

RFID TECHNOLOGY: BUILDING A NEW ENVIRONMENT IN ACADEMIC LIBRARIES

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Abstract

At present, libraries and information services are facing many challenges while transformation from traditional methods to electronic methods. In this digital era, technology has dramatically changed user's need for information service as well as it saved the time of the users. RFID (Radio Frequency of Identification) technology is not only promising but also more convenient, efficient, and cost-effective -in library security. Library circulation system and shelving of the reading materials are quite cumbersome works which require lot of staff time. RFID provides a solution to such problems by reducing the amount of time required to perform circulation services. This research paper covers the advantages and disadvantages as well as application of the RFID technology in library management cycle. The operational benefits and borrowing process cycle of RFID technologies in libraries are discussed. This paper revealed how RFID technology changed the library environment. Its basic and optional components of RFID technology are also mentioned. A few academic libraries in Bangladesh have already implemented RFID technology and library professionals are providing right services more efficiently and library environment looks very smatter, as a result user satisfaction level is enhancing day by day and library resources are being properly used by the users.

Keywords

RFID, Technology, Environment, Implementation, Academic libraries

Introduction

Information Technology (IT) has opened the door for academic librarians to save the time of the patrons. The advent of technology seems to be changing our world, seemingly on the hour, libraries and their needs are no exception (Narver, 2007). Technology has changed patron's expectations and they want to save their time with required resources in the library. Academic libraries aim to provide right information to the right patron at the right time. New technologies have always been significant for libraries, both for the potential of increasing the quality of service and for improving efficiency of smooth operation. Now, librarians, realizing the benefits of RFID technology, are trying to implement this technology to make a predictable environment for the betterment of the users. Therefore, the authorities of libraries are

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relying on technological systems to improve patrons' services and to perform internal management of various services.

With massive knowledge explosion in every branch of knowledge, the need for satisfying the thirst of information cannot be over emphasized. Libraries have traditionally acted to protect library resources and defend the privacy of their patrons and yet some libraries are implementing technologies before putting proper safeguards in place. At present, libraries are using Radio Frequency Identification (RFID) technology to ensure maximum protection as well as proper management of library resources. RFID is a wireless technology used for tracking, tracing or identifying an individual item or group of items. Libraries are rapidly adopting RFID technology to alleviate recurring strain injury, speed patron self-check-out, and make possible inclusive inventory. The tasks of lending, returning, sorting, tagging etc. of books have become much easier because of the RFID tags system.

Review of Literature

Lee & Lee (2010) observed that RFID technology management is a process of evaluating RFID technology, developing RFID systems, managing RFID systems and RFID infrastructure to achieve the objectives of the library. Libraries have been using RFID technology since 1990. Since traditional security systems were proved to be less effective, RFID has become a perfect solution in the digital era.

Roh et. al. (2009) studied the adoption of RFID in some organizations and they explained RFID usages in libraries with a case study. They found that more than 300 libraries in the United States had implemented RFID technology since 2003. As a result, these libraries had benefited from this technology and it was seen that the libraries which were using RFID technology were able to make their tracking, identifying and controlling system more efficient.

Hossain and Prybutok (2008) informed that the application of RFID started commercially in 1980 to tag livestock with an aim to track and monitor the wellbeing of animals. This technology entered into supply chain to manage production and distribution systems. Now RFID technologies are being used to select, identify, capture, and transmit information from tagged objects to enterprise systems. It became popular for finding, counting and detecting items in retail sector and libraries.

Edwards and Fortune (2008) observed that RFID system could work along with barcode system. Many libraries have already installed barcode systems where a

barcode has been placed in each book and the system uniquely identifies the book by reading the barcode. Using a barcode scanner, the system can automatically identify items for library circulation and it employs a specific radio frequency to transmit information to multiple readings from or to the tag.

Rajendra & Rathinasabapathy (2007) maintained that electronic security systems are used along with electrical apparatus to secure library materials. Information providers can control library resources, minimize or avoid library material theft and unethical losses. University libraries can implement such technologies to protect their resources like Electrical Security Systems installed in libraries, which include electronic surveillance camera (CCTV), electronic security gates, radio frequency identification (RFID) system, perimeter alarm system, etc.

Boss (2004) explained the benefits of RFID technology in libraries saying that the system combined tracking system with security system. He opined that, the newly developed security door of the RFID is a real security tool. It controls 4-5-meter length area of the outside door easily and acts as anti-theft system in the libraries.

