

Library Automation and RFID- Radio Frequency Identification

Abstract

Library and information science education in India is undergoing fundamental change in its basics framework and is being re-oriented to meet the current requirements of information society. This paper highlights RFID technology in context to library automation. Today's libraries require new technologies like RFID. RFID is a technology that is sparking interest in the library community because of its applications that promise to increase efficiency, productivity and enhance user satisfaction. Although RFID technology has matured and offers an ideal solution for libraries to replace their EAS and barcode systems for security and theft prevention, the picture is not all that smooth. There are several concerns and some are about patron privacy violations.

Keywords: RFID (Radio Frequency Identification), Automation, Library, RSI-Reducing Repetitive Stress Injuries.

Introduction

Information proliferation on the one hand and enormous growth in the volume of transactions on the other has led to the wide and extensive adoption of computer in library management. Many libraries and information centers have now employed computerized information systems and a large number are seriously planning implementations of computer-based systems. Another development that has accelerated the rate of transition in libraries from manual to machine-based systems is that increasingly libraries are becoming part of larger library networks to facilitate information exchange and resource sharing and with the objective of enhancing to quality of library service.

Mechanization of library housekeeping operations predominantly by computerization is known as library automation. The appearance of computer has greatly increased the activities of library Automation in addition to computer advancement; telecommunication, audio-visual technologies and now day Radio-frequency identification (*RFID*) gave way to new possibilities in information handling. However the use of computers is limited to only some specialized libraries unlike the case of developed countries. Library automation includes other semi-automatic devices like reprography etc. They are semi-automatic because human intervention is greater in extent. Hence library automation principally the use of computers; associated peripheral media; computer based products and services in library work.

Efforts in automating library catalogues and designing automated text retrieval systems have largely been influenced by the availability of the CDS/ISIS (Computerized Documentation System-Integrated Set for Information Systems) software from UNESCO through the NISSAT. Increasing availability of training facilities in the package has also stimulated the interests of library professionals towards the goal of package has also stimulated the interests of library professionals towards the goal of automation. Now a day various private and not approved softwares available in market which help in library automation.

Developing Application Software

There are several approaches in developing application software for a library. They are

1. TURN-KEY System
2. Custom designed for a particular computer system
3. Bought off-the shelf from a software vendor.
4. Internally developed with the library
5. Obtained freely or at nominal cost.

Turn-key system approach where a system is designed marketed and maintained by a vendor who supplies a computer system of software and hardware to perform a defined application.



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Custom design for a particular computer system or a range of computer systems by a software vender either by developing a completely a new package or by turning an existing package.

Bought off-the shelf from a software vender, along with necessary documentation for installation, usage and maintenance.

Internally developed within the library or its parent organization.

Obtained freely or at nominal cost from professional societies or individuals or international agencies like UNESCO, etc.

Recommended Steps for Automation

1. Identifying the library function that could be computerized.
2. Analyse these functions in details from the view point of
 - a. Operations involved
 - b. Type and size of records
 - c. Storage media required
 - d. Various outputs required
 - * formate
 - * media (in print out or store in disk)
3. Estimation of the volume of information to be handled and the rate of growth.
4. Cost factors
 - * for manual system
 - * for automated system
 - * benefits
5. Justification to introduce automated system
6. Selection and acquisitions of hardware that meets the local requirements
7. Identification of software available
8. Selection and /or development of software which meets the local requirements
9. Training of library professional
10. Training of users
11. Frequent evaluation and modification of the software if necessary
12. Evaluate documentations and support.

Principal Approach to Library Automation

There are two principle approaches to the development of automation library systems. They are

1. Single application systems
2. Integrated system

Traditionally libraries have designed systems to accomplish single, simple tasks such as acquisition, serial control etc. it is easier to achieve a workable solution to a given function by developing a single purpose system, which has its own files defined advantages of single application systems. However, when single application systems are to be integrated, specifically designed data files pose problems.

Single application system

The advantages of single-function automation are that

1. Automation can begin with a small, easily managed system
2. It will be possible to implement the automation quickly for the particular function.
3. It will be less expensive
4. It will be easy to change as technology changes.

