Implementation of RFID System in Modern Libraries: A Study on University Libraries of Assam

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Abstract

Invention of new technologies has drastically changed our traditional methods of livelihood, our thinking and even our education system too. And the Libraries are not so far beyond this change. In early decade books are kept in almirah as prestigious symbol; later it becomes the collection centre of books and now libraries are regarded as the store house of knowledge. Day by day new technologies and terminologies have been included in libraries and library science education. As a result services offered by libraries become updated including its security system also. This paper is based on such a topic which is most reliable and most modern technique related to the library security system and that is the Radio Frequency Identification in short RFID. The paper describes the implementation of RFID in the university libraries of Assam along with some basic findings and suggestions.

1.   Introduction

"Library" the seven letters' words for common people mean only the storehouse of books. In the age of a technological era we cannot simply accept the library as a storehouse of books; instead it is the store house of knowledge. The concept of library is going through a revolutionary phase due to proliferation of electronic resources. Our methods of producing, organizing and seeking information have been changed drastically with the application of ICT. In this digital era library is not merely considered as a way of preservation of documents but as the 'source' or 'guide' for better advancement of knowledge in the field of prosperity. But, gradually this so called 'source' or 'guide' is not confined only to the academic institutions, but also involved in various govt. as well as private organizations. Today, the library is not only confined to the traditional books, but includes various types of electronic materials, audio video materials etc. However appropriate services can only be acquired from the libraries if library resources can be secured. From the early days to today lots of security measures have been implemented in the libraries to reduce the damage of library materials by environment, natural calamities and from by human errors.

Security, in a very simple form, means a risk free or threat Free State. While security system is literally a way or method by which a system of interworking components and devices secures something. In a Library both library collection and other reading materials can be made secured by installing and implementing physical and environmental security system and digital data security system. Digital data

security system generally refers to the security system of both information and computer security from the unauthorized access of data. While physical and environmental security system involves traditional as well as electronic security systems. Lock and key system, installing grills on windows, single door entry- exit system, signature of every library users etc. can be treated as the traditional security system; on the other hand, CCTVs, RFID, electronic recording, biometrics, smart cards, glass break sensor etc,. are treated as electronic security systems. In today's context modern libraries which are automated and ICT based service provided consider RFID as the most secured security system for the libraries. Radio Frequency Identification (RFID) is a type of auto-identification technology. This grouping also includes bar codes, optical character readers, and biometric technologies. Each of these technologies allows the transmission and connection of unique information about an object or person to a set of data. This is achieved by RFID using radio waves. The main objective of adopting RFID for today's libraries is to increase efficiency and reduce costs. Automation and self-service can help libraries of all sizes achieve these goals, and RFID has the added advantage of providing security for the range of different media available in libraries as well.

1.1 RFID- Definition with its brief History

RFID can be considered as a generic term of technologies that identifies any object or human being automatically through radio waves. There are several methods of identification, but the most common is to store a serial number that identifies a person or object, and perhaps other information, on a microchip that is attached to an antenna (the chip and the antenna together are called an RFID transponder or an RFID tag). 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. Radio frequency identification (RFID) is part of the family of Automatic Identification and Data Capture (AIDC) technologies that includes 1D and 2D bar codes. RFID uses an electronic chip, usually applied to a substrate to form a label, which is affixed to a product, case, pallet or other package. The information it contains may be read, recorded, or rewritten.

(Source: https://www.rfidjournal.com/faq/show?49).

Radar was created in the U.S. in the early 1930s by Scottish physicist Sir Robert Alexander Watson-Watt—to warn of approaching planes while they were still miles away. Radar was refined in the 1940s and RFID was developed as a mixture of radar and radio wave. RFID-related technology was studied in labs in the 1950s. Inventors started to apply radio frequency technology to devices directed at non-military markets during the 1960s. Academic institutions, public laboratories and autonomous scientists are all working in the 1970s to create RFID technology. Work at this moment was directed at collecting electronic tolls, monitoring animals and vehicles, and automating the plant. RFID was fully introduced commercially in the 1980s and 1990s.

