

EXHIBIT Q

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Automated Circulation Systems in Libraries
Serving the Blind and Physically Handicapped:
A Reference Guide for Planning

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CHAPTER 5.
BASIC SYSTEM REQUIREMENT CONSIDERATIONS

The essential source of input into the design of any set of system requirements is the articulation of specific service and performance objectives. Although objectives that apply in a manual operating environment provide a starting point for this articulation, they need not--even should not--represent a system design constraint. Through computer-assisted circulation, it is possible to achieve objectives not possible within a manual operating environment, particularly one that is strained to capacity. On the other hand, it is important that expectations not be established whereby the computerized system is viewed as the sole means for solving essentially intellectual or staffing problems or for removing bottle-necks in areas that do not interface with and cannot be influenced by computerization.

Automated circulation systems are most typically expected to permit a library to improve its overall service through increased productivity and efficiency: by serving greater numbers of borrowers*; by increasing the speed with which items can be put into circulation; by using more effectively an entire collection; and by exerting more management control over inventory and operations. In addition, a computerized system can be used to expand the range of service modes that will be accommodated and, if well designed, can permit flexibility in serving borrowers with different and changing needs and preferences.

At some point, early in the specification of system requirements, library staff must specify quantitatively their expectations regarding the numbers of borrowers to be served and the volumes of transactions to be handled in specified periods of time. Considerations in this area are discussed further in Chapter 6. The focus of the following sections is on the definition of various modes of service and the dimensions of those modes that have implications for system design.

*The term "borrower" is used throughout this and the following chapters to refer to both individual patrons and institutional users of the library.

TYPES OF MATERIALS TO BE HANDLED

A circulation system encompasses ~~the following major functions:~~

- It provides for the storage of computer-readable data about borrowers and about items that are held in the collection.
- It supports and/or automatically performs the selection of items in that collection for borrowers, the assignment and check-out of items to specific borrowers, and the check-in of returned items.
- It maintains records, or can produce data, on borrowers, items, and circulation, to support the generation of management statistical reports.
- It provides for the generation of mailing labels and/or cards, in appropriate shelf list order.

Because the system encompasses functions relating to inventory control, it can be used to handle a wide variety of materials, including those that are not checked out, in the traditional circulation sense, but that are distributed or placed on loan. Therefore, it is reasonable to consider and to prioritize for inclusion the full range of materials that are presently represented in a library's collection. In addition, library staff will want to consider the possibility that additional types of materials will be added at a later time, given the need and the capacity to handle them.

As shown in Exhibit 11, all of the 19 Libraries included in this study plan to, or now use the system to support circulation of recorded book media--disks and cassettes. In the case of braille materials, 15 of the Libraries that handle this type of item include them or are planning to include them in their systems, and, of the Libraries that handle large-print books, 7 include them or are planning to include them in their systems. Clearly, materials in the book collection have traditionally received the highest priority, although, within this overall scheme, priorities have been established for implementation by media and by source (i.e., NLS/BPH-produced versus locally produced materials).

The set of decisions that are made with respect to these various areas of system requirements provide the initial framework for system design. These areas are discussed in the following three sections: Frequency of Service and Circulation Service Levels; Major Characteristics of the Selection Function; and Selection and Automatic Check-Out.

Frequency of Service and Circulation Service Levels

The set of choices for periodicity in circulation service to borrowers includes the following:

Calendar Service. Provides for circulation of items on a fixed-calendar schedule (e.g., weekly, biweekly, every three weeks, or monthly), to accommodate the reading rates of individual borrowers.

Turn-Around Service. Provides for circulation of a new item to a borrower for each checked-out item that is returned by that borrower.

Will-Call Service. The provision of one or more items, to be circulated only when the borrower contacts the library for service.

Each of these options is, in turn, related to a concept of service levels--quantities of items to be in circulation, per borrower, at a given time.

In the case of Turn-Around service, a minimum or standard number of items for check-out is established initially and, thereafter, the service level is controlled through the process of circulating a new item for each returned item. With Calendar Service, additional management controls are needed in the system design if there is to be a maximum number of items for a given borrower in circulation at any given time. The items in circulation may begin to cumulate if a fixed number of items is being sent out at each service date, but items are not also being returned. With Will-Call Service, the problem of maintaining service levels is not present, but a decision must still be made on whether to impose a maximum on the number of items that can be checked out at one time.

