Application of RFID Technology in Olusegun Oke Library, Ladoke Akintola University of Technology, Ogbomoso: Challenges and Future Prospects

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ARTICLE INFO	ABSTRACT
Published Online: 10 January 2022 Corresponding Author: **Olatundun Oluwatoyin Oyewumi**	Radio Frequency Identification (RFID) offers tracking capability to locate equipment, supplies and people in real time, and provides efficient and accurate access to library transactions such as book search, security, inventory, borrowing and book return. The paper studied many aspects of the RFID application such as budgeting, purchase process, advantages and limitation of RFID technology, documentation and financial implication, challenges faced in initial stage and remedies. A structured questionnaire using descriptive survey method was designed to collect data. The study employed the method of quantitative research to gather an in-depth understanding of the nature of usage of RFID system among users of Olusegun Oke Library. The findings of the study revealed that RFID is functional and useful in such areas as speedy circulation, easy book identification, security of library materials and other value added services while the major problem to implementation include technological limitations, interference concerns, prohibitive costs and lack of global standards. The study concluded that orientation programme for all users for the RFID enabled is very much important.

1. INTRODUCTION

Olusegun Oke Library has more than 0045843 books including many scientific encyclopaedias periodicals and CD-ROMS covering all aspect of technologies and applied sciences. The library offers services like current awareness, literature search, reference and newspaper services. The library is computerized with RFID technology and it subscribe to a large number of electronic resources.

Previously, the library operations were done manually (a situation where library assistants charge and discharge books to users manually and the library porters check the bags of users at the exit point to find out if library materials are not in their possession). This method was not sustainable due to the growing needs of the library users and staff members. But today, technological improvements have changed the ways of working in the business and academic world. RFID technology is one of the emerging technologies that are being adopted by both industry and academic world and the academic libraries are not left out. Thornton (2006) is of the opinion that RFID is not a new technology; rather, it is its use in library application that is relatively new because RFID has been in use since 1970s.

Radio frequency identification (RFID) is an electronic information technology that utilizes wireless radio waves to transmit, identify, trace, sequence and confirm various objects (Liu & Chen, 2009; Roberts, 2006). It is one of the Automatic Identification and Data capture (AIDC) technologies. According to Potdar, Wu & Chang (2010), the purpose of such technologies is to identify objects, automatically collect data about objects and update the data to computer system without human intervention. The objective of any RFID system is to carry data in suitable transponders, generally known as tags and to retrieve data, by machine readable means at suitable time and place and to satisfy particular application needs (Kattimani and Machendranath, 2014). RFID tags are used to tag objects or assets while an RFID reader gathers the tag information. RFID tags can be active, semi-passive and passive. It is a small device that can store information. Passive tags do not have internal batteries. RFID reader is a device that can receive and transmit radio signal. According to Kattimani and Machendranath (2014), it is built to encode data stored in the

tags compressor. But because of the high cost, active and semi-passive RFID tags are used for valuable asset tracking.

Yusof and Saman (2016) submits that RFID technology is a replacement for barcode technology in terms of non-optical proximity communication, information density and two-way communication. In comparison to barcode technology, Bi, Cao and Sheng (2011) stated that RFID technology possesses powerful properties which include being waterproof, having a magnetic scratch-resistant, being long lasting, transmitting data transmission over long and short distances, data encryption and relatively large memory capacity. RFID technology is also more powerful than other AIDC technologies such as cameras, magnetic cards and can identify card because of its data read and write functions, easy miniaturization and diversification of the shape, environmental resistance, reusability, data penetration, data memory capacity, system security and data security (Yusof and Saman, 2016).

Library RFID systems have a great deal in common with one another, including 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. According to Roy & Kumar (2016), current standard (ISO15693) apply to container-level tagging used in supply chain applications and do not address problems of tracking and hot listing while the next generation tags (ISO 18000) are designed for item level tagging (Shahid, 2005).

Objectives

This paper studied the aspects of RFID application, challenges faced at the initial stage and remedies, RFID tag and RFID gate. The library has taken many innovative steps to implement the RFID and there is the need to examine user's expectation and reaction to confirm the effectiveness of RFID application. The objectives of this study are to:
1. Know the awareness and satisfaction level of users about RFID technology.
2. Identify the benefits of RFID technology in comparison to the previous system.
3. Ascertain the problems faced by the students at the time of charging and dischargingof books
4. Ascertain the problems faced by the staff while using RFID technology.

