

Radio frequency identification (RFID) and its role in modernization of the libraries

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- **Abstract**

This paper provides a brief overview of Radio Frequency Identification (RFID) Technology including their operations as it is increasingly being used in supply chain management. Libraries are a fast growing application of RFID as it able to provide service to user , decrease book theft and keep constant record update more effectively without human interference. This paper also discussed about the hardware components of RFID device with special emphasis on the merits and demerits of its uses in modern libraries environment as it can promote operational efficiency and precision better than barcode.

- **Introduction to RFID**

Radio frequency identification (RFID) is the latest technology which is generally used for describing any technology where radio signals are used to identify the specific objects. RFID has become popular for using a wide variety of application ranging from asset tracing, services industries, logistics, libraries, manufacturing to supply chain. In 1948 Harry Stockman first introduced the theory and implementation of RFID in his paper entitled “Communication by means of reflected power” [2]. But in the decades of 1970’s RFID technology achieved the interest in research community.

RFID is the similar concept of bar coding which is now used to manage the library automation of the housekeeping operations by tagging the library collection. Unlike EM (Electro-Mechanical) and RF (Radio Frequency) systems, which have been used in libraries for decades, RFID-based systems helps librarian to reduce manpower instead of scanning barcode while charging and discharging library households and also 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, inventorying, and materials handling, It is combination of

microchip and radio frequency technologies. The information which is contained / entered in the chips is detected by the radio frequency waves for further processing of carried data.

RFID tags are a small low cost small device that can hold a limited amount of data and report the data when queried over radio by radar. It can be active, semi-passive and passive which is available in many sizes with varying data storage capability. Passive tags don't have internal batteries. It is built to encode data stored in the tag's microprocessor. Because of the higher cost, active and semi-passive RFID tags are used for valuable asset tracking. The passive RFID tags are used in RFID library management systems

- **Usage of RFID in libraries**

There are many areas/housekeeping operations where RFID technology is used in the libraries which are described below:

- **Book charging/discharging:** This is one of the most useful application of RFID in libraries, it provide very fast and accurate transaction of library items, and main advantage is at a time more than one item can be issued/returned.
- **Book Drop:** This is a drop box where user can just drop their items, and book will be returned with return slips, it can be placed outside the libraries at various remote locations so that users can have opportunity to return the books at any time irrespective of holidays.
- **Self-issue/return KIOSK:** The concept of KIOSK is almost similar to Automatic tailoring machine (ATM) of banking and railway where users can access their necessary services at any time. However this device is placed inside the library only so that users can themselves issue and return the documentary items without the interference of the library staffs, it helps to reduce the manpower of the library.
- **Shelve reader:** The RFID tag provides memory to record information storing bibliographic records and circulation status and to supply the system .Besides that it also traces the location of the specific collection material which also plays a major role in inventory control/stock verification and locating the missing items in the library.
- **Security (EAS) gate:** The use of EAS (electronic article surveillance) gates used in RFID (radio frequency identification) tags for a wide variety of read, track and/or detect applications for security purpose. It also concern the library personnel's from the RFID system this gate alarm about possibility of theft if a library member attempted to take out the books outside the library without proper issue. Now a day's these gates also help in counting the total visitors to the library.

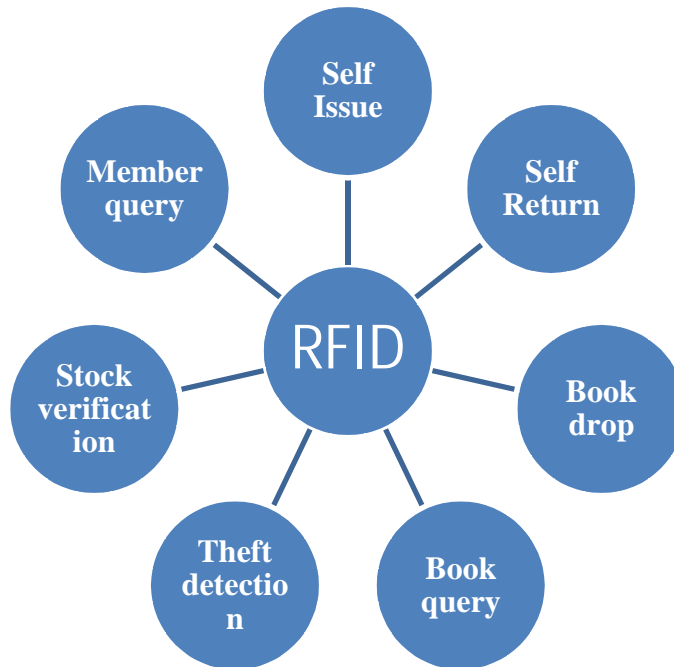


Fig. 1 some application of RFID in libraries

- **Hardware Components of RFID devices**

- RFID tags/ transponder: There are two main components present in the RFID tag. Firstly, a small silicon chip or integrated circuit which contains a unique identification number, and secondly an antenna that can send and receive radio waves.