A number of possibilities present themselves in specifying the way in which a computerized system can help in this selection function. They range from a totally system-managed and system-controlled approach, with a sophisticated type of automatic SDI (Selective Dissemination of Information), to one in which the system does no more than permit the library staff to key in the items that they have selected for check-out, using the same capabilities established for handling requests for titles made by borrowers. A number of factors--including numbers of staff, service characteristics of a particular borrower population, and the volume of transactions to be handled, in relation to various periodicities--need to be weighed in defining the extent to which the system is to be actively involved in this function. One of the most critical requirements decisions has to do with determining what "judgments" the system will be programmed to make and what judgments will be left to staff members. Other operational considerations are introduced below.

Origination of Selection. At a minimum, the selection function typically provides for the entry of data on titles that have been requested by borrowers or identified by the staff through some manual means. Any additional requirements reflect choices along a continuum--from fully manual to fully automatic--choices that must take into account the originator of the selection and the role of that originator.

When the staff member is the originator of a selection, the role of the system can be to assist the staff member in creating a subset of titles in the collection that are potential matches. From this subset, the staff member can make final choices on the basis of apparent relevance (judged by reading the title and/or annotation) and can also introduce other considerations, to provide variety. Among the questions to be asked in this area of design are:

- Which elements of information supplied in the borrower's interest profile and in the record for each title will be used by the system to create an appropriate subset of the holdings?

- Which elements of data will the staff member want to review in the list of potential matches to make the final selections, and how many items will the staff member want to view to make those selections?

A number of data elements that can be used for these purposes are described in detail in Part III. The most important of these are presented in Exhibit 13.

To take the requirements resulting from staff-originated selection the next step, to a total automatic selection process, the library staff may need to establish additional principles for the matching process and decide how the system will provide for variety among the items selected and/or will reflect specified preferences of the borrower (e.g., in the case where a borrower prefers to receive more mysteries than historical fiction).

A particularly critical issue in automatic selection is whether the selections made by the system are truly final or a staff member will "intervene" to review the items selected and make any needed revisions. The concept of interactive automatic selection lies somewhere in the middle on the continuum between a staff-selection approach and a system-selection approach. If staff intervention is not provided as a means to identify and correct poor matches, then a library will need to invest more resources in a mechanism for system evaluation, to test periodically the quality of matches that are being generated by the system.

As indicated in Part I, a few Library Directors expressed concern that, with computer-assisted staff selection, the staff tended to lose its familiarity with items in the collection. In the manual operating environment, staff members handle printed tools and skim annotations, in the process of selecting items. One way of thinking about the effect of dealing with computerized records is that the database tends to become an "invisible" medium. In skimming through printed materials, one can absorb, almost unconsciously, the essence of the information but online technology does not promote that type of skimming and unconscious learning. Online technology can, in fact, create some feelings of distance between the staff member at the terminal and the information in the databases. Therefore, in parallel with considerations of these several design choices, library staff will also want

Exhibit 13. Set of Major Data Elements To Be Considered
for Use in Computer-Assisted Selection

Part 1. Matching Criteria

A. Possible Inclusion Criteria

1. Book medium (Disk, Cassette, Large Print, Braille, Double-Vision)
2. Subject (e.g., insurance) and type (e.g., mysteries) terms (or codes)
3. Reading level
4. Language
5. Books in series

B. Possible Exclusion Criteria

1. Borrower acceptance of staff or system selection.
2. Content characteristics (e.g., contains violence, explicit sex)
3. Borrower has already read (determined from a record of "Has-Had" information)
4. Borrower has now (determined from a record of "Has-Now" information)
5. Narrator characteristics (e.g., male/female, accent)
6. Book length (long/short)

Part 2. Additional Fields To Be Used for Display
by Staff in Selection

1. Title
2. Annotation
3. Borrower Notes
4. Author
5. Narrator
6. Other titles on the same disk or cassette
7. Re-issue information (to select latest version of a re-issued book)
8. Number of requests currently pending for a book (to select books with good chance of availability)
9. Number of copies available for check-out

to envision staff procedures and system-user interfaces that are designed to enhance interaction with the information, e.g., through the provision of flexible and simple means for viewing selected amounts and parts of a given database.

Selection in Relation to Check-Out. Many of the systems that have been developed to date have been designed to provide automatic check-out, particularly in a batch process, of items for groups of borrowers. This processing can be done in the late afternoon or evening, for example, or on some regular schedule. These systems vary in terms of the role of selection within the check-out function. In some systems, selection is viewed as a separate function and is not linked in time with the execution of the check-out function. In these systems, the selection function is a means for generating, in advance, a temporary file ("bank") of items that have been selected--by borrower, by staff, or by the system, automatically--and that can be drawn upon at the time of check-out, when a particular individual or group of borrowers is due for service.