2. REVIEW OF RELATED WORKS

Previous studies were reviewed in order to assess the implementation and use of RFID in libraries. Yorkovich (2001) revealed that with the use of Self Check System, users can check out the material themselves without the assistance of the library staff. He further highlighted that DLA is among the most revolutionary technology to affect the way libraries

manage information and with the use of this technology, a library becomes a more efficient place to retrieve information. Fabbi et al. (2002) conducted a study on implementation of 3M digital identification at UNLV Libraries and reported that with the implementation of 3M digital identification system at UNLV libraries, performance and efficiency of the library staff increased and users were able to find out the books which have been properly arranged on the shelves due to the capabilities of the Digital Library Assistant. Hopkinson & Chandrakar (2006) in their study found that RFID offered not just a solution to the security question, but also the possibility of self service and stock management facilities not available from traditional solutions. They revealed that RFID self-service has become popular with library customers and has enabled significant changes in delivery of library service and its ease of use enabled self-service to account for around 50 % of total transactions. Selamat & Majlis (2006) opined that self-check counter makes borrowing and returning book process more automated with less involvement of librarians; therefore librarians can focus on providing more effective work to better serve the library. Golding & Tennant (2008) observed that the books closest to the metal separator or to the metal upright were consistently misread. These books had to be physically removed from the shelves to obtain a reading. Ching & Tai (2009) observed that since the start of the UHF RFID pilot test in April 2008, check-outs of the semi-closed collection has increased by 50%. Cunningham (2010) highlighted no unified standards, high cost, security and integration with the library management system, etc as problems in implementation of RFID in libraries.

3. METHODOLOGY

Descriptive survey method was used for the study. A structured questionnaire was designed to collect data. The population consist of students and academic staff of the institution. 100 questionnaires were distributed out of which 92 were collected and all found useable for the study. 8 questionnaires were not received. A separate questionnaire was prepared for the library staff. 10 questionnaires were distributed among the staff and they were all retrieved. The staff questionnaire is taken to evaluate the different infrastructure available in the library while the user's questionnaire was also taken in order to understand their reaction on RFID library system.

RFID Implementation

Olusegun Oke Library RFID library operation started in 2013 and it is being used for library housekeeping operation. The system moved beyond security to become tracking system that combine security with more efficient tracking of materials throughout the library including easier and faster charge and discharge, material handling and automated book drop kiosk being used for easier return of books. The RFID

system included self-circulating desk, staff work station, staff station reader, inventorying, security gate, book drop box, RFID reader and RFID sticker for book.

Security Exit Gate

Two pedestals with internal RFID sensor gate were installed at the entry and exit gate of the library. It is a walk through gate antenna system which is reading the tags in all three orientations. It is a combination of gate antennas and long range reader. It keeps log of all items passing through the gate. A buzzer sound on passing of unauthorized items as per configuration set to inform the security personnel that some mischief has taken place. The gates are used at the entry and exit points in the library.

Staff Station Reader

Staff station reader is connected with a desktop computer using USB. Multiple books can be placed on it for scanning at the distance of 40-50cm. It is a plug and play multiprotocol reader system specially designed for library application. Both operate with industry standard tags at 10.56 to 13.56 MHz. It support global ISO 15693 and ISO 14443 tags.

Self-Check Station

The Self-check station has an inbuilt sensor and it has the capacity to sense books and member cards brought near. It can display related information such as name of book, author, category of books etc. It is a stand-alone multiprotocol self-checkout station primarily for issue and return of books in library. It can operate with industry standard tags at 13.56 MHz. It support global ISO 15693 and ISO 14443 tags.

Book Drop Kiosk

With an inbuilt sensor, it sense books and member cards brought near and can display related information like name of book, author, category of books etc. It can return the book and issue a printed receipt. It is a stand-alone multiprotocol book return station primarily used for returning library books. It can operate with industry standard tags and cards at 13.56 MHz. It support global ISO 15693-3 tags.

Portable RFID Reader

The portable RFID reader can be moved along the items on the shelves without touching them at the distance of 70-120cm. This could be used for taking inventory as well as searching for a particular book. The inventory data is exported to LMS software for reconciliation. It is loaded with easy application development. It has the option of integrating WLAN, Bluetooth and barcode technology. It can operate with industry standard tags and cards at 13.56 MHz. It support global ISO 18000-3 mode 1.