There are three types of tags available in the market namely Low frequency (LF) which covers frequency from 30 KHz to 300 KHz and provide very short read range of approximately 10 cm, High frequency (HF) tags are those tags which work in between 3 to 30 MHz frequencies but most of the HF tags work in 13.56 MHz and it is applicable for libraries. HF RFID is commonly used in ticketing, libraries, payment, and data transfer applications. There are several HF RFID standards in places, such as the ISO 15693 standard and the ECMA-340 and ISO/IEC 18092 standards for Near Field Communication (NFC), a short-range technology that is commonly used for data exchange between devices. Other HF standards include the ISO/IEC 14443 A and ISO/IEC 14443 standards for MIFARE technology, which used in smart cards and proximity cards, and the JIS X 6319-4 for FeliCa, which is a smart card system commonly used in electronic money cards. Ultra high frequency (UHF) tags cover the 300 MHz to 3 GHz; UHF Gen2 RFID systems in most countries operate between 900 and 915 MHz. The read range of passive UHF systems can be as long as 12 m, and UHF RFID has a faster data transfer rate than LF or HF. UHF RFID is the most sensitive to interference, but many UHF product manufacturers have found ways of designing tags,

antennas, and readers to keep performance high even in difficult environments. Passive UHF tags are easier and cheaper to manufacture than LF and HF tags.

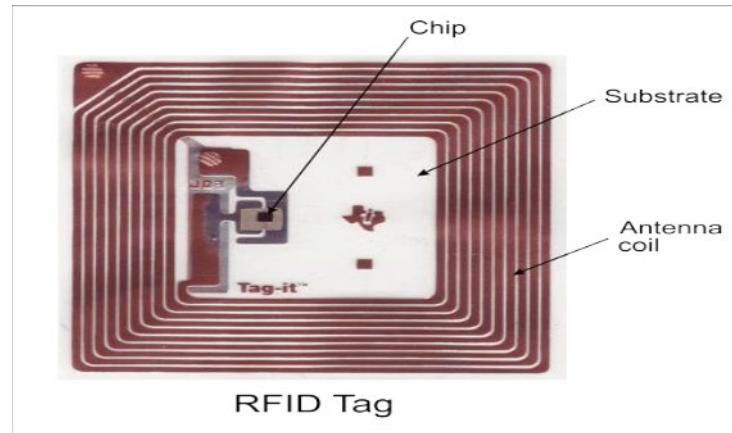


Fig. 3.2 Components of library RFID tag

- Readers or Sensors to query the tags: Reader is the main device which detects the signals as soon as it appears in its radio range and decodes the signals for further processing. Hence, reader interrogates the tags and detects the data contained inside the chips and sends it to the system for processing.
- Antenna: a device which emits the frequency and connected with the reader as soon as any tag is detected within the range of antenna is charge the tag (passive tag) and get the data to be sent back to attached reader. This is also used as staff station for tagging, retagging of library materials and circulation of books with staff interference.
- RFID Label Printer: This is nothing but generally high-speed thermal printer which is used to generate the slips.
- Handheld Reader: Device with varying size and models which detect the tags on the shelves and stores the data, it helps in locating and stock verification of library collections.
- Self Check Unit: ATM-like device with monitor and printer connected with it an antenna and reader attached with it helps in self-issue/return of books.
- Book Drop: a box-like structure with monitor, printer, reader and antenna inside that through which users can just drop their item and it will be returning from their accounts.

- **Benefits of RFID in Libraries**

- Fast check-in/check-out of Library households.
- Increased security of library materials.
- Self-check-in/check-out facility to patrons
- Long life of RFID tags in comparison to Bar-code
- Fast stock verification

- Save the wastage of time and man power to the library
- Ability to locate/search the misplaced books in the library
- Enhance reputation of the library and its services

- **Drawback of RFID in Libraries**

- Implementation of RFID system may be high-cost affair for small libraries
- Security may be cracked by placing aluminum foil, magnet and wrong alignment of two tags in books.
- Maintenance of RFID devices is very sophisticated and much more economic.
- RFID devices need some basic infrastructure for more effectiveness like wooden rack/shelves, proper electric wiring beyond RFID devices, etc.
- Proper ventilation and controlling of moisture need to be maintained in the libraries.
- Due to lack of standards in RFID system changing the RFID vendor is very difficult.

- **Conclusion**

It quite clear from the above discursion that the Radio frequency identification (RFID) is one of the modern technologies which speedup the work of the library and provide the user services in smooth and effective manner with independent of the library staff up-to some extent. The RFID devices are very sophisticated and costly for implementation and maintaining proper way which may not be possible for the small budgeted libraries to adopt it. But the facilities and other features of RFID indicate that it is very cost effective in nature and hence it may save other library efforts and cost like staffing, timings etc in future. RFID facilitates user based transaction services which is more necessary to satisfy the user needs in this information era as well as provide much security to the library materials through Electronic article surveillance gate (EAS gate). RFID implementations need more planning and its compatibility related issues are some times more serious due to non availability of international standards. Hence libraries face more difficulty especially at the time when they wish to change their existing ILMS or RFID devices.

References:

1. Bose, R. W. (n.d.). RFID Technology for Libraries. Retrieved March 01, 2016, from <http://www.ala.org/PrinterTemplate.cfm?Section=technotes&Template=/ContentManagement/HTMLDisplay.cfm&ContentID=68138>
2. H. Stockman, "Communication by means of reflected power," Proc. IRE, vol. 36, no. 10, pp. 1196–1204, Oct. 1948.
3. Pandey, P., & Mahajan, K. D. (n.d.). Application of RFID Technology in Libraries and Role of Librarian. Retrieved February 06, 2016, from <http://eprints.rclis.org/15253/3/RFID.pdf>

4. Shahid, S. M. (n.d.). Use of RFID Technology in Libraries: A New Approach to Circulation, Tracking, Inventorying, and Security of Library Materials. Retrieved February 06, 2016, from <http://unllib.unl.edu/LPP/shahid.htm>
5. State Library of NSW. (n.d.). A business case framework for RFID in NSW public libraries. Retrieved February 12, 2016, from http://www.sl.nsw.gov.au/sites/default/files/rfid_cost_benefit.pdf