

# Effectiveness of RFID Technology in Library Management System in Bangladesh

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**Abstract** - The purpose of the study is to evaluate the effectiveness of Radio Frequency Identification (RFID) technology in library management system and services in Bangladesh. This study followed survey and interview methods of data collection through a structured questionnaire. The population of study was all nine libraries in Bangladesh where RFID technology has been installed. The study reveals that all nine libraries are using RFID technology, namely, anti-theft detection Electronic Article Surveillance (EAS) gate, staff-work station and RFID tag. In addition to these, some of them are using kiosk, converter, level printer, book drop station, digital library assistance (DLA) and RFID smart card for entrance. The significance numbers of library users employ the RFID system and services and it is increasing gradually, but some of the RFID machines like level printer, book drop station and DLA are under-utilized because of lack of trained staff, patron's doubt on new technology and less demand on using them in house-keeping library operation.

**Keywords:** RFID, Library, Library System, Radio Frequency Identification, Bangladesh

## I. INTRODUCTION

Radio Frequency Identification (RFID) technology is now commonly used in all sectors of communication, transportation, identification, distribution, security, inventory, library management etc. Technically it is a technology that consists of an electronic system and tiny tag, which uses radio waves to automatically identify people or objects. This wireless automatic identification data capture electronic system allow for non-contact reading or writing of data. It is highly effective in securities, tracking, manufacturing and other hostile environment where barcode labels cannot survive and work properly. This system consists of a transponder with antenna, a chip and a reader which attached to a computer to identify the object. The complete set of these objects is called a tag or a label. Data or information can be written on the chip and stored in the tag or label that is attached to the object to be identified and the reader is non-movable which can read the stored data of the RFID tag or level when it is within the frequency range of the reader.

The RFID technology has dynamic roles in the library for tracking objects and provides unique identification. The main aims of today's libraries to adopt RFID are meeting the need of increasing efficiency and reducing cost. Automation and self-service by RFID technology can help

the libraries in achieving these aims. This technology can also provide security to the range of different media offered in the libraries. It can also improve circulation and inventory control that help allocate human and financial resources. So the libraries in Bangladesh have adopted this technology for better management and providing appropriate library services to the users with the high reliability, high speed inventorying, automated materials handling and significantly reduce the manpower, amount of stuff and time required to give services.

### A. History of RFID Technology

During World War II, the British Army used RFID technology to differentiate between the own aircrafts and the aircrafts of the enemy. They fixed transponders made of RFID technology on their aircrafts which was respond to interrogating signals from base radar stations. This was called the Identification, Friend or Foe (IFF) system (Dittmer, 2004) and is widely considered the first use of Radio Frequency Identification in the world. However, Waddenkeri (2006) reported that the first RFID system was used in British Army during the Second World War in the 1940s.

The first commercial use of RFID started in the 1960's with the development of the Electronic Article Surveillance (EAS) equipment by the companies Sensormatic, Checkpoint and Knogo to prevent the theft of merchandise. In the 1970s developers, inventors, companies, academic institutions, and government laboratories began working actively on RFID, and notable advances were being realized at research laboratories and academic institutions. In the 1990s, the wide scale deployment of RFID was seen in electronic toll collection in the United States and the installation of over 3 million RFID tags on rail cars in North America (Landt, 2005). Subsequent to the announcement of United States Department of Defense that RFID technology held the potential to revolutionize In-Transit-Visibility and the Total Asset Visibility in supply chains, many technology vendors were encouraged to push forward RFID development for commercial purposes (Liard, 2003). However, the value of RFID technology for managing business supply chains has only been recognized in recent years. The business press has since proclaimed that RFID marks a commercial innovation with the potential to replace

barcode technology in the supply chains of numerous industries (Ustundag & Kilinc, 2011).

Libraries began using RFID technology to replace their electro-magnetic and bar code system in the late 1990s (Molnar & Wagner, 2004). Now it is guided by the principle of the use of self-service in other aspects of modern life like the supermarket checkout. It is estimated that over 30 million library items worldwide now contain RFID tags (Ching & Tai, 2009). Whereas Mehrjerdi (2011) wrote that over 8 percent of libraries in the worldwide are using RFID and this figure is rapidly increasing as libraries understand the advantages of RFID system.

