
USE OF RFID TECHNOLOGY IN MODERN LIBRARIES: AN OVERVIEW**Manisha Atul Samant**

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Abstract: -

RFID is just about the right set of tools that bring an agile nature to the library operation by incorporating asset identification and tracking by the electromagnetic wave. In libraries, this technology is used for locating lost items, tracking moving objects, and others. It also enables efficient and ergonomic inventory, security, and circulation operations in the library. The quick and easy benefits of RFID in libraries ensure both intuitive and satisfying experiences for library staff and users. RFID provides great value to librarians and is simple enough even for young children to use. This paper discusses the concept of Radio Frequency Identification (RFID) technology, a brief introduction to the technology, its components, the role of the librarian in this changing era of technology, the application of RFID tags in libraries, and the best practices guidelines for library RFID use (Berkeley Public Library n.d., Ayre 2004)

INTRODUCTION

We are passionate about technology and how it can help people become happier and more successful in their professional lives. Life teaches us a lot about people, inspiring us to create high-impact, hard software solutions with true value. Dr. S. R. Ranganathan, the father of Indian Library Science, correctly pointed out in his five laws of library science that the library is a growing organism. Due to the information explosion and availability of various library materials, the library has grown in size, and the problems associated with the maintenance and security of the documents also developed. In this situation, technology helps librarians to solve the issues of arranging documents in the order they have given classification schemes, solving the problems of searching records according to cataloging guidelines, solving the issues of space of the library, and delaying service time over the period. Nowadays, using technology, librarians can digitize documents and share them over the network. To automate the daily routine counter activities, librarians generally use barcode technology. Barcodes have served librarians and libraries for a long time, and now it is slowly getting replaced by RFID. It is mainly known as the modern version of the barcode. RFID is used to wirelessly transmit an object or person's identity (in the form of a unique serial number).

The main purpose of RFID technology in libraries is to identify documents with the help of magnetic security tags. RFID-based Library Management system would allow fast transaction flow for the library and provide immediate and long-term benefits to the library in terms of traceability and security. RFID has thus entered the library and expedited the circulation process. The entire gamut of library activities is streamlined with the help of this new technology.

What is RFID?

The acronym RFID, Radio Frequency Identification, employs several technologies to identify objects via radio waves. Radio Frequency Identification (RFID) systems are among the few latest technologies facilitating greater productivity and sheer excellence. The goal is to carry data on a tag that can be retrieved using readers through

wireless connectivity. It uses an amalgamation of radio frequency-based technology and microchip technology. The ability to access information through a non-line-of-sight (N.L.O.S.) storage in a tag can be utilized for the identification of library materials. It is read using radio frequency technology regardless of alignment and distance from the item. The antenna helps to produce radio signals to read and write data on the tags. The tags can be read at a distance of up to two feet by each parallel exit sensor. The devices used for circulation are usually called "readers," while the ones used at building exits are generally called "sensors"

THE HISTORY OF RFID

The concept of RFID (Radio Frequency Identification) technology was developed in 1948, but it took fifty years for large-scale implementation. The British were the first to pioneer this technology during World War II for identifying their aircraft. Its use extended in the late 1960s when the U.S. government began using RFID to tag and monitor hazardous nuclear materials. RFID in India started in the 1940s for 307 defense applications. It was used on a large scale in 1980 for tracking cattle. In the mid-1990, the RFID suppliers started marketing this system to libraries. Regarding library use, Seattle's RFID library project is the largest in the world. Today, RFID is used in various applications such as access control, security, tracking objects, toll collections, shops, hospitals, etc.

HOW DOES RFID WORK?

An RFID-equipped library usually has readers at the circulation desk, and self-service kiosks with additional readers installed in the security gates near the entrances and exits. These devices detect books or other media that haven't been checked out. Many libraries also use RFID technology in an automated returns and materials handling system. Productivity can be further enhanced with a handheld reader, which is used to pull holds and transit materials after check-in, scan shelves for misplaced books, or take a full inventory of the collection.

