RFID Technology: Implementation Process and Role of Librarian

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Abstract: *In this digital environment library grows in size and collection of reading materials, hence the security of library materials and maintenance is concern of library professionals. In this aspect RFID can be very useful for security of material and for prompt circulation transactions. Also it saves huge time of library staff. RFID adds additional features to security system and enhances efficiency, productivity and boosts the user satisfaction. Considering the significant of RFID technology in this e-era, the present paper focuses on application of RFID technology in libraries, its components, merits and demerits of RFID, implementation process and role of librarian and HRD aspects are described.*

Keywords: RFID Technology, AIDC technology, Library security, Tag, Radio waves, RFID implementation, Role of Librarian and HRD

1. Introduction

RFID is an abbreviation of Radio Frequency Identification. It is a mixture of radio frequency based technology and microchip technology. In other words, it is the technology that uses radio waves to automatically identify individual items. It is technology, that has been adopted by industries as well as academics world now a days. In the today's advanced world and in this 21st century not only commercial industry but also academics sector is taking advantage of RFID technology to keep product more productive, safer and making it more user friendly for the end users. RFID technology carries data into suitable transponders (i. e. tags) and retrieves data by machine readable means to satisfy particular application's needs. It is very fast growing technology. This technology improves library services with less human intervention. The online RFID journal describes RFID technology as "Radio Frequency Identification is a generic term for technologies that use radio waves to automatically identify the individual item. There are several methods of identifying objects using RFID, but the most common is to store a serial number that identifies a product, and perhaps other information, on a microchip that is attached to an antenna. The antenna enables the chip to transmit the identification information to a reader. The reader covers the radio waves returned from the RFID tag into a form that can then be passed on to computers that can make use of it.

2. History of RFID

RFID technology is in use since 1970s. Mario W. Cardullo claims to have received the first U. S. patent for an active RFID tag with rewritable memory on January 23, 1973. That same year, Charles Walton, a California entrepreneur, received a patent for a passive transponder used to unlock a door without a key. A card with an embedded transponder communicated a signal to a reader near the door. When the reader detected a valid identity number stored within the RFID tag, the reader unlocked the door. Walton licensed the technology to Schlage, a lock maker, and other companies.

The RFID technology reduces time of library circulation and thus saves valuable time and energy of library staff and it also improves the library services. Also library material gets additional security layer from theft. RFID technology can be considered as Automatic Identification and Data Capture (AIDC) technology. The main objective of this technology is to identify objects, automatically-collected data about the objects, and update the data into a computer system without human intervention (Potdar Wu & Chang, 2010). Along with library circulation and safety, RFID is very useful for library stock verification. In the recent time along with industry, retail chain and commercial firm along with library section has widely used RFID technology. This technology automates the issue and return of library materials (books, journals, CD/DVDs etc). It can be considered as an important tools/technology to provide efficient, prompt and secure service to end users with user friendly approach.

RFID technology is based on tags. These tags can be active, semi-passive and passive. It is a small device that can store information. Passive tags don't have internal batteries. 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.

3. Objectives

Following are the mail objectives of this paper:

- To know the process of the installation of the RFID technology in the Library.
- To know the merits and demerits of RFID technology in the library.
- To understand the impact of RFID technology in quality of library service
- To find out the difficulties while implementing the RFID Technology in the library.
- To find the impact of RIFD during COVID 19 situation
- To provide the suggestion to the library professional for implementing RFID Technology.

What is RFID Technology?

RFID is combination of radio frequency and microchip technology to tract, identify the library materials/documents. It is also used for accuracy, stock verification, security of library materials, theft control. It uses wireless radio communication to identify objects. RFID is used in libraries to maintain library housekeeping operations, circulations operation and theft detection mechanism.

Yu (2008) defined RFID, "Regulating necessary standards, process and interfaces to fit in with current information systems and extend automatic library operations require continuous efforts." In the words of Liu and Chen (2009), "RFID is an electronic information technology that utilizes wireless radio waves to transmit, identify, trace, sequence and confirm various objects."

RFID library Management System

RFID in library saves the time of library staff and increase their efficiency by automating their tasks. Generally users have to be a queue for ling time for issue and return of reading material from a library. But now with the advent of RFID technology circulation becomes automatic with help of book reader and it save precious time. Quality time of library staff is being spent only in recording and verifying issuance and return of reading material, it can be saved by RFID. This has been one of the best advantages to the library staff. In RFID system, self check in/out systems in place for borrowing and returning of books with help of special software. Users can borrow a book without intervention of library staff. Users is presented on computer screen and needs to entre personal details such as library membership no and code). Books selected by a person are identified by the system's build in RFID reader and surveillance bit in the book's tag is deactivated by system. When a book is returned, the check in/out system activates the surveillance bit.

4. Components of RFID System

Generally, RFID system has main four components i. e. tags, readers, antenna and server. But other allied components are stated below:

1) **Tags:** It is the heart of the RFID system. It is fixed inside the book back cover and it contains a chip, programmable with an antenna. Its capacity is 64 bits. Tags are paper thin electronically programmed smart labels with unique information with a reader using a radio frequency signal.
2) **Reader:** It is a receiver device that detects the signal as soon it enters into its radio range and decodes the number for interpretation. It consists of a transmitter, receiver, antenna and decoder to communicate with RFID tags to receive data link for circulation of reading material without opening. When tag passes through the field, the reader power an antenna to generate a Radio Frequency Field.
3) **Antenna:** It is connected with reader to process identification of items and to activate and to deactivate the tag function simultaneously. It is bridge between tag and reader.
4) **Server:** It is main components of RFID system and it receives information from one or more of the readers and exchange information with the circulation database.
5) **RFID Label Printer:** It is used to print the labels.
6) **Handheld reader:** It is used for stock verification and to locate miss-shelved books and to trance books on request.
7) **Shelf Check Unit:** It is self circulation unit for self check in/out for registered users with help of RFID ID card. Multiple items can be checked out at the same time.
8) **Book Drop/Return Station:** Even if the library is closed, user can return the books with help of this station. This station has a RFID reader into walls and it identifies the users and books while returning. Also user gets a receipt for circulation status.
9) **Staff Station:** It consists of antenna, electronic module and power supply with additional software window integrated into library management systems.