The introduction of RFID norms and improved technology led to miniaturisation in the 2000s and from 2000 onwards RFID is used in various sectors including libraries to prevent theft.
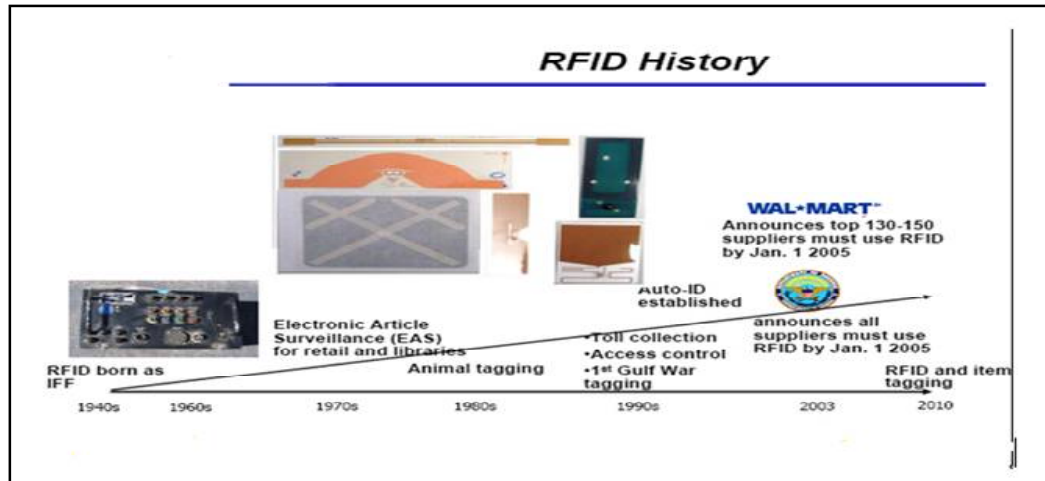
Fig 1: History and development of RFID in chronological order

1.1.1   Components of RFID

A standard RFID system consists of mainly four parts-

❖   RFID tags that are electronically programmed with unique information.

❖   Antenna that provides the vital link between reader and tag, serving as the medium that moves data back and forth.

❖   Reader/coupler which is the link between RFID tags and server/ PC.

❖   Server/PC which is the link between the Reader and library automation system.

1.1.2.   The Process of RFID Library Management System

The library employees are generally well trained to deal with this technological setting in RFID implemented library systems. Therefore, library employees are trained in tagging books. Inside the bound cover, the tags are labeled to protect the tags from becoming spoiled. The tags are then usually covered by the logo labels of the Institute. Tagging is done by placing the tagged book on the reader and the information of the book is tagged onto the tags using the application of library management software. When the book is issued the details from the tag are read into the database by placing the book on the reader and then the book is issued. In case if anyone takes the books without issuing then the reader at the entry exit point beeps sending alarm to the library staff about the unauthorized movement of the book. In case if anyone takes the books without issuing then the reader at the entry exit point beeps sending alarm to the library staff about the unauthorized movement of the book. Thus the technology results of a successful decrease in theft of books.

Fig 2: Diagrammatic representation of RFID implemented Library
(Source: https://www.rfid-library.com/)

2. University libraries of Assam:

Assam has the largest network of higher education organizations throughout India's North-East region .There are two central universities, one deemed university, twelve state universities and six private universities in Assam.

Table 2: RFID Implemented university libraries of Assam

Sr. No	University Name	Year of Est.	Status	Library Name
1.	Cotton University	1901	State	Dr. Surjya kumar Bhuyan Library
2.	Gauhati University	1948	State	Krishna KantaHandique Library
3.	Dibrugarh University	1965	State	LakshminathBezbaruah Central Library
4.	Assam Agricultural University	1969	State	Reverand B M Pugh Central Library
5.	Assam University	1994	Central	Rabindra Library
6.	Tezpur University	1994	Central	Central library, Tezpur University
7.	Central Institute of Technology, Kokrajhar	2006	Deemed	Central Library, Central Institute of Technology, Kokrajhar
8.	Krishna KantaHandique State Open University	2007	State	Central Library,KrishnaKantaHandique State Open University
9.	Assam Don Bosco University	2008	Private	Assam Don Bosco University library
10.	Bodoland University	2009	State	ManoranjanLahari Central Library, Bodoland University

