ESSENTIAL OF RFID IN LIBRARY MANAGEMENT - A VIEW

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Abstract
The paper concentrates on the essentials of RFID in library management. The authors say that library is a pool of resources and the emergence of various IT products for library collection management has bought library to apply the security of the resources in all forms along with equipments. The paper highlights that the RFID is the unique identifier of the object, works better. Further the paper shows the first RFID in libraries in world, and also about RFID library management, advantage and so on.

INTRODUCTION

Today security of the resources in the society is a vital issue. Every individual as a resource of the society has an obligation to safeguard his belongings. At the same time, an individual also tries to take care of the societal value systems. In addition to this, various organizations, institutions in the society are under constant pressure for the safety and security of their resources. Libraries, as important institutions for human development, advancement and progress in the society are no exception to this. The century old library development process itself reflects the various security measures to safeguard the library resources but still this institution is subject to a wide variety of security concerns including theft and mutilation of library materials.

The malpractices of users based on this dictionary definition refer to the evil or improper acts of users which they display as they use the library. It means the selfish acts users carry out the benefit themselves at the expenses of the other users of the library. Such acts includes book theft, mutilation/defacing of materials, hiding of materials extended borrowing, over borrowing, theft of users items misuse of catalogue etc.

1. This is an old and a universal problem. In 1896, more than a century ago, the sixth Librarian Congress, Ainsworth Rand Spofford, commented in all great libraries, and in
many smaller ones, there are continual depredations, cutting from newspapers by unscrupulous readers.

2. Chambers English Dictionary defines malpractice as: An evil or improper practice: professional misconduct treatment falling short of reasonable skill or care: illegal attempt of a person in position of trust to benefit himself at other cost.

It is true that the library is a pool of quality resources and library staff has made concerted efforts to select, process, shelve and promote resources to benefit library users. Traditionally library security has been a matter of devising safeguards in reaction to specific losses. Especially when we think of library security, it applies to the security of resources in all forms along with equipments. It may include security of library collections, bibliographic and patron records, employees and readers as well as overall aspects of the building. Today very few libraries can afford to use technology driven security solution and almost all the libraries are in search of proper solution to this problem. Whatever may be the type of library, collection security has always been given a top priority by the Librarians.

Library collections are at risk under following conditions:

- Theft and vandalism
- Mutilation of material due to careless handling
- Poor environmental conditions
- Natural disasters like flood, earthquake etc
- Virus attack on digital data

The library was earlier considered as storehouse of knowledge and librarian a storekeeper. Librarians were using their skills for maintaining and preserving the physical collection for posterity. Even in those days the concept of security was so strong and rigid that most of the library resources were kept under lock and key. The very purpose of making knowledge available to library users was never followed. The readers used to get a rare glance at the books from a safe distance. A few privileged users could get a chance to browse or lend a document under the strict watch. The situation improved slowly when H. H. Maharaja Sayajirao Gaikwad III, ushered the era of modern Libraries in India by opening his own Library to public use.

The advent of printing and publishing technology opened the new avenue for printed
knowledge. This helped to increase the library collection which no longer could fit into the locked cupboards. The continuous increase in literacy rate and the development in knowledge increased the awareness and need for library facilities. Slowly the knowledge locked inside cupboards came out on the display rack and bibliographic information about the document was made available in the catalogue cabinets. The security system in the library was not allowing users to get a direct contact with the book but libraries were following closed access for using documents. Even today most of the university libraries are still following closed access system as a measure of security for the collection. The concept of checkpoint at the entrance of library along with security guard is still in vogue.

**NEED FOR SECURITY SYSTEM**

Since 1980s the emergence of various IT products for library collection management have brought the total transformation in libraries. Slowly with the multifold increase in library collection as well as variety in user's demands, the need was felt to develop professionally trained manpower development policy. The steady increase in trained manpower helped to develop the library resources systematically and effectively. These factors helped to initiate new services and offer extended facilities to get the maximum benefit from the library resources like:

1. Open Access to limited area for browsing and selection of library materials
2. More access points for catalogue; cabinets for effective searching
3. Xeroxing facility
4. Reference desk/ Ask me counter for reference queries
5. Services like CAS, SDI to the specialized readers engaged in research work
6. Reading facilities for longer time

Such an open door policy was welcomed by the user community and library usage increased enormously. The increase in library collection as well as usage is directly proportionate to the increase in security related problems even after recruiting special drive of security personnel for library security.

