IMPLEMENTATION OF RFID TECHNOLOGY IN JAYAKAR LIBRARY, UNIVERSITY OF PUNE; PROBLEMS AND PERSPECTIVES

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Abstract

This paper introduce the structure and application theorem of the RFID system, discuss application models and issues when implement the RFID system. Radio Frequency Identification (RFID) systems have been used in libraries. These applications can lead to significant savings in staff costs, enhance service, prevent book theft and easy to stock verification, provide a constant update of library collections, holding management, but also attain real-time services. Due to the issues about reliability, insufficient, interfere with noise, cost and without killer application, therefore major library only experiment with RFID for holding management. RFID provided with these characters of batch access, storage mass data, and reprogram that were barcode cannot archive. Integrate both parent and holding with functions of RFID to extend various application. Just replace barcode and magnetic strip then archive there advantages for book identification, for the sorting and conveying of library books and AV materials, not only realize precise. The most important issue is that libraries can use nonproprietary systems today because the new generation of RFID chips with the ISO standard 15693 is available.

Keywords : RFID, University Library, Library Automation

1.   Introduction

WhenThe information explosion and information technology revolution had led to the emergence of the electronic information era. We live today in an information era where in information as commodity is increasingly playing a central role in our daily life. The knowledge is ever changing in every discipline and library and information science is not an exception to understand the changing concepts in different areas of library and information science. Information explosion revolution has given rise to new mythology of the information society , where information technology 'parse' is being presented as the new savior of mankind. In library literature a variety of context phrases such as information age global information economy, virtual library, and information super highway are appearing with considerable frequency.

The stage has come when traditional type of library has to automate their services and try to disseminate the information using new technologies. Demands of new information environment on library and information are not only complex but also rising and libraries have also changed from static warehouses of interested documents to dynamic service centers serving all the professionals as well as non professionals . New technologies have always been of interest for the libraries both for the potential of increasing the quality of service and for improving the efficiency of operations. At present time, when libraries of all kind,(Public, research, special) are facing economic hardships the overwhelming reason for considering new technologies is the potential for cost savings in the operations and the management of the materials flows.

2.   Jayakar Library

Jayakar library was established in the year 1948 to serve its users with the best services and to fulfill the requirements of the users as well as the organization . since in this changing environment with the introduction of new technologies and the changing perception about the information and the information system it is seen that the libraries need to understand this change and work accordingly with the current situations and accept the current trends. As automation become a boon factor Jayakar changed itself from a traditional library to the new modern library with the introduction of different technologies available for library's automation.

From 1990 onwards Jaykar library is using LIBSYS software package for library activities. It made an infrastructure for LIBSYS software by using different networks like LAN and different points for user (OPAC) to consult the catalogue. After this it started with a new technology i.e. Barcode technology in the year 2000 and now it has gone one step ahead with the implementation of radio frequency identification (RFID) .

Jayakar library is the first library in the country to implement this RFID technology with the initiative of Prof. A S Kolaskar , Vice Chancellor , University of Pune, Dr. S K Patil , Librarian Jayakar library, University of Pune, and his team executing this technology.

3.   Library Automation

The objective in automating any library activity was strictly limited regardless of size and complexity of the task to be mechanized . The goal of any mechanized system was essentially to change the traditional system. On the basis all major areas of library housekeeping have been successfully mechanized. The first viable system became operational roughly in 1963 and 1966. The stage has been reached when the technology and perhaps all the economic facilities exist for a change to be made in libraries to achieve the goals and objectives.

Library automation is nothing but the use of automatic and semiautomatic data processing machines to perform traditional activities such as acquisition, cataloguing , circulation. Library automation may be distinguished from related fields such as information retrieval, indexing, abstracting and automatic textual analysis.

Also the libraries, which have initiated a mechanization program, have attracted attention within the library profession and have enhanced their reputation as well as gained a higher position. The growth in the sheer mass of published information to be handled has also been offered as an explanation for the increased activity in library automation. Most of the library automation projects began in 1960's. Much of the early literature on library automation speaks about total systems and it is implied that most of the libraries should be automated library systems.

