

RELEVANCE AND APPLICATION OF RFID TECHNOLOGY IN MODERN LIBRARIES

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ABSTRACT

RFID Technology is wildly used in modern times. It has so many applications RFID applications have been in use for many years in transport (public transport entry), access control cards (building and highway entry), event ticketing and management, and, more recently, in government identity cards and passports and extensively in manufacturing supply chains and in logistics for goods distribution. Industry sectors differ widely in RFID deployment, with many automotive companies and hospitals relying on RFID systems. RFID plays an important role in modern times. The technology increases recently in all fields and also in the library field. The recent technology used in the library is RFID Technology which enhances the speed, accuracy, productivity, and efficiency of library staff. This study provides the information about how RFID technology applicable to modern libraries and how it becomes essential for library automation.

KEYWORDS: *RFID Technology Library Library Automation*

INTRODUCTION

A library is an important source from where the information can be tapped effectively. It is an organized means which include books, periodicals, newspapers, maps, manuscripts films, prints, documents, microforms, cossets etc... The items which are stored processed and transferred through digital devices and networks are called as Digital Materials. The computer networks deliver the digital services.

For the operations in the library like circulation and theft detection, the technology named RFID is been used. It is a wireless non-contact system and it uses radio frequency electromagnetic fields to transfer data from an attached tag to another object. It helps the librarians to save time during the checking in and out procedures. It joins both radio frequency basic technology and microchip technology. RFID system consists of terms like a reader, transponder and associated antennas. It is a relatively new automotive identification system. The barcodes are used for identifying the item.

The dictionary for library and information sciences defines RFID as, “the use of microchip to tag library materials 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 waves.” The RFID developed its first commercial application the electronic articles surveillances. It combines the use of electromagnet in the radio frequency portion. Its three components are RFID tags, readers, servers. In the world war IInd in order to accomplish the bombing mission, they used RFID technology. The Germans were the people who took high advantage of the same.

Because of the broad applicability, RFID is emerging as one of the most effective computing technology. The radio frequency waves technology is been used in this. In the physical world, it has created a large number of opportunities for connecting various objects. These are those which can be identified, numbered and tracked. Many peculiar features and merits can be found in RFID, rather than many other technologies. The use of RFID communication is faster, and more convenient and time-saving. It has also a merit of improving services and reducing labour cost.

OBJECTIVES OF THE STUDY

- To find out the effectiveness of RFID technology in libraries
- To find out the different modules in RFID technology
- To find out the benefits of RFID application in libraries

METHODOLOGY

The methodology used for this study is a descriptive method. This study also adopted the methods of observation and interviews with the users and vendors of RFID.

SCOPE OF THE STUDY

RFID is the most modern automated data capture technology used for electronically identify, track, store, and analyze information associated with any physical object using a wireless tag. RFID is advanced technology it is relevant to study more about the technical and practical aspects of it and it also leads to improve the confidence of libraries to use it. Study about the various aspects of RFID which enhance the knowledge about RFID.

REVIEW OF LITERATURE

Recent trends leads to the use of Radio Frequency Identification (RFID) technology in day to day life. At the beginning, RFID was developed to replace barcodes in the supply chain. RFID technology used in various access such as Schools, Colleges, industries, supermarkets, agriculture, hospitals, poultry, etc. They are small in size and also do not consume more power. RFID tags are used mostly in areas of tracking and monitoring. They are low cost, high speed, and high accuracy. This article also explains to the working process of RFID (Daya Priyanka, 2016). Technology has been part f the market for a long time. It has proved itself as the boon the global market world. RFID security and protection are progressively increasing more significance. Its advancement is encouraging yet they require a lot of advancement cycles to end up basically helpful for associations and to stand as a reliable resource in the future generation (Richa Mishra, 2015). RFID systems have been used in libraries for book identification, for self- checkout, for anti-theft control, for inventory control, and for storing and conveying of library books. The technology requires the cooperation of RFID reader and RFID tag. RFID tag can contain identifying information, such as book title or code, without having to be pointed to a separate database (Rishabh Jain, 2015)

RFID System in Libraries

In the field of library system and services, there has been a revolutionary change due to the instant growth of technology. The scenario of the library has been transformed from manual to a computerised and automated system with the application of information technology. The latest technology for automatic identification method is the RFID

technology. Libraries have always been interested in the emerging technologies as they are relief from the time-consuming library operations. Moreover it also comes as a solution for budget crunches as they are cost saving. Among the several advantages of the implementation of the implementation of RFID systems, some are circulation, reshelving and theft detection. The traditional barcodes have been outdated by the RFID Technology. The past few years witnessed the steady growth of the global industry for the RFID technology and it is expected to stabilize on a steady path of growth.