COMPONENTS OF RFID

- 1. Tags:** Tags are the heart of the RFID security management system that can be fixed inside the back cover of the books or directly on C.D.s and videos. The tag is equipped with a programmable chip and an antenna.
- 2. Readers:** The reader interrogates the tags and offers optimum reading performance enabling instant data capture when passed alongside the items in a continuance movement.
- 3. Antenna:** An antenna is connected to the reader to help process the identification of the items and activate/deactivate the tag's antitheft function simultaneously. An additional antenna may be required to increase the number of items processed in case of huge transactions.
- 4. Server:** The server is the heart of some comprehensive RFID systems. It is the communication gateway among the various components. It receives the information from one or more of the readers and exchanges data with the circulation database.
- 5. RFID Label Printer:** Used to print the labels
- 6. Handheld reader:** It can be used along the items on the shelves without touching them. It may be used in stock verification, used in the search for mis-shelved items and also search for an individual book on request.
- 7. Shelf Check Unit:** Through this method, user identification is made with an RFID-ID card.
- 8. External Book Return/book Drop Station:** Libraries can provide a distinct service, such as the ability to return books when the library is closed through drop station.
- 9. Staff and Conversion Station:** The staff station consists of an antenna, electronic module, and power supply. In the simplest terms, an RFID system has two parts: a tag and a reader. Information is encoded on the label; the RFID reader accesses that information and passes it to the person or system that needs it. Within the tag, a microchip holds data and an antenna. This assembly is usually covered with a protective overlay. The application

determines the durability of the overlay. If your tag is placed inside a book, the paper provides adequate protection; if the label is affixed to a jet engine part, something more resilient would be required. The back of the overlay has an adhesive so that the assembly can be permanently attached to an item. The final community is hidden in a book, usually 2 inches or 50 millimeters square, and very thin. The RFID tags placed on library items are passive, meaning they have no batteries or other power source. The energy needed to power and read the tag comes from the reader.

RFID SYSTEM IN MODERN LIBRARY PERSPECTIVE:

RFID system provides a very effective solution for library activity with minimum staff, minimum time, and minimum effort. Though its high installation cost is a factor for library budget allocation, it will provide a very effective tool for library automation management systems in the long term. It provides an automated charging and discharging system in a minimum time, and library staff shortage problems can easily solve with this technology. The RFID system contains a paper-thin RFID tag, where bibliographic information related to each document is placed. Library automation software reads that information through the reader. At the circulation desk where users bring the documents, the reader reads the data from the tag, passes it to the library management software, and the paper is automatically issued. If it is not administered properly or not according to the antenna, alert the system automatically. The RFID system can also detect the library collection, which is useful for library stock verification

RFID STANDARD FOR LIBRARY

The International Organization for Standardization and E.P.C. Global have actively developed RFID standards. The AutoID centre and their commercial offshoot E.P.C. Global have also defined specifications and standards. There are two ISO standards pertinent to library RFID systems:

ISO 15693 Standards.

ISO 18000-3 Standards.

APPLICATION OF RFID TAGS IN THE LIBRARIES

The RFID tag can be applied in different areas of the library. Here are the following areas we can use RFID Systems in the libraries:

- Circulation section**
- Shelf Management section**
- Book drop section**
- Security gates**
- Used for High-speed Inventorying**

Circulation section:

The RFID technology works through flexible, paper-thin RFID tags, which can be placed inside the cover of every document. Complete information about each record is entered into the Library Management Software. Users can take the help of the librarians for the check-in or check-out service. The previous books tagged are given to the librarian for check-in or check-out by the customers. The librarian would then place the books on a reader, and the books will be mapped/unmapped to the User on his identity (RFID card for users) in the database. An e-Slip will be generated for the customers where they can see in how many days the book has to be returned. As the User takes the document outside the library, the antenna placed at the exit gate automatically reads the information contained on the RFID tag to verify whether the document is properly issued or not. If it is not issued to the User as per library norms, or it is being stolen from the library, the antenna senses it and gives an instant alert. Thus, it results in the successful theft reduction of documents. RFID technology is used not only for circulation purposes

in libraries but also for stock-taking purposes.

