

Transformation of Library Circulation System

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Abstract

Any library has the primary function to cater to the informational requirements of the patrons within minimum possible time. For this purpose, libraries acquire resources subject to financial constraints. No library can provide every document to every member out of its stock. The available stock of a library is shared by its patrons by borrowing books for a particular time and then to return in the library for others. With the passage of time and emergence of new techniques, the circulation system of library transforms accordingly. Libraries implemented the modern techniques to save the time of its patrons and to share its resources at national and international levels. The present paper is an attempt to discuss some of the important and widely used library circulation systems.

Keywords: Financial constraints; Informational requirements; Library circulation systems.

The primary aim of library is to acquire process, store, retrieve and provide relevant information to its users within minimum possible time. To make the reading easy, the libraries issue books and other reading materials to its patrons. Libraries take every measure in order to save the time of the readers in retrieval of documents so that the same can be borrowed by the users. If the users get the documents they want to borrowed from the library within few minutes they become dependent on the library for their study and research. The intensive use of information communication technologies has changed the scenario in all sphere of life. Libraries are not the exception of it. Libraries are also applying new methods to issue/return the documents to the users to make the system efficient and effective by exploring the use of information communication and technologies. For a

general user, the person sitting on circulation counter or the In-charge Reader Services sets the image of the library. If the users are tackled properly and he is satisfied with the library services, he will be back otherwise either he may be sufferer or use the services of the other library but he will keep the bad image for the whole life. Therefore the person involved in direct contact with users should be very cautious, knowledgeable and well mannered. Some time we find the situation differently as L. W. Dunlap viewed that librarians appeared to be more interested in acquisition and administrative problems than in ways and means to improve a library's services to the readers.[1] This observation does not apply to all chief librarians, but, insofar as it is true of some, it is indeed strange that use and service is not of greater concern because this should be the end result of all activity-ordering, cataloguing, binding.

When the users enter in the library for making library transactions, they must get their documents issued within five minutes. It must be kept in mind by the library circulation staff that these are the users (faculty, scholars or the students) for whom the library exists. If they are satisfied, a very good image of library will be prevailed in the organization & society and vice-versa.

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The fourth law of library science states that save the time of the users. Users' time is very precious and library must take every possible action to save their time. Open access system, proper classification, subject headings, updated catalogue (OPAC), proper shelving, early membership, sufficient and trained library staff in circulation system, helping hand of library staff are such measures which can save the time of the readers. An excellent circulation system is one which saves borrower's time, reduce recurring costs, provide proper information with regard to availability of books, status of books (issued or on shelf) and date of return (if issued to someone), number of books issued to a particular member, easy to calculate fine and finally allow circulation librarian to devote maximum time for qualitative professional work.

Major Library Circulation Systems

In the ancient time libraries were only for personal use of selected people. Since the libraries are opened for public use, many changes in library circulation systems were applied. Some of the major library circulation systems implemented, particularly in India, are discussed below:-

1. *Borrows' Register System*

In the early days when only few hundred readers were library members and they have to get the book issued from a very short collection of books, the register system was very useful. Membership can be given in a very

short time and record of library membership can be maintained very easily. A layman can do this job. In the closed access system, the reader gives a requisition slip to the library restorer who sends the book at the issue counter. Small public, school and college libraries of India have still using closed access system in vogue due to lack of staff. The institution issues Library- cum Identity Cards to its members and library reserve a particular page of borrows register to a particular member. When the user gets the book issued from the library it is recorded in the register and an entry is made in the Library-cum Identity Card so that the user can remember the books issued to him/her and its due date of return.

However, this system is very easy but it has many difficulties which make the user dissatisfied. If a user doesn't find a particular book on shelf and wants to know its status, the library staff cannot reply immediately as they are not confirmed whether the book is wrongly shelved in the library or it is issued to any member. If so issued, they are again unable to tell to whom the book is issued. To reply for this query, they have to check from all pages of borrower's register. The columns of the register may differ from library to library but the common columns are shown below:-

2. *Readers' Ticket System*

Now libraries are generally using open access system in big libraries, particularly university libraries and big college libraries. The users select books from the shelves in an open access system and bring it at the issue counter. In