In library automation the first thing, which comes to our mind, is the technologies involved or which can be adopted to automate the libraries. As with a large research in development of new technologies some, which can be applied to libraries for easy working and for providing better services, are :

1.   Barcodes

2.   Electromagnetic security

3.   Radio frequency identification.

4. Technologies for library Automation

Libraries continued to be mildly interested in such machinery for most of in the 21st century. The general-purpose computers that become widely available in 1960s changed all that and made it possible a second era of library automation systems. Most of the systems common in 1960's used punched cards. The increased availability of computers and improvements in data processing made it possible the development of library automation system. Another was the growing realization throughout society that the computers could be used effectively for numerical work.

Since 1960's with the introduction of electronic security systems many libraries have started using these systems for theft control, inventory etc and for automation of different activities.

5. Barcodes

The basic structure of a barcode consists of a header, a manufacturers identification number, item number and check digit. Barcodes is a fundamental technology for library automation and flow management . In application for the circulation of books, barcodes technology has been proven to be robust , reliable and efficient.

Barcodes are noting but self-contained messages with information encoded in a series of black bars of varying breadths and white spaces between every two of them. The barcodes have found its application in different fields like supermarkets, courier companies etc. barcodes are used basically for circulation management of document.

Barcode system is now being considered as an effective addition to support automation process. Barcode can eliminate human errors and are considered in terms of reliability of information ease, speed of operation and use. Barcode have distinct advantages over other techniques like manual data, magnetic stripes etc. In the effort to extend barcode technology to self service stations, which is one major direction for achieving better efficiency in operations the experiences have been less satisfactory.

6. Electromagnetic Security Systems

Barcodes cannot be the signal feed for anti-theft systems so the usual combination is to have a combination of barcodes for identification , and some electromagnetic (EM) based antitheft system. In self service stations the identification system must interact with antitheft system so that the items have the correct electromagnetic state after the circulation transaction, i.e. checked out items must be deactivated , and returned items activated.

As for the signal source for antitheft system i.e. the magnetic stripe , label, or rod there is a danger of a technology trap, once the magnetic device is attached to the library item it should, ideally, not be possible to take it away. This, however, makes it difficult to switch to another electromagnetic security system if the signal source was used in alternative solution.

7. RFID (Radio Frequency Identification)

RFID is a method of remotely storing and retrieving data using devices called RFID tags. Take a closer look at how RFID has the potential to seamlessly invade our daily lives. The RFID applications are two main areas of applications defined broadly as proximity (short range) and vicinity (long range). Long range or vicinity applications can generally be described as track and trace applications but the technology provides additional functionality and benefits for product authentication.

RFID enables greater automation of data collection process. Most companies spend considerable effort in knowing what is in their warehouse. RFID will help them dig deeper and much more easily, tracking to the detail of even each unit, long after it has left the factory or warehouse.

RFID allows all this data to be transferred securely. Companies use independent suppliers data from each of them can be carried on tags and uploaded the companies central system.

This technology have been in use in libraries for five years for book identification, for self checkout, for antitheft control, for inventory control, and for the sorting and conveying of library books and audiovisual materials . These applications can lead to significant saving in staff costs, enhance service, lower book theft and provide a constant update of media collections.

The technical features of a modern RFID system are described to provide a guideline for the evaluation of different systems. The most important issue is that non proprietary systems can be used by libraries today because to new generation of RFID chips with the ISO standard 15693 is available , with this technology, libraries are not tied to one company edited version of "Radio Frequency Identification" systems for libraries and archives.

Many libraries including Jayakar library (University of Pune) are declining to put the name of the book or even the books ISBN its International Standard book number, on the microchip implanted in it. They are using a unique bar code number instead one that would have to be hacked out of a libraries circulation database to assuage the privacy concerns of readers. For inventory management, libraries need to track individual copies of books and not the words between a given book covers.

8.   Historical Development of RFID Technology

RFID is a term used to describe technologies that utilize radio waves to automatically identify people or objects .Concept of RFID can be simplified to that of an electronic barcode. RFID technology has been around for many years, but it's only in the past few years that there has been a surge in its acceptance and a massive growth in it use. From its use back in 1940's RFID suffered a very great set back but slowly took pace. First emerging in 1980s RFID was primarily used to track objects in industrial environment. Today in 2005 RFID is being used to authenticate official memorabilia, track proprietary automate access control and since in the 1990's manage inventory and theft in libraries.