Challenges in Implementing RFID

An informal committee of experts was formed in order to access feasibility of the RFID implementation. The committee discussed on several factors such as budget which was available through the Tertiary Education Trust Fund (TETfund) special intervention project provided by the Nigeria Federal Government to tertiary institutions, required hardware and software and manpower. The experts concluded that RFID provides more security with efficient tracking of materials throughout the library, including easier and faster circulation of documents, the ability to create an inventory, stock verification of documents manually or by scanning with barcodes.

Software

The existing software used in the library is the Koha library integrated software and it did not pose a challenge to the implementation of the RFID.

Tagging

The tagging of the library books along with the RFID was not outsourced. Though some of the existing senior library staff were busy with the operational aspect of the library, some junior staff were designated with the tagging. The tagging was supervised and examined regularly by the Readers' Services librarian and the Acquisition librarian. A period of six months was taken for pasting RFID tags to the whole library collection.

Power Backup

Apart from the electricity supplied in Nigeria through thermal and hydro power sources, the library rely on two generating sets for power backup bearing in mind that Nigeria is a developing country.

Networking

This is the connectivity of different autonomous system on the network. The library makes use of the I.P address given by the university Information Communication Technology centre

Users Orientation

The common orientation programme was done for students while the staff members were educated by staff at the circulation desk anytime they come in to make use of the library. Interestingly, within a few weeks of time, users of the library were very much comfortable with the new RFID technology.

Reputed Vendors

Choosing of vendors was a bit difficult because the major reputed vendors are from outside the town. A vendor who would provide local support service was finally chosen.

Remote service is acceptable for software but for the hardware, local and support service is required immediately.

4. RESULTS AND DISCUSSION

Orientations and demonstrations were conducted among the user groups of the library after the implementation of RFID. A survey was made to know how the users awareness, acceptability and reaction in order to improve the RFID system in the library after a period of six months. The result of the survey of users' awareness in (Fig. 1) revealed that 78 % of the users are well aware of the new technology while 22% of the users were not aware of the implementation of the technology and how it is being used in the library.
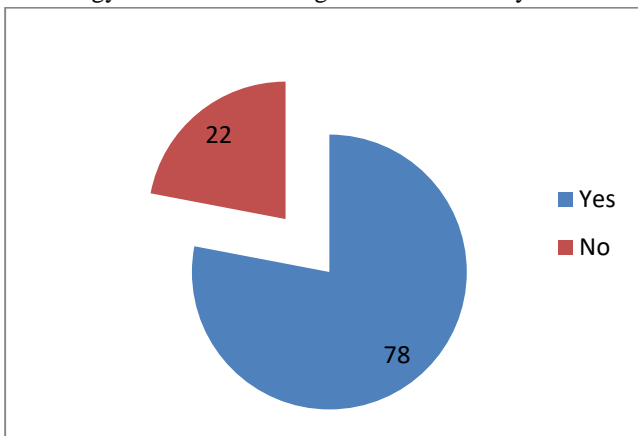

Fig. 1: Awareness of RFID

The result above is still worrisome to the library staff about the acceptability of the RFID technology by users of the library. But within six months period, the users have started using the technology rapidly which is a positive point to the library staff. However, the library initiated more orientation program in order to capture users who claimed that they were not aware of the technology.
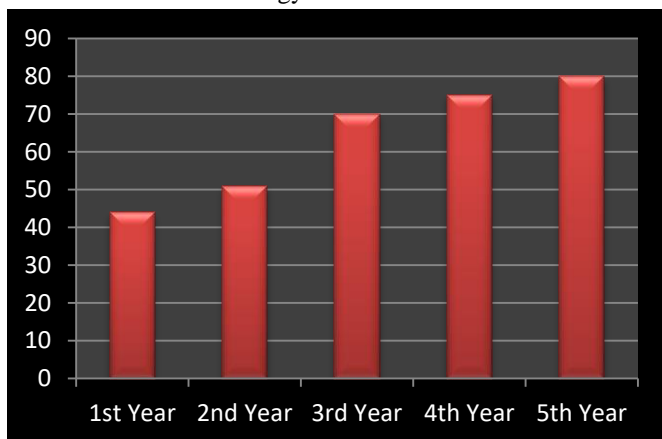

Fig. 2: Awareness among the students category

The study took separate views from different level of students. Fig. 2 shows that third, fourth and final year (5th year) students are best known of the technology, second year are more aware, while first year are less aware. This could be because they are fresh students and it is only because the

faculty libraries and the medical library are not RFID enabled. It is only the main library that has the RFID system in place. The library intends to start special initiative to make them understand the recent technology and how it works as soon as they are done with their course registration.