Table 1: Specimen of Columns of Borrows' Register

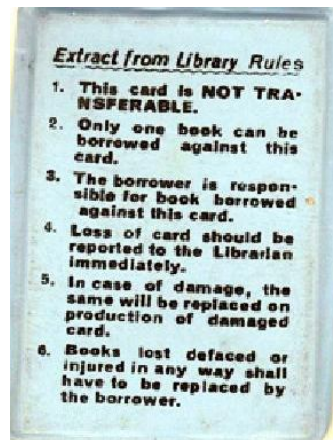
Name _____ Borrower's Card No. _____ Class or Designation _____

Sr. No.	Author	Title	Acc. No.	Borrower's Signature	Date of		Signature Lib. Asstt.	Fine, if any	Receipt No.	Libn's initial	Remarks
					Issue	Return					

Figure 1: Reader Ticket (Front Side)



Figure 2: Reader Ticket (Reverse Side)



readers' tickets circulation system, the library issues readers' tickets to its members as per the loan privileges to various categories of library members. Library readers' tickets has the information with regard to name, class, department, validity of tickets, roll numbers etc. of library members. The figures 1 and 2 below are the pictures of front and back sides of the readers' tickets.

Likewise, every book has one book card inserted in a book pocket. Book card has the information with regard to author, title, accession number and classification number. At the time of any library transaction, this book card is taken out of its pocket and inserted in the readers' ticket and whenever this book is returned in the library, the book card is again inserted in its pocket and the book is re-shelved at its place for future use by any other member. The specimen of book card and book pocket is shown in the figures 3 & 4.

Figure 3: Book Card

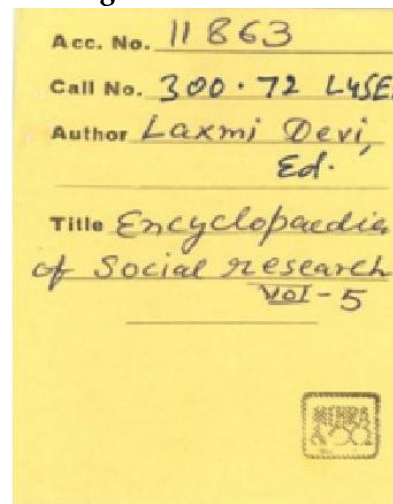
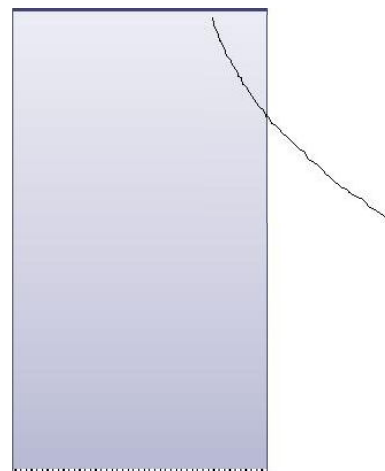


Figure 4: Book Pocket



Charging Method

As and when, readers want to borrow books from the library, they produce library ticket(s) at the counter alongwith the books that they want to borrow. One book can be issued against one reader ticket and if a reader wants 3 books at a particular time, he/she has to surrender 3 tickets. The counter official, after identifying the reader, takes out the book card from the book pocket of the book and places it in the reader's ticket and stamps due date on the date slip and hands over the book to the reader. The book cards placed in reader's tickets are arranged in the charging tray behind a date guide card either by Accession Number or by Call Numbers. The library member shows the issued book(s) to the Janitor at the gate who checks that the book(s) has/have been issued

properly and tickmarks the due date on the date slip.

Discharging Method

As and when, the readers return the issued books at the library circulation counter, the counter official, after ascertaining the due date, picks out the concerned book card and places in the readers' ticket from the charging tray, collect overdue fine against receipt (if any on overdue books) and crosses the due date on the date slip, returns the reader's ticket to the reader and places the book card in the book pocket. The attendants and book restorers lift the returned books from the circulation counter and shelve them at their respective places in the racks enabling the other readers to locate the book at right place.

If any member wants to get the already issued book reserved for him, a reservation ticket (bearing the name and address of member) is inserted in the reader's ticket and on its return, the member who requested for reservation is informed to get the book from the counter. When the book is issued, the counter official take out the reservation card and places the book card in the readers' ticket.

Advantages

1. This system is very easy and takes very less time in library transaction.
2. No need to get the signatures of the members.
3. Daily/monthly or yearly statistics with regard to issue & return is easy.
4. Reservations for already issued books can be done.
5. Reminders can be issued without loss of time since no other record except date guides of the charging tray are required to be consulted for this purpose.