However it has its disadvantages such as

1. Difficulties may be encountered later in integrating separate functions and
2. The choice today of a single –function may limit a library's future choice Integrated system
3. A totally integrated system has all principle function automated in a network. An integrated system has the following advantages.
4. A large amount of record keeping can be eliminated by automating all functions simultaneously
5. Functions interface with one another
6. Data is not duplicated
7. System provides many access point to data available

It has disadvantages such as

1. Higher initial cost may be incurred than with other systems
2. Higher conversion cost since many functions are involved

The library staff needs to adjust to much change in short period of time

RFID- Radio Frequency Identification

RFID is radio frequency identification. RFID technology is in use, since the 1970s. RFID tags can be active, semi-passive and passive. It is a small device that can store information. Active tags contain batteries which power their internal circuits and transmit signals using battery power to a RFID reader within a range of 100 feet. With additional batteries, this range can be increased to 300 feet. Semi-passive tags have internal batteries which are used only to power its internal circuit. Passive tags don't have internal batteries. Semi-passive and passive tags draw their power to broadcast a signal from a RFID reader. RFID reader is a device that can receive and transmit a radio signal. It is built to encode data stored in the tag's microprocessor. Because of the higher cost, active and semi-passive RFID tags are used for valuable asset tracking. The passive RFID tags are used in RFID library management systems.

RFID In context of library

RFID is a technology that is sparking interest in the library community because of its applications that promise to increase efficiency, productivity and enhance user satisfaction.

A library stacked with books and other information dissemination processes, has a physical presence. A library is an institution of knowledge acquisition and learning; it provides invaluable service to its members, patrons and to a wider local community. Current library management system use barcode technology and security strips. Using barcodes, a library management system can keep records of lending, borrowing and shelving status of items such as books, audio or video tapes, CDs, DVDs, etc. security strips on library items tag their movements.

But barcodes and security strips (electronic article surveillance or EAS) have their limitations. They are slow to read and are prone to sabotaging by thieves. All these lead to irreparable loss to a library and its valuable inventory stock. This is where RFID

technology can come to the aid of library managers and users.

Many libraries are switching over to RFID applications, for example, the Vatican Library. With its priceless, ancient collections of 2 million books and manuscripts the Vatican Library is now using RFID to track, manage and secure its assets. The main problem these ancient libraries face are thefts, non-returns and misfiled items, it is expected that by adopting an RFID solution the Vatican Library will be able to control misuse of its library and at the same time provide its users the best possible facilities and access to rare manuscripts.

The radio frequency identification (RFID) uses the radio frequency tags and reader for transmission and reception of the radio signals. The RFID tags are of two types, viz. active tags and passive tags. The active tags are tags that have an in-built battery in them. These tags are expensive due to the type of battery used. The passive tags are simple ones, with no internal battery. They are much cheaper than the active tags

How RFID Technology Works In Library Management

A RFID tag is an important part of the RFID library management. RFID library systems consist of an integrated circuit and an antenna, which enables it to function as a transponder. It can be attached to any item with the information about the item stored in it. Details such as name, origin, price, ownership of an item etc. can be a part of the information stored in a RFID tag's microchip. When a RFID reader tries to read data from a tag, its antenna emits electromagnetic energy which is received by RFID tag's antenna. The tag's microchip uses this energy to emit a radio signal using the tag's antenna. The RFID reader receives and interprets this signal and passes interpreted information to a computer network. This computer network can provide information about the items carrying the RFID tag and their present status to a computer user.

RFID library management, using RFID tags library, is easy and convenient. A RFID library management system consists of books, each attached with an RFID tag, RFID reader, computer network and software. Library staff handle lending, returning, sorting, tagging etc. of books, using RFID tags in this library system. A person can locate RFID library books marked with a RFID tag, using the RFID reader which identifies and locates the book. When the book is carried to the counter, the library staff can either activate or deactivate the electronic article surveillance bit in the book's tag. If a book is borrowed, then the surveillance bit is deactivated.

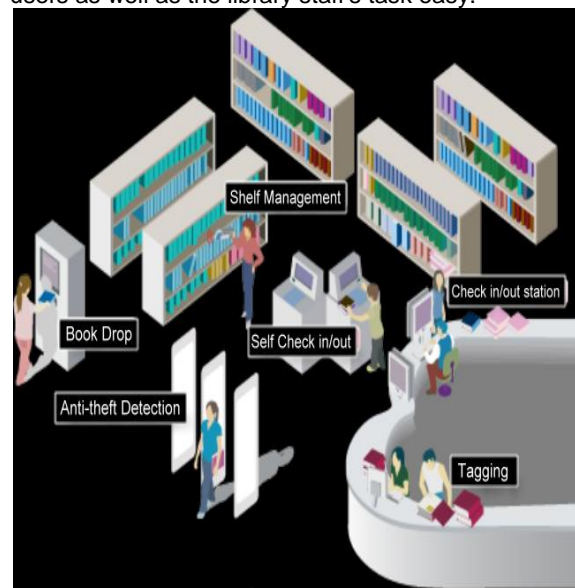
The main entrance of the library is equipped with a RFID antenna which receives radio signals from every book's tag being carried out of the library. It signals a warning, in case a book that is carried outside, with a surveillance bit in its RFID tag active. In this way a RFID equipped library system controls the inflow or outflow of tagged library books and prevents the theft of books. When a book is returned, the surveillance bit in its tag is activated, and the book

cannot be taken past the entrance of the library, without an alarm being sounded.