As a follow up on the question on the awareness of RFID technology in the library, users were asked if they would like the RFID technology to be added as a requirement during their orientation programme since first year students need to know more on the RFID technology and its library application. The result found that majority of the first year students required more orientation, second year less while third, fourth and final year students required less orientation (Fig. 3).
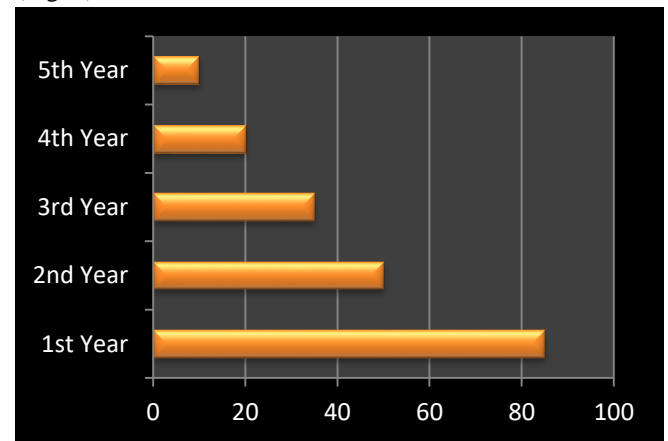

Fig. 3: Requirement of orientation program

Users were excited about the book drop box. The library was able to mount the book drop box and the book drop kiosk. Unfortunately, it only worked for a short period of time due to some technical problems. Even though the RFID system is a costly venture, the library staff and users were happy with the system because it boosted the speed of the house keeping operation. Though the RFID system looked like an extra financial burden on the library, users of the library expressed their view that the expenditure for the RFID are feasible expenditure for smarter library system (Fig. 4).
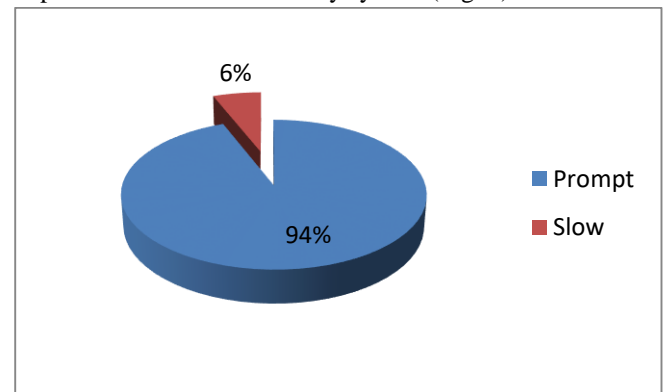

Fig. 4: Circulation of book preferred by the library users

The process of measuring the overall satisfaction of users and staff members are very much satisfactory. It revealed that

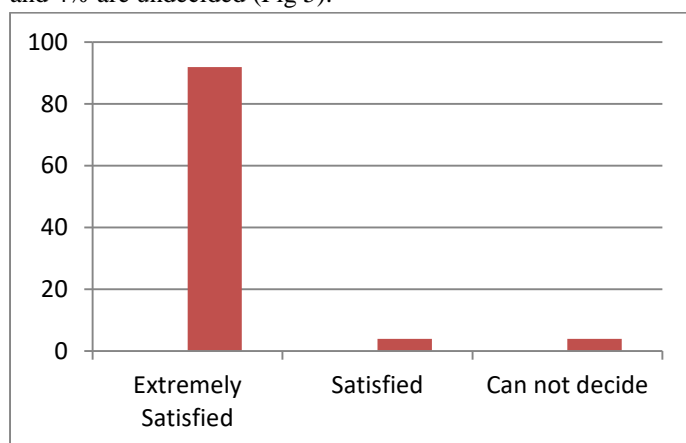92% are very satisfied with the technology, 4% not satisfied and 4% are undecided (Fig 5).

Fig 5: Overall Satisfaction of RFID System

5. CONCLUSION

The experience of the RFID application in the library was extremely satisfactory. Library staffs are now more relaxed as it has reduced many mechanical jobs. The present libraries have become a driving force in the development of RFID for the mass market. Even though the technology is still not widely understood or installed in the library environment yet, the interest in RFID as a solution to optimize further automation and tracking of documents are gathering momentum at an increasing pace with more libraries joining the trail. RFID is increasing the popularity among libraries as the early adopters of this technology have shown that it makes good economic sense both for large and small libraries.

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