Disadvantages

Some disadvantages are also experienced in this system but these are so minor that these do not take away the utility of this method.

These disadvantages are as follows:-

1. It cannot easily be ascertained as to with whom a particular book is issued and when is it due.
2. No permanent issue record is available and there is always a danger of loss of cards.
3. There is a danger that the reader's ticket alongwith the book card can be filed under a wrong date guide card which will be responsible for causing delay in discharging the books and the work may be help up for some time.
4. If a wrong book card is slipped in a reader's ticket it will be difficult to verify as to whom a particular book is issued since no other record is available.
5. This system takes lot of space for keeping the issue records.
6. In big libraries, the charging trays sometimes become unmanageable due to huge transactions.
7. It is not possible to know as to how many books and which books have been issued to a reader at any particular time.
8. It is difficult to trace a particular book since the book cards alongwith the reader's tickets are arranged primarily by date and so it takes time to locate a book.
9. Reservation of books is difficult as first it has to decide when and to whom the same has been issued.
10. There is a danger of misplacement or loss of the book cards and readers tickets.
11. There is no record as to whom the book was issued previously. This information may be required in case the book is found damaged after it has been returned. To overcome this problem, membership number can be written near the due date.

In spite of various defects, this system became very popular not only in India but also in many developed and developing countries. If the suggestion about the arrangement of charged card in a classified order is followed,

most of the subject and book enquiries can be answered easily.

3. *Automated Circulation Services*

The biggest problem in manual systems of library transactions is that it is very difficult to know that whether a particular book which is not available on shelf is issued to any member or misplaced one. This problem is eradicated in automated circulation system. The other main benefit of automated system is that readers' tickets need not to be arranged at the end of the day. The automated system requires the following:-

Hardware

- Server
- Computers
- Printers
- UPS
- LAN
- Barcode scanner.

Software

- Operating systems for
 - o Server - Windows, Windows NT, Linux, Unix etc.
 - o Computers – Windows XP, Windows Vista, Windows 7.
- Library housekeeping software
 - o Proprietary software
 - o Open source software
 - o Indigenously developed software

Human-ware

Personals skilled enough to work with computers can provide efficient library services in an automated environment. Training may be provided by the software / hardware suppliers, big libraries, and library professional associations. Training is also provided in the seminars and workshops organized by the

libraries.

Only registered members of the library are entitled to borrow books against their membership card. Prior to give library membership, the necessary parameters of various categories of users, as per defined library rules, should be set up.

To obtain membership, patrons have to submit an application form duly signed by the chairperson/ branch officers of the concerned teaching departments/ branch. The complete information of a member is entered and thus a database of library members is created. The library provides bar-coded library card to its members against signature. All the activities related to the users such as membership, issue, return, renewal of books, fine collection etc. are undertaken by the circulation section.

The detail provided by the students for library membership, having address, phone no. etc. is entered in the already set format of the software. This is a one time process to create the members database.

Check-out Process

In an automated library circulation system the use of computer systems and library application software is used. Patrons check the location and status of required books on OPAC and present the books to the person working on the circulation counter. The bar code pasted on the membership card is scanned and the information about the member along with the photo is appeared on the desktop of the computer. The software ask to enter the number of the book to be issued and the bar coded book is scanned by the counter official and on a single click the book is issued to the user. A print out of the issued book is generated and the user is asked to check the particulars of books issued and to sign the gate pass. The counter official counter signs the gate pass from where the user proceed to come out of the library gate and present the books alongwith the gate pass to the janitor who checks the particulars and allows the users to take the documents out. In this way, unlike the readers' ticket system, the library take

signatures of the members on the gate pass as a proof. The main benefit of this system is that the library need not to arrange the tickets at the end of the day and all the record is updated automatically in the server from all the client nodes.

Check-in Process

The library users are supposed to return the books within the time period as allowed by the library failing which they may have to pay overdue charges which varies from library to library. When the users want to return the books, they present the book to the counter official who enters/ scan the accession number and the details of the issued book appears on the screen and just clicking on the process button the book is returned from the data base. In case a book is overdue, the software shows the detail of amount to be paid by the member before processing the check-in of the document. In this way all records are updated automatically including calculation of overdue charges. In the check-in process, there is no need to enter the library membership number and it appears automatically when the accession number of the document is entered/ scanned.