11.	Assam Down Town University	2010	Private	Hari Narayan DuttaBaruah Central Library
12.	Assam Rajiv Gandhi University of Cooperative Management	2010	State	Assam Rajiv Gandhi University of Cooperative Management, Central Library
13.	Assam Science and Technology University	2010	State	Assam Science and Technology University Library
14.	SrimantaSankaradeva University of Health Sciences	2010	State	SrimantaSankaradeva University of Health Sciences Library
15.	Kaziranga University	2011	Private	Central Library, Kaziranga University
16.	Kumar BhaskarVarma Sanskrit and Ancient Studies University	2011	State	Kumar BhaskarVarma Sanskrit and Ancient Studies University Central Library
17.	National Law University and Judicial Academy,Assam	2012	State	National Law University and Judicial Academy Library
18.	Assam Women's University	2013	State	Assam Women's University Library
19.	Mahapurusha Srimanta Sankaradeva Viswavidyalaya	2014	Private	Central Library, Mahapurusha Srimanta Sankaradeva Viswavidyalaya
20.	Krishnaguru Adhyatmik Vishvavidyalaya	2017	Private	Krishnaguru Adhyatmik Vishvavidyalaya Library
21.	Royal Global University	2017	Private	Central Library, Royal Global University

(Source:https://www.ugc.ac.in/oldpdf/Consolidated%20list%20of%20All%20Universities.pdf as on 05.09.2019)

3. Scope and Limitation of the Study

Out of total twenty one numbers of university libraries existed in Assam, only four libraries have been selected for the study due to non availability of RFID technology in the libraries. Again out of these four selected university libraries one library just has installed the RFID system but not implanted yet: therefore, this library is also excluded from the study. So, the study is confined only to the three university libraries of Assam.

4. Objectives of the Study

1. To find out the RFID implementation status of the university libraries of Assam.

2. To find out the different types of security measures adopted by the surveyed libraries.

3. To find out to what extent surveyed libraries are implementing RFID in their libraries.

4. To find out the staff strength of the surveyed libraries to cope up with the RFID environment.

5. Research Methodology

To collect proper and correct information, survey method has been adopted. Questionnaires have been sent through e-mail to the respective librarians of the libraries to collect the data and 100% responses are received. The libraries have been visited personally also to verify the collected data. Based on the implementation of RFID system in the university libraries following three libraries have been selected for the study and data has also been collected accordingly.

Table 2: RFID Implemented University Libraries of Assam

Sl no.	Name of The University	Status	Name of The Library
1	Krishna KantaHandiqui State Open University (KKHSOU),Guwahati	State university State	Central Library, Krishna KantaHandiqui Open University (CL, KKHSOU)
2	Central Institute of Technology, (CIT) Kokrajhar	Deemed University	Central Library, CIT (CL,CIT)
3	Assam Don Bosco University, (ADBU) Guwahati	Private university	Assam Don Bosco University Library (ADBU Lib)

6. Data Analysis And Interpretation:

Based on the data collected from the surveyed libraries following analysis and interpretation has been done-

Table 3: Status of RFID implementation in the university libraries of Assam

Sl. No.	Name of the University Library	Status of RFID Implementation
1.	Dr.SurjyakumarBhuyan Library	N/A
2.	Krishna KantaHandique Library	N/A
3.	LakshminathBezbaruah Central Library	N/A
4.	Reverand B M Pugh Central Library	N/A
5.	Rabindra Library	N/A
6.	Central library, Tezpur University	N/A
7.	Central Library, Central Institute of Technology, Kokrajhar	FULLY IMPLEMENTED
8.	Central Library,KrishnaKantaHandique State Open University	PARTIALLY IMPLEMENTED

| 9.	Assam Don Bosco University library	PARTIALLY IMPLEMENTED
10.	ManoranjanLahari Central Library, Bodoland University	N/A
11.	Hari Narayan DuttaBaruah Central Library	N/A
12.	Assam Rajiv Gandhi University of Cooperative Management, Central Library	N/A
13.	Assam Science and Technology University Library	N/A
14.	SrimantaSankaradeva University of Health Sciences Library	N/A
15.	Central Library, Kaziranga University	N/A
16.	Kumar BhaskarVarma Sanskrit and Ancient Studies University Central Library	N/A
17.	National Law University and Judicial Academy Library	RFID Installed but not Implemented yet
18.	Assam Women's University Library	N/A
19.	Central Library, Mahapurusha Srimanta Sankaradeva Viswavidyalaya	N/A
20.	KrishnaguruAdhyatmikVishvavidyalaya Library	N/A
21.	Central Library, Royal Global University	N/A