Shelf Management section:

Shelf reading can be carried out with a portable reader. The reader transmits the identification number to the server, which sends it to library management software, and the response is returned in real-time. If one book is out of place, the system can tell which book is misplaced/missing and where it would be placed if found in a different location. The shelf Management system makes it easier for the library staff to locate and identify the documents on the shelves.

Dropbox section:

The book drop system consists of a book drop with a screen and receipt printer. It allows users to offer a very useful service, such as the ability to return books when the library is closed and automatically return the library documents. A reader installed in a book drop allows reading of the RFID tags as the patron drops off the records. It eliminates the labour-intensive steps of check-in and deactivation of the security protection by the library staff. It automatically checks the document, updates the User's library account, and reactivates the security function. RFID reader captures the electronic signature and sends it to the backend system for loan cancellation. The User's record is updated immediately.

Security Gates/ Anti-Theft Detection:

In the library security gate is an antitheft system. It plays a crucial role in detecting un borrowed or improperly checked-out library documents. Theft detection is an integral feature of the chip within the RFID tag, which performs both the item identification and antitheft function. If the User has not registered any books under their designation, then when they leave the facility, they will be scanned by two sensors for their user id and items id and whether they are mapped to each other. The alarm system can be activated to warn of theft if they are not mapped to each other.

Used for High-speed Inventorying:

A unique advantage of RFID systems is their ability to scan books on the shelves without tipping them out or removing them. A handheld inventory reader can be moved rapidly across a shelf of books to read all of the unique identification information. Using wireless technology, it is possible not only to update the inventory but also to identify items that are out of proper order. This feature of technology is very helpful in stock taking where much time was wasted in manual entries

HOW DOES RFID IN LIBRARIES BENEFIT VISITORS?**Faster and Easier Circulation Transactions:**

The use of RFID reduces the amount of time required to perform circulation operations. A stack of RFID-tagged items can be read several articles in a stack that can be read at the same time and checked out simultaneously by a librarian or a user. If RFID is paired with an automated materials handling (A.M.H.) returns system, the productivity gains are dramatic. A.M.H. systems can accept a returned library item, credit the User's account, and sort the thing for re shelving while the librarian is out on the library floor, engaging with visitors.

Increased attention from library staff:

The use of RFID Technology in the library helps Librarians to spend less time on routine physical tasks; they can pay more attention to human connections and the customer experience. Users can interact more with the library staff and get the required information quickly.

A more productive visit to the library.

Libraries face the tremendous challenge of keeping track of multiple resources. They hold thousands – or even millions – of individual items, each unique, each vitally important to the person who wants it for a report or

because it's the latest work by a beloved author. With RFID, those items are accurately located so users and librarians can easily find them. In the process of converting to RFID, libraries typically get an immediate benefit from the recovery of misplaced items – often hundreds of them – that were thought to be lost.

Improving Staff Productivity and Job Satisfaction results in Effective and Efficient services to users

Due to the effective use of RFID Technology, librarians spend more time helping people and less time processing books and other library materials. It positively improves staff productivity and decreases repetitive stress injuries. The library is a free institution that helps community members engage in lifelong learning activities and is considered a safe place for everyone, regardless of social, cultural, and economic backgrounds. Libraries are tasked to create more programs, partnerships, outreach, innovation, and community connections daily. RFID can help libraries focus on carefully crafted programs, engaging spaces, and building human relationships, ensuring staff time is dedicated to outcomes with the largest community impact.

BEST PRACTICES FOR LIBRARIES

The following may be the best practices guidelines for library RFID use (Berkeley Public Library n.d., Ayre 2004):

- The library should be open about its use of RFID technology, including providing publicly available documents stating the rationale for using RFID, objectives of its use and associated policies and procedure, and who to contact with questions.
- Signs should be pasted at all facilities using RFID. The characters should inform the public that RFID technology is in use, the types of usage and a statement of protection of privacy, and how this technology differs from other information collection methods.
- Only authorized personnel should have access to the RFID system.
- No personal information should be stored on the RFID tag.
- Information describing the tagged item should be encrypted on the tag, even if the data is limited to a serial number
- No static information should be contained on the label (bar code, manufacturer number) that unauthorized readers can read
- All communication between the tag and reader should be encrypted via a unique encryption key.
- All RFID readers in the library should be clearly marked.
- ISO 18000 mode-2 tags should be used rather than ISO 15693.