Radio Frequency Identification stores data using a wireless technology with the help of electronic tags. According to Harold 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 for library and information science defines RFID as "the use of microchips to tag library materials and the library card, enabling patrons to check out items by walking through a self-service station equipped with an antenna that emits low-frequency radio waves". RFID can also be stated as a technology that incorporates the use of electromagnetic or electrostatic coupling in the radio frequency portion for unique identification of objects.

RFID Systems

RFID system consists of three components in two combinations; a transceiver (transmitter/receiver) and antenna are usually combined as an RFID reader. A transponder (transmitter/responder) and antenna are combined to make an RFID tag is read when the reader emits a radio signal that activates the transponder which sends data back to the transceiver.

RFID Tag

The heart of the system is the RFID tag which can be fixed inside a book's back cover directly on to CDs and Videos. This tag is equipped with a programmable chip and an antenna. Each paper-thin tag contains an engraved antenna and microchip with a capacity of at least 64 bits. There are three types of tags: "read-only", "WORM" and "read/write." Tags are "read-only", "WORM," and "read /write." Tags are read-only "if the identification is encoded at the time of manufacture and not rewritable. It can be used for EAS (Electronic Article Surveillance) anti-theft devices. "Read/write tags, "are chosen by most libraries, users have access to read and write into the tag's memory. All of the tags used in RFID technology for libraries are "Passive" tag. The power to read the tags comes from the reader or exit sensor, rather than from a battery within the tag. "Active tags which have their own power supply are substantially larger and more expensive than the tags used in the library applications. Low-frequency RFID system has short transmission ranges less than six feet. High-frequency RFID system offers longer transmission ranges.

RFID Reader

RFID reader or receivers are composed of a radio frequency module, a control unit and an antenna to interrogate electronic tags via radio frequency (RF) communication. The reader powers an antenna to generate an RF field. When the tag passes through the field, the information stored on the chip in the tag is decoded by the reader and sent to the server, which in turn communicates with the automated library system when the RFID system is interfaced with it. RFID exist great readers at exists are to type. One is readers the information on the tags going by and communicates that information to a server. The server, after checking the circulation database, turns on an alarm if the material is not properly checked out. Another type "theft "byte in the tag that is turned on or off to show that the item has been charged or not,

making it unnecessary to communicate with the circulation database. Readers are used in libraries in various ways such as conversion station, staff workstation at circulation, self-checkout station, book drop reader, sorter and conveyor and handheld reader.

Antenna

The antenna uses radio frequency waves to transmit the signal that activates the transponder. The Antenna is the channel between the tag and the reader, which controls the systems data acquisitions and communication. The electromagnetic field produced by an antenna can be constantly present when multiple tags are expected continually.

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 information with the circulation database.

How Does the Tag Work?

A tag is a simple two-way radio. It receives an RF wave from an antenna attached to an RFID reader, processes the signal, and sends the RFID wave with data stored on the tag back through the antenna to the reader. The reader decodes the signal and sends the tag's information to the computer where a software application that receives the data resides. The reader which is at the center of this entire process transmits and receives analogue waves and turns them into digital information consisting of strings of ones and zeros. Like all radio signals, the waves emitted by an RFID reader are restricted to specific and limited areas often called interrogation zones. Only tags within the zone are read. While there are a number of factors that distinguish tags, all have two basic elements: a computer chip and an antenna. The chip stores information and holds the logic that is necessary to know what to do when it is interrogated. The antenna enables the chip to receive power and communicate with the reader.

The Development of RFID Technology Usage in Libraries

Today, technological developments have been changed the working types of businesses radio frequency identification (RFID) technology is one of the emerging technologies that is being used by the organisation such as manufacturers, retailers, logistics providers, hospitals, and libraries. Radio-Frequency Identification (RFID) technology can be defined as a wireless sensor technology which is based on the detection of the electromagnetic signal.

RFID was first invented in 1948 and has subsequently undergone several developmental stages. In the 1950s, the explorations of RFID technology were confined to laboratory experiments while the development of theory and field trials with RFID took place in the 1960s. The next decade saw an explosion in the development and testing of RFID. According to Hossain and Prybutok (2008), the commercial application of RFID started in the 1980s. RFID technology was used to tag livestock in order to track and monitor the well-being of animals in the 1980s. When General Motors began to use RFID tags in car frames, the first commercial application of RFID came through. In the 1990s RFID technology entered in to supply chain to manage production and distribution systems. Currently, RFID technologies are used to identify, capture and transmit information from tagged objects to enterprise systems with these functions, RFID technology became popular for finding, counting and detecting items in the retail sector and others. Some implementations also it was

seen that RFID technology could be used in library circulation operations and theft detection in a security system. RFID can provide many benefits for libraries; therefore it becomes an inevitable technology in libraries, both for financial and human-related reasons. RFID system works similarly with barcode system. Many libraries have already installed a barcode system where a barcode has been placed in each book and the LMS (Library Management System) uniquely identifies the book by reading the barcode, using a barcode scanner. In other words, barcodes simplify the identification of items for library circulation and archives.