As the new millennium unfolds more and more people are becoming familiar with the benefits offered by RFID, The innovative technology in transforming the way many industries operate and are set to create a significant value for a number of libraries. Library everywhere are closely watching radio frequency identification (RFID) technology as an advance over using barcodes on library. RFID has become yet another acronym in our increasingly hi tech world.

RFID frequency identification systems have been in use in libraries for fifteen years for book identification, self-checkout , for antitheft control, for inventory control and for sorting and conveying of library books and audiovisual materials.

These applications can lead to significant savings in labor costs enhance customer service, lower book theft and can provide a constant update of media collections. RFID were developed about 35 years and were originally niche products. Utilizing RFID technology, large quantities of information can be analyzed and made available to internal and external systems. In near real time which is providing crucial to improving the quality of business operations as well in libraries

9.   Components of RFID system

The components required for the RFID setup areas follows :

1   Smart labels (I-Code /Tag it/ISO 15693)

2   RFID card (———— "——————————)

3   Mid range readers/writers (ISO 15693)

4   Gate antennas (EAS)

5   Application software

The smart label , which is attached to the book, carried a film circuit and a very small chip. It works like a little intelligent radio by sending our radio waves, which are detected by antennae. The new advantage is that not the antennae and the label can exchange intelligent information . This makes our systems very fast and efficient for libraries,. The visitor enters the library through an entrance gate, precedes either directly to the shelf to remove the books or asks for advice at the information counter or goes to the online search. He may also want to return some books. The central unit is the self-issue station . At this station books are registered as being checked out together with the visitor name, they are deactivated in their security function and a receipt is printed. The antennae will give an alarm if an item was not issued properly.

Smart Labels

All the books are mainly pasted with the smart labels . All the labels on books are customized with the book name, author's name , accession number of the book and other details, if necessary in their 384 bits memory .RFID smart labels are designed for lasting to lifetime of the item they identify . They have an EAS (Electronic Article Surveillance) function to detect thefts.
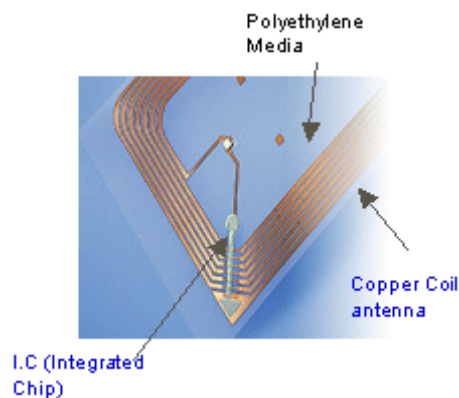

RFID Card

This is passive label card the card draws its power from the readers Radio frequency.

Mid range Reader/Writer :

It comprises of a midrange reader. The equipment can easily be connected to a network or single workstation Pc or notebook and the application can begin functioning thereon. It also supports all RFID functions like anti collision feature allowing to identify multiple labels simultaneously, present in the reader field and full read/write capability. It is used at the issue/return counters at the library and also for label personalization. It is connected to a PC or computer terminal.
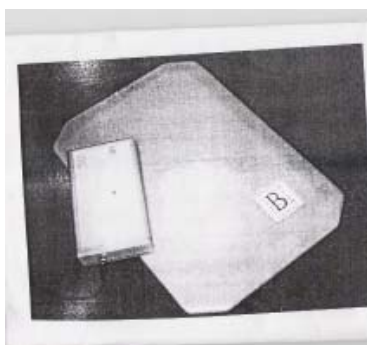
Gate Antennas :

The gate antennas act a as hardware which issue a warning signal and activate the alarm system if a book or file pasted with a label is leaving the premises or department without an authorized issue/ outward entry into software. Gates are easily mounted and are connected with warning light signals and also sound alarms to inform the security personnel that some mischief has taken place. These gates are used at the entry and exit points in the library.

Application Software and Hardware :

The innovative software is the backbone of the RFID system. The software allows fast and high secure identification leading to authorize and authentic transactions with the different entities of the library by facilitating them with a digital smart identity.

Technical Specifications :

Using Visual basic may develop the application software. Net with oracle as a backbone.

