'Implementation of RFID Technology in Indian Maritime University Library: A Study'

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Abstract

This paper is a case study of how RFID was implemented successfully in IMU library. Step by step processes involved is detailed. The latest technologies benefit the libraries in its day to day routine tasks by increasing efficiency and cutting down on staff time.

Keywords: RFID; Radio Frequency Identification;

INTRODUCTION:

Radio Frequency Identification (RFID) technology has changed the concept of security around the world. RFID is a generic term that is used to describe a system that transmits the identity of an object or person wirelessly, using radio waves. It's grouped under the broad category of automatic identification technologies. The use of RFID has now been extended to libraries so as to keep them efficient and competitive to face the new challenges in the always changing workspace. RFID is a combination of radio frequency based technology and microchip technology. The information contained on microchips in the tags affixed to library materials is read using radio frequency technology. The importance of RFID can be summed up as – it is a costly technology and rare collection to be safe guarded from theft and staff time is freed from transactional based activities, so they can add value in other areas, self-service becomes faster and easier. It is a smarter way to manage collections and extends collection security to all items. It also positions the library as an innovator – particularly with new buildings.

METHODOLOGY:

Each organisation will approach the process differently. It's about finding the best RFID system for your library, not the search for the ultimate RFID system.

The methodology for implementation can be divided into many phases taking into consideration of budget provision, the types of document holdings, number of volumes, types of items meant for circulation, and the number and types member the institution has. Care should be taken to integrate the library automation package while detailed tender specifications are drawn. Then approach the market, get express of interest then request for Information and finally put up a request for proposal. This doesn't oblige you to purchase anything. Once you have all the information then put out a request for tender.

COMPONENTS OF RFID TECHNOLOGY:

A comprehensive RFID system has the following components- RFID tags or Transponders that are electronically programmed with unique information (a flat chip with antenna), Antenna, RFID Gates, Readers or sensors to query the tags, Server on which the software that interfaces with the integrated library software is loaded, Hand held RFID Reader (for Inventory control on shelves) and Smart Card Printer

RFID TAGS/ LABELS:

RFID smart labels are flexible paper-thin with an electronic chip. When placed into books or other media, these tags/ labels can be read and written to using radio frequency. Each tag has a certain amount of internal memory in which it stores information about the object, such as its unique ID, or in some cases

more details of bibliographic data and product composition. When these tags pass through a Radio Field generated by a reader, the transponder in the tag transmits the stored information back to the reader, thereby identifying the object. RFID tags/ labels have an in built EAS (Electronic Article Surveillance) function to detect thefts and are designed for lasting to lifetime of the item they identify.

The RFID chip used in the tag should have been designed specifically for Library use i.e. it should have
- o Lockable section—for item identification
- o Re-writable section for library specific use
- o Security function (EAS) for item anti-theft (which can be activated and deactivated).
- o The RFID chip should have multi read function, i.e. several tags can be read at once
- o Tag size usually will be 50mm x 50mm with at least 1024 bits memory, multi-read, antitheft

ANTENNA:
The antenna enables the chip to transmit the identification information to a reader. The reader converts the radio waves reflected back from the RFID tag into digital information that can then be passed on to computers that can make use of it
This facilitates the smooth handling of books and other materials with RFID tags. Through a Modern graphical user interface, any of the following functions can be carried out:-

- Tagging – Once the tag/ label is fixed on the book, its information such as Accession No./ Location is registered in the chip of the label through a function called Tagging. This function allows writing such information on chip either from the library database or by scanning existing barcode label, if any. With radio ID tags on books, librarians can automate checkouts and returns.
- Checking out- After establishing the validity of a member card either by barcode reader or by smart card reader, the books to be checked out of the library are placed on the deck of the station. The library database is updated automatically by registering the book in the borrower's account and the theft detection system in the smart label is deactivated. A receipt is printed out confirming details of borrowed material and due date (this is optional) the due date can be stamped on the due date slip alternatively
- Checking in – The books returned by the borrower are put on the deck of the station/ antenna by the library staff. The late fine, if any, is automatically calculated and updated on the library database. Simultaneously, the theft detection system in the smart label is automatically activated. Optionally, a receipt is also printed out to confirm returning of borrowed material.
- Renewal – The books to be renewed are put on the antenna. The validity of renewal is checked and accordingly the library database is updated. A receipt is printed out confirming renewal of book and new due date.