In other system implementations, automatic selection is viewed conceptually as one of a series of steps that comprise the check-out function. For example, when the automatic selection step is executed, only those items for which copies are available for circulation can be selected, within the framework of other selection principles that have been established. The available items are then processed through in the other check-out steps performed by the system.

These two models do not represent mutually exclusive choices but, rather, alternative ways of specifying the functions within a system and the interface between functions. In any given system, the selection and check-out functions may be designed to be executed both independently and in combination.

With the typical check-out program, the availability of an item must be checked before the item is assigned to the borrower and records of that assignment are made. Therefore, if a number of borrowers are waiting to receive a

certain title, the system must be programmed to follow a certain set of principles in working through the list of borrowers due for service. The choice of principles to be followed depends on the answers to questions such as these:

- Will a "Reserve" system (i.e., records of urgent requests that have been placed by borrowers) be maintained?
 - If so, will Reserves be fulfilled first?
 - If more than one borrower has reserved a given title, will the available copies in each medium be checked out on a first-come, first-serve (i.e., date-order) basis, or on some other basis?
- In what order will the system perform check-out from the request and selection (referred to as a Request File) lists?
 - By borrower:
 - Alphabetically
 - By Borrower ID
 - According to service mode, e.g., Turn-Around Service Borrowers first, etc.
 - By title (or title, per medium):
 - First come, first-serve basis (according to date requested by borrower or selected by staff or system)
 - First those titles of copies that have been checked in, but not yet re-shelved, followed by titles, in some other order, that are in the Request File
 - Titles with the most number of copies that are available, in descending order
 - By some combination of these or other prioritizing schemes

These sets of choices raise a number of considerations and additional questions, some of which can be answered only by careful weighing of the likely impact on service of the choices made. For example, the automatic check-out program

ILLUSTRATIVE IMPLEMENTATIONS

In this section we provide synopses of three automated circulation systems. The systems illustrate various methods of file organization and processing steps. These mini-descriptions have been assembled to provide an overall understanding of how the various components--databases and functions--relate in the flow of selected systems. These particular examples also help to illustrate significantly different implementations. Additional examples, from these and other systems, are provided in Part III of this Guide.

The New York (Albany) System

Exhibit 18 contains a schematic representation of the databases used in, and functions performed by, the automated system in Albany, New York. The basic data used in this circulation system are divided into four datasets (files): the Patron Dataset, the Holdings Dataset, the Request Dataset, and the County Dataset. This system is one of a number of applications that operate on the State Education Department's Burroughs B7765 computer. The Library has 7 Hazeltine 2000 CRT terminals and a GE Terminus 1200 printer on-site for use by staff during normal daily working hours.

The Patron Dataset contains patron and institution profile information on all registered borrowers. The basic components of this information are as follows: (1) patron ID number, name, telephone number, birthdate, and date of registration; (2) address; (3) service information, including frequency, quantities, media, and machine ID numbers; (4) additional patron records containing data on reading preferences. The Holdings Dataset contains one record for each title in each medium. These records include information on the total number of copies owned and the number of copies that are on hand. The Request Dataset contains information on book requests categorized by three different types: (1) unfilled requests--items requested by a patron but not yet received; (2) filled requests--items currently in a patron's possession; (3) history requests--items returned by a patron. The most current three months of history information are maintained on

file for access by Library staff. The remaining information is stored on magnetic tape. The County Dataset is used in the verification of input of county information. Using CRT terminals, the Library staff enter additions, changes, and deletions. Valid records are stored on a disk for later offline updating of the database. All invalid records are reported in printed listings, arranged in order by CRT (terminal) number, for subsequent correction and reentry into the system.

The offline processing of these daily transaction records involves the following processing functions:

1. Changes processed in the Holdings Dataset include addition of new titles, adjustments for returned books--both damaged and undamaged-- and books checked out to walk-in patrons.
2. Changes made to the Patron Dataset include the addition, modification, and deletion of patron profile information.
3. Returned books are checked in by being processed against the Holdings Dataset. The status for a returned item is changed from "filled" to "history" in the Request Dataset.
4. The Patron Dataset is checked daily for such action items as patrons due for service, termination of temporary suspensions, and patrons with no unfilled requests.
5. Books are selected for check-out by matching patron requests against the available inventory information in the Holdings Dataset.
6. Mailing labels are produced.
7. Circulation statistics are compiled.
8. Various reports on the activities within the offline processing cycle are printed.