### *B. RFID Technology in Bangladesh*

The application of RFID technology is still prominent in commercial organizations, especially in well-established supper shops in Dhaka city of Bangladesh. The Apollo Hospital, Dhaka used RFID technology in hospital management for the first time in Bangladesh in 2008. After that some garments and supper shops started using RFID for their security and inventory system. The Bangladesh Road Transport Authority (BRTA) used RFID for transports tracking system of Dhaka City in 2013, whereas, the libraries started using RFID technology in 2011 (Rahman, 2014).

Although, the RFID technology enhances the quality of library services and makes easy to manage the library system, whereas only nine libraries in Bangladesh are using RFID system till today. They are North South University (NSU) library, BRAC University (BRACU) library, Shahjalal University of Science and Technology (SUST) library, Bangladesh University of Engineering and Technology (BUET) library, Bangladesh Bank (BB) library, Bangladesh Secretariat Library (BSL), Chittagong Veterinary and Animal Sciences University (CVASU) library, Sher-e-Bangla Agricultural University (SBAU) library and Khulna University of Engineering and Technology (KUET) library.

### *C. Advantages of RFID Technology in Libraries*

The RFID based library management system is an innovative automated library system for auto-identification and tracking of library materials without physical contact. It provides a platform to automate most of the process performed by the library staff like check-in, check-out, sorting, stock management and inventory control. This is an effective way of managing collection of the library and providing enhanced services to the users having following advantages.

1. RFID tag does not have to be visible for detection. It can be read even when it is embedded in an item, such as in the hardboard cover of a book or inside the other library items.
2. Hassle free automated issue and return of items.

3. Several books in a pile can be issued and returned at a time.
4. Does not need the manual typing, so ensuring accuracy in routine works and repetitive works such as lending or returning of items.
5. No lines or greatly reduced lines of users at check-in and check-out counter.
6. Helpful in identifying miss-shelves, re-shelving, searching, sorting and weeding of books.
7. Increases the security function in library.
8. Instant update of the databases is possible.
9. Improves utilization of library resources like manpower, infrastructure etc.
10. Less time consumption of performing library works as line of sight and manual interaction are not required for RFID tag reading.
11. Flexible library timings by use of books drop station for returning library items.
12. Unique ID of RFID tag prevents counterfeiting.
13. Open access system promotes chances of theft of books, so to secure the valuable resources from anti-social elements.
14. Traditional methods of stock verification are not feasible for libraries having large collection but feasible in RFID system.
15. Inventory visibility, accuracy and efficiency (Vasishta, 2009; Rahman, 2014).
16. EAS gates have option to keep the record of entry and exit of the number of library users.
17. The conveyer and sorting system carry the books and sort them by category for shelving or re-shelving which reduces work load of the staff and save the time.

### *D. Limitation of RFID Technology in Libraries*

Introducing any new technology in anywhere always brings controversial issues due to perceptions of the patrons. When libraries choose to convert their systems to take advantages of the new technology, in that case, obviously there are some pros and cons, criticize and doubt about the new technology. The limitations revolving around the RFID technology such as issues surrounding cost, security and privacy are as follows.

1. Most important limitation of RFID technology is its high cost.
2. Vulnerability is great threat of this technology such as household foil blocks the radio signals so by wrapping it around books, the books can be carried outside of libraries easily without anybody identify it.
3. Possible to create damage in RFID system by placing two items against one another so that one tag overlays another which may cause of collision of radio wave frequency and cancel out the signals.
4. RFID tag cannot be hidden in either spine or gutter of all books and are displayed to be removed.
5. RFID tag can be damaged or removed from the book for stealing.
6. Some patrons are opposed to use RFID system because of perceived privacy issues and surrounding it.

7. Annual maintenance cost after warranty period of RFID system is sometimes around 15% of the system cost which is on a very higher side of limitation (Hasan, 2013).

## II. LITERATURE REVIEW

RFID technology has recently received an emerging attention in the library management although this technology has been using in various sectors since the mid of nineteenth century. There is extensive research works carried on using RFID technology and many researchers have identified the various functional issues of RFID. However, only a very few research works were done on the use of RFID in libraries especially the libraries in Bangladesh. Boss (2003) identified components of RFID system which are: (1). RFID tags that are electronically programmed with unique information, (2). Readers or sensors to query the tags, (3). Antenna, and (4). Server on which the software that interfaces with the integrated library software is loaded.