Renewal Process of already Issued Book

Many times users want to re-issue the books for further term. The library may allow to them only in case if that book is not reserved by another member. If the book is reserved by any member, library inform to that member to borrow books either on phone, e-mail to through a letter. But in the event the book is not reserved, the official scans the accession number and the book is processed for renewal. A gate pass is generated, signed by the user and counter official and the janitor checks the gate pass and allow the member to take the book out from the library. In this case also, the counter official need not to enter the membership number which appears on the screen automatically but it is advised to check the identity card physically.

The automated circulation system helps in

generating many reports on members, collection, transaction etc. which otherwise is not possible. Users check the status of documents and their account. There is provision of automated generation of reminders for overdue documents which saves the time of the counter officials. It is also possible to keep the history of a issued book or a particular member.

Computer based circulation system has its own advantages and disadvantages.

Advantages

1. All library operations are integrated and library staff need not to visit another section to get information. Instant data are modified in the server for the use of library staff and users.
2. Allotting membership and generating membership cards alongwith member's image is very easy and quick. Moreover, keeping and updating membership record is not a problem at all.
3. Once the data related to member and books are entered, it can be used in all sections which help in avoiding duplication of work. i.e. once the information of book is entered in the catalogue, it automatically generate the added entries. More so, there is no need to arrange the catalogue cards in the catalogue cabinet, as in case of manual cataloguing system. Likewise, there is no need to arrange library tickets as in case of manual readers ticket system for lending books. Once the setting in the software is made, it processes the data accordingly.
4. Searching in online patron access catalogue (OPAC) is more easy, fast, exhaustive and user friendly. Addition entries are arranged automatically. An updated catalogue helps in saving the precious time of library staff and users.
5. It is possible to keep the history of a book (number of times issued) and member (which books got issued for how much

time, fine paid etc.). Many reports can be generated, such as- who has given the membership at what time, who has issued and returned a particular book at what time, total number of books issued, returned & renewed in an hour, day, month or year, how much fine is collected, which books are overdue to which members etc.. Such facilities in manual system are not easy or even not possible.

6. Users can check themselves the status of issued books. They can check the fine applicable for overdue book and on the OPAC they can check the status of the book-whether available in the library or issued to someone else, if issued- what is the due date of return. Library members get more satisfied with automated library services as they can get the desired information themselves very easily, pinpointedly and quickly.
7. It is possible to know to whom the book was issued previously. This information may be required in case the book is found damaged after it has been returned.
8. Reservation of books, which was a very tedious and cumbersome job in manual systems, is now very easy in automated system.
9. Reminders for all overdue books can be generated automatically by just pressing two three buttons. This facility has saved a lot of time of library staff.

Disadvantages

1. An automated circulation system requires huge investment in the form of hardware, software, stationary, training etc. However this investment is non recurring. Once the systems are installed, the recurring cost is not so high.
2. Working on a specialized software requires good training. The senior staff working in traditional systems usually may not opt automated system seriously or sometime they may resist to change.

Shifting from manual to automated system requires motivation and willingness.

3. The library staff, particularly those who is about to attain their superannuation age, generally resist to change and want to continue with the traditional manual system.
4. Lack of standardized software is another big problem being faced by the library professionals. The software which are working well are very costly and they also charge 12% to 20% of the total cost of the software as annual maintenance charges.
5. If a library wants to modify the software as per their requirements, the vendor charges very high cost for it.
6. If the server collapse or software start malfunctioning and the backup of the data is not taken properly, then there is fear of loss to library. As a part of disaster management, the data backup should be taken regularly and one of its copy may be kept out of the library.

4 Radio Frequency Identification (RFID)

Auto identification is often coupled with automatic data capture. The organizations want to identify items to capture information about them and to get the data into a computer without having employees. The aim of most ID systems is to increase efficiency, reduce data entry errors and free up staff to perform more value-added functions, such as providing customer service. There is a host of technologies that fall under the auto-ID umbrella. These include bar codes, smart cards, voice recognition, Optical Character Recognition (OCR) and Radio Frequency Identification.[2]

Radio Frequency Identification is a generic term for technologies that use radio waves to automatically identify an object. There are several methods of identification, but most common is to have a unique identification number that identifies an object, and perhaps other information as well on a microchip that

is attached to an antenna. The antenna enables the chip to transmit the identification information to a reader. The reader converts the radio waves reflected back from the RFID tag into digital information that can then be passed on to computers that can make use of it.[3]

How does RFID System Work?

