

**APPLICATIONS OF RFID TECHNOLOGY WITH SPECIAL REFERENCE TO
CIPET LIBRARIES.**

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ABSTRACT

RFID has provided better opportunities, better access, storage of mass data and reprogramming than the Barcode technology. The libraries are growing day by day and it is necessary for large libraries to implement such facilities which save their time and are also user friendly. RFID is one of them. RFID promotes operational efficiency of the libraries. In this paper the components and features of a RFID library are describe to provide guidance for the evaluation of different system. It also briefs about advantages and disadvantages of RFID system in Library.

KEYWORD:-Radio frequency identification (RFID), RFID Tags, RFID reader, RFID server, RFID smart card.

1.INTRODUCTION

RFID means Radio frequency identification i.e. the technology that uses radio waves to automatically identify individual items. The objective of any RFID system is to carry data in suitable transponders, generally known as tags and to retrieve data, by machine readable means, at a suitable time and place and to satisfy particular application needs.

RFID is the latest technology to be used in library for book identification, for self checkout, for sorting, conveying of library books and also for theft detection. The aim of using RFID technology is to increase the efficiency, reduce data entry errors, and spare staff to perform more value-added functions. 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 to read RFID technology regardless of item orientation or alignment, i.e., the technology does not require line of sight or a fixed plane to read tags as traditional theft detection systems do. 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) and can be as wide as four feet because the tag can be read at a distance of up to two feet by each of two parallel exit sensors. The devices used for circulation and inventorying are usually called “readers” while the ones used at building exits are usually called “sensors”.

2.DEFINITION

According to the Harrods’s Librarians glossary and reference book “ RFID an alternative to the barcode that uses tiny microchips in tags to hold and transmit detailed data about the item tagged”.

Dictionary of library & information science defines RFID as “The use of microchips and library card, enabling patrons to check out items by walking through a self-service station equipped with an antenna that emits low frequency radio frequency radio waves.

3.RFID SYSTEM COMPONENTS

A comprehensive RFID system has three components:

- (1) RFID tags.
- (2) Readers.
- (3) Server.
- (4) Antenna.

3.1.RFID Tags.

Each paper-thin tag contains an etched antenna and a microchip with a capacity of at least 64 bits. There are three types: “read only”, “worm”, and/write”. Tags are “read only” if 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 collections without barcode. Such tags need

not contain any more than 96 bits.

Passive Radio Frequency Identification (RFID) Tag has no power source and no on-tag transmitter built onto it, which gives a passive tag a range of less than 10-metres and makes it sensitive to regulatory and environmental constraints. Passive tags are generally the lowest in cost making them suitable for use in large inventories of books and other library media.

Active Radio Frequency Identification (RFID) Tag has both an-tag power source and an active transmitter. Active tags are connected to their own battery. They can be read at much higher ranges, up to several kilometers away. However, they are larger and more expensive than passive tags. Active RFID tags are not suitable for libraries (as will be discussed later on). They are usually used for manufacturing, such as tracking components on an assembly line, or logistics where the tag may be reused.

Categories of tags:

- High frequency can work up to one meter. It can embed with thin objects such as papers, that's why it is mostly used in sales points and for access controls. 13.56MHz is the frequency at which it works and it is less expensive to implement (Srivastava, 2005; Application Notes CAENRFID, 2008).
- Low frequency fulfills short range applications' needs. It is not effective for metal or wet surfaces and only works half of the high frequency range (maximum half a meter) (Frank et al., 2006). Low frequency works on 125 KHz (Application Notes CAENRFID, 2008).

- Ultra high frequency has better read rate and large number of UHF tags can be recognize at one time. It has also good better read range and three times with high frequency, it is capable to read tags up to three meters. However, range can be reduced in wet environment. It works between 860-930 MHz frequencies.
- Microwave has less read range and it works within one meter. But it has rate of reading is faster than UHF with very little affect on wet and metal surfaces. It works on Giga Hertz frequency and faster than LF, HF and UHF, that’s why it can work better for vehicle access application (Application Notes CAENRFID, 2008).

3.2.READER OR COUPLER:

RFID reader consists of a transmitter, receiver, antenna and a decoder. They communicate with RFID tags, identify them and receive data stored on the tag.

3.3.SERVER:-

The link between Reader and library automation system. In other words, it is the communication gateway among the various component(boss). It receives the information from one or more of the readers and exchange information with the circulation database.