Benefits and Advantage of RFID in Libraries:

The prime benefit of RFID is to reduce the time during circulation job and saves time of library staff. Apart of this, following are benefits of RFID system in libraries.

- Improves library services with easy check-in and check out
- Enhance staff productivity
- Users time is also saves and its improves users services
- Shelf Management and easy inventory verification
- Makes shelving process effective and trace missing books
- Makes stock verification easy
- Helps for proper book shelving and trace the missing books
- Automatic check-in enhances book return process more effective and saves users time
- More than one items can be checked-in or checked-out at the same time
- It more reliable process
- Longevity of tag life
- Theft reduction with high level of security of library materials
- Reduce material cost and handling
- RFID technology is better than bar code as it cannot be easily replicated.

Disadvantage of RFID Technology in Libraries:

- High investment
- Changes of removal of exposed tags exit gate sensor problems
- Reader and tag collision
- RFID technology is harder to understand
- The coverage range of RFID is limited which is about 3 meters.
- Lack of trained staff

Installation Process of RFID system in Library:

First step is to collect full information about RFID technology and call for the quotation from different vendors. After comparing the quotes we have to finalize the vendor and following are the steps for installation RFID in libraries. (Figure 1.1)
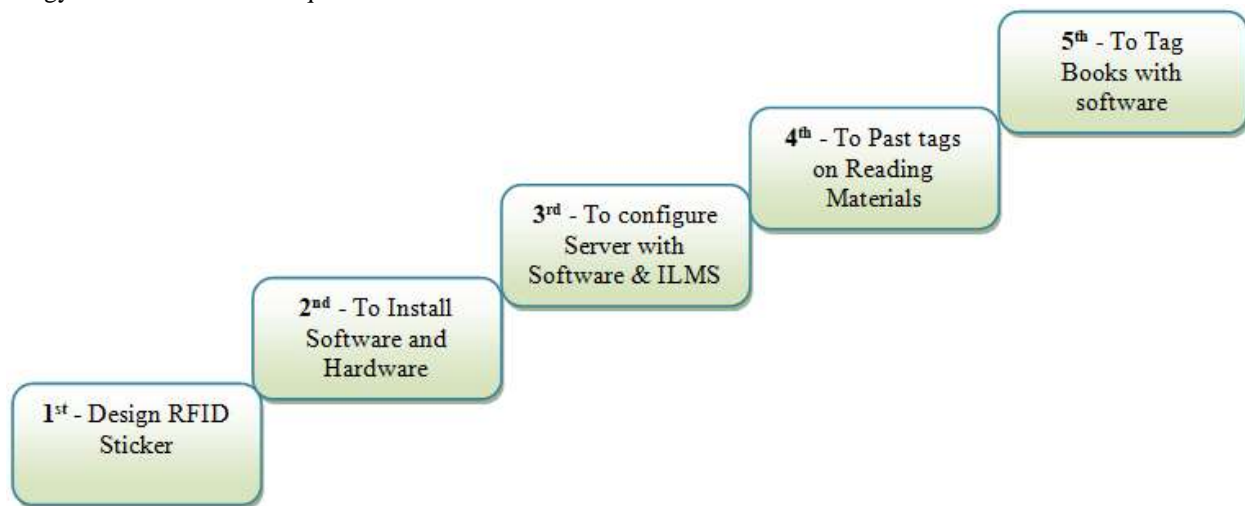
Figure 1.1: Steps for installation of RFID system in Libraries

Before starting the installation process, librarian must complete stock verification of library materials. It is advisable to procure a high quality RFID tags as once the tags are pasted on books, they can't easily be replaced. It is also recommend pasting tags on the back cover of books so RFID staff station can easily read the tags. Also make sure that middleware software should support the library ILMS. For better and effective execution it is advised to procure RFID components in following two phases:

- First Phase - RFID tags, stickers, staff station
- Second Phase - RFID smart card reader, RFID security gate, RFID hand held reader.

Furthermore, library professionals should visit the library/librarian who has already installed RFID in the libraries.

Following are some of the important Link for RFID vendors:

https://www.rfidjournal.com/question/where-can-i-find-a-list-of-rfid-vendors-in-india
http://www.rfidforbusiness.com/rfid-companies-india/
https://onlinelibrary.wiley.com/doi/pdf/10.1002/97804701
12250.oth1

Role of Librarian:

In the advent of the latest ICT tools and technology, RFID is one of them for more effective, convenient and cost efficient technology in library security. This technology has gradually replaced traditional bar code technology. The tag placed inside the book can easily identify the information such as books title, material, type of loan, etc without having to be pointed to a separate. Now bar code reader is about to an obsolete technology in many libraries. One of the additional features of RFID is, it acts as security devices, taking the place of traditional electromagnetic security strips. Along with books, membership card can be fitted with RFID tag. The initially cost to install the RFID is main constraint. The other aspect of RFID technology is Human Resource Development. Library staffs need a proper training for implantation and execution of the technology. Training will also enhance their RFID competencies and they can manage if any problem occurs in future. In this current highly competitive electronic environment, the threat is that this technology may be replaced with another technology.

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