McComb (2004) observed that it is imperative to ensure that the security is performed as effortlessly as possible, without interfering with the library's objective of providing a user-friendly environment.

Ulfelder (2003) provided details about the use of RFID technology at the libraries of Singapore with remarkable results. Under the leadership of the National Library, Libraries in Singapore aggressively implemented RFID technology. In Singapore's library system, all nine million books, videos and DVDs are embedded with antitheft chips, allowing self-checkout. These libraries offer excellent user-friendly environment with self-service desk for circulation system.

Simmonds (2001) defined that university libraries are the heart of the learning community, providing a most excellent place for students and faculty to do their research and express their knowledge. But librarians have been faced with major security challenges in their effort to secure their valuable library resources collected over times. RFID technology changes such situation through implementation in the libraries.

Bello (1998) explained that all thefts are not committed by patrons. Some library information providers take resources from the library without checking them out. This kind of theft is one of the hardest to prevent, since library employees know how to defeat the security system.

Akinfolarin (1992) found that one of the serious issues, which has worried librarians from the earliest times to the present, is - how to safeguard library materials, especially against burglary and mutilation.

Objectives of the Study

The objectives of this study are as follows:

- To examine the check-out system in the library
- To determine the efficiency of electronic security systems
- To observe the benefits using RFID systems.

Methodology of the Study

This study is exclusively a descriptive research and is based primarily on the experience gathered in context of an academic library. The researcher has visited and gained practical knowledge from relevant experts' opinion from Rajshahi University, Bangladesh University of Engineering and Technology and North South University, which have already implemented RFID technology. The researcher has also consulted with Indian RFID experts to implement RFID and associated technologies in academic libraries. In the digital era, technology needs to provide proper services to the right person at the right time. The researcher is working in a university library and trying to develop innovative applications of ICT in library services,

To obtain this objective of the present study, the researcher has mostly used secondary data from a number of research papers. Secondary data have been collected from various relevant publications and books. The focus was mainly on the benefits of RFID and how the users can borrow library resources by using RFID technology.

Significance of the Study

Academic libraries are considered as the heart of higher learning mainly because this is a hub for the dissemination of updated knowledge in the form of books, journals, magazines, audio and video, etc. The fundamental aim of any library is to provide opportunities to its readers for optimum utilization of available resources. In this digital era, library professionals are keen to provide proper services to the right patron at the right time.

Nowadays, libraries are seeking technological aids to improve their services and internal management of various services offered. The users, too, are using updated technologies including Smart phones and mobiles devices for meeting their

information needs. Librarians, in their turn, have realized their responsibilities for improving and developing library services to meet the diverse needs of their users. RFID technology is one of the experimental tools which are being used to improve the efficiency of libraries all over the world. It has been observed that very few private and public universities have implemented RFID technology in Bangladesh and the some other universities are planning to do so in an attempt to ensure smooth operation. Unfortunately, some people try to take library resources without properly checking out the resources. In view of this, library authorities need to take all necessary measures to protect library resources through implementing RFID technology.

Discussion of the Study

RFID System Cycle

The use of RFID technology in the library saves information providers' time by accelerating their works. By using this system, users can self-check-in or check-out library materials. They have to identify themselves with a code which is preferably a personal identification number. Books are selected by the patrons so as to be identified by the system's built-in RFID reader and the surveillance bit in the book's tag is deactivated by the system.

Tagging: Books tagging is playing a vital role in the RFID system. It is one of the most valuable interlinks in any RFID system and has the ability to store information relating to the specific item in which they are attached, rewrite again without any requirement for contact or line of sight.

Counter Station: Counter station is a staff assisted station on services such as loan, return, tagging, sorting, etc. It is loaded with arming disarming module, tagging module and sorting module.

Shelf Check-out Station: It is basically a computer with a touch screen and a built-in RFID reader with special software for identification of books and other media for handling and circulation.

Anti-theft Detection: RFID gates are the anti-theft part of the library management system using the RFID tags entrenched in the library items. It has built-in alarm system which is activated when un-borrowed items passed through them. The alarm will sound and lights on the gate will flash as patron passes through with the un-borrowed library materials.

Book Drops: The book drops may be located at a suitable place in the library or outside the library. It is possible to be place in remote area so that patrons drop their borrowed books conveniently and easily anytime when the library is closed.

Shelf Management: It is used for making the task of locating and identifying items on the shelves easier for library personnel. It basically comprises a portable scanner and a base station.