Key Features of RFID in Library

The important criteria in choosing an RFID system are the reliability of the system, its ease of operation and flexibility of tagging various media are the sole reasons for libraries to adopt RFID. To achieve these aims, automation and self-service help libraries of all sizes. It also has the advantage to provide security for different media offered in libraries. To optimize the allocation of labour and financial resources, the technology provides the facility of improved circulation and inventory control. This provides relief for professional employees of libraries from routine work and operational tasks.

Passive tags are used in RFID technology for libraries. The power for reading tags does not come from a battery within the tag but from the reader or an existing sensor. An RFID card, with additional encryption, is now as “smart card”, is used in some libraries instead of simply adding an RFID tag on staff and user identification cards. This not just facilitates the user to issue and return library materials, but also provides access to restricted areas for services. This would transform it into a “debit” card with value added upon prepayment to the library and value subtracted when a user uses a photo copier, printer or any fee-based devices.

Speedy and Easy User Self Charging or Discharging

The use of RFID reduces the amount of time required to perform circulation operations. RFID speedup the borrowing and return procedures.

Reliability

The readers are highly reliable. Several vendors of RFID library systems claim an almost 100 percent detection rate using RFID tags. Some RFID systems have an interface between the exits sensors and the circulation software to identify the items moving out of the library. Were a library user to return out of the library and not be caught, the library would at least know what had been stolen. If the user card also has an RFID tag, the library will also able to determine who removed the items without properly charging them. Other RFID systems encode the circulation status on the RFID tag. This is done by designating a bit as the theft bit and turning it off at time of charge and on at the time of discharge. If the material that has not been properly charged is taken past the exit gate sensors, an immediate alarm is triggered. Another option is to use the theft bit and the online interface to integrated library systems, the first to signal an immediate alarm and the second to identify what has been taken out.

High-Speed Inventorying

The unique advantage of the RFID system is the 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.

Automated Materials Handling

It is one of the important application RFID Technologies this includes conveyor and sorting systems that can move library materials and sort them by category into separate bins or on to separate carts. This reduces the amount of staff time required to ready materials for re-shelving

Tag Life

RFID tags last longer than barcodes, the technology does not require line of sight

Fast Track Circulation Operations

The use of RFID reduces the amount of time required to perform circulation operations. The most significant time savings are that information can be read from RFID tags much can be read at the same time.

Applications of RFID Technology in Libraries

The latest technology use in the library for book identification, for self-checkout, for sorting, conveying of library of the library books and for theft detection is RFID. Its aim is to increase the efficiency, reduce data entry errors and spare staff to perform more value-added functions. It is a combination of radio - frequency based technology and microchip technology in which the information contained in the tags affixed to library materials which is read RFID technology regardless of item orientation or alignment. The technology does not require line of sight or a fixed plane to read tags as traditional theft detection system. Except in the case of extra exit gates, distance from the item is not a critical factor. The corridors at the exit can be four feet because the tag is readable at a distance up to two feet by each of two parallel exit sensors. The devices named 'readers' used for circulation and inventory control and 'sensors' used for building exit. Both Electromechanical (EM) and EF, even barcodes are replaced by the technology used in RFID systems.

Modules of RFID

There are different components called modules used in RFID technology are Tags, Readers, Connectors, Antennas, cables, sensors, networks, controllers, data, software, anti-theft detection gates, RFID handheld the reader, drop box, RFID smart cards etc. Different libraries are using different modules as suitable as their requirements.

Effectiveness of RFID Technology

The applications of RFID are:

- Provide batch access
- Storage of mass data
- Re programming

Which are better than barcodes. This system improves the efficiency of the system, systematic organization, maintenance of collections and provides better and improved services to the users although the installation is costly. The cost becomes one of the major factors to decide whether or not to use RFID in libraries. The essence of the library service has not changed even though RFID has improved the efficiency of Libraries. The system prevents mutilation, misuse and theft of library documents and thereby the librarians are able to do quick, accurate and timely services to its

users without carrying any barriers in mind.