The check-out process begins with the identification of readers due for service, i.e., those that have just returned books. These readers are sorted by date of last service so that those with the longest periods are the first to receive service. Since the system relies on borrower-generated requests, most readers maintain very large numbers of requests on file. At any one time, however, a maximum of 126 requests are available for possible check-out. The remaining overflow requests are stored separately. Periodically, the current and overflow requests are merged, sorted by the last digit of the book number, and the first 126 requests form a current list. As check-out proceeds, a file of inventory change data is accumulated. The data are used to modify the Book File (e.g., to adjust the inventory count) when check-out is completed (see Exhibit 22). Punched cards that identify the reader and the book are enclosed in envelopes and placed in the containers of the appropriate items for mailing.

The processing of returned books (check-in) is accomplished in the following set of steps: punched cards are removed from the containers; these cards are read into the system and the data sorted by reader number; the returned books are removed from the readers' request lists and added to their history lists. If the maximum number of entries that can be accommodated in the History File is exceeded, the overflow items are printed offline, and the hardcopy is filed with other records maintained for each reader. The Book File is then updated to reflect the addition of returned books to the available inventory.

Similarly, to add new requests to the Request File, Library staff code the requests on coding sheets, and the information is keypunched onto cards. During processing, those requests that are valid (i.e., have valid book numbers) are added to the reader's request list. Invalid requests are listed for return to the library staff for correction and resubmission.

Because each transaction is recorded by a staff member on the appropriate coding sheet, it is easy for the Library to support walk-in borrowers. Books checked out to or returned by walk-in readers are processed during the same sequence as those that are circulated by mail.

The Pennsylvania Regional Libraries' System

The system used in both the Philadelphia and Pittsburgh Regional Libraries was developed by a consulting firm with extensive library experience. Each installation of the system utilizes a dedicated PDP 11/35 mini-computer with 96K of memory. Philadelphia operates 10 terminals and Pittsburgh, 9.

The basic data used in this circulation system are divided into these eight files:

- (1) The Patron File contains basic information on each borrower, including name and address, demographic data, reading interest profile data, and such service indicators as frequency, media, and quantities desired.
- (2) The Request File contains book requests made by or for each borrower. Each request is identified by a book ID number, date of request, and an indicator of the source of the request (borrower or library).
- (3) The Now-Has File covers all books currently checked out to each borrower. It includes the book ID number, date sent, copy identification, and a patron (P) or library (L) selection designator.
- (4) The Has-Had File lists all titles that each borrower has ever received.
- (5) The Bibliography File contains a list of titles for each of the 128 subject codes used to classify books and borrower subject interests. Each list contains the titles that have been assigned a given code.
- (6) The Machine File contains data on equipment that allow the library to keep track of the borrower to whom each item has been checked out, the sub-lending agency, machine status, and the most recent transaction date.
- (7) The Magazine File contains data on available magazines to support library distribution and direct distribution by publishers.

- (8) The Title (Book) File contains basic bibliographic information about each book in the library collection. Each record also contains subject and inventory information for use in the selection/check-out process.

The Request, Now-Has, and Has-Had Files are designed to contain any number of items, although the library staff can specify a maximum size for each one.

Library staff can add, modify, delete, or display records from any of the files described above. A table summarizing the function commands is given in Exhibit 23 and illustrations of the use of selected commands are shown in Exhibit 24. CRT terminals are used in both libraries, and the system operates in a line-by-line mode for all functions. Each maintenance function has a number of options and built-in safeguards to reduce errors.

In this system, the selection and check-out functions are combined and "selection" means the process of identifying and assigning books to be sent to borrowers. The system allows selection to be performed in one of three modes or in some combination of these modes: Request, Title-ID Input, and Profile. In the Request mode of selection (see Exhibit 25, section labeled A), the system attempts to fill outstanding borrower requests from the Request File by matching each request against the inventory of available books. (The borrower's exclusion criteria and Now-Has and Has-Had lists are checked at the time requests are entered into the system, through use of the REQADD command.) If there are no copies available for a particular item at the time of selection, the Selector may change a request into a reserve on behalf of a borrower.

In Title-ID Input mode (see Exhibit 25, section labeled B), the Selector keys in specific title ID numbers and the system attempts to locate an

Exhibit 24. Selected Examples of Interactions
from the Pennsylvania System

1. Adding a New Title

**** ADD TITLE ****

ENTER TITLE ID > RC15321

NEW RECORD BEING CREATED.