An RFID system consists of a tag made up of a microchip with an antenna, and a reader with an antenna. The reader sends out electromagnetic waves. The tag antenna is tuned to receive these waves. The chip then modulates the waves that the tag sends back to the reader, which converts the new waves into digital data.

Basics of RFID Technology

RFID technology uses the electromagnetic spectrum radio signals to transmit information from a transponder (tag) to a receiver for purposes of identifying items. Kern enumerated the following three basic capabilities of modern RFID-system:-

- Signals are sent through non-metal materials (there is no line of sight necessary as with a barcode)
- Many transponders can be read at the same time (e.g. a stack of books);
- Some specific information can be read from the transponder and also be programmed (e.g. the checked in or checked out status)[4]

The RFID system entails the following:-

RFID Tags: The vast majority of RFID tags use a silicon microchip to store a unique identification number and usually some additional information. There are two broad categories of RFID tags – *active* and *passive* tags. Passive RFID tags do not have a transmitter; they simply reflect back radio waves coming from the reader antenna. Active tags have their own transmitter and a power source, usually – but not always – a battery. It

broadcasts a signal to transmit the information stored on the microchip. Active tags are used on large assets, such as cargo containers, rail cars and large reusable containers, which need to be tracked over long distances whereas passive tags have a much shorter read range than active tags.

Readers: RFID readers are basically used to read information stored in the tags. The reader powers the antenna to generate a radio frequency field. As and when a tag passes through the RF field, the reader decodes the information contained in the tags and sends it to the server. Readers are available in the market in various shapes, sizes and price depends on their respective features and functionality. Modern RFID readers have Ethernet, Wi-Fi or USB ports. As per the convenience, Readers may have internal or external antennas. Readers are of various types such as:

Hand-held readers used for shelf rectification, stock verification and finding misplaced book.

Reader used in Book Drop unit for self check-in facility.

Reader used in Detection system for controlling theft of library material.

Reader used in Self Check-in system to get the material issued by the patrons themselves.

Reader used in staff workstation for circulation facility.

Server: Server is the communication gateway among the various components connected with it. A servers is required to run middleware within a warehouse, distribution centre or production facility. Server receives information as and when read by any of the readers, and takes action accordingly with the database. To generate various reports, server uses a relational database.

Middleware: Middleware is a generic term used to describe software that resides between the RFID reader and enterprise applications. It's a critical component of any RFID system, because the middleware takes the raw data from the reader – a reader might read the same

tag 100 times per second – filters it and passes on the useful event data to back-end systems. Middleware plays a key role in getting the right information to the right application at the right time. There are many RFID middleware products on the market. Some middleware manages RFID readers other middleware may manage the data recorded in databases for enterprise applications to use.

RFID Required for Libraries Circulation System

The RFID technology has changed total scenario of circulation counter in the libraries. The chip of RFID Tag can carry not only the item number used by a library but it can also hold additional information such as the name of author, title and class number etc. which is not possible in other auto-ID system. Once the database of library collection and library users is created, the quality circulation services become more reliable, efficient and time saving. The saved time of library staff can be utilized for enhancing the quality of library services. The following circulation processes are undertaken by using RFID technology.

- I. *Check-out, Check-in and Renewal of Library Material:* The library creates the databases of users as well as of documents. In a library using barcode technology, they need to have a direct line of sight on the barcode affixed on document. The library staff repeats the same process to read the barcode of each document whereas the RFID system can read multiple tags at once for checking out many books to a single user. Likewise, the RFID reader, at the time of check-in and renewal of documents, can read many books. Thus the RFID system saves the time of the users and makes him fully satisfied with its service.
- II. *Self Check-out and Renewal:* With the help of RFID technology, readers can check-out the documents required by themselves. In an interactive station with touch screen, the users enter their card and after checking the validity of the member, users are supposed to place the

required document on to the deck of the station. The status of the checked-out document(s) is changed automatically in the library database i.e. documents are registered in the readers account and the theft detection system is deactivated allowing the users to take the document out of the library. A receipt may be printed out confirming details of checked-out material and due date to return in the library. The self check-out is as easy as ATM facility of banking system. This facility relieves the staff for other services and personal attention to the readers. When the library staff will provide the individual care and attention to the readers, the users' satisfaction level and the quality of library services shall be definitely on the higher side.