•   N/A= Not available
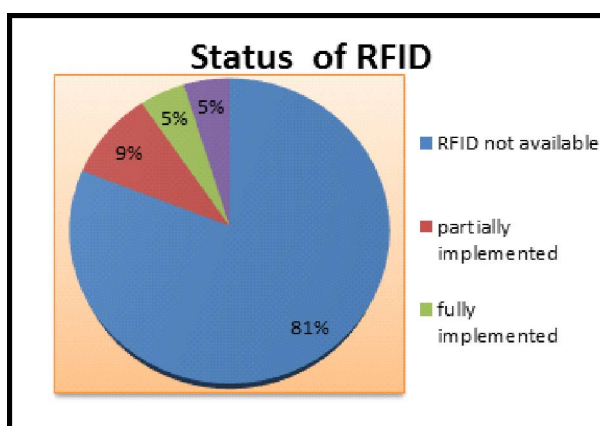
Fig 3: RFID status of university libraries of Assam

From the Fig 3 it is clear that only 5% university library of Assam has fully implemented RFID system, while 81% libraries do not have a RFID automated system. On the other hand 9% library has implemented partially RFID in the university libraries of Assam. From this observation it is easily find out that maximum numbers of university libraries don't have adopted RFID system in their libraries.

Table 4: Print collection of the surveyed libraries (N=3)

Name of the library / Collection type	CL, KKHSOU	CL,CIT	ADBU Lib
Books	18,258	1,18,845	24,000
Journals	35	0	75
Magazines	2563	12	25
Theses	17	0	30

Table 4 shows that central library, CIT has the highest book collection, whereas, ADBU Lib has the highest journals and theses collection than that of the two libraries. In case of Magazines, central library, KKHSOU has the highest numbers of magazines subscribed in comparison to the two other libraries.

Table 5: LMS used by the surveyed libraries(N=3)

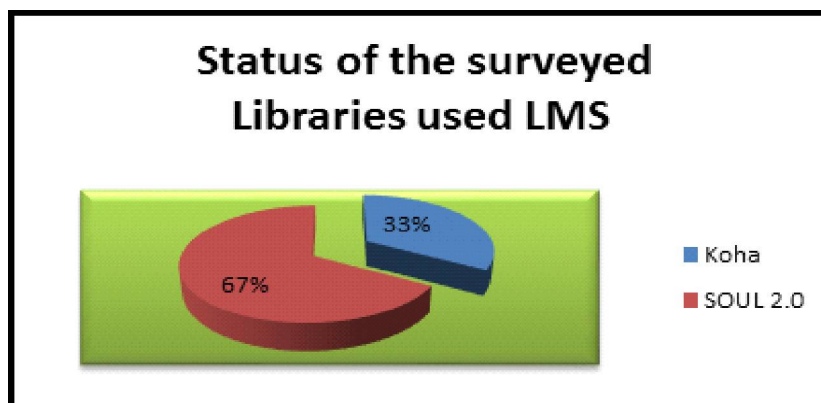| Name of the LMS	No of University	Libraries
SOUL 2.0	2	
Koha	1	
Any other	Nil	

Fig 4: LMS used by the surveyed libraries

From the Table 5 and Fig 4 it is clear that Soul 2.0 software is used by 67% (2 NOS.) of university libraries, whereas only 1 library (33%) is using Koha Library Management Software (LMS).

Table 6: Per day circulation of books in the surveyed libraries (N=3)

Range (No. of books issued)	Name of the of Libraries
1-50	CL,KKHSOU
51-100	Nil
101-150	CL,CIT
151-200	Nil
200-250	ADBU Lib

 Table 6 shows that number of books issued by the surveyed libraries are all different in ranges. It can easily be observed from this table that ADBU Lib has the highest number of books issued per day to its users, on the other hand, CL, KKHSOU has the lowest number of books issued to its users per day.