TITLE ID (ASCII) > RC15321

COPIES > 21:

CONTAINERS > 1

DISC/CASSETTES PER BOOK > 2

AUTHOR > RINESEN, ISAK

TITLE > WINTER'S TALES

PUBLISHER >

PLACE >

DATE >

REISSUE 1 > TB00299

REISSUE 2 > CB00299

REISSUE 3 >

REISSUE 4 >

REISSUE 5 >

REISSUE 6 >

REISSUE 7 >

STATUS > P

SUBJECT 1 > 37

SUBJECT 2 >

SUBJECT 3 >

READER'S NAME > DUNNOCK, MILDRED

VIOLENCE > N

SEX > N

STRONG LANGUAGE > N

LONG > N

SHORT > Y

MALE VOICE > N

FEMALE VOICE > Y

ADULT LEVEL > Y

YOUNG ADULT LEVEL > N

JUVENILE LEVEL > N

ACCENTS > N

GRADE LEVEL > 32

LANGUAGE > EN

RECORDING SPEED > 3

PROFILE SELECTABILITY CODE > Y

LC SUBJECT HEADINGS >

CLASSIFICATION # > FIC

#CIRCULATION YTD INDIVIDUALS >

#CIRCULATION YTD INSTITUTION >

#COPIES ON HAND > 20

COPIES LOST > 0

BRAILLE VOLS/COPY > 1

BRAILLE COPY # > 0

RESERVES > 0

ADD ANOTHER RECORD? > N

2. Modifying a Title

**** MODIFY TITLE ****

ENTER TITLE ID > TB00299

TITLE : LONE JOURNEY; THE LIFE OF ROGER WILLIAMS.

CORRECT RECORD? > N

ENTER TITLE ID > CB00299

TITLE : WINTER'S TALES.

CORRECT RECORD? > Y

ENTER ITEM # > 11

REISSUE 1 : 00000

**** ENTER NEW ITEM >>>> > RD\DC15321

ENTER ITEM # >

MODIFY ANOTHER RECORD? > N

1.0 BORROWER DATA ELEMENTS1.2 Service Profile Information

To achieve weighting or some variety in selecting a set of titles, e.g., to provide more mysteries than historical novels, several different approaches are used. For example, in the DRA system, a major or preferred interest area is represented in the list of codes more than one time, e.g., the code for mysteries is repeated several times, so that, after the system has processed all subject interest codes for selection, the selected items represent the numbers of repeated codes, e.g., more mysteries will have been selected. In the Pennsylvania system, a borrower's subject categories are processed in random order to ensure variety in the books selected for the borrower. To support staff selection in some systems, additional information on borrower interests is stored in the Notes field of the borrower database.

1.2.04. Exclusion Criteria

A special set of general content codes are represented in a field (or fields) of exclusion criteria—characteristics of books that are used to identify titles the borrower does not want to receive. Among the criteria used in one or more systems are: sex; violence; rough language; length of book (e.g., long or short); narrator (male or female); and narrator characteristics (e.g., foreign accent).

The most common ways in which these criteria are stored is in the form of Yes/No flags in a fixed set of positions. The number of exclusion criteria used among the systems ranges from 1 to 11.

1.2.05. Media

The standard book media included among the BPH library collections are disk, cassette, and braille; in addition, some also handle large-print books and/or reel-to-reel tapes. However, because all borrowers cannot

1.0 BORROWER DATA ELEMENTS

1.2 Service Profile Information

accept all media (e.g., because of their particular handicap or because of the equipment they have available), the designation of acceptable media per borrower is an important requirement.

Although a number of systems store media data through Yes/No flags in a series of fixed positions designated for each medium, other approaches are also used. For example, in the Alabama system, a set of two-character subfields is used, each of which represents one of the four media that Alabama circulates. A number in a given subfield (e.g., cassettes) identifies the initial quantity of books to be sent in that medium. This approach combines media and quantity data. In the Pennsylvania and DRA systems, status and activity data are carried in each medium field. For each medium, an indication of the borrower's service or status in that medium is provided: active; inactive; on hold; not wanted until requested; has never received before; deceased; hold; transferred; or removed.

In the Cincinnati system, a one-character field is used for storing one of the following codes, representing permutations of all possible options: 1 (disks); 2 (cassettes); 3 (disks and cassettes); 4 (braille); 5 (braille and disks); 6 (braille and cassettes); 7 (braille, disks, and cassettes), etc.

1.2.06. Maximum Number of Books Allowed

An administrative limit is generally set to establish a ceiling on the number of books that can be checked out to a borrower at one time. These limits are sometimes established to conserve storage. Unless a fixed amount of storage is actually allocated for various files, the systems generally permit a library staff member to override the limit on a discretionary basis. In a few systems, the maximum number of books is specified for each medium in which the borrower receives service. Most of the limits on the number of books permitted in circulation for a borrower are under 100.

