

# Middlesex University Research Repository

An open access repository of

Middlesex University research

<http://eprints.mdx.ac.uk>

Vyas, Shalini, Jetty, Sridevi and Hopkinson, Alan (2010) Emergence of best security systems for libraries: RFID. In: Emerging trends and technologies in Library and Information Science, 2010. The Conference, New Delhi. . [Book Section]

This version is available at: <https://eprints.mdx.ac.uk/6051/>

## Copyright:

Middlesex University Research Repository makes the University's research available electronically.

Copyright and moral rights to this work are retained by the author and/or other copyright owners unless otherwise stated. The work is supplied on the understanding that any use for commercial gain is strictly forbidden. A copy may be downloaded for personal, non-commercial, research or study without prior permission and without charge.

Works, including theses and research projects, may not be reproduced in any format or medium, or extensive quotations taken from them, or their content changed in any way, without first obtaining permission in writing from the copyright holder(s). They may not be sold or exploited commercially in any format or medium without the prior written permission of the copyright holder(s).

Full bibliographic details must be given when referring to, or quoting from full items including the author's name, the title of the work, publication details where relevant (place, publisher, date), pagination, and for theses or dissertations the awarding institution, the degree type awarded, and the date of the award.

If you believe that any material held in the repository infringes copyright law, please contact the Repository Team at Middlesex University via the following email address:

[eprints@mdx.ac.uk](mailto:eprints@mdx.ac.uk)

The item will be removed from the repository while any claim is being investigated.

See also repository copyright: re-use policy: <http://eprints.mdx.ac.uk/policies.html#copy>

# EMERGENCE OF BEST SECURITY SYSTEM FOR LIBRARIES: RFID

\**Shalini Vyas*

\*\**Sridevi Jetty*

\*\*\**Alan Hopkinson*

\**Cataloguer, Central Library, Bundelkhand University, Jhansi, U.P., India. shaliniviyas@yahoo.co.in*

\*\**Dy. Librarian, Central Library, Bundelkhand University, Jhansi, U.P., India. sridevi.jhs@gmail.com*

\*\*\* *Head, Library systems and Bibliographic services, Learning resources, Middlesex University, The Burroughs, London, U.K.. A.Hopkinson@mdx.ac.uk*

**Abstract:** *The state-of-art technology for library theft detection is RFID which is now mostly introduced and used by many library and information centres. It is a combination of radio-frequency-based technology and microchip technology to be utilized. It uses radio waves to identify individual items automatically and can be used any where that needed a unique identification. In this paper we present about various components of RFID, operations, advantages and essential requirements.*

**Keywords:** *RFID, Security system, Library management systems, self service.*

## Introduction

RFID, which stands for Radio Frequency Identification Technology is the latest technology, used for library Information inventory functions and theft detection system. It uses radio waves to identify individual items automatically and can be used anywhere that needed a unique identification, RFID is a generic term that is used to describe a system that transmits the identify at an object or person wirelessly, using radio waves RFID is a next generation of auto identification and data collection (AIDC) technology which helps you automate business process. This automation can provide accurate and timely information without any human intervention. RFID is a means of identifying a person or object using a radio frequency transmission. This wireless automatic identification data capture system allows for non-contact reading or writing of data and are highly effective in environments where barcode labels can not survive. RFID replaces the barcode with a piece of wire which has a chip attached to it all encased in a small envelope. This tag is coded with an identifier which could be the same as a barcode and with other identifiers which can be updated dynamically at an RFID pad. These pads do not only read or identify but also write data to indicate the status of the item. This is known as radio frequency identification.

## Why Libraries require RFID?

RFID has many applications in libraries that can be highly beneficial such as one of the major functions of a library is to issue and return the books and other library materials. RFID can do this automatically. All the users of the library can be issued an identification card. Just before issuing the books, the ID card need to swipe and the RFID tag affixed to the book passed through the sensor. This will activate the tag and also record the particulars like date and time of issue, the person to whom it is being issued. Similarly when the books or other materials are being returned, they can simply be dropped in specified box. Since the server works 24 hour/ day, the information can be stored at any point of time. When the books are being dropped, the information of returned is recorded and the tags are discharged. This way issue and return of materials does not require the

invention except in exceptional cases like the issue of no dues certificates.