3.4.ANTENNA:-

The Antenna produces radio signals to activate the tag and read and write data to it. Antennas are the channels between the tag and the reader, which controls the system’s data acquisitions and communication. The electromagnetic field produced by an antenna can be constantly

present when multiple tags are expected continually. Antennas can be build into a doorframe to receive tag data from person’s things passing through door.

4. BENEFITS OF RFID FOR CIPET LIBRARIES:-

- * Fastest, easiest, most efficient way to track, locate & manage library materials.
- * Efficient Book circulation management.
- * Automatic Check-in and Check-out.
- * Library inventory tracking in minutes instead of hours.
- * Multiple books can be read simultaneously.
- * Unique ID of the RFID tag prevents counterfeiting.
- * Automated material handling using conveyor & sorting systems.
- * Stock management.
- * Operations such as managing material on the shelves, identifying missing items and taking stocks regularly will be feasible.
- * Spending minimal time on circulation operations allows library staff to assist patrons
- * Routine patron services are not disturbed even when libraries are facing staff shortages & budget cuts.
- * Security
- * Library item identification & security is combined into a single tag, there by eliminating the need to attach an additional security strip.

5. PRACTICAL ISSUES FACED DURING IMPLEMENTATION OF RFID TECHNOLOGY IN LIBRARIES.

- * Hardware & Software should meet global recommended standards for use of RFID in Libraries.
- * RFID hardware products for library should be compatible with global protocols
- * Such as SIP2, NCIP, ISO 18000-3, ISO 15693, ISO 14443A & ISO 28560
- * Supplied equipment should allow forward compatibility with anticipated new standards.
- * Special emphasis on Staff training & Local Support.
- * Vendors Selection.
- * In Libraries, 860-930 MHz Ultra High Frequency tags should be used.
- * RFID Tags for library use should be passive.
- * The typical read range of tags for library applications should not be increased substantially beyond the present range of 8-20 inches for smaller tags in future.
- * Only tags including standardized EAS & AFI feature should be used in libraries.
- * The system will cause no interference with other applications
- * The system will utilize ISO/IEC 18000-3 mode 1 tags programmed so that they should work for identification of items in other libraries.
- * Security implementations for RFID in libraries should not lock a compliant system into any one security possibility (EAS, AFI, Virtual deactivation), but rather leave security as a

place for differentiation between vendors.

- * RFID tags should be reprogrammable for migration purposes.

6. ADVANTAGES OF RFID SYSTEMS :

6.1 Rapid charging/discharging: The use of RFID reduces the amount of time required to perform circulation operations. The most significant time savings are attributable to the facts that information can be read from RFID tags much faster than from barcodes and that several items in a stack can be read at the same time. While initially unreliable, the anti-collision algorithm that allows an entire stack to be charged or discharged now appears to be working well.

6.2 Simplified patron self-charging/discharging: For patrons using self-charging, there is a marked improvement because they do not have to carefully place materials within a designated template and they can charge several items at the same time. Patron self-discharging shifts that work from staff to patrons. Staff is relieved further when readers are installed in bookdrops.

6.3 High reliability: The readers are highly reliable. Some RFID systems have an interface between the exit sensors 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. This is done by designating a bit as the "theft" bit and turning it off at time of charge and on at time of

discharge.

6.4 High-speed inventorying: unique advantage of RFID systems is their ability to scan books on the shelves without tipping them out or removing them. A hand-held 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 which are out of proper order.

6.5 Automated materials handling: Another application of RFID technology is automated materials handling. This includes conveyor and sorting systems that can move library materials and sort them by category into separate bins or onto separate carts. This significantly reduces the amount of staff time required to ready materials for reshelving. Given the high cost of the equipment, this application has not been widely used.

6.6 Long tag life: Finally, RFID tags last longer than barcodes because nothing comes into contact with them. Most RFID vendors claim a minimum of 100,000 transactions before a tag may need to be replaced.

6.7 Fast Track Circulation Operation: The use of RFID reduces the amount of time required to perform circulation operations. The most significant time savings are attributable to the facts that information can be read from RFID tags much faster than from barcodes and that 279 several items in a stack can be read at the same time. While initially unreliable, the anti-collision algorithm that allows an entire stack to be charged or discharged now appears to be

working well.

7. DISADVANTAGES OF RFID SYSTEMS:

7.1 High cost:

The major disadvantage of RFID technology is its cost.

7.2 Vulnerability to compromise:

It is possible to compromise an RFID system by wrapping the household foil to block the radio signal. It is also possible to compromise an RFID system by placing two items against one another so that one tag overlays another. That may cancel out the signals. This requires knowledge of the technology and careful alignment.