1.0 BORROWER DATA ELEMENTS.1.3 Request and Reserve Information

Request data are stored for two main purposes:

- to keep track of which items a borrower has asked to receive
- to support automatic check-out from a set of pre-selected and pre-screened materials from which items can be sent as copies are available

In almost all of the fully operational systems, data on requests are stored in a "Request File" that is physically and logically separate from General Borrower and Service Profile Information. This approach is taken because General Borrower and Service Profile Information are more easily stored in fixed-length records, whereas borrowers' request lists are typically of variable length, and because the request lists are subject to frequent additions and deletions.

In six of the systems, provisions are made for storing and processing high-priority borrower-generated requests, generally known as "reserves." (In two other systems, this capability is being planned.) This capability is not provided in all systems because the philosophy of service in some libraries is that books should always be sent to borrowers on a first-come, first-served basis. However, in other libraries, the argument is made that, for a variety of reasons--school, work, research, or therapy--an individual may need to receive a book as soon as a copy is available.

Before discussing the individual elements of Request and Reserve Information, three considerations related to the storage of these elements need to be mentioned for context:

- Requests can be stored in the borrower database, as a list of titles selected by or for a particular borrower, or they can be stored in the book database, as a list of borrowers for or by whom a particular title has been selected.

1.0 BORROWER DATA ELEMENTS1.3 Request and Reserve Information

- The order in which titles are stored on the request list can affect the order in which they are processed during the check-out function.
- Request lists for books and magazines are stored together in some systems, while in others they are stored separately. An equipment request list that is accommodated in one system is also stored separately.

1.3.01 and 1.3.05. Number or ID of Item Requested/Reserved

For reasons of compactness and convenience of access, a book number (magazine issue number or equipment model number) is used in most systems to record a request or a reserve. For purposes of display, however, the library staff may require that the system also retrieve the book or magazine title associated with that stored number.

1.3.02 and 1.3.06. Date of Request/Reserve

The date on which a request or a reserve is entered into the system is used in several ways, including the following:

- to establish a processing order at check-out;
- to identify the oldest requests on a borrower's request list if periodic purging will be required;
- to assist in the identification of requests that have not been filled for some period of time.

The presence of large numbers of old, unfilled requests--determined through periodic review by staff or, preferably, the generation of periodic reports by the system--can indicate a potential problem in the system's circulation procedures or, possibly, the need to produce a greater number of copies for certain titles.

5.2 The system must provide assistance to staff members in the identification of potentially suitable titles for borrowers who have titles selected on their behalf.

5.2.1 The system must provide staff members with the means to review relevant borrower and book data in the process of their making selections for the borrower.

5.2.2 The system must perform automatic selection of titles, according to a set of pre-established principles, that are suitable for each borrower designated to receive automatic selection service.

5.2.1 and .2. Computer-Assisted Selection

We have presented requirements in this area for two different roles that can be specified for a system. In actual fact, any number of variations on these two roles can be specified. As discussed earlier, in Part II of this Guide, the definition of "computer-assisted" involves specification of the degree to which the system performs automatically some or all of the operations to match data that represent a borrower's interests with data that represent the contents and characteristics of a book.

Among the possible variations in roles are these:

- A staff member must be able to review at the terminal some or all information contained in the borrower's interest profile and be able to request a display of titles and other selected book data in the subject categories of interest for review and selection.

5.0 BOOK SELECTION

5.2 Computer-Assisted Selection

- A staff member must be able to specify several criteria, e.g., subject, medium, reading/education level, exclusion criteria, for a given borrower or group of borrowers for use by the system in producing a subset of titles that can be displayed at the terminal for review and selection by a staff member.
- A system must perform the necessary matches automatically ("Automatic Selection") using multiple criteria from a borrower's interest profile to identify a set of suitable titles to be recorded for that borrower in a Request File (or assigned for immediate check-out).
- A system must perform all of the necessary matches automatically, using multiple criteria from a borrower's interest profile to identify a set of suitable titles that are then reviewed by a staff member ("Interactive Automatic Selection") for final changes or final selection.

The major data elements used in producing these manual (i.e., staff) or automatic matches are identified on the following page in Exhibit 45. These were discussed earlier in more detail, in Chapter 7. In Exhibit 46, we provide a sample interaction for automatic selection.