The next role of RFID is inventory management in the labour intensive activity. But in case of RFID, several books and other library materials which are present in the library can be read by the sensor simultaneously. All that is required, even an unskilled person need to carry the sensor and just walk around the library shelved the sensor automatically reads the information present in the tag of the library materials. The sensor then connected to the server and we have full information about all the materials which are present in the library at the point of time. This can be done in a matter of few minutes saving the time of the library staff. RFID system has an interface between the exit sensor and the circulation system to identify the items moving out of the library. Were a patron to run out of the library and not be intercepted, the library would at least know what had been stolen. If the patron card also has an RFID tag, the library will also be able to determine who removed the items without properly charging them. Hence, RFID can reduce the security expenses substantially.

All the above activities reduce the conventional work load of the library staff substantially and free up their time for productive use.

## **RFID Components**

**Tags:** Tags are the heart of an RFID system, because they store the information that describes the object being tracked. RFID tags come in wide variety of shapes and sizes. The tag is paper thin, flexible and approximately 2" X 2" in size that are applied directly to library items. Each paper thin tags contain an etched antenna and a microchip with a capacity of 64 bits. The RFID tags and two types such as active tags and passive tags.

### **Active or write once read many (WORM) Tags**

The active tags are powered by an internal battery. This type of tag are "read only" because the identification is encoded at the time of manufacture and not rewritable. This type of tag contains nothing more than item identification. It can be used for items acquired after the initial implementation of RFID and by libraries that have collection without barcodes. Such tags need not contain any more than 96 bits. These tags are expensive also.

### **Passive or Read / Write Tags**

The passive RFID tags operate without a separate external power source and obtain operating power generated from the reader. Read/ Write tags, which are chooses by most libraries can have information changed or added. The power to read the tags comes from the reader or exit sensor, rather than from a battery within the tags. These tags are much lighter than active tags, less expensive and offer virtually unlimited operational lifetime.

Almost all libraries tag new acquisitions as part of the cataloging process, however libraries that have experienced losses of unprocessed library material from technical services, might consider doing the tagging at the time of receipt in acquisition it should significantly reduce losses and facilitate tracking of items in technical services. A few libraries have placed RFID tags on staff and patron identification cards. Not only does that identify patrons for charging and discharging of libraries materials but also for access to restricted areas or services. A "smart" card which is an RFID card with additional encryption is an alternative to merely adding an RFID tag to a patron card. That would make it possible to make it into a "debit" card, with value added upon pre-

payment to the library and value subtracted when a patron used photocopies, printer or other free based device or wished to pay-tines or fee.

## **Reader or Coupler**

When the tag passes through the field, the information stored on the chip in the tag is interpreted by the reader and sent to the server. These are radio frequency devices designed to detect and read tags to obtain the information stored thereon. The reader powers an antenna to generate Radio frequency field. When a tag passes through the field the information stored on the chip in the tag is decoded by the reader and sent to the server, after checking the circulation database, turns on an alarm if the material is not properly checked out.

