

Growth and Development of RFID Application in Library Sciences

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INTRODUCTION-

In today's information society the librarians have a great responsibility to organize and manage the knowledge center due to exponential increase the volume of information which leads to the information explosion. Libraries are moving towards adopting latest technological environment. Libraries are regarded as the central agencies for the dissemination of knowledge in the form of books, journals, audiovideo tapes, CD-ROMs, and via digital information services to one and all.

The primary aim of any library is to provide maximum opportunities to its readers/end- Page | 11 users for optimum utilization of available resources. So, libraries have been seeking technological support to improve their organizational setup for providing efficient customer services and also manage various services. Previously barcode technology was one such tool which has been used to enhance the efficiency of libraries all over the world. Now libraries and information centers have started using Radio Frequency Identification (RFID) systems to replace their electromagnetic and barcode systems in the late 1990's. As its name implies, the term RFID is used to describe any technology that uses radio signals to identify specific objects. RFID technology is a non-line of sight AIDC technology that provides numerous advantages over existing options for identification of items. RFID technology is primarily intended to reveal a current change in the library user service from the semi-automated to the fully-automated mode (Chan and Ying, 2005). It is a fast-growing technology used in libraries for enhanced circulation capabilities, better inventory control, reliability (Ayre, 2006), minimizing theft of documents (Golding and Tennant, 2008; Sumi and Kumar, 2007), and provides batch access and storage of mass data.

The implementation of RFID technology certainly improves service efficiency for libraries and enables more diversified applications and service modes. However, as stated by Yu (2008) "Regulating necessary standards, processes, and interfaces to fit in with current information systems and extend automatic library operations requires continuous effort." RFID technology promises to change our world. It has the capability of making our personal lives and our professional lives in the library more convenient. At present when libraries of all kinds are facing economic hardship the overwhelming reason for considering RFID technologies is the most beneficial one, not only for improving the quality of service also for promising to relieve repetitive Page | 12 strain injury, speed patron self-checkout, and make possible comprehensive inventory (Madhusudhan, 2010). In a library kind of environment, RFID has significant potential to speed up library services and streamline time-consuming operations such as check-in and check-out, sorting, stock management and inventory when compared to the barcode-based solution. RFID tag implementation can be a time-consuming, distracting, and expensive process for any library system. Simply stated, the commitment required is greater than most libraries can successfully support.

RFID is a combination of radiofrequency-based technology and microchip technology. The information contained on microchips in the tags affixed to library materials is read using radio frequency technology, regardless of item orientation or alignment (i.e., the technology does not require line-of-sight or a fixed plane to read tags as do traditional theft detection systems). The RFID gates at the library exit(s) can be as wide as four feet because the tags can be read at a distance of up to two feet by each of two parallel exit gate sensors (Shahid, 2005). Phased implementation for deployment of RFID solution in the library should be planned out carefully.

HISTORICAL DEVELOPMENT OF RFID TECHNOLOGY

RFID was developed in 1948, but its implementations started in the 1970's. RFID in India was introduced in the 1940's for defense applications. The first time it was used for commercial purpose in 1980 for cattle tracking applications. Recent interest is in making RFID technology more ubiquitous in the global value chain. The first library suppliers started to market their systems in the mid-1990. During the 1990's the proliferation of competing systems and radio frequencies employed created the need for standards and interoperability. Libraries need the higher frequency waves to allow for smaller, less powerful and portable readers. As complexities and uses increased, standards were developed to enable systems to work together. Development of standards is still going on with the latest standard being release late in 2004 (Somvir and Kaushik, 2011).

Radio Frequency Identification (RFID) has been around for decades, and its development can be divided into 10-year periods as follows:

1: Growth and Development of RFID Application

-The Decades of RFID Decade Event 1940-1950-

- Radar refined and used significant World War II development effort. RFID invented in 1948. 1950-1960

- Early explorations of RFID technology, laboratory experiments. 1960-1970 Development of the theory of RFID. Start of applications field trials.

-1970-1980 The explosion of RFID development. Tests of RFID accelerate. Very early adopter implementations of RFID.

-1980-1990 Commercial applications of RFID enter the mainstream. 1990-2000 The emergence of standards. RFID widely deployed. RFID becomes a part of everyday life.

- 2000 onwards RFID explosion continues... (Source: The decades of RFID [Landt, J. 2005])

COMPONENTS OF RFID TECHNOLOGY

RFID system for library containing six components, i.e., RFID tags, a staff check-out station, a self-return book drop with an automatic check-in feature, a tagging station, a set of security gates, a shelf scanner for inventory and administrative station. The self-check-out station allows library member to borrow books without the help of library staffs; the book drop allows returning of books and updating the database; shelving station speeds up the process of sorting return books for re-shelving. But mainly and essential components RFID system contains three main components. A comprehensive RFID system has following components:

RFID Tags The RFID tags have been specifically designed to be affixed to library media, including books, CD's, DVD's, and tapes. The tag is paper thin, flexible and approximately 2"x 2" in size which allows it to be placed inconspicuously on the inside cover of each book in a library's collection. The RFID tag has three sections: a lockable section for the item identification, a rewritable section for library-specific use and a security function for the item antitheft, i.e., which can be activated and deactivated. The chip also has multi-read functions which mean that several tags can be read at once.