To economize the expense, the first step is to apply for RFID to scientific collections. It is possible to employ RFID systems to supply inventory, entrance guard and to gather reading statistics. Further extensions of its applications in libraries and other collections are likely to come after its development.

Application of RFID Technology In Libraries

Circulation

It is one of the important applications of RFID technology. The circulation in the library carried out with the help of RFID with smart card system helps the students to borrow and return books in an easy.

Self Check Out Station

RFID checks out system is user friendly, highly intuitive and reduces queuing times. At this station, the books to be checked out are placed on the desk and both user card and the stack of books can be read simultaneously that is, recording the user's identification, the borrowed items and deactivating the antitheft.

Self Check in Station

Books can be replaced in deck station one by one without any intervention by staff. The returned items are instantaneously updated in the integrated library software and the anti-theft device is activated. This automated book returned gives enhanced benefits to patrons as well as librarians.

Inventorying

It is one of the applications of RFID technology. It is also help to library to check out the transaction and detect all of the collection, including abnormal situations such as books put on the wrong shelf.

Automated Materials Handling

This significantly reduces the amount of staff time required to ready materials for re-shelving. Given the high cost of the equipment, this application has not been widely used.

RFID has some disadvantages also, the major disadvantages is cost. Thus most of the libraries can't adopt this RFID technology. RFID is also emitting some radiation. It is harmful to humans and it leads to major health problems such as cancer.

FINDINGS

A finding is a piece of information that is discovered during an official examination of a problems and situation or object. The findings of the study are mainly grouped in to two parts, according to the nature of the study. The first one is the findings on RFID technology and other one is the applications of RFID technology in libraries. Now a day's most of the libraries are using RFID and it has so many applications in libraries.

- RFID Technology is first used in other sectors of the industry, such as logistics, airline luggage automation or parcel distribution.

- RFID system in libraries can minimize/eliminate drastically a number of barriers like lack of speed, accuracy, reliability, time consumption, manpower, etc.
- RFID system has four system and three optional components.
- RFID technology can be applied best in middle or larger size libraries.
- The average cost of Tags is around Rs.15 per unit. Based on the frequency and capacity the rate may get change.
- HF (High frequency) tags are good for Library management system.
- Materials like aluminium, iron should be removed. Should have wood partition to avoid tag and reader collision.
- Librarian should know about RFID components and the specifications clearly before installation. So he should study the current system completely before any new system installation.
- Librarian should be careful while selecting the vendors of RFID and the component of RFID.

SUGGESTIONS

- Librarians should select the proper vendor for this work, the vendor who already been implemented RFID can do the implementation easily. So select the experienced person for this work.
- Check the compatibility of RFID with current software.
- Have a clear agreement with a vendor on his part of task at implementation.
- Decide the required data to be programmed into RFID Chips and insists on data ownership (independence with Library Software).
- Clean the database before starting. And plan thoroughly, Convince and train the library staff for this new technology.
- It is better to install CCTV Cameras in addition to RFID Gates. During the rush, it may help for additional surveillance.
- Before going for RFID implementation ask the vendor to demonstrate the inventory control system, if you are satisfied pls. go ahead. Libraries should adopt RFID technology for effective library services.
- Proper fund allocation is very much important for RFID implementation.

CONCLUSIONS

RFID (Radio Frequency Identification) is a recent technology used in library as theft detection system. It is more effective than EM (Electro –Mechanical) and RF (Radio Frequency) system, which have been n used for decades in the libraries. The RFID system is being used and installed since late1990s not only for detecting the unauthorized removal of library materials but to speed up staff charge and discharge, speed and simplify self-charge and discharge, support electronic inventorying and integrate with materials handling system. The significant advantage of all types of this system is the non-contact, non-line of sight nature of the technology. This technology assures to change our world.

It has the capacity to make our personal lives and work in the library more convenient. It is mostly used for self-service and the vast majority used the systems are very positive about its benefit.

RFID in the library is not a threat if guidelines are practiced and followed religiously. It speeds up book borrowing and inventories and frees staff for more user- service tasks. It saves money to and quickly returns on investment. It is important that education is given to library staff and users about this technology before implementing it. It is good for librarians to watch the development in RFID until the cost of tags comes down to Rs.20 or less, the figure determined by some librarians as the key to their serious consideration of it. Though library RFID systems have a great deal in common with one another, including the use of high frequency (13.56MHZ), passive, read-write tags, and lack of a standard and compatibility of tags created by different vendors becomes a major problem. The newer tags are able to resolve many of the privacy problems of today's tags. Thus librarian should be aware of the technical specification of the hardware and software of RFID before implementing. Every technology has advantages and disadvantages and so is RFID. But it is a good system to track the materials and for theft control at the library.

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