Requirement	Hardware	Software
Server	PentiumIV/1GB RAM/40 GB HHD or above with other standard configuration.	Windows 2000 Professionals or higher version as operating system, Oracle 9i server crystal reports 6.0 net framework.
Client	Pentium IV 512 MB RAM/40 GB HHD or above with other standard configuration.	Windows 2000 or higher version as operating system, oracle 9i server, crystal reports 6.0 net framework.

10.   Software for RFID in Jayakar Library

The application software used by Jayakar library is developed by Infotek software and systems Pvt ltd., also known as I-Tek which is a leading RFID systems

integrator based in Pune. Their principal company X-Ident technology, GmbH is based in Dueren, Germany and is one of the World's largest smart labels, manufacturing company with the production capacity of 160 million RFID labels per annum.

This application software which is the backbone of the system is developed in-house by their team of experienced developer's using the latest development tools. This software allows fast and high secure identification leading to authorize and authentic transactions with the different entities of the library by facilitating them with a digital smart identity. The software has eight modules which are as follows:-

*   Acquisition module deals with ordering of library materials, monitoring their receipt, invoice processing and accessing. It also maintains expenditure and budget analyses under a variety of accounts / headings.

*   Cataloguing module provides online catalogues in the various orders maintained in traditional libraries. Additionally, it makes available instant listings under a variety of searchable fields to suit the requirements of a modern reference centre , other data entry facility, the system has the additional facility to accept data in standard format such as MARC (ANSI – Z39.x), etc.

    This makes possible import / export of bibliographic data in standard exchange formats, meeting specific requirements of any library. The system provides facilities to generate bibliographies, current awareness service and SDI (selective dissemination of information).

*   Circulation module maintains up to date membership records as well as the latest status of the collection meant for circulation. It performs all functions related to circulation providing suitable checks at every stage. It takes care of infrequent but routine functions such as bindery record management, books on display in the library, latest additions to library etc.[14]

- Journal / Serial module provides control of periodical subscriptions and subsequent monitoring of the schedule arrival of individual issues. It maintains records of the budget sanctioned for serials under different categories, amounts encumbered and expended, thus providing complete budgetary control.

  It handles serials which are received or in exchange. The article indexing system provides the facility to create and maintain a separate articles database.

- Masters provide control on all the masters used in the entire module i.e. Acquisition, Cataloguing, Circulation, Journals etc.

- Setup provides control on the entire library software. The end user can configure the entire software as per the needs of the library.

- OPAC system as the acronym suggests provides Online Public Access Catalogue. The bibliographic databases can be accessed in a manner never ever possible before with printed indexes. The system includes a word – based search facility.

- Web OPAC facilitates OPAC access through the web browser over the Intranet or Internet.

There are other softwares compatible to RFID technology available such as Libsys, Lib-sut, Bibliothica, etc.

11.   How Does RFID Work ?

The smart label, which is attached to the book, carries a film circuit and a very small chip. It works like a little intelligent radio by sending out radio waves, which are detected by antennae. The new advantage is that both the antennae and the label can exchange intelligent information. This makes our systems very fast and efficient for libraries, especially with exit gate antennae.
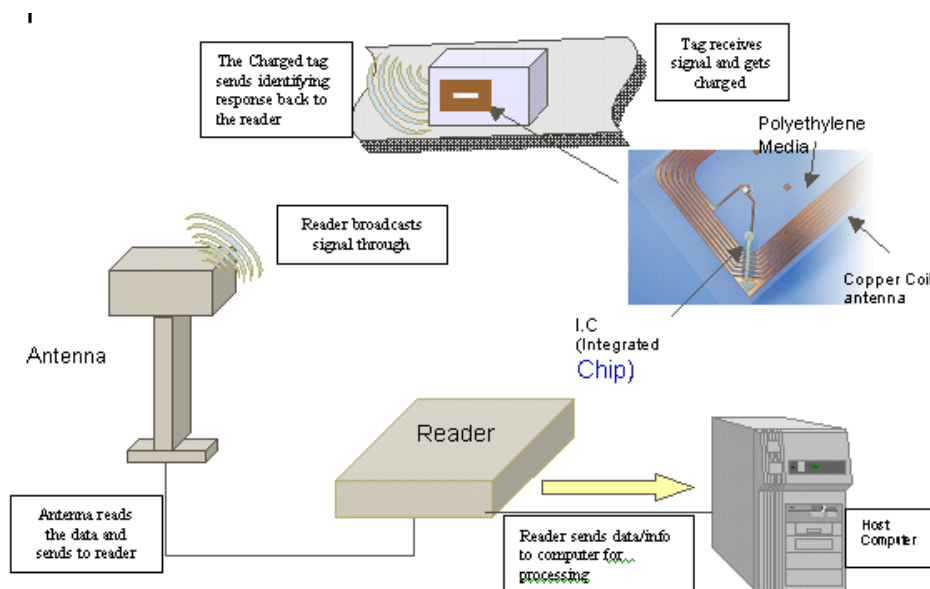
12.   Advantages and Benefits of RFID