Table 7: Establishment and RFID installation year of surveyed libraries

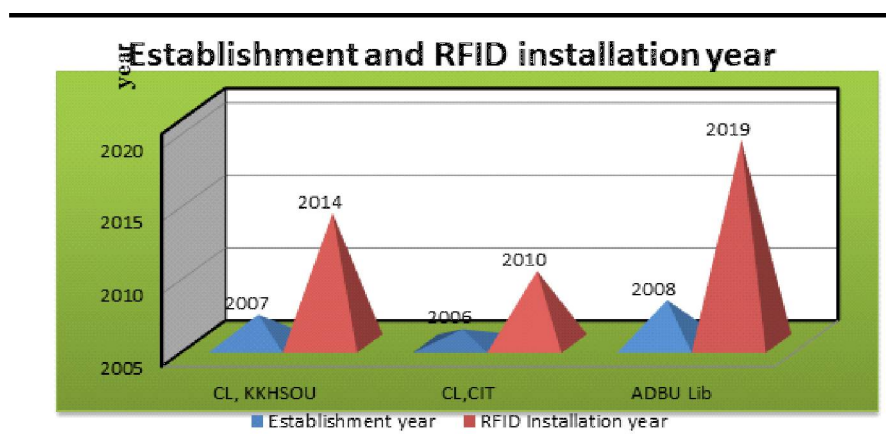| Name of the library	Establishment year	RFID installation year
CL,CIT	2006	2010
CL,KKHSOU	2007	2014
ADBU Lib	2008	2019

Fig 5: Establishment and RFID installation year of surveyed libraries

IT can easily be found out from the Fig 5 that though Central Library, CIT was established earlier in comparison to the other two university libraries but within four years of its establishment the institute

installed and implement RFID in its library. While ADBU Lib takes almost ten years from its establishment to install and implement RFID in its Library. Again CL, KKHSOU needs five years to adopt RFID system from date of its establishment.

Table 8: Status of RFID implementation in the surveyed libraries

Status of RFID implementation	No. of surveyed libraries
Fully implement	1
Partially implement	2

Table 8 shows that out of total three libraries surveyed for the study, only one library has fully implemented RFID system while other two libraries have implemented partially the RFID system.
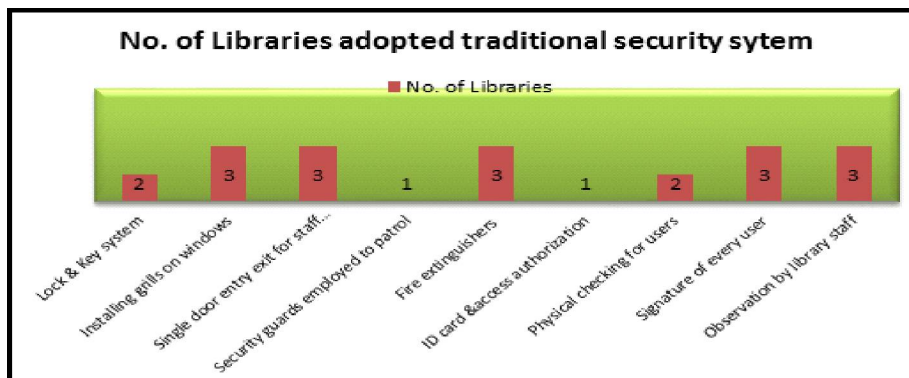

Fig 6: Surveyed libraries adopted traditional security system

Fig 6 shows that most of the surveyed university libraries have adopted traditional security system for the security of the libraries. However, Security guards employed to patrol and ID card & access authorization process has been available only in one library.
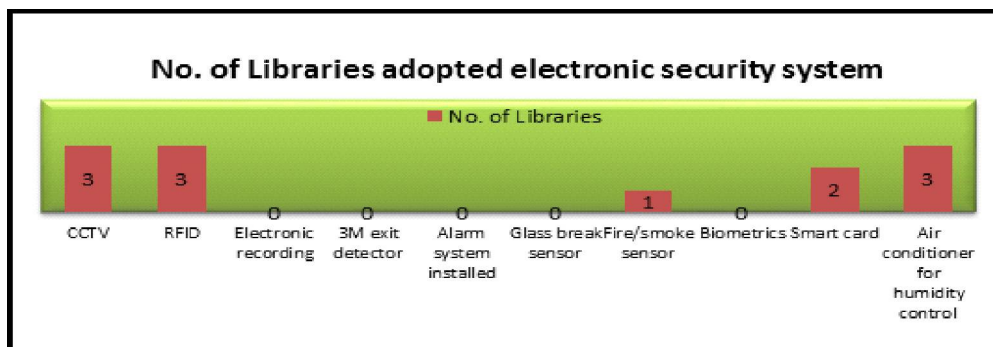