Borrowing and returning of books can be fully automatized with the help of self check-in/out systems. This system involves installation of special software. A person using this system to borrow books, is presented with options on a computer screen. The person has to identify himself with a code, which is preferably a personal identification number, or any form of unique identity code. Books selected by the person are identified by the system's built-in RFID reader. And, the surveillance bit in the book's tag is deactivated by the system. When a book is returned, the check-in/out system activates the surveillance bit.



Taking care of books and making them available to the book readers are important tasks. Most of the library staff's time is spent in recording information of incoming and outgoing books. Using RFID in libraries saves library staff's time by automatizing their tasks. An establishment that uses RFID library management saves a book reader, precious time that he would have been spent, waiting for his turn in a queue for borrowing or returning a book. RFID tags manufacturers are trying to bring tag prices below 50 cents per tag. Using low-priced RFID tags in libraries will reduce the cost of modernization. RFID library management system makes the library users as well as the library staff's task easy.



Six Sentences about RFID for Library

1. RFID tags replace both the EM security strips and Barcode.
2. Simplify patron self check-out / check-in.

3. Ability to handle material without exception for video and audio tapes.
4. Radio Frequency anti-theft detection is innovative and safe.
5. High-speed inventory and identify items which are out of proper order.
6. Long-term development guarantee when using Open Standard.

Benefits of RFID

The RFID technology is rapidly replacing the barcode system, which has been popular until now. The applications of the RFID technology are known to have many benefits over the other automatic identification technologies.

1. In today industry, handling of material is the primary or secondary efficiency. A library can easily checkout book at a much faster process without going through opening and stamping books that need to be checkout. Obviously this is a dramatic reduction in the steps required during checkout.
2. For instant like a library with RFID fully implemented, the system can replace a complicated checkout process or system. The patron walks past the exit sensors, the information is read off the smart card right from the patron's pocket and the items are checked out. No contact with human being, no need to interact with a station of any kind.
3. The RFID system also has the potential to use a smart card to increase services to patrons. Information can be embedded in the card including profile or other information useful at the checkout or other library service desks.
4. Obviously with the installation of security addition into the RFID tag then the checkout stations become far more user friendly. All items can be checked out using the self checkout units as no electromagnetic desensitizing occurs that can damage sensitive audiovisual material. Also, this could eliminate barcode system and barcode technology is no longer necessary.
5. Other than that, tracking of lost items, identify quickly of the shelf reading and all work associated with checking the shelves becomes much easier using the portable readers. Scan at shelf and the reader will tell what you have on the shelf and what title of books you have on the library shelf. RFID allows taking item inventory right in the stacks rather than having to remove the items from the shelves. It also enables quick shelf reading, re-shelving, sorting, searching, weeding and exception finding.
6. Book check in becomes far more efficient as entire bins of books can be checked in by moving the bin through a large reader or scanning a truck of books with a portable reader. This process reduces handling of returned material by several steps.

Benefits to Staff

Less Time Needed For Circulations

Implementing RFID will considerably reduce the amount of time required to issue, receive, transport, sort & shelve library materials.

Efficient inventory management

Inventory management can be done using a handheld reader without classing the library and is at least 20times faster compared to existing barcode system.

Reducing Repetitive Stress Injuries (RSI)

RFID based system reduces repetitive scanning of individual items at the circulation desk during check in, check out and hence avoids RSI such as carpal tunnel syndrome.

Taking inventory in RFID based system doesn't require physical deshelfing & shelving of library material

Benefits to Patrons

1. Patrons will spend less time waiting in check out lines by using self check in –check out systems.
2. Patrons find what they are looking for quickly & easily.
3. Reminders for due dates allows patrons to submit borrowed materials in time.
4. Use of book drops & return chutes for returning library material, allows for flexible timings.
5. RFID enabled patron cards allows for easy patron identification & reduces errors.
6. Self service enhances patron privacy.
7. Improved patron services even when libraries are facing staff shortage.