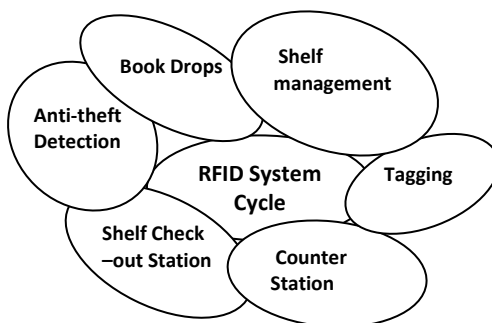


Figure-1: RFID system cycle

RFID Technology in Libraries

Advantages

- i. **Rapid charging/discharging:** The implementation of RFID system reduces the total time required to perform circulation functions. In fact, information can be read from RFID tags much faster than from barcodes at the same time.
- ii. **Patron self-charging/ discharging:** It allows patrons to borrow and return books and other items on their own, which relieves some workloads off the library staff.

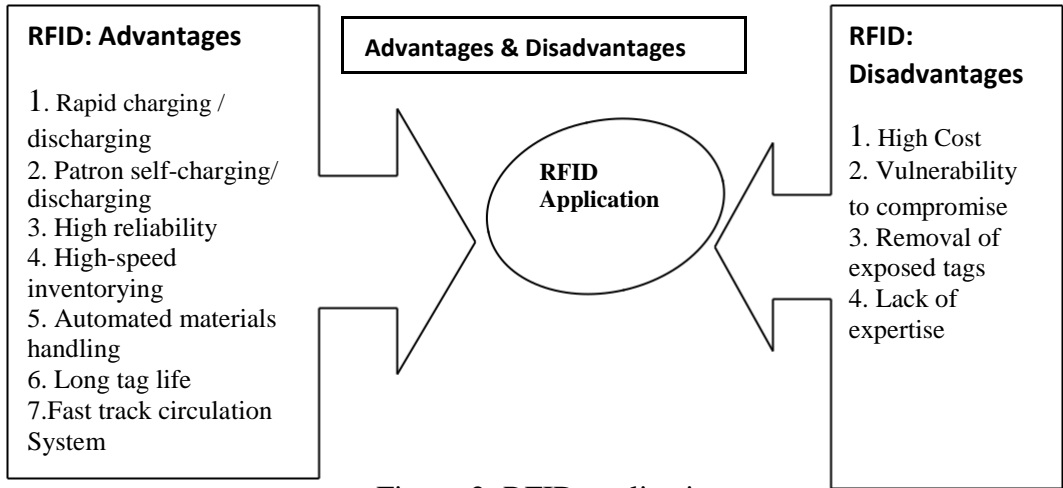


Figure-2: RFID application

iii. **High reliability:** RFID systems have an interface between the exits sensors and the circulation system to identify the items moving out of the library. If patrons' cards also have RFID tag, the library staff will be able to confirm who removed the materials without properly charging them.

iv. **High-speed inventory:** This is very important to identify unorganized materials on the bookshelves. The benefit of RFID systems is to scan books on the shelves without taking them out. A handle reader can be moved rapidly across a shelf of books to read all of the unique identification information. It is possible not only to update the inventory but also to identify items which have not been kept in their proper places.

v. **Automated materials handling:** This technology helps in automated handling of library materials. It includes conveyor and sorting systems that can move library materials and sort them by category into separate carts.

vi. **Long tag life:** RFID tags last longer than barcodes because nothing comes into contact with them. Most of RFID vendors claim that a minimum of 1,00,000 transactions is possible before a tag may be needed to be replaced.

vii. **Fast track circulation systems:** RFID technology saves the time of the information seekers as well as the information providers during issuing and returning. This system is faster than other technologies.

Disadvantages

i. **High cost:** The major disadvantage of RFID technology is its cost. In the digital era, it is required to be implemented in university libraries to provide better services to the users.

ii. **Vulnerability to compromise:** It is possible to conciliate to block the radio signal by packaging the household foil through RFID systems.

iii. **Removal of exposed tags:** The library can imprint the RFID tags with its logo and make them appear to be bookplates. RFID tags cannot be obscured in the spine of the books and are exposed for removal.

iv. **Lack of expertise:** There is a lack of skilled technicians to implement RFID technology in the libraries of Bangladesh.