RFID GATEs:
The security gates are two or more Theft detection Pedestals which are independent of each other and also have an overlapping protection zones providing additional security. Any item that has not been checked-out either by staff station or self check-out station will be detected as it goes past these pedestals. The gates also records the people count i.e., the number of persons entering and leaving the library.

READERS:
RFID exit gate sensors (readers) at exits are basically two types. One type reads the information on the tag(s) 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 relies on a "theft" byte in the tag that is turned on or off to show that the item has been charged or not.

SOFTWARE:
RFID software (also known as RFID server layer) includes the SIP/SIP2 (Session Initiation Protocol), APIs (Applications Programming Interface) * NCIP (NISO Circulation Interchange Protocol) or SLNP necessary to interface it with the integrated library software.

HAND HELD RFID READER:
Inventory of the collection, normally a time consuming process, is made easy and quick. Inventory controls on shelves can be performed rapidly and accurately using special hand held terminal. RFID tags secured in books can be read in seconds. Up to 64,000 book ID numbers can be stored in the reader memory, which is then downloaded to the central database through one the software interface for stock verification. The same hand held terminal can also be used to identify books/ items not placed in proper order of class no. on the shelves.

CASE STUDY OF RFID IMPLEMENTATION IN IMU LIBRARY

Brief about IMU library-
The Library of the National Ship Design and Research Centre, Visakhapatnam, was established in 1991 and renamed as Indian Maritime University Library, Visakhapatnam Campus, on 1st April 2009. This is regarded as one of the best Maritime Libraries in India. The Library aims to develop a comprehensive collection of documents that is useful for the faculty, students and research scholars in their education and research activities in the University or even outside. The major objective of the library is to acquire useful information sources – process, organize and to make them available to the users.

The library has a total collection of documents consisting of 6000 books and manuals, 830 ship drawings, 22823 articles, 184 project reports, 806 standards, 690 reports, 70 national and international periodicals, 8 online journals, 1000 bound volumes, 630 CD ROMs, 4000 equipment catalogues. 3 Online databases exclusively dealing marine subjects form part of IMU library collection. The library use an integrated library management software **LIBSYS** for the library housekeeping operations and **LSDigital** for management of e-resources. The Online Public Access Catalogue (OPAC) can be accessed from our website www.nsdrc.com

Recently "IMU PORTAL" was designed and deployed on LAN with links to "various Library Resources", "Bulletin Board", "Latest updates" "Mails", "Archives" and links to our campus website and Hqs website. The Links under "Library Resources" are – Web-OPAC, Local Guru, E-Books, Question Papers, Video Lectures, J-Gate, Online Journals (both free and paid), Online Databases and Research Publications.

Our library is open till 10 pm from Mon - Sat and half day on Sunday. Mon- Fri the library working hours are 9.00 am to 5.30 pm, after working hours one security guard is posted in library who takes care of in/ out of students and there will not be any circulation. The library is open only for reading and reference purpose.

