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ANANDHI C Sr

Annamalai University, anandhinities@gmail.com

SARANGAPANI RAMASAMY Sr

Bharathiar University, rspani1967@gmail.com

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Implementation of RFID in Arignar Anna Central Library, Bharathiar University, Coimbatore: A Case Study

Dr. C. Anandhi

Assistant Professor
Department of Library and Information Sc.,
Annamalai University
Annamalai Nagar – 608 002, Tamil Nadu
anandhinithies@gmail.com

Dr. R. Sarangapani

Head of Department & Library i/c,
Dept of Library and Information Science
Bharathiar University,
Coimbatore- 641046, Tamil Nadu,
Mobile No. 9443098662,
Email id: rspani1967@gmail.com

Abstract

The RFID (Radio Frequency Identification), a technology which uses radio waves to automatically identify items or individuals. Library started utilizing RFIDs system to supplant their electro-attractive and bar code system in the last part of the 1990s. This paper attempts to discover the detailed information about new implementation of RFID in Arignar Anna Central Library and focuses on different component of the system and their standards. The AACL started using RFID in the year of 2017 under the supervision of University Librarian, for their regular activities like circulation, shelf management, stock verification shelf rectification and theft detection etc. It also explained the relevant cost of the different component and approximate total cost after implementing the RFID system.

Keywords: RFID, Radio frequency Identification, tags, barcode, Automatic Identification and Data Capture (AIDC).

Introduction :

The library of Bharathiar University was established in the year 1981 at the Madras University Autonomous Postgraduate Centre of the University is an area of 11,750 sq. Feet. The seating capacity currently is about 300, and has over 1, 47, 350 volumes covering all disciplines. The library subscribes to 153 National and International journals and 10 leading news papers, 150 journals magazines and periodicals are received on gratis.¹ The AACL started using RFID in the year of 2017 under the supervision of University Librarian, for their regular activities like circulation, shelf management, stock verification shelf rectification and theft detection etc.

RFID is an innovative automated library system for automated identification and tracking of library material. It is combination of radio-frequency-based technology getting management commitment may be a big challenge as it may look into the Return on Investment (ROI) (Nabi Hasan, 2014). RFID has a major advantage over all technologies used in libraries for this purpose: the tag has the ability to combine the functions of a barcode (as a unique item identifier) and a security device (able to indicate that an item is being removed from the library without permission). It is a combination of radio-frequency and microchip. RFI chips are of particular interest, because they have become smaller and smarter to the point where they can be added every kind of document and can be read and updated from a distance.²

According to **Automatic Identification and Data Capture (AIDC)** [3], "Radio Frequency Identification is a technology that uses radio waves to transfer data between a reader and an electronic tag which is attached to a particular object. Typical uses are for object identification and tracking". According to **Harrod's Librarians' Glossary and Reference Book** [4], "Radio Frequency Identification, an alternative to the Bar Code that uses tiny microchips in tags to hold and transmit detailed data about the item tagged. RFID has advantages over bar codes such as the ability to hold more data, the ability to change the

stored data as processing occurs, it does not require line-of-sight to transfer data, and is very effective in harsh environments where bar code labels may not work".

The history of RFID is surprisingly contentious, although there is general agreement that the basic technology dates back to at least the Second World War. RFID invented in 1969, patented in 1973, first used in harsh industrial environment in 1980s', and standards presented in 2001, is the latest addition of technology to be used in the libraries for a combination of automation and security activities in the well maintenance of documents either inside the library or goes out of library. In 1999 the Auto-ID centre at MIT was founded. Its task was to develop a global standard for item-level tagging. The probably first paper related to RFID technology was the landmark paper by Harry Stockman. "Communication by Means of Reflected Power" in October 1948 (Christoph J. 2013). RFID uses wireless radio communications to uniquely identify objects or people, and is one of the fastest growing automatic data collection (ADC) technologies, which is comprising one or more reader/interrogators and RF transponders in which data transfer is achieved by means of suitably modulated inductive or radiating electro-magnetic carriers. [5]

Review Literature :

Nagalakshmi outlined the deployment, issues and best practice of RFID technology in libraries. The author opined that the deployment of the RFID in library should come after the checking privacy policy to protect issues and benefits related to the patrons and standards since most of the Indian institutions have started implementing RFID for tracking the library materials.