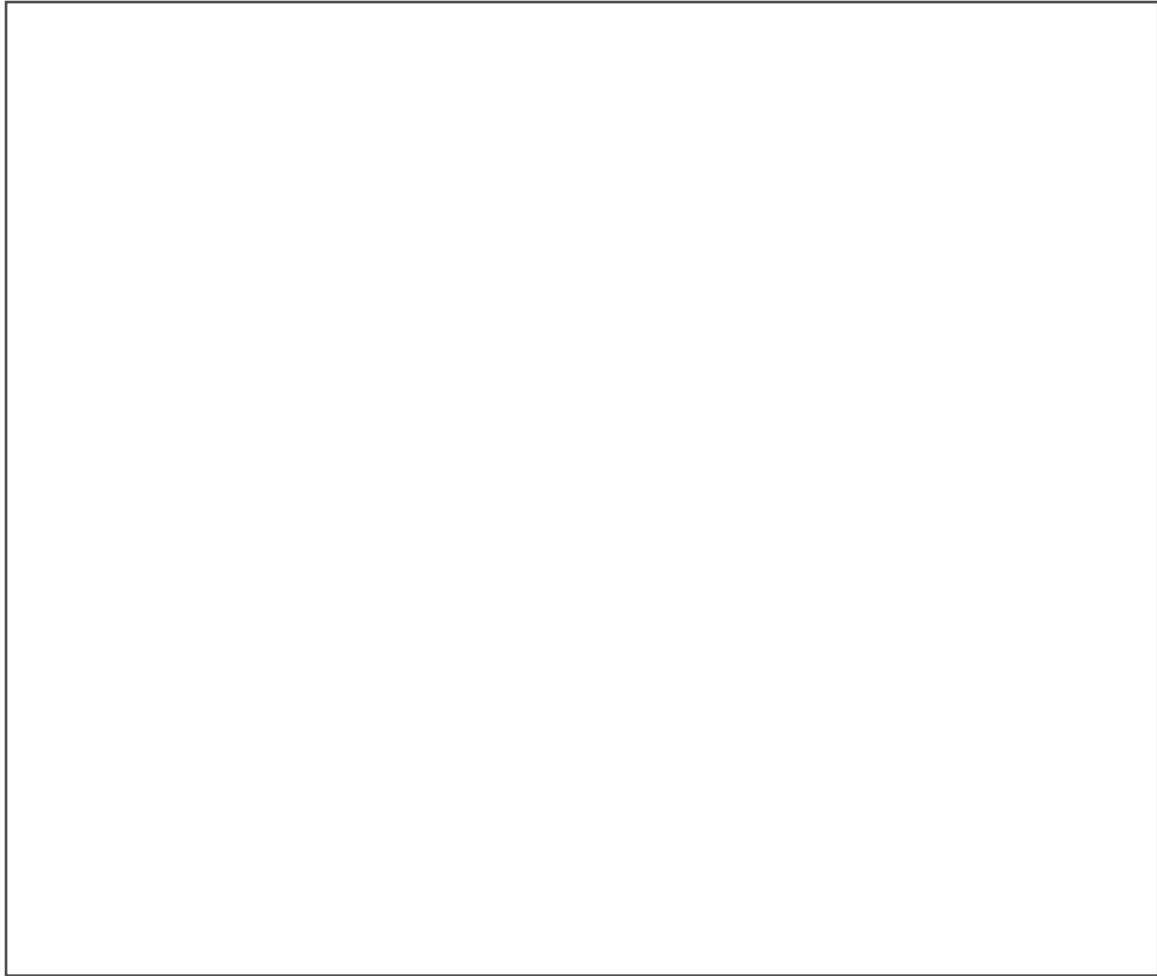
## **Antenna**

It is conduit between RFID tags and the reader. RFID antennas emit radio waves that activate RFID tags as they pass through the activation field. After a tag is activated, it can send information or receive information from the PC through the reader.

## **Server or Docking station**

It is the communications gateway among the various components. It receives the information from one or more of the readers and exchanges information with the circulation database. Its software includes the APIs (Application Programming interface) necessary to interface it with the automated library system.

## **How it is supportive in Library Operations?**



### **Borrowing Station or RFID Checkout**

Considering the high levels of circulation per day, the staff is always over loaded with the issue and return books. They are not able to help out members with the book selection and knowledge sharing based on their subject of interest which is expected out of librarians. By RFID without any assistance from library staff, it permits patrons to follow the touch screen menu and checkout documents. The patron's card and their stack of documents are read simultaneously.

### **Return Station or Book Drop:**

Many Libraries have a separate book return station. The book identified at RFID reader unit, which is located inside the book return slot and then placed in a bin. It automatically checks in documents, takes them off the patron's library account and reactivates the security function.

### **Security Gates**

RFID tags provide enhanced security as instant alarms can designate if a patron passes through security gates with documents that have not been checked out and alarm sound will alert library. There is only one tag to apply which reforms both the item identification and antitheft function, saving application time.

## **Automated sorting station**

Sophisticated system can take books from the return station, check them in, sort and distribute the books to multiple bins or areas for re-shelving. Books are re-shelved by determining their shelving location in less time with less staff work.

## **Inventory Control**

Librarians can collect inventory in few days which other wise manually would take months or even year. But RFID used to take inventory and locate missing items without closing the library.