Fig 7: Surveyed libraries adopted electronic security system

Fig 7 shows that all the three surveyed libraries have CCTVs, RFID and air conditioner for humidity control system but most of the electronic security systems are not available in the surveyed libraries. Fire/smoke sensor have been adopted by only one library smart cards are available in two university libraries.

Table 9: RFID based services provided by surveyed libraries (N=3)

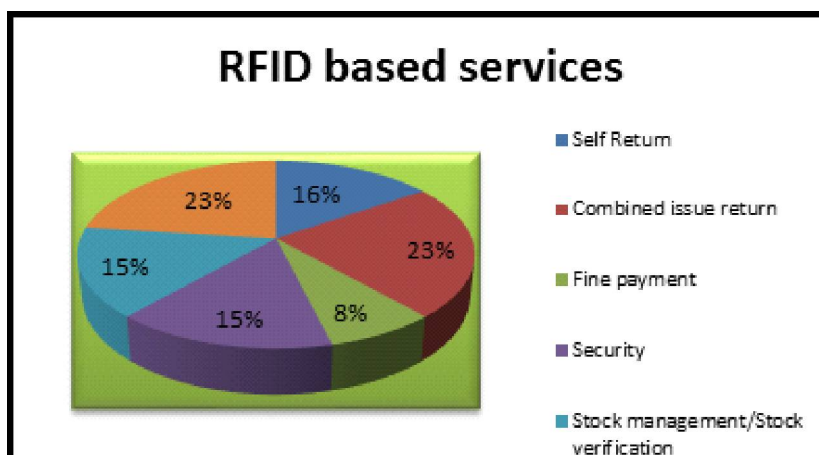| Services	No. of libraries
Self Return	2
Combined issue return	3
Fine payment	1
Automatic sorting	0
Security	2
Stock management/Stock verification	2
Accessioning	3

Fig 8 :RFID based services provided by surveyed libraries

Table 9 shows that no single surveyed library is providing automatic sorting service, while only one library is providing fine payment service through RFID system. On the other hand combined issue return service and accessioning services are providing by all the three surveyed libraries. Self return, security and stock management/stock verification services through RFID system have been providing by two surveyed libraries.

Table 10: Objectives of Using RFID in Libraries (N=3)

Name of the Libraries → ↓ Objectives	CL, KKHSOU	CL, CIT	ADBU Lib
Self-Check-in/out	√	√	X
Return items to shelf more quickly	X	√	√
Increase security	√	√	X
Reduce theft	√	√	X
Increased equipment reliability	X	X	X
Better inventory control	√	√	√
Faster processing of new materials	√	√	√
Track materials more accurately	√	√	√

Table 10 shows various objectives for which surveyed libraries have adopted RFID system in the respective libraries. It shows that most of the objectives (except some) are same for all the three libraries.

Table 11: Surveyed Libraries having RFID components (N=3)

Name of the Libraries → ↓ Components	CL, KKHSOU	CL, CIT	ADBU Lib
RFID tags	v	v	v
Self-check-in/out station	v	v	X
Staff check-in/out station	v	v	v
RFID smart card	v	v	v
UPS for power backup	v	v	v
RFID handled reader	X	X	v
Antenna	v	v	v
Server	v	v	v
RFID label printer	X	X	v
Security gate	v	v	X

Table 11 shows that RFID handler reader and RFID label printer is not available in CL, KKHSOU and CL, CIT but the other components of RFID are present in these two libraries. On the other hand Self-check-in/out station and Security gate are not available in ADBU Lib.

