Implementation of RFID Application in Indian Institute of Technology, Kanpur

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Abstract - According to Dr. S. R. Ranganathans' five laws "A library is a growing organism". In this Digital era, library grows in size and collection of documents, the problem of library document security and maintenance also growing day by day. For the purpose of library security, the library needed Radio Frequency Identification (RFID) technology. RFID has been installed in P. K. Kelkar Library, Indian Institute of Technology Kanpur. This paper discusses the whole process of the installation of an RFID system and the difficulties during the implementation of the RFID system. It also covers the advantage and benefits of Radio Frequency Identification in the library.

Keywords: RFID Technology, Implementation of RFID, RFID in IIT Kanpur, Radio Frequency Identification, RFID Application in IIT Library, Indian Institute of Technology Kanpur

Introduction

Radio Frequency Identification is a combination of radio frequency-based technology and microchip technology. It is a fast-growing technology for improving library services. RFID uses radio waves to identify objects and items. RFID is automatic item identification and tracking technology. 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."

RFID Technology Reduces the time required for operations of library circulation. Radio Frequency Technology offers great potential for expanding access to library services. The RFID Technology reduces the valuable time of library staff. RFID Technology can be used in library circulation and theft detection. RFID is one of the automatic identification and Data Capture (AIDC) technology. The purpose of such technologies 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). RFID does not only help in issue and return but also helps in other library services and works like library stock verification.

The RFID applications are not limited to the Industrial and retail supply chain sector. It has recently been introduced into the library sector as well, to automate the library materials, library services like issue & return of books. Radio Frequency Identification Technology is an important tool to bring an efficient, secure, fast, and user-friendly approach for material

transactions. Many IIT libraries already implemented RFID Technology like IIT Delhi, IIT Roorkee, IIT Chennai and IIT Kharagpur.

Objective

- To know about the installation process of the RFID System in the Library.
- To know the benefits of RFID technology in the library.
- To provide suggestions to the library staff for implementing RFID Technology.
- To know the changes in library services.
- To know the difficulties while implementing the RFID Technology in the library.

Indian Institute of Technology, Kanpur

IIT Kanpur established in 1959 is one of the premier institutes established by the government of India. The Kanpur Indo-American Program (KIAP) from 1962 to 1972 at IIT Kanpur was set up to collaborate closely with the outside world and thereby keep pace with the ever-changing world of Science and Technology.

Website of IIT Kanpur: https://www.iitk.ac.in/

About P.K.Kelkar library

P. K. Kelkar Library is housed with all modern amenities, and is situated in a magnificent three- storied building covering an area of 5730 square meters. The mission of the library is to provide information services and access to bibliographic, full text both in digital and printed resources to support the scholarly and information need of all student, faculty members and staff. The Library remains open for 358 days of the year, from 8 am to 12 midnight on all working days. The library provides various types of services and resources to the users of the library.

Total humber of Library Resources on 1107 2020							
Books	278265						
E-Books	16006						
Gratis	2251						
Housner's Collection	252						
Manglik's Collection	139						
Gifted Books	1860						
Journals	1643						
Subscribed E-Resources	26						
Bound Volumes	235537						
Annual Reports	144						
Technical Reports	21187						
E-Journals through E-ShodhSindhu	16000+						
Theses & Dissertations	17605						
Faculty Publication							
Full text	5353						
Bibliographic Data	9341						
CDs/DVDs	5780						

	Total	number	of L	ibrary	Resources	on 2	Nov	2020
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Services provided by the library

- Circulation with RFID Application
- E-mail Alerts
- Interlibrary Loan
- Library Consultation
- New Arrivals Display
- Photocopy
- Reserve section
- Search Request
- E-Shodh Sindhu Consortium
- Web OPAC Service
- Internet Access

Source: Website: https://pkklib.iitk.ac.in/

What is **RFID** Technology

RFID stands for Radio Frequency Identification. RFID is a combination of radiofrequency and microchip technology. It is used to track, identify the library materials/ documents. RFID is also used for accuracy, stock verification, security control, and control increasing theft. RFID Technology is a combination of Microchip Technology and Radio Frequency Identification based Technology. RFID Invented in 1969 and first used in the 1980s in a Harsh Industrial Environment. It uses wireless radio communications to identify people or objects. library management software helps libraries to maintain library housekeeping operations easily RFID can be used in library circulation operations and theft detection systems.

According to Yu(2008) "Regulating necessary standards, process, and interfaces to fit in with current information systems and extend automatic library operations require continuous efforts".