## **Advantages of RFID**

1. More than one item can be checked out or checked in at the same time.
2. Items can be placed on reader without careful placement that it is required for line of sight system (barcode scanner).
3. Increases the difficulty in intentional or accidental removal of items from the library without checkout.
4. Faster inventory process
5. Ability to locate specific items
6. Mis-shelved reports
7. Automated check-in chutes can provide 24-hour check-in
8. Automated 24-hour holds pickup and checkout units
9. Books get sorted and back on the floor quicker for enhanced circulation capabilities.
10. Tags are for the life of the item
11. Once only operation for item lifecycle.
12. protects staff from many materials handling-related injuries (e.g. RSI)
13. Staff can exploit their profession skills as opposed to clerical skills.
14. Ability to manage the expenses over a number of years.

## **Benefits of RFID**

1. Reliable borrower self-checkout.
2. Immediate and consistent borrowers self-check in.
3. Circulation staff free for other library tasks.
4. Reliable knowledge of stock locations (i.e. checked in or checked out).
5. Financial- reduces costs of replacing stock.
6. Labour savings on inventory processes, filling holds lists, shelf reading and correction processes, etc.
7. satisfaction with correct and reliable shelving order.
8. Lower labour costs on
  - \* Check in processes
  - \* re-shelving
  - \* holds pickup
9. Higher staff job satisfaction
10. Financial:
  - \* Cost of qualified staff exploited with increase in added value work.

- \* Reduced cost associated with staff down-time through RSI type injuries.
- 11. Staff experience greater job satisfaction from less repetitive tasks, i.e. productivity gains.
- 12. Lower initial capital investment allows for easier approval for startup solutions

## **The Essential requirements in RFID with EM system**

### **A) General requirements**

1. The system must interface with the Library's existing automated Library system using the SIP, SIP2 protocol. This must not use a proprietary ILS connection.
2. The system must not interfere with other equipment. Automated library system clients or PCs that may be nearby.

### **B) Electro Magnetic Security Strip Requirements**

1. The size of the security strip should be minimum 160 MMx3MM for hardbound books, soft bound books and periodicals.
2. Strips once applied on material should be hidden in nature and it must be perform for life time of the object in which they are placed.
3. The strips shall be virtually unaffected by simple shielding materials such as gum or cigarette wrappers.

### **C) RFID Tags**

1. The system must provide tags that are operative at a frequency of 13.56 MHz.
2. It must provide tags with a range of memory options from 1024 to 2048 bits that can be used simultaneously in the library.
3. All data on the re-writable RFID tag, including the item identifier field, must be fully rewritable.
4. The RFID tags must provide both security and inventory control functionality.
5. The system tags must be a one-step application, with no need to apply a cover label over the tag inlay.

### **D) DETECTION SYSTEMS**

1. System shall use Electro Magnetic Detection Principles.
2. Should be able to detect Print Materials, CD, Single sided DVD, Audio Cassettes and Video Cassettes.
3. Upgradeable facility from single to dual corridor should be.
4. The system shall be interrogating "look for" library materials only when activated by

exiting patrons.

5. There should be both an audible and visible alarm when responding to an active strip in the corridor.

## **E) Circulation Staff Workstations- Combined Electro Magnetic and RFID Workstations**

1. The system must be able by default to scan the barcode of the item if RFID tag is not detected in the item.
3. Must allow for check-in and checkout of multiple items, if each item has an RFID Tag.
4. The system must provide a displayed count of the number of items processed simultaneously to ensure complete check-in/out transaction processing.
5. RFID with EMS must recognize that an item is magnetic media. It must transfer Magnetic media ID to the circ system and automatically turn off the desensitizer, so it does not destroy the magnetic media.
6. The system should use an anti-collision algorithm that does not limit the number of tags which can be simultaneously identified and read.

## **F) Self-Checkout Units**

1. The electro magnetic security with RFID self-checkout units must be able to read item-specific identification numbers, communicate to the host circulation system to update the library's inventory, and turn the security status off.
2. The system must possess touch screen.
3. The system must have the ability to print out all information for a patron check-out or check-in transaction on a single receipt. Such receipt should be customizable to incorporate library identity, hours etc.
4. The system's self-checkout units should have customizable messages based on patron and item status.
5. The system should have the ability to perform off-line transactions and maintain records of all barcodes checked out when the ILS is offline, and then upload transactions when the ILS is back online.
6. The system must turn on/off the security feature on Electro Magnetic Security strips and RFID tags to allow secure library operation during offline situations.
7. It should provide performance statistics that can be accessed through the web. Data must be broken down by day of the week and hour of the day. Data to include: number of transactions, type of transaction, and number of successful and unsuccessful transactions.
8. The system must allow multiple item check outs without first choosing the number of items that you want to check-out.