Readers or Sensors RFID readers or receivers are composed of a radio frequency module, a control unit and an antenna to interrogate electronic tags via Radio Frequency (RF) communication. These components are available in various shapes and sizes to suit respective applications within the library and are often integrated into one enclosure for that specific purpose, i.e., patron self-check-out machines and inventory readers. **RFID-Reader Energy Data Clock Coupling Element** (Antenna, Inductive Coil, Capacitive Application Server) The reader powers an antenna to generate an RF field. When a tag passes through the area, the information stored on the chip in the tag is interpreted by the reader and sent to the server, which in turn communicates with the integrated library system when the RFID system is interfaced with it (Shahid, 2005).

Server/Docking Station The server is the heart of some comprehensive RFID systems. It is the communications gateway among the various components. It receives the information from one or more of the readers and exchanges information with the circulation database. Its software includes the APIs - Applications Programming Interface, necessary to interface it with the automated library system (Sinha and Chanda, 2014).

FACTORS AFFECTING IMPLEMENTATION OF RFID TECHNOLOGY IN LIBRARIES

The following factors are affected by implementing RFID technology in libraries:

- Saving of time, labor and material costs for processing new materials;
- Less consumption of time and labor workforce associated with checking-in, sorting, and shelving materials;
- Less percentage of staff time spent on the circulation tasks;
- Trace out easily the number and value of lost items for a specified period;
- Minimum time spent on searching lost items;
- Less time spent doing inventory and the amount of stock completed;
- Less time and labor expended in shelf reading and maintenance;
- Average wait at circulation desk during a busy period;
- Requirement of less number of staff at the circulation desk during an active period;
- Prevent theft.

POLICIES/GUIDELINES FOR USING RFID TECHNOLOGY NISO

(National Information Standards Organization) recommendations for using RFID technology in libraries:

1. In libraries 13.56 MHz High-Frequency tags should be used;
2. RFID tags for library use should be passive;
3. The typical read range of tags for library applications should not be increased substantially beyond the present range of 8-20 inches for smaller tags in future;
4. Only tags including standardized AFI (Application Family Identifier) features should be used in libraries;
5. The system will cause no interference with other application;
6. The system will utilize ISO/IEC 18000-3 (ISO/IEC 18000 is an international standard that describes a series of diverse RFID technologies) Mode 1 tags programmed so that they should work for identification of items in other libraries;
7. The system will use tags that will not interface with the operation of security systems in other libraries;
8. Security implementation of RFID in libraries should not lock a complaint system into any one security possibility (EAS [Electronic Article Surveillance], AFI, Virtual deactivation), but rather leave security as a place for differentiation between vendors;
9. RFID tags should be reprogrammable for migration purpose;
10. Data on RFID tags should be encoded according to the recommended data model using encoding described in ISO/IEC 15962 (ISO/IEC 15962:2013 deals with the processing of data and its presentation to the RF tag, and the initial processing of data captured from the RF tag) and using relative object IDs specified in anticipated standard ISO/NP 28560 for RFID in libraries.

CONCLUSION

RFID technology in libraries is not new in North-East India, implementation of RFID technology was started before 2010 in libraries of North-East India, but still a very less number of libraries has implemented this technology to date, many libraries could not implement this technology due to its high cost, some libraries mentioned that they could not implement the technology because authority does not allow them. There are some libraries that are going to

implement the technology near future. Before concluding, below are a few points that are to be followed while implementing RFID at libraries-

- Before going to implement RFID in libraries, librarians should consider the infrastructure of the library; book shelves should be well furnished;
- Books available in the library should be in good condition otherwise pasting tag will be difficult;
- Librarian should carefully analyses the tags and if possible test the read range, size, capacity and design to meet the requirements of the library;
- Libraries are mostly using HF (High frequency) RFID tags which are low expensive having good read range for library tracking, some libraries are using UHF tags, but it is recommended that library should use HF RFID tags;
- Testing is necessary whether the RFID tags are intact due to liquid, steel, metal and other environmental issues;
- Cost can be reduced by tagging the required materials like books only and selecting only components needed like reader, security gate, server, Page | 293 check-in/out unit and inventory control (printer, shorting machine are not needed for basic works);
- If the library provides small training to the students or research fellow; how to paste tags in the library materials than tagging can be done by the students or research fellows or it can be done with the help of internal members of the library to avoid the additional charge from vendors.
- The gate should be in 3 dimensions; if it is 2 dimensions (2D) then the item cannot track 100%. Though 3 dimensional (3D) gate is little costlier than the other one it can detect the material at any point which is very important for security point of view;
- Librarians have to choose the best products which are available in the market with ISO standards. As it is a one-time investment which is very high, so it is needed to be very careful while selecting the hardware and vendors of RFID. Before deciding vendor always go through their record, it is necessary to know how many libraries they have already installed RFID and if possible try to contact those libraries and try to get feedback from them about the vendor.
- Before going to any management change, librarians should consult with the authority and if possible librarian may give a proper presentation about the RFID technology so that that authority can understand the benefits of the technology;
- Nothing can be done quickly without technology in this modern world; we cannot think our self without technology, so librarians should believe for modernization of library with the help of new technologies;

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