Kern (2004) stated that RFID systems used in libraries for book identification, for self-checkout, for anti-theft control, for inventory control, and for sorting and conveying of library books and AV materials. Kern (2004) and Keshinro *et al.*, (2016) reported that the RFID applications could lead to significant savings in labor costs, enhance customer service, reduce book theft and provide a constant record update while charging and discharging items.

Koneru (2004) depicted that, after realizing the advantages of RFID technology, libraries are considering it as a productive tool for flow management rather than barcodes and other identification technologies.

Waddenkeri (2006) observed that, among the various technologies, the radio frequency identification seems to be dominating in the information industry as a means to improve efficiency in library activities and services. He reported that RFID based systems move beyond security to become tracking systems that combine security with more efficient tracking of materials throughout the library, including easier and faster charge and discharge, inventory and materials handling.

Dhanalakshmi and Mamatha (2009) wrote that RFID based library management system (LMS) would allow fast transaction flow for the library and will prove immediate and long term benefits to library in traceability and security. They proposed a library system based on ultra-high frequency (UHF) RFID readers, supported with antennas at gate and transaction sections, and library cards containing RFID transponders which are able to electronically store information that can be read and written even without the physical contact with the help of radio medium.

Makori (2013) found that the various problems hindering the adoption of the technology, such as a lack of

information communication technology (ICT) policies, lack of a business approach, limited market opportunities, lack of lobbying or negotiating skills, inadequate funding and budgeting, and lack of ICT competencies and skills. The study recommended that the library ICT professionals, information professionals and other stakeholders should make tireless efforts to implement and use RFID technology with the view to building, strengthening, improving and supporting information work and activities in university libraries.

In a study, Ali, Satter and Shohel (2013) proposed the RFID based vehicle tracking system in Bangladesh for benefits to both private and public sector individuals, allowing for real-time visibility of vehicles and the ability to receive advanced information regarding legal existence and security status which is not possible by the existing system.

In another study, Masum, Bhuiyan and Azam (2013) proposed the potential use of RFID chip in the passport, human implant, item-level tagging, inventory tracking and access control system in Bangladesh.

Kamal (2013) explained the operation of RFID technology, its potential benefits and applications, the threat it poses to the citizens specially consumers and its likely impact on Bangladeshi legal regime. He put the main looks at privacy issues relating to the use of RFID, and suggested the desired parameters to these systems which are consistent with present privacy laws of Bangladesh.

Keshinro *et al.*, (2016) stated that this (RFID) technology helps librarians reduce valuable staff time spent scanning barcodes while charging and discharging items. They mentioned that it is important to educate library staff and library users about RFID technology before while the use of high frequency (13.56 MHz), passive, read-write tags, lack of a standard and compatibility of tags produced by different vendors is a major problem in implementation of RFID in libraries.

ALA (2017) referred to its RFID guidelines that several libraries around the world announced their intent to integrate RFID technology into their library systems, pioneering its use for contemporary library functions in 2000s and the National Information Standards Organization (NISO) has published a Recommended Practice, entitled "RFID in U.S. Libraries" in 2012. This publication reflects changes in technology, security, and privacy measures, and suggests a common set of data elements to be placed on library tags in the United States, in addition to preferred encoding and formatting of that data, under the titled RFID in Libraries - NISO RP-6-2012. It serves as a United States profile to the three-part international standard ISO 28560, RFID in Libraries.

Nisha (2018) wrote an overview of the work on implementation of the RFID system at DESIDOC library including the philosophy or the background or thought

process that had gone into deciding in its implementation. The study concluded that implementation of RFID technology has brought a bouquet of benefits to librarians, the staffs and scientists or users of the library.

Rahman and Islam (2019) identified the challenges of implementing RFID system in libraries of Bangladesh which are - lack of adequate funding, unavailability of RFID accessories, lack of skilled manpower, unwillingness, erratic power supply, etc. This study suggested some measures such as creating positive impression and attitudes, arrange training, recruit skilled manpower and allocation of sufficient budget to overcome the existing challenges of RFID based library management system in Bangladesh.

In view of the above, it can be stated that RFID technology is an innovative and smart system for identifying, tracking and supporting information processes and services in libraries. Although the concept of RFID applications in libraries is still considered young and emerging in Bangladesh but some libraries have already started implement this technology and others will be realized its reality in the years to come.

