

# Circulation Systems Past and Present\*

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*A review of the development of circulation systems shows two areas of change. The librarian's perception of circulation control has shifted from a broad service orientation to a narrow record-keeping approach and recently back again. The technological development of circulation systems has evolved from manual systems to the online systems of today. The trade-offs and deficiencies of earlier systems in relation to the comprehensive services made possible by the online computer are detailed.*

In her 1975 *Library Technology Reports* study of automated circulation control systems, Barbara Markuson contrasted what she called "older" and "more recent" views of the circulation function. The "older" or traditional view was that circulation control centered on conservation of the collection and recordkeeping. The "more recent" attitude encompasses "all activities related to the use of library materials."<sup>1</sup>

It appears that this latter outlook is not as new as Markuson had suggested. In 1927, Jennie M. Flexner's *Circulation Work in Public Libraries* described the work of circulation as the "activity of the library which through personal contact and a system of records supplies the reader with the [materials] wanted."<sup>2</sup> Flexner went on to characterize four major functions of circulation as follows: (1) The staff must know the books in the collection, and have a working familiarity with them. (2) The staff must know the readers; their wants, interests, etc. (3) The circulation staff must fully understand the library mission and policies and work harmoniously with those in related departments. (4) The circulation department

has its own particular duty to perform. . . . Effective routines and techniques must be established by the library and mastered by the staff if the distribution of books is to be properly accomplished and the public is to have

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the fullest use of the resources of the institution. The library must be able to locate books, on the shelves or in circulation; to know who is using material and how the reader can be traced, if he is misusing or unduly withholding the books drawn.<sup>3</sup>

The function of circulation has not changed since Flexner's description. Even within the context of online circulation systems, it is absolutely essential that the circulation system be seen in as broad a context as possible. It is not merely an electromechanical phenomenon staffed by automaton-clerks. Circulation services involve that function which is ultimately one of the most fundamental: the satisfactory bringing together of the library user and the materials sought by that person.

It follows, then, that the mechanism and means of delivery and control of the service are only a small part, and certainly not the most important part of the circulation function. Knowing your collection, your readers, and clearly knowing your library's mission are crucial prerequisites for the effective circulation of library materials.

An examination of the history of circulation systems and their evolution to the present state reveals the change in outlook from a narrow view of the circulation function to a broader view.

Let us begin by establishing the basic elements of record keeping, upon which circulation control is based. There are three categories of records:

1. For the collection of materials, books, tapes, microforms, etc., comprising the library.
2. For the readers or users of the library service.
3. For the wedding or concatenation of the first two, i.e., the library user's use or borrowing of the library's materials.

A minimal circulation model is a set of procedures or recordkeeping with respect to only the third category, i.e., records of the materials held by the library user outside of the library. A total or complete system would then be one that provides for all three categories. Using these criteria to judge the level of control provided by the various circulation systems of the past, let us review.

The earliest method of circulation control was the chain method. In this case, "circulation" is not an accurate term; "use" of materials is more appropriate, as the collection did not circulate. Books were chained to the wall and the user did not take the material outside of the library. The minimal circulation model is not met, and records were not required.

Several hundred years later, the ledger system's first iteration involved a simple notation into a ledger. The identification of the book—call number and/or author and title—and the borrower's identification were recorded. Upon the return of the book, the borrower or the receiving clerk initialed the ledger entry or otherwise indicated the return of the item. Minimal circulation control is met.

A more developed or sophisticated ledger system exceeded this minimal circulation model. The new ledger had each page headed by a different

borrower or registration number. Consequently, a given user had all of his or her charges recorded on the given page indicated by the user's number. The economy of not having to write the borrower's name for every transaction was made possible through the creation of a file of patron records linked to the ledger page by common registration numbers. In effect, this was our first "automation." The use of a master file in support of a numbered page provided information that had previously been handwritten every time someone wished to borrow books from the library.

The new ledger system also allowed for a more orderly control of charges. Only the borrower's number was needed to get at the page of transactions relating to that borrower, as opposed to the former method—a benchmark method, in a sense—in which the transactions were chronologically entered and had no other ordering whatsoever. Even with the improved ledger system, though, the only ordering was by borrower number and date of issue to the borrower. There was no arrangement that provided for sequencing or finding the books borrowed.

The need to identify borrowed books led to the *dummy* system. Every book had a concomitant dummy book (or large card) that had a ruled sheet of paper with the book identification information on it and the borrower's name and/or number. When a user wished to borrow a book, the dummy was pulled from a file and the borrower information was written on the sheet of paper. The dummy was then filed on the shelf occupying the space formerly occupied by the book itself. When the book was returned, it was reshelved, the dummy removed, and the circulation transaction was crossed out.

This system is interesting in that it provides for a complete inventory control. Either all items are on the shelf in proper sequence or a physical surrogate or record for circulating items is substituted and placed in proper sequence. One has instant and, in effect, "online" access to the presence or absence of materials if one has the call number and can go to the shelf. Unlike most systems that can only tell whether or not the book is present, the dummy system tells who has the book and when it was charged. In terms of a minimal model, this system provided less and more than the ledger system. If a reader wanted a list of books he or she borrowed, the reader would have to view every dummy and see if the listed item was charged to him or her. In contrast, the ledger system served such a request well, though every page of the ledger might have to be examined to find out who had borrowed a book not found on the shelf.