Table 12: Staff details of surveyed libraries

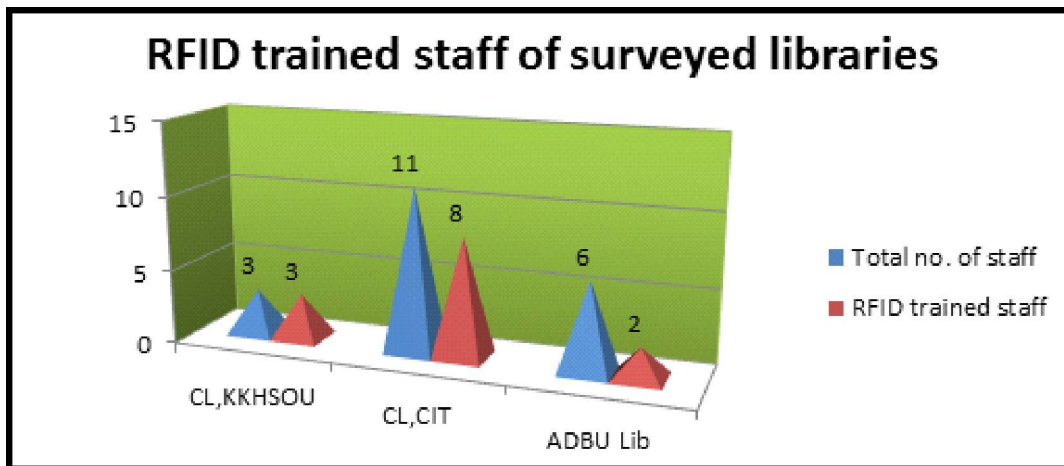| Name of the Libraries	Professional staff	Nonprofessional staff	RFID trained staff
CL,KKHSOU	3	0	3
CL,CIT	4	7	8
ADBU Lib	5	1	2

Fig 9: Total no. of staff along with RFID trained staff of the surveyed libraries

It is clear from Fig 9 that though CL, KKHSOU has the least number of libraries in comparison to the other two surveyed libraries yet all the staff of this respective library is well trained to cope up with the RFID based system of the library.

Table 13: Total Cost of installing and Implementing RFID in College Libraries (N=3)

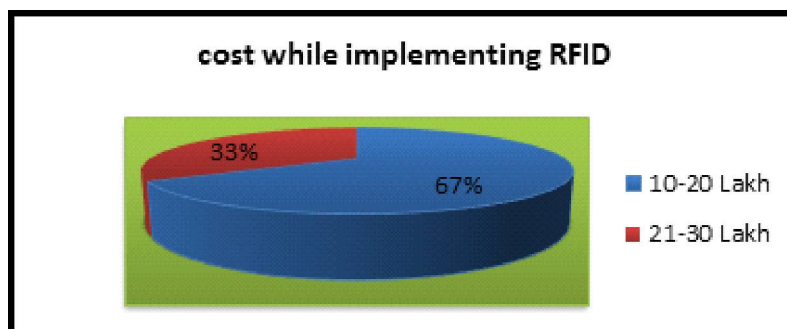| (Amount in Rs.)	No. of surveyed libraries
10-20 Lakh	2
21-30 Lakh	1
31-40 Lakh	-

Fig 10: Installation and implementation cost of RFID in the surveyed libraries

From the 13 and Fig 10 it is found that most of the surveyed libraries have spent almost Rs. 10-20 lakh for installing and implementing RFID technology in their libraries. However, the cost will be high if the collection of the library will be increased as more tags need for more collection.

7.   Major Findings and Suggestions

The researcher has found out some major findings along with some suggestions that are relevant to the study. These are-

❖ Though in Assam twenty one Universities (including central, state, deemed and private) are there but only three numbers of universities have implemented RFID in the respective libraries and one library has installed RFID recently but no library works are done through the RFID system. This is happening due to the high cost of the RFID system. The UGC, other govt. agencies and MHRD should look this matter seriously and should release fund for installing and implementing RFID in the university libraries of Assam.

❖ It is seen that Assam Don Bosco University is the first private university of not only Assam but also of the whole entire North East to implement RFID system in their library. The other private universities of Assam should be inspired from ADBU Lib and should implement RFID in their respective libraries as RFID is considered the most powerful security system in today's context.

❖ All the surveyed libraries have a good collection of print documents. But the libraries should also subscribe adequate number of e documents to serve its user community in a better way.

❖ It is observed during the study that most of the university libraries (except the private universities) prefer SOUL 2.0 as it is well and more compatible to the RFID system than that of the other library management software. If possible the competent authorities of SOUL 2.0 make free this software to the private university of Assam also.