### III. OBJECTIVE OF THE STUDY

The libraries always implement new techniques and technologies to meet the demand and pressure of the users. With the view of implementing new technology and changing perception about the information, communication and dissemination of the information, and information system, it is essential for the libraries and library professionals to understand contemporary transformation, accept the new trend and work proactively to handle the current situations of the library. As RFID is a new generation auto identification technology that helps to automate library system and allows identification of large

number of tagged objects in the library, so the libraries in Bangladesh have started using this latest technology to meet the aspirations and expectations of the library users. That's why, the objectives of this study are to evaluate the effectiveness of RFID technology in automated library system and services, make everyone's work easier right from the users to library staff and impact on library management system in Bangladesh.

### IV. METHODOLOGY

This study followed both qualitative and quantitative method of research. The research sites of data collection were nine libraries in Bangladesh that have been using RFID technology to manage the library system and services such as North South University (NSU) library, BRAC University (BRACU) library, Shahjalal University of Science and Technology (SUST) library, Bangladesh University of Engineering and Technology (BUET) library, Bangladesh Bank (BB) library, Bangladesh Secretariat Library (BSL), Sher-e-Bangla Agricultural University (SBAU) library, Chittagong Veterinary and Animal Sciences University (CVASU) library, and Khulna University of Engineering and Technology (KUET) library. The data were collected from October 2018 to January 2019 through a structured questionnaire, face-to-face and telephone interview with librarians, official documents and institutional websites.

### V. DATA ANALYSIS AND RESULTS

This study collected the data from all nine RFID technology installed libraries in Bangladesh through survey and interview. The collected data were analyzed after editing, classifying, transforming and modeling to achieve the goal of the study and presented the analyzed data in the following tabular form.

TABLE I USING RFID IN THE LIBRARIES OF BANGLADESH

Name of the University	Year of Installation	Name of the Project	Financer	Total Cost in Tk. Lac
BRAC University (BRACU) Library	2011	RFID implementation at BRAC university library	BRAC University	n/a
North South University (NSU) Library	2012	Building E- resources access centre and RFID based library management system at NSU library	HEQEP*	Tk. 318.4
Shahjalal University of Science and Technology (SUST) Library	2013	Total computerization of SUST	HEQEP*	Tk. 400
Bangladesh University of Engineering and Technology (BUET) Library	2014	Digitalization of central library of BUET	HEQEP*	Tk.345
Bangladesh Bank (BB) Library	2015	Modernization of Bangladesh Bank library	Bangladesh Bank	Tk.133
Bangladesh Secretariat Library (BSL)	2015	Networking, automation and database development	Govt. of Bangladesh	Tk.200 (approx.)
Chittagong Veterinary and Animal Sciences University (CVASU) Library	2015	Promoting library facilities by introducing RFID solutions at central library of CVASU	HEQEP*	Tk. 60
Sher-e-Bangla Agricultural University (SBAU) Library	2016	e-Capacities enhancement of SAU library for learning teaching and research development	HEQEP*	Tk.100
Khulna University of Engineering and Technology (KUET) Library	2018	Enhancing the teaching, learning and research capabilities through library system automation	HEQEP*	Tk. 75

\*HEQEP: Higher Education Quality Enhancement Project, Ministry of Education, Govt. of Bangladesh

### A. Using RFID in the Libraries of Bangladesh

The NSU library has implemented RFID technology in its integrated library management system for the first time in Bangladesh in 2012 under the project titled “Building E-resources access centre and RFID based library management system at NSU library”. This project was funded by the Higher Education Quality Enhancement Project (HEQEP), Ministry of Education, Govt. of Bangladesh. Whereas the BRACU library has introduced RFID by its own fund in 2011 for the security purposes of library resources and implemented integrated library management system in 2013 under the project titled “RFID implementation at BRAC university library” (Rahman, 2014, 2016). Table I also shows the same findings as above.