Leaping past several systems, let us now discuss the Newark system, the overwhelmingly prevalent system in the United States today (if we include the mechanical or electromechanical versions of Dickman, Gaylord (the manual, not automated), and Demco).

The Newark system incorporated the best features of the systems already mentioned. A separate registration file was kept which provided both alphabetic access by patron and numeric access by patron registration

number. Consequently, the recording of the borrower's identification during circulation transactions only involved the notation of the number. For book identification, a card and matching pocket were placed in each book with the call number and/or author-title identification information. The circulation transaction involved the removal of the card from the pocket and the entering on it, a la dummy system, the date of the transaction and the borrower number. The cards for all of the books borrowed on a given day were aggregated and filed in shelflist sequence in a tray headed by the date of the transactions. Resorting to computer jargon, the major or primary sort of the book cards (read circulation cards) was by date, but the minor sort was by call number. Consequently, if one wanted to know the status of a given book and one had the call number, it would not take too long to search, even with a file as large as the one in the main branch of Newark Public Library, by looking for the item in all of the different days' charges.

When a book was returned, the clerk noted from the date-of-issue card inserted in the book's pocket, the tray in which to search, and the matching call number on the pocket which was used for discharging the book, i.e., removing the charge card from the tray and replacing it in the book.

The combination of the books on the shelf plus the cards in the different trays in shelflist order constituted a complete inventory. Additionally, the trays of cards comprised a comprehensive record of all current charges, i.e., all transactions by date, call number, and borrower, with borrower number pointing to fuller information in the registration file.

Looking back at our basic model, the Newark system offered not just the minimum—a record of the item and the borrower who took it—but also introduced a major step toward inventory control. There was an inventory sequence involved, or, more accurately, several inventory sequences—one for each given collection (or day) of circulation transactions. What was still missing was a record by borrower of what was charged to him or her. In the original Newark system, the borrower's card had entered upon it dates of issue and return of items. This way, even if the library could not tell the user what items (s)he had, the user's card would reflect the number of items outstanding.

The handling of reserves, renewals, and overdue notices occurred as follows: a colored clip or some indicator on a circulation card would be used to indicate a reserve. A renewal would be handled the same as a return except the person would wait while the charge card was pulled from the appropriately dated tray, and assuming that no reserves had been placed on the circulation card, the book would be recharged (i.e., renewed) to the borrower. Overdues automatically presented themselves by default. Cards left in a tray after a predetermined number of days represented charges for which overdues were to be sent. The tray was taken to the registration file and the numerically sequenced registration cards for the delinquent borrowers removed so that notices could be prepared and sent. Then the

registration slips and circulation cards had to be refiled at the completion of the process.

Essentially, most subsequent systems are variants on the Newark system. The McBee key-sort system involves the use of cards with prepunched holes around the edges, one of which can be notched to indicate the date an item is due. The cards are arranged by call number creating a single sequence. The insertion of a knitting needle-like device through a given hole will allow all of the books overdue for a given date to fall free of the deck. This system is like the Newark system in that it has inventory and date access, but unlike Newark it places a horrible burden on the borrower. Each card has (written by the borrower) the borrower's name and address and the call number, author, and title of the book. Thus, the library is saved the labor of creating circulation cards and maintaining registration records for every patron—all of the information needed is on the charge card. But here, as Marvin Scilken has pointed out, the burden of the library's tasks are merely passed on to the users. This point should be emphasized.

The next system to be considered is the photo-charge system. Microphotos are taken of the borrower's card, which has the name and address on it, the book card (as in the Newark book identification card), and a sequentially numbered date-of-issue or date-due slip. Again, as with the McBee, since the photo record includes the borrower's name and address, one can throw away registration files. Also, a list or range of transaction numbers is kept by date used. Since the numbered date-of-issue slip is placed in the book at the time of charging, and one removes it when the book is returned, it is a simple step to cross off or remove the number on the slip from its corresponding duplicate on the list of numbers for that day's transactions. Overdue transactions are found by searching for unchecked transaction numbers on the numerically sequenced microfilm.

This system does meet the criterion of the minimal model, a record of the user's use of the item. In terms of labor intensity, one has eliminated the maintenance of charge-card files and registration files by a single microfilm record. Reserves, though, are terribly time-consuming with the photo-charge system: each returned book, before it can be returned to the shelf or renewed, must be searched against a call-numbered sequence of reserve cards. Academic libraries would not use this kind of system because call-number access is a necessity, especially in relation to recalls of long-loaned items. The elimination of paper files is what so commended this system to public libraries over the Newark-based systems. But, as was noted, one has virtually no way of determining who took a book out or when it is due back except, in principle, by searching all of the reels of microfilm.

Some variants on this microfilm system were developed. Bro-Dart marketed a system that thermographically produced eye-readable records instead of microimages.