❖ During the study it is observed that ADBU Lib has the highest number of book issued to the students than that of the other two libraries. It is because of the students' need and awareness towards the use of library collection and services that is provided by the library staff at every

time as and when students demand. The other university libraries should also develop reading habit among the students of their respective libraries and should make them aware about the library services and collection too. Installing and implementing new technologies like RFID system attract library users towards the library. Proper services provided through this technologies to users not only increase the numbers of library users but also make the library collection safe from any unauthorized act.

❖ Before the year 2000 six numbers of universities along with its libraries are established in Assam. But not a single library from this list has adopted RFID in their libraries. The university authority should consider this matter seriously and inform the higher authority for adopting RFID within a short time to avail the facilities of RFID as huge numbers of users are using these libraries every day.

❖ Though the surveyed libraries are adopting most of the traditional security measures but in case of electronic security system only CCTVs and RFID have been applied by most of the respective libraries. As these libraries are adopting new technologies to reduce work load to make the library safe from any hazards, therefore, these libraries should also adopt the other security measures and all RFID components to make the library modernize as well as more safe.

❖ The surveyed libraries should increase the staff strength to provide better services to its users. The university authority and other respective higher authority should fill-up all the vacancies in the libraries and should create more

professional posts in the surveyed libraries to reduce the work load of the staff. Proper training must be provided on timely basis to all the newly appointed as well as existing staff of the university libraries of Assam to cope up with RFID based environment.

8. Conclusion

Though the RFID technology is quite good and has lots of advantages over barcode and other technologies used by the university libraries of Assam yet due to its high price it is not implemented in overall university libraries of Assam. Due to its application and standardizations RFID is considered as the most convenient electronic security system by the higher institution libraries of the world. Though the maximum numbers of universities of Assam were established a decade ago, yet they are unable to understand the efficiency, effectively and user friendly measures of RFID only because of proper knowledge on it. Again some of the library staff of the university libraries of Assam feels difficult to cope with ICT environment and they are not interested to work under a RFID based environment. Proper training and awareness program on RFID make these staff tension free to work with a RFID based system. The major changes brought about in libraries by RFID technology are detection of robbery, safety, time reduction, etc. RFID saves time in circulation as well as stock management and other library works which decreases the work load of library staff and the staff can be deployed in some other innovative works of the library. Though cost is considered the major factor for RFID implementation in libraries but ultimate solution to avoid theft and other time consuming issues of any kind of library will be revealed by RFID only. Due to

the greater demand for RFID technology in market vendors will also try to reduce its cost and the day will not be so far when in every library irrespective of its status and collection will adopt RFID technology. Because of the increase demand in market, the RFID suppliers will also attempt to decrease their costs and the day will not be so far when RFID technology will be adopted in every library regardless of its status and collection.

References

1. Babu, M suresh. (2013). The Way the Library System Grows with RFID. In B.Ramesh Babuandet.al.(Ed). Information Products and Services in the E- environment. NACIPROSE 2013: Proceeding of the National seminar on Information Products and Services in the E-Environment,Tirupati,27-28 April, (pp. 106- 107). Hyderabad: Paramount.

2. Md. Rafiq. (2008). Radio Frequency Identification (RFID): Its usage and Libraries. In Smitha Ramachandran. Radio Frequency Identification in Libraries. Hyderabad: Icfai.

3. Nagalakshmi, L. Radha Alias. &Trivedi, M. (2014). Success of RFID Technology in Indian academic libraries - A study.The International Journal's Research Journal of Science &ITManagement. 3(8), Pp.51-58.

4. N.K. Kumbhar& D.K. Veer. (2016)Study of security system in college libraries. International Journalof Research in Library Science, 2(1),1-8.

5. Shahid, Syad. (2005).Use of RFID Technology in Libraries: a New Approach to Circulation, Tracking, Inventorying, and Security of Library Materials.

6. Library Philosophy and Practice 8,(1). 35-41.

7. https://www.rfidjournal.com/faq/show?49. (retrieved on 28/09/19)

8. https://www.rfid-library.com/ (Retrieved on 25/09/19)

9. https://www.ugc.ac.in/oldpdf/Consolidated%20list%20of%20All%20Universities.pdf retrieved on 25.09.2019

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