Operational benefits of RFID technologies

RFID technology system offers several operational benefits for the libraries. It benefits the library in various ways, including advantages for library managers, information providers and information seekers.

i. Library management:

- To improve inter-library cooperation
- To maintain the level of patron satisfaction
- For better preservation of inventory system
- To maintain the same security and labeling formats for all items
- To support flexible staff schedules
- To arrange efficient collection management system
- To control uncompromised security within the library

ii. Information providers

- To save the time and to provide better services to the information seekers.
- To reduce cost and saving devices from doing repetitive, physically stressful jobs.
- To make flexible working schedules for information providers.
- To provide services to the patrons efficiently, sincerely and properly.

- To create a favourable environment for all patrons and library personnel.

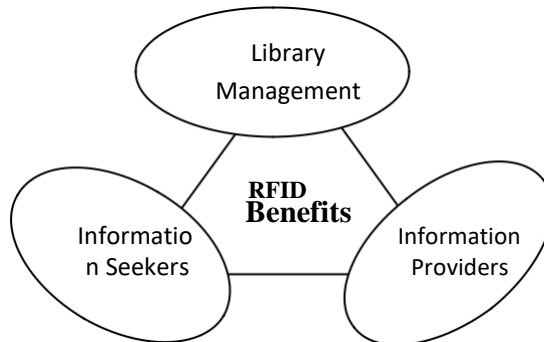


Figure-3: RFID benefits

iii. Information Seekers / Patrons

- To maintain flexibility of self-check-in and check-out of all types of items.
- To provide better inter-library and reservation facilities.
- To provide quicker services such a payment of fees, fines etc.
- To easily find out items by the information seekers.
- To make accurate and faster re-shelving of library materials for rendering satisfactory service.
- To improve patron services when library faces staff shortage.
- To enhance patrons' self-service privacy.
- To remind over-due dates allowing patrons to return borrowed materials in time.

Borrowing process cycle using RFID technology in libraries

Library circulation managers have to supervise many activities within their libraries and these activities have to be performed smoothly for the betterment of library services.

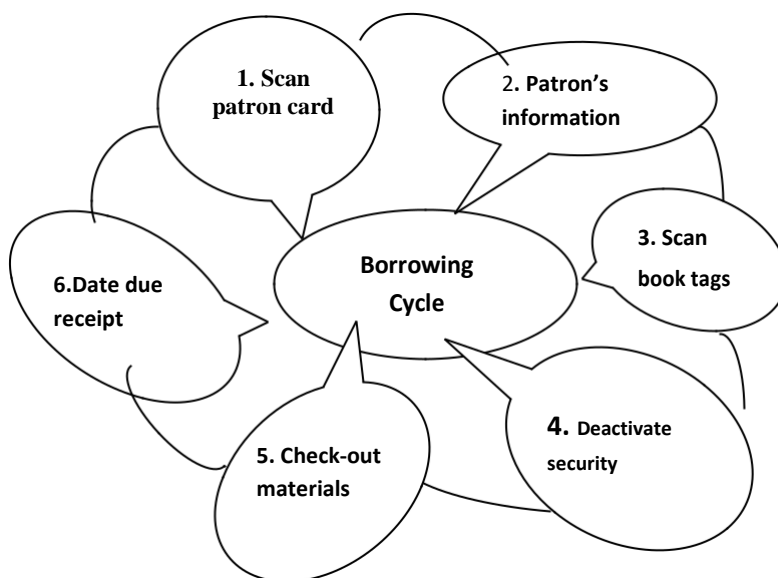


Figure-4: Borrowing cycle

It is a six steps process by using RFID technology in libraries so that patrons can get their required services easily and properly.

Library environment using RFID Technology

Due to the vast explosion of information, library activities have dramatically changed. The librarians are facing difficulties to meet the users' demand and are compelled to take critical decisions regarding the systematic management of the recorded knowledge of institutions. The library needs to provide an environment for blending technological innovation with the sustained need for patrons' services and highly efficient information management. RFID technology offers libraries much compensation to save the time of the readers and provide better services efficiently and accurately. By improving efficiency in circulation and security, library professionals provide required information and intellectual support to the patrons.

RFID technology reduces the frequency of recurring stress injuries, gets materials back on the shelf more quickly and provides higher levels of privacy to the patrons

who can check out their own materials. RFID inventory systems can also save time, provide smart services environment and create a smooth operational system. In the digital era, patrons wish to take their library services more easily and timely. Therefore, at present, library automation and, particularly RFID technology has become critically important for speeding up library activities and to fulfill the needs of the information providers and information seekers.