Table I shows that the SUST library has implemented RFID system under the HEQEP project titled “Total computerization of SUST” in 2013 while BUET library has installed RFID system under the HEQEP project titled “Digitalization of central library of BUET” in 2014. The BB library has implemented RFID system with its own funded project titled “Modernization of Bangladesh Bank library”, the CVASU library has also installed RFID system under the HEQEP project titled “Promoting library facilities by introducing RFID solutions at central library of CVASU” and the BSL has implemented RFID system through the Government of Bangladesh funded project titled “Networking, automation and database development” in 2015. The SBAU library has implemented RFID system through the HEQEP project titled “e-Capacities enhancement of SAU library for learning teaching and research development” in 2016 while KUET library has

implemented RFID under the HEQEP project titled “Enhancing the teaching, learning and research capabilities through library system automation” in 2018.

### B. RFID Equipments Installed in the Libraries

Table II reports that all nine libraries have installed Anti Theft Detection EAS gate, Staff Work Station (with RFID Scanner) and RFID Tag. The Self Check Machine/Kiosk has been installed in all libraries except SUST and BRACU library. The NSU, BUET, SBAU and CVASU library have set up Book Drop Station and the NSU, BB and SBAU library have installed the RFID Conversion Station/Machine. The Self Manager or DLA has been procured by NSU, BRACU, BB and SBAU library and the Hand Held Scanner has been introduced by NSU, SBAU and CVASU library. The RFID Smart Card and Smart Card Printer/Convertor have been implemented in the BUET, KUET, BSL and CVASU library. The Access Control Gate with SS Fence has been installed in BUET and CVASU library. Whereas, RFID Level Printer with Conversion Station has been installed in NSU and BB library. The Smart Card Reader, Dual Side Smart Card Printer with production software and Digital Web Cam with stand have been procured in the CVASU library only.

The researcher interviewed the librarians and came to know that the Self Manager or DLA, Book Drop Station, Level Printer and Smart Card Reader are under-utilized because of their complicated functional operation, lack of trained staff, less trust on this new system and insufficient house-keeping works in the library.

TABLE II RFID EQUIPMENTS INSTALLED IN THE LIBRARIES OF BANGLADESH

S. No.	Name of the RFID equipments	NSU	BRACU	BUET	SUST	SBAU	CVASU	KUET	BBL	BSL
1.	RFID Tag	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2.	Self Check Machine/ Kiosk	Yes		Yes		Yes	Yes	Yes	Yes	Yes
3.	Anti Theft Detection EAS Gate	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4.	Staff Work Station/Circulation Station	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5.	Book Drop Station	Yes	-	Yes	-	Yes	Yes	-	-	-
6.	Conversion Station/Machine	Yes	-	-	-	Yes	-	-	Yes	-
7.	Shelf Manager or DLA	Yes	Yes			Yes		-	Yes	-
8.	RFID Level Printer with Conversion Station	Yes	-	-	-	-	-	-	Yes	-
9.	Hand Held Reader	Yes	-	-	-	Yes	Yes	-	-	-
10.	Access Control Gate with SS Fence			Yes			Yes			-
11.	RFID Smart Card System with Printer/ Convertor	-	-	Yes	-	-	Yes	Yes	-	Yes
12.	RFID Smart Card (ID card)	-	-	Yes	-	-	Yes	Yes	-	Yes
13.	Smart Card Reader, Dual Side Smart Card Printer with Production Software	-	-	-	-	-	Yes	-	-	-
14.	Digital Webcam with Stand	-	-	-	-	-	Yes	-	-	

### C. RFID Tagged Items in the Libraries

TABLE III RFID TAGGED ITEMS IN THE LIBRARIES

Name of the University	Books	CD & DVD	VHS	Others
BUET Library	137,000	2000	Nil	Nil
SUST Library	70,000	Nil	Nil	Nil
NSU Library	50,000	2000	50	Nil
BRACU Library	40,000	Nil	Nil	Nil
SBAU Library	40,000	Nil	Nil	Nil
BB Library	25,000	1000	Nil	Nil
Bangladesh Secretariat Library (BSL)	22,000	1100	Nil	Nil
KUET Library	20,000	Nil	Nil	Nil
CVASU Library	8,000	500	Nil	Nil

Table III reveals that the highest number of tagged items (139 thousand) is in the BUET library and the second highest number of tagged items (70 thousand) is in the SUST library, followed by NSU library with 52.05 thousand tagged items. BRACU library and SBAU library have 40 thousand tagged items each. Then BB library has 26 thousand tagged items, BSL has 23.1 thousand tagged items and KUET library has 20 thousand tagged items while CVASU library has only 8.5 thousand tagged items.

