
Prospects and Challenges of RFID applications in Libraries: A Case Study

C. Indraji

Research Scholar,
Dept. of Library and Information Science,
Hindustan Institute of Technology and Science,
Chennai. Email : indragee18@gmail.com

J. Dominic

Chief Librarian,
Dept. of Library and Information Science,
Hindustan Institute of Technology and Science,
Chennai. Email : cl@hindustanuniv.ac.in

J. Jaganbabu

Research Scholar,
Dept. of Library and Information Science,
Hindustan Institute of Technology and Science,
Chennai. Email : jjlibrary@gmail.com 9176743723

T.Jothi

Research Scholar,
Dept. of Library and Information Science,
Hindustan Institute of Technology and Science,
Chennai. Email: jojothi912@gmail.com

Abstract

RFID systems include data collection, distribution, and management tools by electronic devices. The effectiveness of the library service procedure has been attempted to be better understood by employing RFID technology. The Study was undertaken a detailed literature review with this goal in mind. After this endeavor, it understands how utilizing RFID technology helps to increase the effectiveness of library service processes in the library sector. This paper also addresses several recent and possible uses of RFID in libraries including access control systems, human implants, item-level tagging, inventory tracking, and passports with RFID chips.

Keywords

RFID; Potential Applications; Challenges; Libraries

Electronic access

The journal is available at www.jalis.in

DOI: 10.5281/zenodo.8416198



Journal of Advances in Library and Information Science
ISSN: 2277-2219 Vol. 12. No.3. 2023. pp.205-209

1. Introduction

Despite the recent surge in interest in RFID technology, RFID is not new. Following technological advancements in the 1930s and the creation of radar during World War II, the notion for the technology dates to the mid-to late 1940s. Several technologies that are related to RFID technology were developed in the 1950s. The effects of technological advancements are now an integral part of daily life. One of these advancements is RFID, which makes data entry, storage, and transfer simple, secure, and speedy. It is employed in a variety of settings where real-time data should be used, including shops, stores, hospitals, pharmaceutical firms, logistical services, etc. In order to maximize sales by lowering out-of-stock levels, it is crucial to increase efficiency and visibility, lower costs, deliver greater asset utilization, manufacture higher-quality goods, and reduce shrinkage and counterfeiting. The majority of industrialized and emerging nations use RFID technology in both their public and private sectors. Although integrating RFID technology is challenging, with the correct planning and creation of an RFID strategy, commercial systems and public sectors can gain significant benefits. Although RFID technology has recently gotten some media exposure, many people are still unaware of what RFID is and the advantages it may provide.

2. Objectives of the study

In this study, an effort has been made to ascertain how adopting RFID technology aids in enhancing the effectiveness of library services in Tamil Nadu. However, the following is a list of the study's particular goals:

- a. Outline the succinct fundamentals of RFID technology.
- b. To investigate its current and forthcoming uses in the modern world, specifically about Libraries in Tamilnadu
- c. Assessing the difficulties in implementing RFID technology in libraries
- d. Providing guidelines for using RFID technology.

3. Methodology of the study

The paper has been created to look into how adopting RFID technology improves the effectiveness of Library services in Tamil Nadu in light of the study's objectives. An intensive literature review has been done in order to achieve this. The study's primary data source is secondary data. Reading through previously published articles, online journals, working papers, existing case studies, and websites again gathered data and in-information from secondary sources.