With increased awareness of library collection and improved library services, library staff started facing dual responsibility of preserving their collection and yet providing access to different resources. Introduction of technology in libraries transformed the scenario. Convergence of information and communication technologies further increased the access to information which had tremendous potential for open policies in various services. The security problem still continued due to the hybrid nature of collection. Ease in access further increased
the problems of library security. The reduction in staff strength due to reasons like superannuation, financial constraints for new recruitment etc needed a fresh approach to security problem. Sometimes the security problems like book theft, cutting/tearing important pages from the documents, misplacing the documents from the book racks etc. posed serious dilemmas to the library authorities.

Book theft is on the increase and its cost is formidable. A 1969 survey at Carnegie Mellon University Library indicated that of 5000 monographs, 10.2% had been lost. Estimating replacement cost at $15 a book, that library lost $7500 in materials in one year. A few years prior to the Carnegie Mellon study the Suffolk County Senior High School Libraries discovered that 22.7% of newly acquired books had been stolen.

A 1973 inventory at the C.W.Post centre Library of Long Island University revealed a loss factor of 10%. In 1977 newspapers reported that a middle aged man’s abandoned apartment in New York City contained 7000 books stolen from East Coast libraries. The book covered a multitude of subjects, from birth control to Cicero. Two years earlier another New York apartment housing 15,000 books valued at $125,000 had been discovered.

The preceding examples suggest that for individual institutions, loss rates of between 2% and 10% are not uncommon. While the cost to any one library is high enough, the loss on a national scale becomes impressive.

In the United States, where the nation’s libraries contain an estimated 1.5 billion volumes, a loss of even 1% annually amounts to some 15 million books. Again, using an average cost of $15 to replace a missing book, the total annual replacement cost would be $225 million. This is more than 10% of what libraries spend annually. The 15 million volumes are almost 16% of the 95 million volumes added annually by the nation’s libraries.

And many of the items stolen from libraries are worth far more than $15. Rare books and manuscripts present an especially inviting target. Well known book theft scholar Lawrence S. Thomson notes the increasing activity of professional thieves which has made “the record of major theft in the last 15 years… little short appalling” Current reports back him up.

On July 16, 1971, the FBI recovered the first volume of the elephant folio edition of Audubon’s Birds of America stolen from the Schaffer Library, Union College, and Schenectady, NY. The thief, an ex-convict, was held for trial under $100,000 bail. The following year police apprehended two thieves who had been burglarizing the Lincoln Library in Springfield, IL for
more than a year. In 1973 the two “self styled unfrocked Byzantine priests” who had stolen rare books from Fordham, Harvard, Yale and numerous other libraries were arrested. The thief who devastated northeast academic libraries, removing Winslow Homer prints from 19th century journals, has not yet been caught. Cornell University lost 156 prints.

**ELECTRONIC SECURITY SYSTEMS:**

In the early 1970s, electronic security systems - systems which electronically survey exiting patrons to detect improperly checked out library materials - become very popular. A 1973 survey by R.M. Broadhead summed up the general attitude: electronic systems were “more effective in cutting book theft” than other systems. A few dissenting voices were raised, but, by and large, the literature heralded the 1970s as the decade of electronic security.

Responding to this literature, librarians began asking which electronic security system is the best? Such a question assumes that electronic security system provides the best protection and that one electronic security system is better than another. Neither assumption is necessarily true. The best question to ask is theft prevention program or system is most suitable to the type magnitude of loss the library sustains.

**RFID**

RFID stands for Frequency Identification. The acronym refers to small electronic devices that consist of a small chip and an antenna. The chip typically is capable of carrying 2000 bytes of data or less.

The RFID device serves the same purpose as a bar code or a magnetic strip on the back of a credit card or ATM card. It provides a unique identifier for that object. And, just as a bar code or magnetic strip must be scanned to get the information, the RFID device must be scanned to retrieve the identifying information.

**RFID WORKS BETTER**

A significant advantage of RFID devices over the others mentioned above is that the RFID device does not need to be positioned precisely relative to the scanner.

In contrast, RFID devices will work within a few feet (up to 20 feet for high-frequency devices) of the scanner.

RFID technology has been available for more than fifty years. It has only been recently that the ability to manufacture the RFID devices gas fallen to the point where they can be used as
a “throwaway” inventory or control device. Alien Technologies recently sold 500 million RFID tags to Gillette at a cost of about ten cents per tag.

One reason that it has taken so long for RFID to come into common use is the lack of standards in the industry. Most companies invested in RFID technology only use the tags to track items within their control; many of the benefits of RFID come when items are tracked from company to company or from country to country.

**COMMON PROBLEM WITH RFID**

Some common problems with RFID are reader collision and tag collision. Reader collision occurs when the signals from two or more readers overlap. The tag is unable to respond to simultaneous queries. Systems must be carefully set up to avoid this problem. Tag collision occurs when many tags are present in a small area; but since the read time is very fast, it is easier for vendors to develop systems that ensure that tags respond one at a time.