RFID offers the following improvements

i. **Reduction in workplace injuries:** Workplace injuries caused by the repetitive motions related to flipping books and angling books under barcode readers cost libraries millions of BDT every year. It leads to pain, limited physical range, and other problems familiar to a feminized workplace.

ii. **Facilities self-check:** Self-check saves money directly by reducing labor costs for circulation activities and indirectly by reducing opportunities for repetitive stress injuries.

iii. **Streamlined inventory management:** It helps to correctly locate books if any book is displaced in the shelves. RFID offers the ability to evaluate and correct library inventories without handling the items.

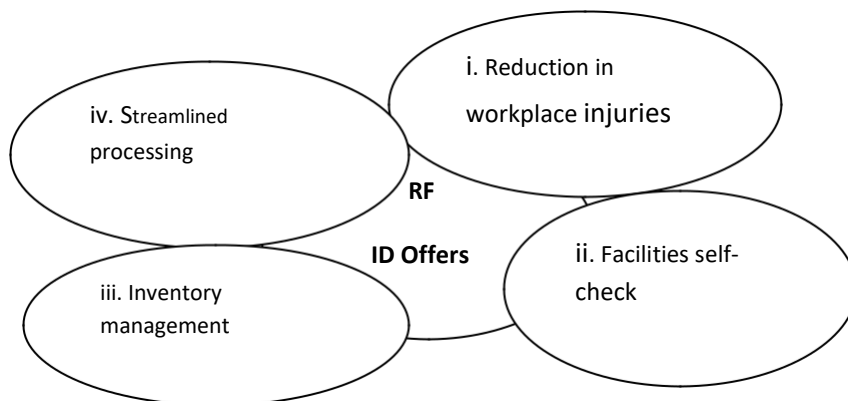


Figure-5: RFID facilities

iv. **Streamlined in processing:** Acquisition is one of the main activities of a library, which is associated with purchasing books and adding them to the collection. This critical activity can be streamlined with the RFID.

Components of the RFID System

According to Boss (2004), RFID technology can be adapted in library circulation and theft detection systems. This system moves beyond security to become tracking systems and combines security with more efficient tracking of materials throughout the library, including easier and faster charge and discharge, inventorying, and materials handling.

RFID is a combination of radio frequency-based technology and microchip technology. This technology reduces valuable staff time spent scanning barcodes while charging and discharging items.

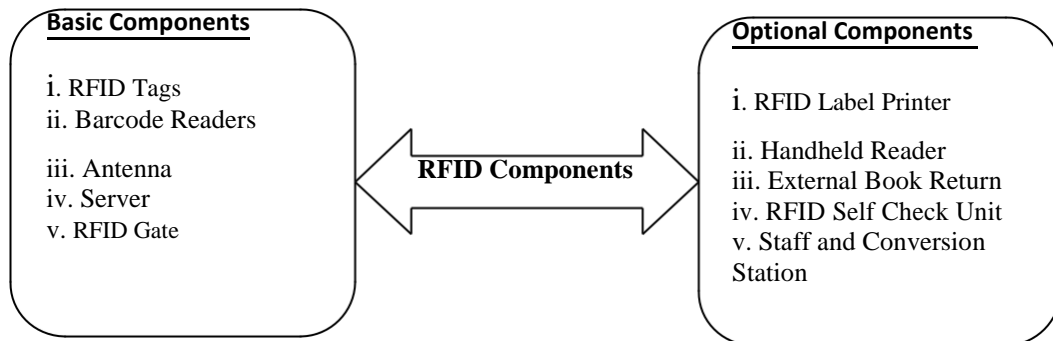


Figure-6: RFID components

Conclusion

This research paper is mainly designed to explain how RFID technology could be used in libraries and mentions the benefits of using this technology. RFID has proved to be an effective, convenient and cost effectual technology for ensuring library security. Main aims of academic libraries are to provide right information at the right time to the right users. These days, librarians need to realize how to arrange their resources and provide better services among the users. RFID technology meets their expectations and helps them perform their routine works with the help of technology. New technologies have significance for libraries both for the potential of increasing the quality of services and for improving efficiency of operations. With massive explosion of knowledge, the need for quenching the thirst of information cannot be over emphasized. The library professionals need to be encouraged to develop best practices to meet the demand of the present situation and requirements of the users. RFID technology facilitates the libraries in developing best practices and meeting

these requirements. Therefore, the library authorities should take initiatives to implement RFID technology to provide the required services to the readers.

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