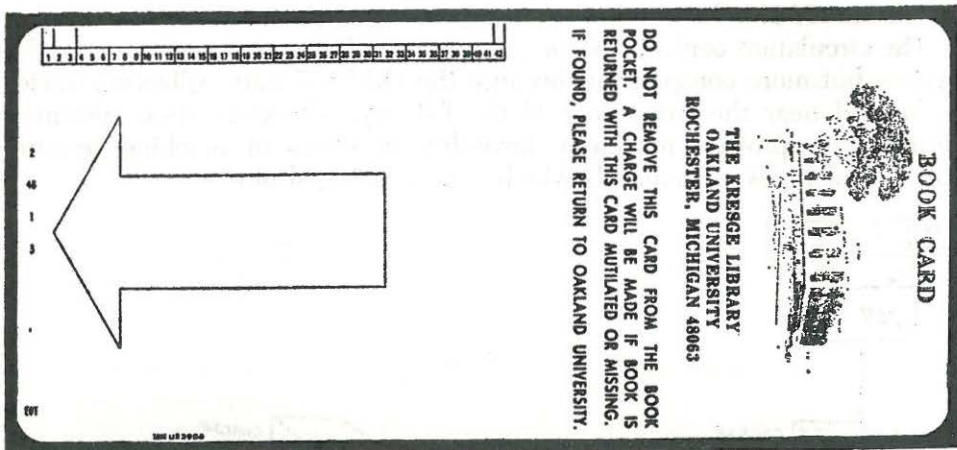
Fig. 7. Book Card.

The IBM 357 data collection device will perform only one operation without special instructions. If it is to perform more than one operation, it must receive instructions for each variant operation and it must receive them each time the variant operation is performed. This limitation can be met in one of three ways: by not admitting variant operations, by using a cartridge as a carrier for some information, or by providing special instructions as they are needed via a "trigger" card.

Denying the existence of a variant operation was not practical, because at Oakland the identification of a borrower constitutes a set of variant operations. The Library's clientele includes not only Oakland University students, faculty, and staff, but also residents from the surrounding communities, area high school students, and neighboring college students. The heaviest users are Oakland's own students and faculty, who have machine readable plastic identification cards issued by the Registrar or the Personnel Office. It has been impractical for the Library to attempt to issue similar cards to guest borrowers. Thus, the identification of a borrower is a set of variant operations.

Use of a cartridge to gain the borrower identification number would be possible but would leave the borrower identification badge unused. This badge card constitutes an official identification card and as such should be utilized throughout the University whenever practical.

Trigger cards to instruct the 357 in the performance of variant operations were developed to control the recording of borrower identification and to identify discharging and certain charging functions. The use of trigger cards provides flexibility, in that machine instructions are carried in trigger cards and are not an integral part of the book cards. A change in machine configuration would probably not require repunching book cards for the book collection. At the same time a wide range of 357 machine functions are made possible through the use of different

trigger cards. In short, the adoption of trigger cards provides the greatest degree of flexibility in operating the 357.

In the customary borrowing procedure the student brings a book to the circulation desk and presents it, along with his machine readable student ID card, to the desk attendant. The attendant first inserts the book card into the IBM 357 data collection device, then retrieves the book card and inserts a "student badge trigger card", which activates the badge reader on the 357. Then the badge is inserted into the badge reader, completing the transaction. By remote control this has created on an IBM 026 printing keypunch a card with the following information: typical loan period, collection from which the item came, type of material, call number, borrower type, borrower's identification number, the day of the year, and the time of day secured from an on-line clock.

If the borrower does not have a machine readable badge card, an alternate method of charging a book is to use a "manual entry trigger card" which activates the manual entry unit, with which can be recorded numeric information identifying the borrower.

With special trigger cards books can also be charged to reserve, bindery, or "missing". Books are discharged by passing the book card through the 357 and following it by a "discharge trigger card".

Monday through Friday at closing the charge and discharge cards for the day are delivered to the Computing and Data Processing Center, where they are processed by the IBM 1620 computer system. The circulation file is maintained on a disk pack similar to that for the order system.

Three reports are received from the Computing and Data Processing Center: a daily cumulative listing of all books and materials in circulation (Figure 8); a cumulative weekly list of all books on long-term loan; and a weekly fines-due report. In addition, overdue notices, computer printed on mailable postcard stock, are sent weekly to the Library where they are audited before being mailed. The fines-due report is arranged by borrower, bringing together in one place all of the borrower's delinquencies; the books which he has neglected to return are listed here, as are the overdue books which he returned through the outdoor book return chute. For the latter the number of days overdue at the time of return is listed.

Subsequent refinements introduced into this system include two additional reports: a pre-notice report in call number sequence produced two days in advance of the fines-due report and a listing of books discharged each day. The pre-notice report makes it possible to search the shelves for books which have been returned but, because of time lag, may still have overdue notices generated. Normal turn-around time for the system is 24 hours, but on weekends it goes to 63 hours and at certain holiday periods even higher. The daily list of discharges documents the return and discharge of each book and is used to answer the student who says, "But I returned the book."