### D. Using RFID Based Library Management Software

Table IV depicts that NSU library, BB library and BSL are using their self developed software, named, NSU Library Management Software, Bangladesh Bank eLibrary System and BSL Management Software respectively. On the other hand, all other libraries are using open source Integrated Library System-Koha.

TABLE IV USING LIBRARY MANAGEMENT SOFTWARE

Name of the University	Name of the Library Management Software	Software Installation and Maintaining	RFID Equipments Supply and Installation
NSU Library	NSU Library Management Software	Self developed and maintaining	LITME Enterprise
BB Library	Bangladesh Bank eLibrary System	Self developed and maintaining	LITME Enterprise
BSL	BSL Management Software	Technovista Ltd	Electro Home Limited
BRACU Library	Open source Integrated Library System-Koha	Self installed and maintaining	LITME Enterprise
BUET Library	Open source Integrated Library System-Koha	Installed and maintaining by Dept. of CSE, BUET	Endover Company
KUET Library	Open source Integrated Library System-Koha	Self installed and maintaining	Electro Home Limited
SBAU Library	Open source Integrated Library System-Koha	Self installed and maintaining	Electro Home Limited
CVASU Library	Open source Integrated Library System-Koha	Electro Home Limited	Electro Home Limited
SUST Library	Open source Integrated Library System-Koha	Dhaka Services Company	Dhaka Services Company

The NSU, BRACU, BUET, SBAU, KUET and BB library have installed and maintained software by themselves. Whereas, others libraries have installed and maintained software by commercial companies.

### E. Frequency of Using RFID System

Table V shows that the highest numbers of users (1000 user) employ the NSU library every day.

TABLE V FREQUENCY OF USING RFID SYSTEM

Name of the University	Number of library users per day	Number of check-in items by RFID machine per day	Number of check-out items by RFID machine per day	Average number of users use RFID machine per day	Percent of use RFID system per day
NSU Library	1000	650	600	625	62.5%
KUET Library	700	600	600	600	85.7%
SUST Library	600	400	400	400	66.6%
BUET Library	350	150	140	145	41.4%
CVASU Library	350	125	120	122.5	35%
BB Library	300	100	90	95	31.6%
SBAU Library	250	50	50	50	20%
BRACU Library	150	30	22	26	17.3%
BSL	40	22	18	20	50%

Out of them, 625 users use RFID system. It means 62.5 percent of library users use the RFID system every day. The second highest numbers of users (700 user) use the KUET library every day. On which, 600 users (85.7%) employ the RFID system. The third highest numbers of users (600 user) use the SUST library every day, where 400 users (66.6%) use RFID system. The number of users of both BUET library and CVASU library are 350 per day where 145 users (41.4%) of BUET library users use RFID system and 122 users (35%) of CVASU library users use RFID system per day. Out of 300 users, only 95 users (31.6%) of BB library use RFID system while out of 250 users of SBAU, only 50 users (20%) use RFID system every day. Whereas, BRACU library has 150 users per day, but only 26 users (17.3%) use RFID system every day. The lowest number of users (40

user) at BSL per day where 20 users (50%) use RFID system. The above libraries informed that the library users are quite satisfied with the services of RFID system and the frequency of using this system is increasing day by day.

#### *F. Stocktaking (Inventory) of the Library Items by RFID System*

Table VI reports that NSU, BRACU, BB, SBAU and CVASU library did stocktaking (inventory) whereas only NSU and BRACU library use RFID system to do stocktaking. The number of lost items are 60 copies, 50 copies and 50 copies per year in the BRACU, NSU and BB library respectively, which total costs are approximately taka sixty thousand and taka eighty thousand only.

TABLE VI STOCKTAKING (INVENTORY) OF THE LIBRARY ITEMS BY RFID SYSTEM

Name of the University	Stocktaking	Stocktaking by RFID System	Number of lost items per year	Total price of lost items in Tk.
NSU Library	Yes	Yes	50 copies	Tk.80,000
BRACU Library	Yes	Yes	60 copies	Tk.60,000
BB Library	Yes	No	50 copies	n/a
SBAU Library	Yes	No	n/a	n/a
CVASU Library	Yes	No	n/a	n/a
SUST Library	No	No	n/a	n/a
KUET Library	No	No	n/a	n/a
BUET_Library	No	No	n/a	n/a
BSL	No	No	n/a	n/a

## VI. DISCUSSION OF THE RESULTS

Since the beginning of civilization, the library always equipped with technology to manage the library resources and enhance the quality of services. Nowadays, the libraries are using RFID technology for proper handling the resources, control over them and meet the requirements of the patrons. Whereas, a very negligible number of libraries as compare to total academic and special libraries are using RFID system in Bangladesh. At present 145 university libraries and around 680 special libraries are functioning in Bangladesh on which only seven university libraries and two special libraries are using RFID system.