Some of the Technical Problems may be occur with the RFID Applications in Libraries

1. RFID reader range depends on its power and antenna size.
2. Some interference from metallic material in book covers does occur and tag reading may not be correct.
3. RFID reading accuracy declines if may items are read simultaneously.
4. RFID tags are easy to shield from readers by ordinary aluminum foils and may not serve the purpose of being anti theft tools.

Privacy concerns are the main drawback to the technology. The very usefulness of the system is what makes it vulnerable to privacy abuses.

There are two types of tags on the market. One has a read-only capability; the information stored on the tag is only that which was entered at the time the item was processed into the library's catalogue. These tags have limited privacy issues related to them as no patron information is added to the item's RFID tag.

The other is a read/write type of tag. These tags can be both read by the RFID readers and have information added to the tag by them, such as the patron's name and other information. The potential for a privacy breach by such a tag is possible. However, all systems are structured differently; encoding has differences required by the individual institutions. A compliant reader could read the information off the tag but the information would be in an encoded form. The

theft would have to be by someone who understood how that particular library encoded its material

Technology comparison: RFID, Barcode and EM

S. No.	Features	RFID	Barcode	EM security
1.	Identification technology	Non Line of sight RF	Line of sight optics	Non line of sight EM
2.	Built in security	Yes	No	Yes
3.	Multiple items identification	Yes	No	Yes
4.	Automate circulation of books	Yes	Yes	No
5.	Automate search	Yes	No	No
6.	Self check out facility	Yes	No	No
7.	Self check in facility	Yes	No	No
8.	Flexibility and modularity	Yes	Yes	No
9.	Common id card	Yes	Yes	No
10.	Automated sorting	Yes	No	No
11.	Reduce RSI of staff	Yes	No	No
12.	Automate stock management	Yes	No	No
13.	Longer tag durability	Yes	No	Yes
14.	Allow for 24hrs open access reading room	Yes	No	No
15.	Secured inter library borrowing	Yes	No	No
16.	Budget	Medium	Low	Medium
Overview		Single technology that can automate major routine functions of library. Allowing users to access the library resources at flexible timing and provides library staff & institute management with better control over their resources	Low cost technology can automate circulation function in a library. Does not support security, auto inventory, stock management, self issue return etc.	Serves only security aspect for library items.

Aim of the Study

RFID is a technology to use security purposes, to save the time of users in library and to provide convenience in process mainly in circulation section. Aim of the study descriptions mentioned in the paper is to provide understandable information of RFID technology after read or understand the technology, scholars can get detail knowledge of RFID technology and Tags used with in it.

Conclusion

RFID is technology that is booming in libraries due to increased productivity in library processes and a possible increase in the security of items for loan. And it has proved very useful in library automation. RFID technology leaving behind the barcode system. The only barer in the journey is cost, but every new technology comes at a cost. Some body rightly said, "there's never a 'best time' to adopt any new technology-today's facilities are always better, cheaper and faster than yesterday's, but what ever you by today is almost guaranteed to have been superseded by something even more ideal by the time tomorrow comes".

References

Application of computer to information storage ad retrieval; annamalai university, directorate of distance education, p.43-45

Meheta, M. and Jani, J. (2007), "RFID technology:a changing scenario and new pilgrim for libraries", paper presented at the 5th international Caliber conference, 8-10February, panjab university, Chandigarh, p.p458-470.

Mkhdumi, G. and Verma, V.K. (2007), "RFID implementation in libraries: a survey of some lected libraries in India", paper presented at the 26th IASLIC All india confence, 26-29 december, Dr. Zakir Husain library, jamia millia islamia, new delhi, pp65-74.

Razak, AA (2007), "A comparison of barcoding and RFID technologies in practice", journal of information, information technology and organization, vol. 2,pp 11-32, available at : <http://jiito.org/articles/JIIT0ov2p119-132White96.pdf>(accessed on 29 november 2009).

Singh, J. Barar, N and Fong, C (2006)" the state of RFID application in libraries", information technology and libraries, vol. 25.pp 28-35

Sumi, S. and Kumar, J. (2007), "application of rfid technology in libraries", paper presented at the 5th international caliber conference, 8-10 february, panjab university, Chandigarh, pp. 450-465. www.infosciencetoday.org/digital-libraries/libbest-rfid-library-management-system.html

http://www.rfid-library.com/en/default_e.html

<http://www.rapidradio.co.in/rfid%20library.html>

<http://www.rfidjournal.com/>

Wikipedia (2009), "radio frequency identification", available at <http://wikipedia.org/wiki/rfid#libraries> (accessed 29 November 2009)