SEQUENCE OF ACTION PERFORMED:
It nearly took 1year 3 months time for entire process, from submission of procurement proposal, finalization of Tender document, releasing the tender document, corrigendum to tender document, receiving of tenders, technical evaluation of tenders, placing of purchase order to the eligible tenderer,

setting up of extra power points and LAN connections in the library circulation counter, Finalisation of University Logo for Tag Shielding stickers. Receipt of RFID components. Installation, Commissioning, Testing of LSmart RFID System by LIBSYS Ltd., Training provided by Libsys to all library staff. Started the work of fixing RFID tag/labels and shield stickers to reference collection, main collection and academic collection (approx. 5000 documents). Through libsys circulation module and web cam captured photograph of Members and students and captured signature through digital pad (approx. 260 members). Printed smart cards (colour ID cards for members) through card printer. Tagging of smart cards and distribution to all members. Finally, **full fledged issue system started through LSmart RFID system.**

The main principles for consideration before taking up implementation of RFID

The main principles for consideration should be not to duplicate LMS (library management system), consider strategic infrastructure, interoperability, increasing intelligence of devices and increasing integration with LMS

The RFID system should be able to integrate with any library management software or compatibility to execute with the existing library management software. In case, you are purchasing a new library software ensure that - the new library management software that you are planning to buy has the feature of interoperability with any RFID system.

Care should be taken to integrate the library automation package while detailed tender specifications are drawn. Since the technology is new to Indian library environment proper demonstration of the system can be arranged and should visit the library where the system is successfully running. While evaluating the tender the past experience of firm supplying the equipment, tags, reader and software should be thoroughly investigated.

Generally library RFID software use either SIP 2 (Standard Interchange Protocol 2) or NCIP standard, SIP2 is a prominent integration protocol for RFID. NCIP (NISO Circulation Interchange Protocol) also known as Z39.83 is a North American standard. NCIP is a server layer that helps in communication between library system and RFID device application to provide all functionality of library operations, i.e. Issue, return stock taking etc.)

Ensure that RFID tags are ISO 28560 compliant – For future interoperability of vendor products.

WHAT IS ISO 28560?

ISO 28560 is a standard for Library RFID tag structure and content, i.e. standard for memory data model the structure of the data within the tag.

ISO 28560-1:2011 provides the framework to ensure interoperability between libraries in exchange of library items with RFID tags, the freedom of the library to acquire or renew equipment or library items from different vendors and interoperability of a single RFID application from the vendor's perspective.

ISO 28560-1:2011 specifies a set of data elements and general guidelines for implementation, to meet the needs for: circulation of library items; acquisition of library items; inter-library loan processes; data requirements of publishers, printers and other suppliers of library items; inventory and stock checking of items.

ADVANTAGES OF RFID:
RFID technology helps librarians reduce valuable staff time spent scanning barcodes while charging and discharging items. RFID lessens the monotonous tasks. It is a support tool to automate processes and to improve operations management. It reduces labor, eliminates human errors. In self service units and multipurpose stations the patrons can speed through all the process of self check-outs, check –in and renewal without any assistance or even opening the book. Such multi-purpose station could be cost effective and quite useful for small library setup.

ESCALATING MANPOWER EFFICIENCY:
Our library has only two assistants and the workload is at its peak during exam times. In less time more books are issued, as the Antenna recognizes 6 books at a time. Thus the time saved during issue and return of books and during inventory the staff can now focus on other woks and jobs at the counter, helping in locating books, providing photocopy service, scanning and data entry works. Staff will have more time to engage with users of library in new ways and with new skills in tow.
The library collection is growing in leaps and bounds since we have to cater to the needs of academic curricula. We have done away with the earlier UNAS classification system - a special classification system for marine related collection which could not accommodate other subjects and topics hence started re-classification of entire book collection using Dewey Decimal Classification.

CONCLUSION:
Recent developments in hardware and software for RFID systems have increased the potential of this technology in library automation and security. It speeds up book borrowing and inventories and frees staff to do more user-service tasks. The Surveillance system cautions the student from stealing the library documents as he/ she is aware of the signals given by the RFID gates alerting the staff during day time and the security guard in the evening and at night.
The limitation of this technology is the cost factor, as the components are expensive, libraries with fewer budgets cannot think of implementing it.

IMU library is manned by non professionals after office hours who feel more comfortable managing the student flow into library with a good secure system. This system has also discouraged the theft and enabled us in securing our collection.

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