The study found that all nine libraries have installed RFID technology such as anti theft detection EAS gate, staff-work station and RFID tag. In addition to these, some of the libraries are using self check/kiosk, book drop station, DLA and smart card for the better system management and services. It also revealed that the self manager or DLA, book drop station, level printer and smart card reader are not executing its function properly because of lack of trained staff, patron's less trust on RFID system and handling complicity. The libraries are not doing stocktaking (inventory) with RFID system except NSU and BRACU library although it is an important facility of the RFID system.

The study also found that only 412,000 books, 6600 CDs and DVDs and 50 VHS have RFID tagged in Bangladesh and the BUET library has done alone RFID tagged around one third, i.e. 33.25% items. The high cost of RFID and lack of skilled manpower are the main reasons of less using this modern technology in Bangladesh. This study also found that six university libraries have implemented RFID system by using HEQEP fund, two libraries have got fund from their own institutions and one library has received fund from the Government of Bangladesh. Due to constraint of the fund and lack of trained staff, six libraries are using open sources software Integrated Library System- Koha. On the other hand, NSU, BSL and BB library are using their own developed software for RFID based library management system.

The significance finding of the study is the library users are coping with this new technology. Currently, 17% to 85% users employ RFID system and it is increasing day by day. It's probed that the users have realized the advantages, benefits and effectiveness of RFID technology in the library.

## VII. IMPLICATION OF THE RFID TECHNOLOGY

The RFID technology could effectively protect the stealing of valuable resources, enrich efficiency and increase the

quality of services and also attract the users to visit the library. So, the study makes the following suggestions for effective utilizes and implements RFID technology in libraries of Bangladesh.

1. National libraries, university libraries, big colleges, schools and public libraries, researcher institute libraries and special libraries in Bangladesh should implement RFID system for enhancing security of resources, quality of services and increasing number of users.
2. Library Association of Bangladesh (LAB) and Bangladesh Association of Librarians, Information Scientists and Documentalists (BALID) should jointly prepare a RFID Application Guidelines like ALA for proper implementation of RFID system in the libraries in Bangladesh.
3. The LIS departments and institutions should incorporate RFID technology in their curriculum.
4. The library professional associations and institutions in Bangladesh should arrange seminar, lecture, conference and training program on RFID based library management system and launch awareness program on RFID technology.
5. The government should allocate a separate budget every year for library development, automation and digitization of libraries in Bangladesh.
6. Create a RFID technology users' group for discussion, exchanges views and sharing experiences on this technology.
7. The ex-patriot library professionals who have skill in RFID system can provide guideline on implementing RFID technology in library and if possible arrange training on it.
8. The government of Bangladesh and non-government organizations can offer scholarship for training the library professionals on RFID system in abroad.

### VIII. CONCLUSION

RFID technology has the capability of making the management processes in the library more convenient. Its application lead to significant savings in manpower costs, improve quality of services and make efficient results, which leads to the best security and access control. It not only provides a constant update and proper handling of library collections, but also accomplishes real-time services. RFID system offers a complete package from security, theft detection, tracking, monitoring, inventory control, and act as an expedient in books circulation or charging and discharging of books; and, lessens the burden of librarians, who could be better redeployed to other productive activities in the services of the users (Nisho, 2018). The bottom line is that the synergy between the latest technology like RFID and libraries can create wonders resulting in empowerment of both users as well as librarians.

RFID technology as a new innovation appears to be at an early diffusion stage with many articles reporting individual trials or experiences of implementation in their own

institution. This study did not focus on the technological issues associated with RFID, but has examined its value of the technology by identifying the information attributes associated with many of the reported adoption benefits. In conclusion, implementing RFID technology has provided major benefits for libraries in Bangladesh including it serves a large clientele, enables the library to provide a quick, accurate and timely service to the users effectively.

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