Liu and Chen,2009: Roberts,2006 explain that "RFID is an electronic information technology that utilizes wireless radio waves to transmit, identify, trace, sequence and confirm various objects".

Component of RFID

RFID Tags: Tags are the heart of the RFID System, it is fixed inside the book's back cover. Tags contain a chip that can be programmable and an antenna. The chip has a capacity of 64 Bits. Tags are paper-thin smart labels that are electronically programmed with unique information, consisting of an integrated circuit and antenna coil that communicates with a reader using a radio frequency signal.

Reader: These components are available in various sizes and shapes. It consists of a transmitter, receiver, antenna, and decoder. It communicates with RFID tags, identify them and receive data link which means books can be issued/returned without opening. The reader powers an antenna to generate a Radio Frequency Field. When a tag passes through the field. The information stored on the chip in the tag is interpreted by the reader and sent to the

server, which in turn, communicates with the integrated library system when the RFID system is interfaced with it. (Boss 2004).

Antenna: The Antenna produces radio signals to activate the tag and read and write data to it. Antenna helps to activate and deactivate the tags. The antenna is the channel between the tag and the reader. RFID Antenna performs two very important functions. First, they transmit power to the RFID tags by activating them, and second, they receive data back from the activated tags. A single antenna can activate and receive data from multiple tags simultaneously.



Self-chechout

RFID GATE



BOOK DROP BOX



RFID working Station



Installation Process of Rfid System in Library

- Collect the Full Information about the RFID Technology.
- Contact with the Vendor.
- Compare the Quotations and Finalize.
- Arrange the Meeting of Committee Member.
- Purchase Order.
- Design the RFID Sticker.
- Install the Middleware software and hardware by the vendor.
- SIP2 Server configuration for connection middleware software with the Library management software- KOHA.
- Pasting tags in books and other library materials.
- Tagging the Books with Software.

Benefits of RFID Technology in Library

- Ability to locate Specific Items.
- Self- check-in & check-out can be done using RFID by the user.
- Easy to find the misplaced books.
- Library theft control.
- Time-consuming for staff and the user.
- Easy stock verification.
- Faster circulation (RFID Application reduces the amount of time required to perform circulation operations).
- Faster inventory process.
- More than one item can be checkout and check-in at the same time.
- The ability to scan books on the shelves without tipping them out or removing them. Using wireless technology it is possible not only to update the inventory but also to identify items, which are out of proper order.

Suggestion for Implementing RFID Technology in Library

- Before going to install an RFID system in the library, the librarian must complete stock verification of the library materials (books).after tagging it's easy to find the total no of tagged books.
- Check the features and the manufacturing country of RFID components before purchasing,
- Ask your vendor to give all the details with the quotation.
- Buy high-quality RFID tags, because once the tags have been pasted on the books they can not easily be replaced. There are many types of RFID tags in the market, so go for high-quality tags.
- Paste the RFID tags on the back cover page of the books. Change the tag position of the RFID tag in every second book's back cover so that the RFID staff station of self kiosk reader can easily read the tags.
- Always try to Buy the RFID components in two-phase: RFID tags, stickers, Staff Station, and in other- RFID smart card reader, RFID security gate, RFID hand-held reader.
- Go with the vendor who can give you quick services, consult.

- Contact with the librarians who have already installed RFID in the libraries.
- Sometimes middleware software may not work and your ILMS may also give problem so always try to take a backup of your data
- Provide proper training to the library staff so that they can manage if any problem occurs.

Difficulties During the Implementing RFID Technology

- Lack of Awareness.
- Multiple Errors showing during tagging the books.
- Connection Problem with the RFID Reader and RFID Application.
- Connection with SIP2 server and LMS KOHA.
- Lack of trained Library staff.

Conclusion

RFID Technology is not only emerging but also a more effective technology for library security. The RFID tag contains all the whole information about the library book like the Title of the book, Author, Publication year, Accession number, call no., and the Book no also. RFID is working as a Security device. RFID Application supports tracking of materials, improves accuracy, and controls theft.

In this paper, we define the whole process of the library. We also discuss the RFID, its advantages, Disadvantages, and the difficulties which are observed by the library staff during implementing the RFID System. Some of the major suggestions are also provided to the librarians who are going to implement RFID Systems in their Libraries in the future.

In the P. K. Kelkar library, we have completed all the processes of installation of RFID Software and Hardware. We have completed tagging process in just 4 months. The whole RFID System working properly in the library and self kiosk, Book drop box is also ready to help the users self-check-in and check-out.

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