## **G) RFID Circulation Staff Workstation**



1. The system should provide a reader pad.
2. The minimum read range for book tags should be 8” inches.
3. The system should be able to work with a weed list (a list of items to be removed from the Library), to automatically alert staff to weed an item upon scanning the barcode, before applying an RFID tag on Conversion.

## **H) Handheld Reader**

1. It must be light weighted, to carry by the user and must be a cordless, one-piece design, to be held in one hand.
2. The handheld reader must accommodate data collection simultaneously with other functions. These other functions must include shelf reading, inventory, identifying items on search lists, and items with incorrect security.
3. The handheld reader must accommodate shelf order checking: to locate items that are out of place on the shelves. This capability must be sensitive enough to locate items that are out of place by as little as 5 inches.
4. The system should accommodate searching: to identify items on multiple, user defined search lists, (e.g. Missing, Claims Returned, lost, weed, etc...).
5. Security status checking capability must also allow the user to scan items on library shelves to identify individual items which have not been properly checked in, before re-shelving.
6. The handheld reader must be easily set down on a library shelf when necessary to free the users’ hands.
7. The reader must have the capacity to read multi-line fixed-length-field, or delimited- field records from an electronic file containing shelf or search lists and create a portable database for use in a RFID reader.
8. The search capability must be active during order checking, data collection, sorting, pulling, and finding functions, with option to turn it off if desired.
9. It should have an audible tone and visible indicators to verify item has been identified. The audible tones shall be adjustable by the user.

## **I) RFID Book Drop**

1. The system should have the ability to quickly download exceptions from the RFID book drop for pulling holds, transits and other exceptions to the RFID handheld wand.
2. The system should have data to prove at least 96% accuracy when items are placed in the RFID book drop one at a time.
3. The system should have included a touch screen monitor and staff printer.
4. The system must offer automatic staff hold slips.

## CONCLUSION

RFID has proved popular with library users. Library staff has been enthusiastic about the ease of self-service as compared with earlier equipment. RFID has the capability of stock management, to improve patron services, security, efficient inventory management, review, repetitive stress injuries. Implementing RFID will considerably reduced the amount of time of library staff required to library operations such as issue, receive, transport, sort and shelve library materials etc. Therefore, libraries are choosing RFID technology which significantly improves the customer services and enhance the patron satisfaction. RFID is seen as excellent opportunity by contributing, to save time, manpower creating cost efficient and total quality services. This technology will improve the efficiency by helping staff track materials better, prevent theft and allow patrons to check-out book faster. It converts a traditional library to “Book Smart Library” by reducing queue time at circulation desk, quick inventory control without handling books, trouble free identification of misplaced books, automatic book sorting and theft prevention and provide more time for library staff to assist the patrons. To conclude with the necessity to upgrade our present traditional system with the latest technologies available to reduce the workload and provide the faster and better services to the library users.

## REFERENCES

- Hopkinson, A and Chandrakar, R (2006). “Introducing RFID at Middlesex University Learning Resources”, Program 40(1). P89-97.
- Cooney, Elaine M.(2007). “RFID: Complete review of Radio Frequency Identification Delhi: Thomson Learning”.
- Ganguly, S and Singh, M.K (2008). Introduction of RFID in Library & Information Centers: A State of the Art Technology, In Modernisation of Libraries: Challenge in Digital Era, Edited by S.K. Satpathy, C.K. Swain & B. Rautray. New Delhi: Mahamaya Publisher. p 279-302.
- [http://www.aimglobal.org/techonlgies/rfid/what\\_is\\_rfid.asp](http://www.aimglobal.org/techonlgies/rfid/what_is_rfid.asp)
- [http://www.libsuite.com/lib\\_rfid/htm](http://www.libsuite.com/lib_rfid/htm)
- <http://www.ifla.org/IV?ifla69/papers/161e-lindquist.pdf>
- <http://www.eff.org/Privacy/Surveillance/RFID>

- <http://www.ifla.org/IV/ifla69/papers/132e-Chachra.pdf>

- <http://www.rfidjournal.com/article/articleview/207>