4. Literature Review

One of the most promising and widely debated auto-identification and data capture (AIDC) technologies nowadays is radio frequency identification (RFID). It isn't really a new technology, but thanks to advancements in technology and falling costs, it is being used in novel ways. Originally employed to identify allied aircraft during World War II, RFID is currently used in a range of public and commercial sector settings, from hospitals to the highways. Studies have shown numerous ways to use it to add value. Because of this, a number of the largest firms in the world employ RFID technology to improve corporate performance while taking great care to consider the needs of customers and the environment. The work of Chao-Che Lin and Teh-Hsing Ku demonstrates how participating personnel with a systemic perspective may adopt a better methodology to address issues with RFID and how Systems Thinking can improve performance. Mehmet Barut, Robert Brown, Nicole Freund, Jonathan May, and Elizabeth Reinhart advocated in a different study to include thorough ethical and investment discussion to investigate the real worth of RFID and its applications. To quantify the economic performance of their applications and how performance measurement affects the success of RFID applications, conducted the first thorough empirical investigation of performance measurement behavior in the RFID area. Analyze the literature on RFID technology trends and predictions from 2005 to 2020 using bibliometric analysis and the historical review approach. They concentrate on supply chain management innovation related to RFID deployment by en- businesses and market dissemination. Recently, Delaunay and associates. cite a survey of the literature on the use of supply-chain RFID technology. They emphasize the benefits of RFID technologies for inventory control. Additionally, they examine various issues and earlier viewpoints

relating to the privacy and authentication capabilities of RFID devices.

5. RFID (Radio Frequency Identification)

RFID has come to represent methods for employing RFID tags to track and trace items locally and internationally. RFID is one of the many technologies used in "auto-ID procedures," or methods for automatically identifying items. RFID isn't a location-tracking technology by itself. RFID can be used to track tagged items at locations where readers have been installed, but this static readability differs from systems like global positioning systems, or GPS, which employ a network of satellites to determine the receiver's location. Several significant aspects affect how well an RFID application will address intended functionality.

Durable: RFID tags and readers can work with ease in challenging settings.

Very High Reading Accuracy: RFID is an accurate and secure technology for data management and gathering thanks to its significant reading accuracy advantage.

Support for Various Tag Readings: In a short time, an RFID reader may automatically read numerous RFID tags in its reading range.

Broad Data-Capacity Spectrum: A tag can store nearly any data, ranging from a few bytes to many megabytes.

Contactless: Without any physical touch between the tag and scanner, an RFID tag can be read.

Lline-of-sight obstruction: An RFID reader typically doesn't need to be in direct line of sight to read a tag.

Writeable Data: Multiple data rewrites are possible using read-write (RW) RFID tags.

The benefits mentioned above apply to all forms of RFID systems. Consideration must also be given to other elements, such as privacy and security issues, data mining, and integrating RFID with other technologies, including biometric systems, Global Positioning Systems (GPS), and wireless communication technologies.

6. Working Principle of RFID

The three main components of an RFID device are a reader, an antenna, and a chip. The database contains data about the tagged objects and is a fourth crucial component of any RFID system. The chip has data on the object to which it is attached. A product code called a "Electronic Product Code" (or "EPC") may be present on chips used by retailers and manufacturers to identify consumer items. PC chips contain a radio frequency-readable product code that is encrypted and uniquely identifies the particular product to which it is attached. The antenna attached to the chip utilises radio waves to communicate data from the chip to the reader. A transponder, or a tag, is the term used to describe the chip and antenna combination. The scanning equipment uses the reader's antenna to communicate with the tag. RFID systems can use authentication and encryption to protect data from being read without authorization. By using radio waves that have a particular frequency, reading tags involves talking with a tag. Whether it's a stationary reader that could be used to track tagged cases of goods entering a warehouse, a mobile reader that could be used to keep an eye on inventory on the floor of a retail store, or a prototype of a glove with an embedded scanner, a reader communicates with a tag in order to capture the data stored in the tag. Normally, the tag is activated by a low-power radio signal from the reader, and it then communicates information back to the reader. Most readers can only read data, as their names would imply, while some may also write to specific tags. Readers typically send the information to other systems (like PCs) for further processing. Readers are larger, more expensive, and use more power than tags. RFID systems use radio signals to communicate, however only a few frequency bands can be used without a license. The frequencies and power levels that are available for RFID systems vary internationally. DUE TO DIFFERENT NATIONAL LEGISLATION, an RFID system manufactured in one country might not function in another. Information regarding RFID-tagged objects is stored in the database or another back-end logistics system. Before data stored on an RFID tag can be accessed and interpreted, access to a reader and its associated database is required. Tags come in two varieties: active tags and passive tags. Because active tags have their own power source (battery), they are bigger, heavier, and more expensive than passive ones. Although they operate typically at higher frequencies (455 MHz - 950 MHz or 2.45 - 5.8 GHz), they emit a stronger signal that the reader can pick up at a greater