- III. *Self Check-in:* Likewise the check-out system, readers can check-in the documents by themselves. The users drop the document in the specified Book Drop Units through suitable slits. The status of the checked-in document(s) is changed automatically in the library database i.e. issued documents are returned from the readers account and the theft detection system is activated. A receipt may be printed out confirming details of checked-in material and balance documents due against the particular reader. The Book Drop facility allows patrons to return items 24 hours a day. Such units could work as remote kiosks placed at different suitable/convenient places in the Institute enabling patrons to drop the book without visiting the library. This facility saves the valuable time of the readers and enhances their satisfaction level and quality of library services.
- IV. *Automatic Sorting of Returned Books:* According to the check-in load, the library may install sorting systems with the Book Drop Units. These sorting systems place the returned books in specified bins according to Book Class Number automatically which not only

facilitate the staff in re-shelving of returned books but also save the time of the library staff.

In addition to the above stated advantages of RFID, there may be some other direct or indirect benefits of RFID system that are enumerated below:

- *Life Span:* RFID tags are last longer than barcodes as the technology does not require line-of-sight at the circulation counters.
- *Reduction in Handling Cost:* Once the RFID system is installed; it reduces handling/processing cost drastically.
- *Reliability:* RFID readers are more reliable than any other readers
- High speed inventory control and update of the data base
- RFID Technology is safe for magnetic media
- RFID is helpful in reducing the repetitive work
- Easy to search a misplaced book
- RFID Tags are rewriteable

Limitations of RFID

Some of the basic disadvantages of a modern RFID Systems installed in a library are enumerated below:

- I. *High Cost:* Because of its high cost, even the big libraries are not able to implement RFID technology.
- II. *Lack of Technical Knowledge:* One-tag overlays another by placing two items against one another. This requires adequate technical knowledge and due to lack of the technical knowledge there is always a fear of cancel out the signals.
- III. *Chances of Removal of Exposed Tags:* The affixed RFID tags inside back cover can be removed. Any mischievous user, who is familiar with the role of the RFID tags, can take the books out of the library

without getting it properly checked out. In the absence of RFID tag, the security gates will not raise alarm and the person holding the book may take the book out.

IV. Exit Gate Sensor (Reader) Problems: While the short-range readers used for circulation charge and discharge and inventorying appear to read the tags 100 percent of the time[5], the performance of the exit gate sensors is more problematic. They always don't read tags at up to twice the distance of the other readers. There is no library that has done a before and after inventory to determine the loss rate when RFID is used for security.

V. Reader Collision: If the coverage overlaps due to the signal from one reader interferes with the signal from another, is called reader collision. This problem can be solved by the technique of TDMA (Time Division Multiple Access). In this technique, the readers are instructed to read at different times, rather than both at the same time.

VI. Tag Collision: Tag collision starts with confusion of the reader. Tag clash occurs when more than one chip reflects back a signal at the same time.

VII. RFID Signal Failure: It becomes very easy for a mischievous person to take the material out of the library gate without properly checked it out by the following two ways— by tearing off the page bearing RFID label (in case of a book/ journal) and by wrapping the material under multi folds of wrapping foils (in case of audio/video cassettes, CDs, DVDs etc.)

VIII. Lack of Standard: Different vendors supply different RFID tags to the libraries. They follow different standards for the RFID, which are not compatible. The pattern of encoding information and the software that processes the information differs from vendor to vendor.

Conclusion

The time of the patrons is now considered as most precious which must be saved enabling them to use for teaching and research. Libraries, since inception, are devising more and more advanced methods to provide better library services in order to make them more satisfied. The shift from traditional manual to modern automation and using RFID technology in libraries shows the dedication of librarians to their profession. In the present age, the development of any society is highly dependent on information management. The purpose of making use of modern technologies in circulation section is to save the time of patrons and to enhance the quality of library services. Time has now gone when the quality of library is judged by its collection size, space, staff and budget etc. If the libraries are having all these things but its users are not satisfied, then there is no quality. Cook and Thompson rightly opined that the quality of a library has traditionally been measured by its collection size and various counts of its uses.[6] It has long been argued that library users must be involved in the evaluation process in order to obtain valid and acceptable results. In the competitive age, libraries are under pressure to evaluate its services and take appropriate

actions to enhance the quality of services, wherever required. The emphasis on these measures of services provided to library clientele requires librarians not to equate "quality" merely with collection size. The effective and hi-tech library circulation system, alongwith ICT based library services can make the users more satisfied and dependant.

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