Such was the state of circulation systems before computers began to be used. The following—a discussion of the involvement of computers—can

be separated by the type of hardware: main frames, minicomputers, and microcomputers.

The main-frame computer has been used primarily in the past as a processing unit for batches of circulation transactions collected and fed to it via punched cards, terminals, or minicomputers.

Call number and author and title (albeit brief) and user identification number, were captured for each transaction. In the 1960s and into the early 1970s, this information would be batch-processed by the computer and a variety of reports would be produced. What the computer does, then, is keeps track of numbers, their ranges, and the dates of the ranges. But the computer can do much more than this. It is capable, as none of the nonautomated systems were, of rearranging the data input and then comparing and tabulating them as desired and appropriate.

Consequently, the fact that the call number, author, and title are stored by the machine means that lists or files can be arranged by any of these elements. The same goes for date of transaction. As to borrower identification number, a master file much like the Newark registration file is kept (only now in its machine-readable form), and the computer does the comparing at high speed instead of the clerk taking the charge record and going to the numeric file to find the name and address of the borrower. Of course, the computer can then readily and quickly print out overdue notices with an obvious absence of clerical support and labor intensity. As we all know, the rate of increase of labor costs is increasing, and the rate of increase of computer costs is decreasing.

Two kinds of large computer systems have been used. The batch-oriented one, which either kept track of items in circulation only (the absence system—only items absent from the collection were tracked), or one that kept track of the entire collection (the inventory system).<sup>4</sup> Normally, identification numbers were used for patrons in either system.

Although relatively rare in academic and public libraries, the main-frame-based online system is also in use. Ohio State University is famous for its online system. What is meant here is that all transactions are immediately recorded and all files are instantly updated. Printing is still necessary for overdue notices, but printed circulation lists are not necessary because of the online answers to queries regarding books or patrons now possible through terminals distributed to appropriate locations.

The minicomputers came on the scene in two stages. CLSI's entrance in 1973 utilized one of the early minicomputers, quite small by today's standards. For relatively small libraries that had not begun to dream of having their own computers, it became possible to have an entire inventory (in abbreviated form) and an entire patron file online. Consequently, all of the access power of the Newark system, and none of its labor intensity, was available online and much more besides. Few libraries could afford the main-frame system of Ohio State, but many could pay for CLSI's, and indeed they did.

In the last few years, minicomputers have grown several magnitudes

above the capacity and speed of main-frame computers of the 1960s. Consequently, such firms as Dataphase, Systems Control, GEAC, Gaylord, and others offer these larger minis, which can now support online the needs of large branch systems with inventories of hundreds of thousands of books. Incidentally, CLSI, with a new mini line, can do this now as well.

Both the mini- and maxi-based systems do all of the basic work originally outlined: the whole inventory can be accessed online or with printed lists arranged by author, title, or call number (and, presently, some vendors offer online subject access and cross-references); access can also be made by patron's name. Further, the basic transaction—item, borrower, and date—is recorded and checked for holds or delinquency before it is accepted.

Without overly extolling the present state of the art, it should be said that all of the information identified as important in the earliest systems is now not only available in a far quicker and more usable fashion, it can be manipulated by the machine in a variety of ways to meet and serve management objectives not considered practicable in the past. Peter Simmons showed how collection development could be aided by automatically generating purchase orders when reserves exceeded a specified acceptable level.<sup>5</sup> All kinds of statistical data regarding collection and patron use can be generated that could not have been possible in a manual mode. While at the University of Southwestern Louisiana, William McGrath was able to adjust book budget allocations in terms of collection use and undergraduate major in a most interesting fashion.<sup>6</sup> The net result was an empirically based expenditure of book funds.

Now the microcomputer or microprocessor is the newly emerging phenomenon, and in many respects it is not unlike the minicomputer of the early 1970s. It is being used to perform single data-recording functions, and is also being seen as the link to the larger computer.

So we have moved from chained books to microcomputers the size of a desk top. Originally, a great deal of information was captured at great expense and laboriously maintained. Certainly the handwritten and typed records of the Newark system, although relatively comprehensive, were obtained and preserved at great cost. And, despite it all, there were real limitations of access. The succeeding McBee and photo-charging systems appreciably cut out-of-pocket costs to the library, but either passed labor directly on to the user, or eliminated access altogether. Book or patron access are virtually impossible with the photo-charging method. Simply put, that system tells what is overdue, and that's all.

The entry in the 1960s of the computer radically altered the ground rules. Now all sequences of encoded elements are possible, and management information can be derived. Important statistical data pertaining to collection use and library users can be obtained by further manipulating the data accumulated in the circulation process. It is now possible for all but the smallest and the very largest libraries to have access to and control

of their materials through the current range of minicomputers on the market.

Jennie Flexner told us that circulation had to be more than maintenance and record keeping of loan and borrower transactions. Through the advances of the computer technology and its application to circulation control, we have finally seen what seems to be an optimization of the record-keeping process and, by extension, an improvement in circulation service. If instantaneous access to patron files, inventory files, and outstanding transaction files through a variety of modes and computer-developed management data does not constitute that optimization, it will have to do—until the real thing comes along.

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