Baidwan, Adarsh & Harvinder attempted to study the functional barriers and challenges faced while implementing the RFID technology. The authors opined that the application of this technology has come out in the betterment of services of the library. Although the technology is dearer in some respect, but the pro has outweighed the cons, thus making it cost effective.

Anuragi overviewed importance, components, operations, merits, demerits, and essential requirements of RFID technology in the library system. The author opined that the RFID technology is not only emerging but also more effective, convenient and cost efficient technology in library security.

Verma & Meenakshi provided an overview of RFID technology, its limitations and future outlook with a purpose to assist educators in considering new course topics into the curriculum, while involving some teaching resources, objectives and suggestions.

Jain & Krishna in their book discussed the RFID applications that speeds up book borrowing, returning and monitoring, and thus frees staff from doing manual work so that they could be used to enhance user service tasks.

Objectives of the Study :

The basic objectives are to assess the status usage and effectiveness of RFID implementation in Arignar Anna Central Library.

- To find the comprehensive details about RFID technology in Arignar Anna library.
- To highlight the components of RFID technology and their status of operation.
- To examine the RFID technology impact on circulation transactions and usage of library.
- To find the allocation of the budget for RFID in AACL.
- To find the benefits and challenges after implementation of RFID in same library.

Data and Discussion

The study has includes the complete study of RFID system integrated with open source ILMS Koha in Arignar Anna Central University at Bharathiar university. Data were collected by archival data and observations and asking questions from Librarian and other Library professionals about RFID system.

Status of RFID in Arignar Anna Central :

Specification of RFID tag uses in AACL :

RFID (Radio Frequency Identification) there are hundreds of millions of tagged items occupying library shelves and stockrooms all processed (issued, returned, and stock-checked) using standard equipment. 2CQR offer a range of EM and RFID tags for library applications.

2CQR RFID Tags: for Books, CDs/DVDs, Audio Tapes, and Video Tapes.

(RFID) Tags supplied by 2CQR are manufactured to **ISO 15693 / 18000-3** Mode 1 with a 100,000 transaction guarantee.

Table: 1 Specification of RFID tag uses in AACL

S.No.:	Standard	ISO 15693/18000-3, ISO 28560
1	Brand	2CQR
2	Operating Frequency	11.56 MHz
3	Maximum Thickness	0.5mm
4	Memory	0.5k-2.5k bit
5	Data Retention	40 yr
6	Standard format	Aluminium Antenna
7	Operating Temperature	-400C – 850C



Figure- 1 RFID Tags

Specification of RFID Workstation at AACL :

RFID workstation is a fast and efficient component of an RFID system to programme and verify RFID tags without the ILMS software. It also helps to the issue, return and renew of the multiple documents at a time with the help of ILMS. There are three staff workstation options from 2CQR.

Antennae and reader: this is a fixed, discrete and cost-efficient system. The reader is positioned beneath the staff desk, reducing clutter and shielded antennae reads only items placed directly on the reader area.

Movable, flexible: the simple table-top reader can handle multiple items simultaneously and can be transferred.

Mid Ranger: All the features of a shielded RFID staff workstation in an award-winning sleek, modern and robust design.

Table: 3 Specification of RFID Workstation at AACL

S. No.:	Standard	ISO 15693
1	Brand	2CQR
2	Operating Frequency	11.56 MHz
3	Dimension	350mm x 280mm x 15mm
4	Weight	1.2kg
5	Power & Connectivity	Connect to PC via USB
6	Shield	Fully shielded
7	Software Required	yes



Figure: 2 RFID Workstation (reader)

Specification of RFID Gates at AACL :

RFID gate mainly used for security purpose. It protects and secures library collection. When anyone takes books without issue and went between these gates it gives the alarm and sends the information to the local administrator through the server.

Table: 4 Specifications of RFID Gates at AACL

S.No.:	Standard	ISO 15693, ISO 18000-3
1	Brand	2CQR
2	Operating Frequency	11.56 MHz
3	Dimension	499 x 143 x 1920 (l x w x h)
4	Weight	31 kg
5	Power	10 watt
6	Materials	Plexiglas
7	Data	Ethernet TCP/IP
8	Performance	Read 5 tags per second, coverage up to 40 inches/ 1,200 mm can be achieved with certain tags
9	Alarm	selectable
10	Software	No software required for theft detection, software required for user statistics and reporting



Figure: 3 RFID (security) Gates

Specification of RFID Kiosk

This component of an RFID system used for the self-issue /return, renew of the documents. It has connected with the ILMS and server. A printer is also attached with it where the user can take a slip of his/her circulation status. From here, we also get the statistics of circulation status of the library.