distance of 20 to 100 meters. The tags work better for tracking priceless objects. Active tags are larger, heavier, and more expensive than passive tags, on the other hand. Typically, it operates between 30 kHz and 134 kHz, or 13.6 MHz, with a capture range ranging from a few centimeters to ten meters. They are frequently employed in security and asset tracking applications.

7. RFID Application in Libraries

Book Deposit: You can find the Book Drops anywhere, within or outside the library. MRT/train stations, commercial malls, schools, and other potential off-site sites include remote locations outside the library. This provides exceptional convenience and flexibility for returning library materials at any time, even while the library is closed.

Tags or RFID transponders: This is any RFID system's most crucial link. Without the need for contact or line of sight, it can retain information about the object they are linked to and write it again. An item's identification, ownership documentation, initial storage location, loan status, and history may all be found in a tag's data.

Station that offers services including lending, return, labeling, sorting, and others is called a counter station. It has modules for arming and disarming, tagging, and sorting loaded. The Electronic Article Surveillance (EAS) bit within the library material's tag can be adjusted or reset in order to activate or deactivate the EAS gate's alert.

The self-checkout station for clients: It is essentially a computer with a touch screen, an RFID reader, and specialized software enabling personal identification, handling, and circulation of books and other media. The user is then given the option to check out one or more books after being verified by a library ID card, a barcode card, or his personal identification number (PIN). When a patron selects check-out, they place the book(s) in front of the RFID reader, which then displays the book's title and its ID number (along with other optional information, if requested) and the fact that it has been checked out.

Assets Monitoring and Maintenance: Tagging can store information on high-value assets. Machines with tags on them will have information about previous maintenance performed and replaced parts recorded on the tag. High data capacity tags will be

required when data is saved directly on the tag rather than on a company's network.

Controlling theft: At the point of sale or throughout the supply chain, item-level RFID tags can be used to thwart theft. Electronic article surveillance (EAS), which might be RFID-based, is straightforward. Low-end RFID systems will be applied in this scenario, and if they haven't been deactivated, they will communicate with customers as soon as they leave the store. More advanced tags are used in applications for theft control in mail orders for high-value items like mobile phones.

8. Challenges To Implementation RFID Technology In Libraries

RFID hasn't been widely used for commercial purposes, mostly because of difficulties brought on by a number of important variables. We suggest using a straightforward "Challenge Assessment Matrix" (CAM) based on a Likert-like technique to evaluate the organization's overall problem.

Administration's Commitment: The management's dedication to embracing new technology and having realistic expectations of RFID capabilities is the biggest obstacle to implementation.

choosing a tag and tag reader: The type and size of the tags, as well as the read distance and other specifications for tag readers, are important considerations to take into account. Compared to passive tags, active tags are thicker. Anti-collision is a crucial feature that must be included because it enables reading many tags in a single pass.

Cost : Although RFID tag costs are decreasing, they still represent RFID's largest variable cost component. But what about other related cost components? The business case must also account for the considerable effects on software, systems integration, process transformation, and organizational impacts. It is expected that tag costs will continue to decrease given the size and extent of the anticipated RFID implementation.

Data Management: The majority of WMS and ERP systems are not built for RFID data gathering. The Electronic Product Code takes up more space in the data field than the current Universal Product Code. Before making any RFID investments, new data management structures should be considered.

Worldwide Standards: The constantly changing standards for technology, application, data, conformance, firmware updates, and tracking methods present a significant issue. Additionally, because various businesses frequently adhere to different standards, it is challenging for suppliers and manufacturers to work together.

The Accessibility of resources: The lack of comprehensive, readily available knowledge and available trained resources impact training costs and foreshadow prospective implementation issues.