7.3 Removal of exposed tags:

The RFID Tags can not be concealed in either spine or gutter of the books and are exposed for removal. If a library wishes, it can insert the RFID tags in the spines of all except thin books, however, not all RFID tags are flexible enough. A library can also imprint the RFID tags with its logo and make them appear to be bookplates, or it can put a printed cover label over each tag.

8. EVALUATING RFID FROM DIFFERENT VENDORS:

It is potentially overwhelming to evaluate competitive offerings of a new technology; hence the following guide lists some of the characteristics to be considered.

8.1 Security feature :

The same RFID tag used to manage inventory can also be used to protect it from theft. Current offerings provide the choice between a purely RFID solution, or RFID with an EM (electro-magnetic) add-on for theft.

8.2 Tag memory capacity :

More memory is not necessarily better than less - it often correlates with price, and data transmission speed. As a first step, consider what information you need to program into each tag, and then discuss with vendors.

8.3 TAG FUNCTIONALITY:

8.3.1 Read/Write vs. Read Only :

Some vendors offer tags which can only be “written to” once. That is, once the tag is programmed, the information stored in the tag’s memory cannot be changed. Alternatively, information stored in the memory of read/write tags can be updated as required.

8.3.2 Anti-collision :

All RFID vendors in the library market offer a product with anti-collision (the ability to read several tags simultaneously). However, the speed at which this can be performed, and the total number of tags that can be read, will vary. This relates specifically to inventory management with a hand-held reader, and check-in processes. 280

8.3.3 EAS (Electronic Article Surveillance) mechanism:

As mentioned above, RFID can be used to prevent theft in the library. This approach varies from vendor to vendor – the security mechanism may be integrated into the chip itself, or security gates may be linked to a separate server which interrogates the database to conclude whether an alarm needs to be triggered.

8.4 COST :

Expect to pay from US\$0.85 to over US\$1 per tag. • The price of hardware (per unit) varies extensively from different suppliers. However, the infrastructure requirement also varies.

8.5 STANDARDS :

The emerging standard for library RFID solutions is to employ a frequency of 13.56MHz. However, no formal standards are currently in place [6].

9.RFID IN CIPET LIBRARIES:

CIPET Chennai, Lucknow, Bhubaneswar, Ahmedabad High Learning centers are the first to implement RFID technology with the initiative of Prof.(Dr.) S.K.Nayak, the Director General of CIPET and his team executing this technology.

The consideration of implementation RFID technology is across all major CIPET centers libraries in India. The following CIPET centers have introduced RFID in their libraries.

- * Cipet-Aurangabad
- * Cipet-Amritsar

- * Cipet-Bangalore
- * Cipet-Bhopal
- * Cipet-Guwahati
- * Cipet-Hyderabad
- * Cipet-Haldia
- * Cipet- Jaipur
- * Cipet-Mysore

10. SOME IMPORTANT VENDORS OF RFID IN INDIA ARE AS FOLLOWS:-

1. Orizin Technologies Private Limited, 3rd Floor, No.02, 2nd Block, 2nd Phase, 3rd Main Road
Opp Rash Pride Apartment, 6th stage BTM Layout, Near Sai Baba Temple, Bangalore-
560076.
2. RapidRadio Solutions Pvt.Ltd, B-404, Satyamev-1, Opp.Gujarat High Court, Sarkhej
Gandhi Nagar Highway, Ahmedabad – 380 060.
3. Knowledgd Publishing, Printing & Dist.House, H.No.1-27-15, Collector Office Road,
Aurangabad-(Maharashtra).
4. 2cQr Automation pvt ltd, 83, 11th cross street, Lakshmi Nagar, Porur, Cheenai-600116.
5. 3M library Systems Division, C-40, Okhla Industrial Area, Phase-2, New Delhi-110020.
6. Gemini TRAZE RFID Pvt.Ltd, 1, Dr.Ranga Road, Alwarpet, Chennai-600 018.
7. GreenFuturz Software Solutions, Zams Palm Avenue, Alagiri Nagar, Chennai-600 026.

11. CONCLUSION:

RFID is the latest fast growing technology to be used in library for minimizing the theft of documents and as an access control systems. 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. Since RFID technology for the libraries in CIPET is new and the future of CIPET libraries depends on this technology, there is an urgent need to develop CIPET libraries with RFID enabled technologies, to face global competition.

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