Table: 5 Specification of RFID Kiosk

S.No.:	Standard	ISO 15693
1	Brand	2CQR
2	Operating frequency	50-60 Hz
3	Screen size	24"
4	Weight	4-5 kg
5	Power	10 watt
6	Data	500 GB
7	Standard PC	Intel core 2 Duo J1800
8	Brightness	400 cd/m ²
9	colour	White



Figure: 4 RFID Kiosks

Specification of Book Drop at AACL :

RFID book drop allows patrons to automatically return the library documents. A reader installed in a book drop allows reading of RFID tags as patron drops of the documents. It eliminates the labour intensive stapes of check in and deactivation of security protection by the library staff. It automatically check-in the document, takes them off the patron’s library account and reactivates the security function.

Table: 6 Specification of Book Drop at AACL

S.No.:	Standard	ISO 15693, ISO 18000-3
1	Brand	2CQR
2	Operating Frequency	10-12 kg
3	Dimension	Shelf dimensions: (L x W x H) 109 x 71 x 175 cm Terminal dimensions: (L x W x H) 54 x 39 x 142 cm
4	colour	White
5	Power	100-240 Voltage
6	capacity	approx. 120/160 items
7	Touch screen	yes
8	software	LibShelf



Figure: 5 book drop (self issue and return)

Table: 7 RFID Components Implemented in AACL

S.N.	Features	Availability in Koha	Status in AACL
1	Self check-in/out	Fully supported	Successfully installed and effectively in operation
2	Scanners	Fully supported	Fully functional
3	Book drop boxes	yes	Functional effectively since its installation
4	RFID gates	Fully supported	Functional effectively since its installation
5	Stock tacking/verification	Fully supported	Functioning but not completely
6	Tagging stations	Fully supported	Tagging done through Koha since its installation
7	Bar code readers	Fully supported	Fully functional

System Requirement of Implementing RFID System at AAACL Library

Implementation of RFID consists of the following steps it involves requirement analysis, Technical assessment, process analysis, budget analysis, technical selection, and evaluation. At first a team was formed which consist of subject experts, communication engineers, application developer and professional staff and the team was work together in all stages.

Table 8 details of system requirement for RFID system

S.No.:	Description	Required
1	ILMS	Koha
2	RFID tag	30,000
3	RFID Kiosk	1
4	RFID Workstation	2
5	RFID gate	4
6	Smart cards	2000
7	Training	6 persons

Budget Allocation For Implementing Rfid

The most important aspect of any RFID system is the cost. Now for any library in India budgets are limited and in this situation implementation of RFID system is quite expensive.

Table: 9 details of Budget for implementation of RFID in AACL

S. N.	Description	Unit price (in Rs.)
1	RFID Book /CD/DVD Tag	Rs.12.48
2.	Book Reader	Rs. 1,35500.00
3	Security Sensor Gate	Rs. 3,00,000.00
4	Book Finder (Handheld)	Rs. 3,50,000.00
5	Book Return Self- Service Kiosk	Rs. 9,35,000.00

Conclusion

The Arignar Anna Central Library has a very rich collection of more than 1.5 lacks of books collection and more than 300 CDs in field of science, social science and humanities. The library is using open source ILMs KOHA in the year 2005 than updated in year 2013, 2018 respectively. All library materials were bar-coded with accession number as identifier and scanner are used for circulation of library materials. To enhance stock taking and circulation process and security of documents it was decided to implement RFID system with KOHA at AACL in year of 2017.

RFID, the main applications, standardization, and innovation are constantly changing. The implementation is still relatively new and hence there are some features of the technology that are not well understood by the general population. The technology has slowly begun to replace the traditional one. The RFID tag can contain identifying information such as a book's title or material type, without having to be pointed to a separate. The information is read by an RFID reader, which replaces the standard barcode reader commonly found at a libraries' circulation desk. The RFID tag found on library materials which it can also act as a security device, taking the place of the traditional electromagnetic security strip. The cost of the technology is main problem in Indian libraries. RFID technology is not only emerging trend also more effective, convenient and cost efficient technology in library security.

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