Security: Illegal RFID tag tracking can be problematic for some applications. Although security issues affect both businesses and individuals, they are particularly important for military sites. As an illustration, the scanning and cloning of RFID tags has the potential to grant unauthorized access to crucial facilities or be used as payment in commercial operations. Security:

Library Requirements: Different specifications and regulatory requirements complicate implementations; for instance, operational frequencies and power standards differ from one Library to the next.

9. Guidelines For Using RFID Technology

- The Library should be transparent about its use of RFID technology, including by making materials available to the public that outline the justification for doing so, the goals of doing so, any corresponding policies or procedures, and who to contact with inquiries.
- All facilities should have signs posted utilizing RFID. The material on the signage should explain how RFID technology differs from conventional information collection techniques, the sorts of usage, and a statement regarding privacy protection.
- The RFID system should only be accessible to authorized personnel.
- The RFID tag shouldn't include any personal data.
- Even if the data on the tag is just a serial number, any information defining the item that is being tracked should be encrypted.
- There shouldn't be any static information on the tag (such as a bar code or manufacturer number) that unauthorized readers can access.
- A special encryption key should be used to

encrypt each message sent between the tag and the reader.

➤ The library's RFID scanners should all be prominently labeled.

10. Conclusion

The description above makes it abundantly evident that an RFID system might be a comprehensive solution that meets a library's security and content monitoring demands. If best practice rules are strictly followed, book borrowing and inventory are sped up, and staff is given more time to focus on user-service chores, RFID in the library is not a threat. Additionally, the technology offers speedy returns on investment. Before starting a program, informing library employees and patrons about RFID technology is critical. It may be beneficial for libraries to monitor RFID advances until the price of tags drops to \$.20 or less, which some librarians believe is the critical threshold for their serious consideration of it. Although there are many similarities across library RFID systems, such as the use of high frequency (13.56 MHz), passive, read-write tags, the lack of a standard and the compatibility of tags made by various suppliers is a significant obstacle to using RFID in libraries. In supply chain applications, container-level tagging is covered by current standards (ISO 15693). However, tracking and hot listing issues are not addressed. The ISO 18000 next-generation tags are intended for item-level labeling. The newer tags can solve many of the privacy issues with today's tags. However, there are currently no library RFID products that adhere to the new standard. RFID may now be unaffordable in developing nations due to cost and equipment.

REFERENCES

1. Singh, N. K., & Mahajan, P. (2014). Application of RFID technology in libraries. *International Journal of Library and Information Studies*, 4(2), 1-9
2. Gupta, P., & Madhusudhan, M. (2017). RFID technology in libraries: A review of literature of Indian perspective. *DESIDOC Journal of Library & Information Technology*, 37(1), 58-63.
3. Shahid, S. M. (2005). Use of RFID technology in libraries: A new approach to circulation, tracking, inventorying, and security of library materials. *Library Philosophy and practice*, 8(1), 1-9.
4. Pandey, P., & Mahajan, K. D. (2010, November). Application of RFID technology in libraries and role of librarian. In 12th MANLIBNET Convention (pp. 22-24).
5. Mamdapur, G. M. N., & Rajgoli, I. (2011). Implementing radio frequency identification technology in libraries: Advantages and disadvantages. *International Journal of Library and Information Science*, 3(3), 46-57.
6. Madhusudhan, M. (2010). RFID technology implementation in two libraries in New Delhi. *Program*, 44(2), 149-157.
7. Dhanavandan, S., & Tamizhchelvan, M. (2012). An evaluative study of automation software applications and database management systems in academic libraries. *Journal of Emerging Trends in Computing and Information Sciences*, 3(5), 677-682.
8. Mishra, L., & Mishra, J. (2015). Adoption of information & communication technology in the university libraries of Uttar Pradesh. *ACADEMICIA: An International Multidisciplinary Research Journal*, 5(1), 59-64.
9. Parvez, A. (2011). Development in library services with the advent of ICT based products & services: a continuous process. *International Journal of Digital Library Services*, 1(2), 1-9.