

Self Circulation using RFID Technology with KOHA Software at St. Xavier's College, Kolkata.

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Abstract:

St. Xavier's College Central Library has installed Radio Frequency Identification (RFID) technology based kiosk for self circulation through open source library management software KOHA. This technology is also improved library annual stock taking, ensure foolproof security and access control i.e. circulation management. This articles briefly describes why our library switch over from barcode based circulation to RFID based circulation, SWOT analysis of RFID technology, self-circulation using RFID technology, types of problem faced during implementation of the new technology and possible remedies. Lastly, the conclusions are drawn based on SWOT analysis.

Keywords: RFID, Barcode, SWOT

1. Introduction:

St. Xavier's College Library was first automated in the year 1992 using the library automation software LibSys. In the year 2004 the software was upgraded to LibSys-4 and barcode technology was also implemented. The barcode technology was integrated with LibSys for circulation of books and stock verification purpose. Due to some limited features the barcode technology and LibSys-4 were replaced with RFID technology and open source library management software koha in the year 2014.

The library currently has about 68,000 books. On an average the number of daily transaction is 750+. RFID tags and stickers with St. Xavier's College logo are affixed in each book both reading and lending books. Details of the book are encoded to the RFID tags through RFID station and library management software koha. An automatic circulation system (Kiosk) has been installed near the circulation counter to facilitate self issue and return of books by the user themselves. Two staff stations have been installed in the lending counter for issue and return books by the library staff members. Another station is installed in book processing section for updating information from koha software and to replace any damaged tags in books. One RFID based hand held reader is also used to identify particular book or locate misplaced books. This facility can be used effectively for stock verification purpose also.

2. Problems faced using traditional barcode based circulation:

The main reason why St. Xavier's College Central Library wants to replace the barcode based circulation system with the new RFID technology is that it significantly increases

the efficiency of circulation services and inventory operations. Traditionally, the library staff at the circulation counter would need to use a handheld barcode reader to read the information on the barcode of each borrowed item. The RFID technique simplifies the circulation process. The information related to borrowed items are encoded and stored on RFID tags and the radio frequency can transmit information on the tag instead of just reading the traditional barcode in “Line Sight”. The system can identify large quantity of information through built-in chips and the remote sensor can retrieve the information immediately. The problems faced during circulation using barcode technology were:

- Long duration to process the issue and return.
- Poor inventory accuracy of barcode technology
- Lacking in fast and reliable stock verification.
- Lacking in effective control over circulation work flow.
- Inefficient shelf rectification.
- Barcodes are not reusable while RFIDs tags can be reused.

3. Self – Circulation RFID based technology Kiosk:

The kiosk comprises of RFID reader also known as sensors, smart card reader, LCD touch screen monitor, auto cutter thermal slip printer, Orizin RFID software and koha software. Patrons who want to borrow book(s) can themselves issue books using RFID based kiosk [Fig 1.]. Kiosk is an interactive station with touch screen facility. Patrons have to scan his/her library membership card on the card reader after successful authentication the patron will be redirected to select options like issue, return or reissue. Patrons planning to issue items will be required to place the desired items on the RFID reader affixed on the kiosk. Then the patron will be required to select the check-out button on the kiosk console. The check-out process completes after successfully logging out of the system. Similarly patrons who want to return the books have to simply keep the books on the kiosk reader and select the check-in button, the system will automatically record return of books. For every transaction printed receipt are generated and system also sends confirmation mail.

4. Security Gate Antenna:

Security gate [Fig 2.] has been installed near the entrance gate of the library. If any users try to carry a book through the gate without proper transaction, the system will make alert sound and also draws attention to the security staff by blinking red light. These security gates constantly identify non-deactivated books passing through the gate. If patron brings their own books for reading purpose in the library, they can cross the gate without any hassles but they cannot enter with lending books which one already issued, for reading purpose.

5. Advantages of RFID Technology:

RFID technology is a boon to the librarian as well as its users. It makes the work of librarian much easier, and save the time of the users. It has following advantages:

- As human interference is less it reduces the cost of manpower also.

- Rapid check out / check-in facility.
- Independent self check-out/check-in by patron through kiosk.
- Minimize the time of the users as well as library staff during circulation.
- Minimize the expenditure incurred on counter and library staff during stock verification.
- Highly reliable than barcode.
- Provides effective and efficient theft detection system.
- RFID tags are reusable comparison to barcode sticker.



Fig: 1 Self – Circulation Kiosk



Fig: 2 Security Gate Antenna

6. Limitation of RFID Technology:

Though the RFID technology is having enormous advantages it has also many disadvantages as stated below:

- High cost (Cost of each tag around Rs.17)
- Possible to block the radio signal by any metallic content by the users
- Easy to remove the tags from the book
- Exit sensor may create problem during power failure, lightning or if the book passes through the side of the pedestal, which is out of the range of the antenna.