**HOW RFID WORKS**

- A Radio-Frequency Identification system has three parts:
  - A Scanning antenna
  - A transceiver with a decoder to interpret the data
  - A transponder- the RFID tag- that has been programmed with information

The scanning antenna puts out radio-frequency signals in a relatively short range. The RF radiation does two things.

  It provides a means of communicating with the transponder (the RFID tag) AND

  It provides the RFID tag with the energy to communicate (in the case of passive RFID tags)

  This is an absolutely key part of the technology; RFID tags do not need to contain batteries, and can therefore remain usable for very long periods of time (maybe decades)

  The scanning antennas can be permanently affixed to a surface; handled antennas are also available. They can take whatever shape you need

  When an RFID tag passes through the field of the scanning antenna, it detects the activation signals from the antenna. That “wakes up” the RFID chip, and it transmits the information on its microchip to be picked up by the scanning antenna.
In addition, the RFID tag may be of one two types. Active RFID tags have their own power source; the advantage of these tags is that the reader can be much farther away and still get the signal. Even though some of these devices are built to have up to a 10 year life span, they have limited life spans. Passive RFID tags, however, do not require batteries, and can be much smaller and have a virtually unlimited life span.

RFID tags can be read in a wide variety of circumstances, where barcodes or other optically read technologies are useless.

The tag need not be on the surface of the object (and is therefore not subject to wear)

The read time is typically less than 100 milliseconds

Large numbers of tags can be read at once rather than item by item. In essence, that’s how RFID works

**RFID IN LIBRARIES**

Among the many uses of RFID technology is its deployment in libraries. This technology has slowly begun to replace the traditional barcodes on library items (books, CDs, DVDs, etc). The RFID tag can contain identifying information, such as a book’s title or material type, without having to be pointed to a separate database. The information is read by an RFID reader, which replaces the standard barcode reader commonly found at a library’s circulation desk. The RFID tag found on library materials typically measures 50mm. It may replace or be added to the barcode, offering a different means of inventory management by the staff and self service by the borrowers. It can also act as a security device, taking the place of the more traditional electromagnetic security strip. And not only the books, but also the membership cards could be fitted with an RFID tag.

**FIRST RFID IN LIBRARIES IN WORLD**

While there is some debate as to when and where RFID in libraries first began, it was first proposed in the late 1990s as a technology that would enhance workflow in the library setting. Singapore was certainly one of the first to introduce RFID in libraries and Rockefeller University in New York may have been the first academic library in the United States to utilize this technology, whereas Farmington Community Library in Michigan may have been the first
public institution, both of which began using RFID in 1999. In Europe, the first public library to use RFID was the one in Hoogezaand-Sappemeer, the Netherlands, in 2001, where borrowers were given an option. To their surprise, 70% used the RFID option and quickly adapted, including elderly people.

Worldwide, in absolute numbers, RFID is used most in the United States (with its 300 million inhabitants), followed by the United Kingdom and Japan. It is estimated that over 30 million library items worldwide now contain RFID tags, including some in the Vatican Library in Rome.

**TABLE:-1**

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<tr>
<th>Sl No</th>
<th>Name of the country</th>
<th>Institutions</th>
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<tr>
<td>1</td>
<td>Singapore</td>
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<td>2</td>
<td>New York</td>
<td>Rockefeller University(First academic library)</td>
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<tr>
<td>3</td>
<td>Michigan</td>
<td>Farmington Community Library(First Public Institutions)</td>
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<tr>
<td>4</td>
<td>Netherlands</td>
<td>Public Library, Hoogezaand-Sappemeer</td>
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Four phases of Library RFID Management system

1. Library Security System  
2. Support library Circulation  
3. Patron Self Check-in/Check-out  
4. Smart and quick Inventory
LIBRARY SECURITY SYSTEM

RFID EAS Gate is the anti-theft part of the RFID library Management System using the RFID tags embedded in the library items. Each lane is able to track items of 1 meter or more and would trigger the alarm system when an unborrowed item passed through them. The alarm will sound and lights on the gate will flash as patron passes through with the library material. The EAS (Electronic Article Surveillance) Anti-theft gate can detect the RFID tags within 1 meter range without interference of magnetic items. Theft detection is an integral feature of the chip within the tag. It is a stand-alone technology, which operates independently of the library database.