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SHORT TERM BOOKS IN CIRCULATION                    .WEDS-JUL 13,1966    PAGE 18

CALL NUMBER                                 BORROWER   DAY OF YR DUE    ODUE

01  JC0153.L79                          01  000009874      208
01  JC0179.R723                         01  000007736      209
01  JC0179.R83-1962                     01  000004838      199
01  JC0179.R86-1954                     01  000007935      209
01  JC0251.L27                          01  000009021      201
01  JC0421.B8V.1                        01  000000207      127        *
01  JC0423.L58C.2                       04  000002393      199
01  JK0246.B9-1895V.2                   01  000000207      127        *
01  JK0421.P4                           01  000006266      203
01  JK0421.S7                           01  000006266      209
01  JK0516.S3                           01  000003891      199
01  JK0518.H6                           01  000006266      209
01  JK0524.L38                          01  000007717      214
01  JK1541.J27                          01  000006266      182        *
01  JK1561.S27                          01  000003891      199
01  JK1571.M8                           01  000003640      208
01  JK1976.M5-C.2                       05  000002256      207
01  JK2295.M52S3                        01  000007397      209
01  JK2372.H5                           04  000002194      210
01  JK2372.P6                           04  000002194      210
01  JK2408.K4                           01  000000207      146        *
01  JN6769.A5K622                       01  000005231      213
01  JQ1503.1912.B7                      01  000003824      209
01  JQ1503.1911.H72                     01  000003824      207
01  JQ1512.K7                           01  000003824      207
01  JS0323.C58                          01  000007717      209
01  JS0341.W7                           01  000007717      209
01  JX1425.P384                         04  000002925      213
01  JX1428.C6C5-1964                    01  000004154      199
01  JX1977.2.C5A73                      01  000009119      207
01  JX1977.2.U5S77                      01  000007371      201
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Fig. 8. Example of Short Term Circulation Report.

Maximum file capacity will permit up to about 9,000 charges at one time. Assuming an average life of four weeks for each charge, the maximum number of transactions which can be accommodated in one year is about 115,000.

The circulation control system utilizes eight programs. All are written in 1620 SPS and utilize 40K storage. (An additional computational program not included in the production package is written in Fortran.) With only minor modification the programs could be made to work with 20K storage. The individual programs are described in Table 2.

Table 2. Circulation Control System Programs

LIB 201 To update file and to print short-and long-term reports.
LIB 202 To print overdue notices and fines-due report.
LIB 204 Phase 1 routine for LIB 202.
LIB 205 Cold start program to "seed" circulation file.
LIB 207 To restart files from one term to the next.
LIB 209 To print pre-notice report.
LIB 212 To print daily discharges.
LIB 213 To print circulation file or part thereof.

APPRAISAL

The book order system has been described as it was originally designed, and the circulation control system as designed and modified. A partial update together with a critical appraisal follows.

Implicit in the planning of both systems was the assumption that the IBM 1620 would eventually be replaced by a larger and faster machine and that both systems would be redesigned and augmented. However, the IBM 1620 is continuing in use for a maximum rather than minimum projected time.

In July, 1965, Oakland initiated an accelerated library development program. Overnight the book budget projection for several years was available and in less than three months the book order system was consequently overloaded.

With the disk file filled and many orders waiting, drastic action was required. The most obvious solution seemed to be use of an additional changeable disk pack to expand the purchase order file, but this procedure would have been hopelessly unwieldy. To use a second pack would require either that all transactions be run against both disk packs, roughly doubling computer time and costs, or that each transaction be addressed to a particular disk pack which would necessitate extensive systems redesign. Another proposed solution was to revert to a completely manual system, but the Order Section preferred, if at all possible, to retain the automated fiscal control and invoice-voucher preparation features of the order system.

The alternative finally adopted required a basic philosophical change in the system. As originally designed, the system accounted for a book from the time it was placed on order to the time it was cataloged and placed on the shelf. The disk file was one-half occupied with items received and paid for but not yet cataloged. By purging the file of such items, an on-order file in the narrowest sense was created and a doubling of file capacity gained.

Now a new problem was created. How was a book to be accounted for that had been received, paid, and purged from the on-order file, but not yet cataloged? The solution was to print a second (carbon) copy of the LC card order slip which would be hand-filed into the card catalog; there it would serve as an on-order/in-process slip until replaced by a catalog card. Hand-filed slips replacing a machine-filed list further altered the philosophical basis of the system. Discrepancies in entry do occur, but not so often that the expedient does not work.

Four months later the system was again overloaded and a routine had to be devised whereby purchase orders could be issued either manually or through the computer. However, all items were still paid via the computer and all invoice-vouchers computer prepared. Fiscal control was retained even though the rationale of the system was violated.

During the summer of 1967 a change of a different nature was implemented. As originally designed the system provided constant communication between the Library and each faculty department through the departmental report. But, after the changes described above, the departmental report now included less than one-half of the items being purchased with the department's book fund allocation. It had ceased to serve any purpose and was omitted after July, 1967, with a consequent reduction of nearly two-fifths of line-printer time required for the book order system.

To the question, "Would it be better to return to a completely manual system for ordering books?" the answer by the Order Section has always been "No, retention of the automated system for fiscal control and voucher preparation is preferable, even with the patched system at hand." Nor should it be forgotten that the book order system as originally designed worked well until the demand on it exceeded its production capacity. Also to be recognized is the gain in experience and insight by the library staff during these three years. Reading about or visiting someone else's work is enlightening but day-to-day work brings an understanding for which it is difficult to obtain a substitute.

ACKNOWLEDGMENTS

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