7. Problem faced during installation and possible remedies:

7.1 Online keyboard on touch screen and printer:

Initially online keyboard was installed on touch screen. But it takes more time to enter user ID for authentication of the user and the users are standing in queue. Software can not identify the valid user. To solve this problem a fixed scanner is installed in the kiosk and bar-coded college ID is used for scanning member information. Transaction slips are generated from thermal printer, after 10 to 15 days the slip become useless, nothing readable and very difficult to solve any transaction related problems. Using auto generated e-mail services we can solve the problem. Sometimes user forgot to stamping due date in the books, always one staff require for stamping due date.

7.2 Problem of fixing RFID tag:

During scanning the books using staff station reader, sometimes the information of the book was not capturing due to duplicate barcode found or damaged tags. Distance between staff station and other books are properly maintained and remove the damaged one. During removing damaged tags sometimes new books also damaged. If we re-write tags sometimes it shows old books information, in that case we remove old books information and reuse the tags.

7.3 Problem of RFID gate:

During testing period, it was found that the gate was unable to identify some books. After checking the system it was found that the frequency of RFID gate was not properly adjusted and distance between two pedestals was not properly maintained. The gate was reinstalled and the distance between two pedestals was adjusted. In our library one gate used for both entry and exist purpose, during rush hour the security gate sometimes are not working properly. Faculty member can borrow eight books at a time, in that case if the gate identifies any non-deactivated books passing through the gate then very difficult to identify particular book.

7.4 Problems of the software:

When the self check-out / check-in was started for all the users it was found that in case of overdue books the system is indicating fine amount but when books are return through kiosk fine amount write / wave off. Finally the software was customized and the system is running in full swing. When items are issued through kiosk sometime other books kept in the shelf also capture, now the kiosk shifted from the shelf area and solve the problem. During issue through kiosk system can not identify the same title also. During return items system cannot identify the damaged return items and users who borrow the books i.e. student can return friends books using his card; hence in our library all the items are return through staff stations only. Sometime users forgot to log out from the current session; in that case next user can borrow books in the name of previous user.

8. SWOT Analysis:

SWOT [Fig 3.] method is used to evaluate and analyse the Strength, Weakness, Opportunities and Threats on RFID based self circulation technology at St. Xavier's College Library.

Strengths:

In barcode based circulation all books scanned individually but RFID technology all books are scanned at a time, it reduces the time. RFID improves the self-circulation efficiency and saves the patron's and staff's time. It fulfils 4th law of library science theory i.e. save the time of the reader proposed by S. R. Ranganathan. Periodically stock taking or locating the miss-shelved books can be a very time consuming and challenging task in barcode based technology. However, the problems can be easily solved by the use of handheld reader. Staff daily routine work and the labour intensity

are reduced because more patrons prefer to self-check in/out the books, using RFID based kiosk. RFID is also used in library theft detection purpose also.

Strengths Speedy self-check out/in Improves efficiency Reduces staff daily routine work Theft detection	Weakness No global standard High costs Lightning, metal and water interruption
<div style="border: 1px solid black; border-radius: 10px; padding: 5px; display: inline-block;"> SWOT </div>	
Opportunities: Developing uniform standard Prospect for development	Threats: Job security Small libraries cannot afford the cost

Fig: 3 SWOT Analysis of RFID Technology

Weakness:

There is no universal standard for this technology and every country can set its own rules. As a result, the library in one country may not share its resources to another library due to its incompatibility. Though the price of RFID tags decrease every year, in general the system equipment, tags price and the maintenance costs are still relatively high for most of the libraries in India. Since the RFID technology is not mature enough, lightning, metal and water can interrupt the frequency of the chips.

Opportunity:

The main opportunity is that many RFID standards are still being developed and constantly being updated. Due to its unique features its application is adopted in various commercial fields also.

Threats:

Since the technology requires minimum human resources, the library staffs may fear about their job security. Small library could not afford the cost of the RFID technology.

9. Conclusion:

Integration of RFID technology with open source library management software Koha has ensured considerable security and it facilitates value added services to the user community of St Xavier's College library. Though it is costly, in the long run RFID applications will lead to significant savings in staff cost as well as enhance the service quality of the library. It will also provide effective results leading to fool proof security and access control. This technology will ensure better stock verification and circulation management which leads to better library services. By implementing RFID technology

in the St. Xavier's College library, the patron's self-service efficiency can be greatly improved and the staff's work load can be effectively reduced.

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