ROLE OF LIBRARIANS RELATING TO RFID TECHNOLOGY

A library is a place where documents containing information is stored for dissemination according to the need of users for current use and also for future use. Librarians should provide good service to their users with the best way to save the User's time and provide proper security for the documents from unauthorized use. RFID is important technological advancement for library transactions. For every small library action, the librarian now needs this technical help. Updates are compulsory for all professionals, and librarian is not an exception. RFID system provides a very effective solution for library activity with minimum staff, minimum time, and minimum effort. Though its high installation cost is a factor for library budget allocation, it will provide a very effective tool for library automation management systems in the long term. It provides an automated charging and discharging system in a minimum time, and

library staff shortage problems can solve through this technology easily. they have started using RFID to provide more effective and efficient circulation services as well as for the security of library collections. Previously the librarians were skeptical regarding the application of RFID in library services, but over time, they have started to

welcome this technology. Modern libraries are attempting to reap the benefits of RFID technology by employing hardware and software components.

The library staff should develop an interest in new ideas, acclimate themselves to changing working conditions and achieve the goal. The librarian must have the vision, dynamism, determination, persistence, and authority to create the essential requirements for the changeover and plan the entire technological setup.

INDIAN SCENARIO OF RFID TECHNOLOGY

Indian Institute of Management deployed an RFID system in their libraries for automated charging and discharging of books. I.I.T.'s implementing RFID technology for library theft detection systems. C.S.I.R. Labs and D.R.D.O. are using this new technology. I.C.A.R. Labs are also equipped with RFID technology. Recently an indigenous bases study (Margam Madhusudhan, 2010) found that after the implementation of RFID in the Indian Law Institute Library and N.A.S.S.D.O.C. Library in New Delhi, the check-in and use of the libraries have also increased. In both institutions, the RFID implementation is integrated with the library management systems, which I.L.M.S. develops, L.I.B.S.Y.S. L.I.B.S.Y.S. also supplies the RFID system for I.L.I., but at N.A.S.S.D.O.C. the RFID vendor was L.I.B.M.A.N. RFID tags are often seen as a replacement for barcodes, having several important advantages over the older barcode technology. N.A.S.S.D.O.C. had not used any barcode technology before the introduction of RFID.

In contrast, I.L.I. had - and it continued its use after RFID implementation for those items that were not yet tagged. The emerging market of unprecedented growth in RFID technology is likely to provide a fillip to the Indian I.T. industry. Since the amount of software development required to link RFID networks to enterprise systems is significant, India will immensely benefit from these new RFID opportunities. Wipro technologies are launching an RFID concept store at its corporate campus in Bangalore to build expertise in hot supply chain technology. The store will be equipped with RFID technology, including tags, readers, and related software, according to a statement issued by the company during the launching of a radiofrequency I.D. concept store at its corporate campus in Bangalore in July 2004.

CONCLUSION

Librarians are always known as early adopters of technology. Although the use of RFID by libraries over the last few years has grown dramatically, the major barriers to RFID technology adoption by more libraries are its cost factor, non-availability of standards, and user privacy. As far as the cost constraints are concerned, once the libraries implement such a technology, its benefits can be realized in terms of "Return On Investments (R.O.I.)" as it will speed up circulation. The main aim of today's libraries in adopting RFID is to increase efficiency, reduce cost, and provide security for the range of media offered in libraries. RFID technology promises to change our world. The library uses RFID technology because it is the fastest, easiest, and most efficient for locating, tracking, and managing library materials. Annual stock taking/ verification is one of the laborious works of libraries. RFID technology introduces an ethical dilemma for librarians. The technology allows more efficient use of professional staff and may reduce repetitive stress injuries for library professionals. RFID in libraries is an essential part of the upcoming years. RFID tags can be used for status control as well as the security and safety of the document.

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