Librarians everywhere are now-a-days closely watching radio- frequency identification technology as an advance over using barcodes or any other such technologies on library materials. As the new millennium unfolds more and more people are adopting RFID and are becoming familiar with benefits offered by RFID. RFID is an identification technology and does the same job as barcodes but offers potentially a lot more. Therefore it can be fruitful to see what we can learn from its application in library operations. RFID allows you to track Monitor, report and manage products, documents assets and people, more efficiently and as they move between locations anywhere at any time. RFID can improve user self checking and checkout this is because barcode readers require a line of sight. This limits checking to one item at a time and can make the process handling where as RFID scanners can read multiple items simultaneously and anti-collision algorithms ensure that each radio signal can be read accurately.

With the help of RFID automated check-in is also a boon .RFID eliminates line of sight problem another benefit is faster more accurate reshelving. Inventory management is improved with RFID.

The use of RFID reduces the amount of time required to perform circulation operations. The most significant time saving attributable to the fact that information can be read from RFID tags much faster than from barcodes and that several items in the stack can be read at the same time

1.   Improved tracking of high-value items.

2.   Reduce shrinkage errors.

3.   Inventory visibility, accuracy and efficiency.

4.   Improved production planning and smart recalls.

5.   Technology standards to drive down cost.

6.   Automated Issue/Return

7.   Theft Prevention

8.   Stock Verification and control

9.   Automated Sorting Of Books on Return

10.   Tested and Proven solution available now

11.   No lines or greatly reduced lines at the check out counter.

12.   Less repetitive work for personnel and increase the security function in library.

13.   Reduce materials cost and handling.

14.   A regular inventory control and update of the databases is possible.

15.   Automation of sorting and conveying functions and easy search for misplaced books.

As discussed above there are a lot of plus points in using RFID technology for libraries and most of the libraries in India should start using this technology, a much can be achieved with this technology.

13. Problems and Disadvantages of RFID systems for libraries

- Vulnerability to compromise

- Removal of tags

- Sensor problems

- Privacy

- Costly technology

- Reader collision

- Tag collision

- Lack of standard

- Import of equipments from Germany –5%

- Staff difficulty

- Training

- Electronic noise level –reduced

- Metal interface near reader antenna –removed

- Power supply problem at gate antennas –ferrite sheets

- System set-up problems

- Software bugs –removed

- Gate antenna problem- tuning

- Continuous electricity supply-generator back-up

- UPS circuits – acrylic sheet & ferrite

- Sign way UPS required for the reader

- I-tek S/w

14. Conclusion

Libraries have become a driving force in the development of RFID for the mass market. This technology was first used in other sectors of the industry, such as logistics, airline luggage automation or parcel distribution.

The leading role for libraries seems to be understandable, since libraries share their knowledge in the development of these systems and also the benefits have been greatest in the library community. It is important to know that the software was developed in an earlier stage and is today far more refined Finally, the library market also benefits from the current development (and expectations) in other markets; the prices have dropped to a level, where the curve is more or less stable because higher production numbers.

The production capacities for RFID labels have been calculated accordingly to serve a multi-million-unit market - and in recent years the prices for RFID labels have dropped more than a half.

With this background knowledge, it is obviously important to choose a technology that relies on the ISO 15693 standard and that every library must try to adapt to this new growing technology RFID i.e. radio frequency identification.

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