6.0 BOOK CHECK-OUT**6.1 Borrowers Due for Service**

6.1 The system must identify those borrowers due for service.

If several types of service are accommodated by a system (e.g., Turn-Around and multiple frequencies for Calendar Services), then more than one method may be needed for determining whether a borrower is due for service. For example, information may be captured and stored in the system on Turn-Around borrowers who have returned a book and are due for service the next time check-out is performed. However, for Calendar Service borrowers, the system must provide a means for staff to specify (and/or the system to identify) the subset of borrowers to be served during check-out. In one method, used in the Neoterics system, Calendar Service borrowers of a particular frequency (e.g., biweekly) are assigned to one of several service groups (e.g., B1, B2, B3, etc.) for that Calendar-Service frequency. The system operator specifies the group that is to be served when check-out programs are executed.

6.3 The system must make the needed number of assignments per borrower on the basis of priorities established by the Library.

There are two parts to this requirement: the number of books to be assigned and the order in which requests are processed at check-out.

6.3.1. Numbers of Books

The number of books that are to be assigned for check-out to borrowers is generally subject to some constraint: the maximum (or minimum) number of books that a borrower wants to have at any one time or the maximum number of books that the library allows a borrower to have at one time. These constraints can vary within a library by borrower or by service type. For example, with Turn-Around Service borrowers, the number of books to be sent at a given time matches the number of returned items, unless provision is made for some exception. For Calendar-Service borrowers, a minimum, a maximum, a fixed or a per-borrower variable number can be established and stored within the borrower's record. However, a limit in the number of books that a borrower can have at one time needs to be established for Calendar-Service borrowers, to ensure that some items are being returned while others are being mailed.

In many systems, options are provided for altering or overriding the standard procedures. For example, in the Colorado and Neoterics systems, the system user can specify, prior to the batch checkout run, the number of books an individual is to receive. In most systems that provide for interactive check-out, the system user has control over the number of books checked out to each borrower.

6.0 BOOK CHECK-OUT**6.3 Assignments and Priorities**

A major consideration in this requirement area is the need for the numbers of books to be associated with each of the media appropriate for a given borrower. For example, serious consideration needs to be given to whether the system will make a medium-for-medium replacement for Turn-Around Service borrowers.

Another consideration in this area is the need for the system to provide feedback to the library staff, interactively at the terminal or in the generation of a listing, to identify those borrowers who were not assigned the expected number of items. In some systems, this problem will automatically trigger the run of automatic selection; in others, a report is generated for staff review and followup action. In the Neoterics system, the listing that is produced includes: the borrower's name and ID; the number of books expected and the number actually assigned, per medium; and the reason expected service was not achieved (e.g., there were not a sufficient number of titles in the Request File; or the borrower had reached the established maximum).

6.3.2. Priorities in Processing

As discussed earlier in Part II of this Guide, there are a number of priority schemes used in the assignment of available copies to borrowers in automatic check-out. Some of the principles established in these systems are summarized below.

- In systems that accommodate "reserves," these are generally processed first, on a first-come, first-served basis, by borrower, for each title.
- In systems that draw upon a Request File at check-out time, these per-borrower orders are among the ones that are used:
 - Service type order (e.g., Turn-Around Service borrowers first)

6.0 BOOK CHECK-OUT

6.3 Assignments and Priorities

-- Alphabetical order

-- Borrower ID order

- In systems that draw upon a Request File at check-out time, but that also draw upon data in other files to derive a per-title order, the following orders are among the ones that are used:

-- Titles that have been returned (checked in) but not yet re-shelved

-- Titles that have the most number of available copies, in descending order

-- First-come, first-serve basis (according to the date requested or selected)

In many systems, some combination of these or random-order approaches are taken.

6.4 The system must execute updates to the appropriate system files, to reflect changes in the status of data in the book inventory and borrower records.

Among the files in the system that will need to have some modification made to their records, on the basis of the check-out operations, are the ones identified below.

- Borrower's Has-Now File. The book number (or copy number) of the assignments and the date of the assignments will need to be added.
- Book Record. The number of copies checked out will need to be incremented and/or the number of copies available for check-out decremented. The number of times a copy of the book has been circulated (e.g., month-to-date and year-to-date statistics) will need to be incremented.
- Copy Record. If a copy record is maintained, the borrower ID and date of assignment will need to be added and the number of times the copy has been circulated will need to be incremented. The copy status will also need to be changed to "unavailable."
- Borrower's Has-Had File. If not handled later at check-in, the book number and date of assignment (optional) will need to be added to this file.
- Borrower's Request List. The book number and date of request for each assignment will need to be deleted.