SUPPORT LIBRARY CIRCULATION

Together with circulation module from Library Automation Software, this station is used for the following services

1. Editing and updating of patrons record
2. Add and deleting of patrons record
3. Generate loan history for a particular patrons
4. Managing of fines incurred by the patron
5. Sort item in accordance to their branch and category number

CHECK IN/CHECK OUT

Shelf check-out station is basically a computer with a touch screen and a built-in RFID reader, plus special software for personal identification, book and other media handling and circulation. After identifying the patron with a library ID card, a barcode card or a personal ID number, the patron is asked to choose the next action (check-out of one or several books). After choosing check-out, the patron puts the book(s) in front of the screen on the RFID reader and the display will show the book title and its ID number (other optional information can be shown if desired) which have been checked out.

The patron then confirms that he has finished the check-out process and a receipt is printed, showing which books have been borrowed and the return date. The RFID tag in the book is set on quiet as a result no alarm will go off at the EAS gates.
It is also possible to use the station for check-in (return) of books. In this case the patron identifies herself, chooses return and then puts one book or a stack of books onto the reader. She will receive a receipt. If the books were to be taken through the gate now, an alarm would sound.

**SHELF MANAGEMENT SYSTEM**

Shelf Management Solution makes locating and identifying items on the shelves an easy task for librarians. It comprises basically of a portable scanner and a base station. The solution is designed to cover three main requirements:

1. Search for individual books requested
2. Inventory check of the whole library stock
3. Search for books which are miss-helved

All these functions are performed by sweeping the portable scanner across the spines of the books on the shelves to gather their identifies. In an inventory check situation, their identities collected are compared with the database and a discrepancy report could be generated.

In situations when search function is required, whether for a particular item or an item category, the information is first entered into the portable scanner from the base station, and when a foreign item is found on the shelves, a built-in beeper sound to alert the librarians.

**RFID TECHNOLOGY FOR LIBRARIES**

1. RFID is the latest technology to be used in library theft detection systems. Unlike EM (Electro-Mechanical) and RF (Radio Frequency) systems, which have been used in libraries for decades, RFID-based systems move beyond security to become tracking systems that combine security with more efficient tracking of materials throughout the library, including easier and faster charge and discharge, inventorying, and materials handling.

2. RFID is a combination of radio-frequency-based technology and microchip technology. The information contained on microchips in the tags affixed to library materials is read using radio frequency technology regardless of item orientation or alignments (i.e., the technology does not require line-of-sight or a fixed plane to read tags as do traditional theft
detection systems) and distance from the item is not a critical factor except in the case of extra-wide exit gates. The corridors at the building exit(s) can be as wide as four feet because the tags can be read at a distance of up to two feet by each of two parallel exit sensors.

3. The targets used in RFID systems can replace both EM or RF theft detection targets and barcodes, RFID has many library applications that can be highly beneficial, particularly for circulation staff

ADVANTAGES OF RFID SYSTEMS

1. Rapid charging/ discharging
2. Simplified patron self-charging/ discharging
3. High reliability
4. High-speed inventoring
5. Automated materials handling
6. Long tag life (last longer than barcodes)

RFID has many library applications that can be highly beneficial, particularly for circulation staff. Since RFID tags can be read through an item, there is no need open a book cover or DVD case to scan an item. This could reduce repetitive motion injuries, there is still the advantage that borrowers can scan an entire pile of books in one go, instead of one at a time. Since RFID tags can also be read while an item is in motion, using RFID readers to check-in returned items while on a conveyor belt reduce staff time never need the assistance of staff. Next to these readers with a fixed location there are also portable ones (for librarians, but in the future possibly also for borrowers, possibly even their own general-purpose readers). With these, inventories could be done on a whole self of materials within seconds, without a book ever having to be taken off the shelf. In Umea, Sweden RFID is being used to assist visually impaired people in borrowing audio books. In Malaysia, Smart shelves are used to pinpoint the exact location of books in Multimedia University Library, Cyberjaya. In the Netherlands, handheld readers are being introduced for this purpose.

However, as of 2008 this technology remains too costly for many smaller libraries, and the conversion period has been estimated at 11 months for an average- size library. A 2004 Dutch estimate was that a library which lends 100,000 books per year should plan on a cost of €50,000 (borrow- and return-stations: 12,500 each, detection porches 10,000 each; tags0.36 each). RFID taking a large burden off staff could also mean that fewer staff will be needed,
resulting in some of them getting fired, but that has so far happened in North America where recent survey have not returned a single library that cut staff because of adding RFID. In fact, Library budgets are being reduced for personnel and increased for infrastructure, making it necessary for libraries to add automation to compensate for the reduced staff size.

**Conclusion**

Every individual as a resource of the society has an obligation to safeguard his belongings. In addition to this, various organizations, institutions in the society are under constant pressure for the safety and security of their resources. Libraries, as important institutions for human development, advancement and progress in the society are no exception to this. Library is a pool of quality resources and it requires security of resources in all forms along with equipments.

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