For particular implementations that use various other working files, additional changes may be needed.

7.0 BOOK CHECK-IN**7.1 Updates to Records and Files**

- It is permanently unavailable for check-out, because it was lost, stolen, or damaged beyond repair
- The status is temporarily not known, e.g., a mailing card is received by the Library without the accompanying container.

In records maintained at the per-medium title level, one or more of the following changes will need to be made: decrement the number of copies checked out; increment the number of copies in repair; increment the number of copies available for check-out; take no action on returned copies for which the status is not known; decrement the number of copies owned for a given title, to reflect those lost, stolen, or otherwise not available; and increment the number of copies that have been stolen, lost, damaged, etc.

In systems that maintain copy-level data, the following changes will be needed: delete the borrower ID from the copy record; change the status of the copy to the appropriate indicator (e.g., available for check-out); and record the date of check-in.

Borrowers Due For Service File

The return of a book from a Turn-Around Service borrower should trigger some action in the system to indicate that the borrower is to receive another book--i.e., is due for service again. In a number of systems, a temporary file is generated of borrower IDs for those who are due for service. In other systems, where returned items are processed one at a time, in an online mode, the system user can serve that borrower immediately.

CHAPTER 9.

CONSIDERATIONS FOR DATABASE-RELATED OPERATIONS

In the following sections, we address requirements that are related to operations that must be performed on and from the stored data (the databases and files) that have been described earlier, in Chapter 7. In these sections; we cover the following requirement areas:

- 8.0 The system must give the system user access to data contained in the stored databases and/or files.
- 9.0 The system must provide for the display of information contained in the databases and/or files.
- 10.0 The system must provide for the creation of new records and the updating of existing records by the system user and the system for each of the databases and/or files in the system.
- 11.0 The system must provide for the generation of statistical reports and organized listings.

Requirements to cover the operations encompassed in these four areas need to be specified in terms of those actions that are to be taken by the system user and those that are to be taken by the system, internally, in the execution of one or more of the functions outlined in Chapter 8. With certain exceptions, both of these aspects are covered in the following sets of requirements.

9.0 DISPLAY OF DATA

The display of a record can sometimes require more than one screen. For example, in the DRA system, a display of borrower data requires four screens. There are important differences in the way in which different volumes of information are displayed. Two major approaches are used among the various implementations, to reduce the time that is needed for a system user to obtain a display of particular data elements with a record.

Screen Selection. The system user specifies the particular screen of a multi-screen record that is to be displayed. If, for example, a borrower's subject interests are to be displayed, the request is made to view "screen three" of the borrower record, which is known by the system user to contain this element.

Field Selection. The system user specifies a field or a range of fields that are to be displayed. In the Pennsylvania system, for example, each field in a record carries a unique number. A selection of fields 2-12 of the borrower record for John Smith displays the following elements:

2-3	Borrower, institution name
4	Institution code
5-8	Address
9	County code
10	Telephone number
11	Birthdate
12	Service start date

Sorting is another method that is used to facilitate the location of desired information within a record or set of records. Sorting arranges a set of items in a specified order, e.g., by date or by ID number. The system user can take advantage of the ordered arrangement to advance to the screen that contains the desired information. For example, if a borrower's request list is arranged in book number order, the system user can quickly scan the list to determine if the borrower has requested a particular title. This type of

10.0 CREATION OF NEW RECORDS AND UPDATING

10.0 The system must provide for the creation of new records and the updating of existing records by library staff and the system for each of the databases in the system.

The system must permit staff members to add and delete records and to modify existing records in each of the four databases that were described earlier in Chapter 7. Proper database maintenance ensures that data in the system are as accurate and up-to-date as possible.

These databases are maintained by two sources: library staff and the system. In general, the system performs its maintenance operations during execution of selection, check-out, and check-in. Implicit in the set of requirements in this area, however, is the need for staff to be able to access and maintain almost all data elements in the databases. During the process of converting from a manual to an automated system, library staff are typically responsible for data entry, although a system should be able to support the generation of databases from data already in computer-readable form. Thereafter, when errors are detected in the databases, the staff must be able to delete or modify erroneous data. Finally, as borrowers initiate, terminate, or otherwise alter their service and items are added and removed from circulation, staff must be able to make the appropriate additions, deletions, and modifications. The requirement that authorized staff be able to take whatever actions are needed to maintain the integrity of the databases and effectiveness of the operations may lead, as well, to another requirement for security provisions. Such security measures, through special IDs or passwords, may be required to limit system access to certain staff members who are solely responsible for a certain set of functions.