



INFRASTRUCTURE AVAILABILITY, BARRIERS AND SUCCESS FACTORS FOR RFID IMPLEMENTATION IN POLYTECHNIC DIGITAL LIBRARY, ADO-EKITI, NIGERIA

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Abstract

This paper explored infrastructure availability, barriers and success factors for Radio Frequency Identification (RFID) implementation in the Polytechnic Digital Library, Ado-Ekiti Nigeria. The title of the paper is justified because few researches have been carried out on implementation of RFID in Polytechnic Libraries in Nigeria. The paper adopted descriptive survey design. Populations of paper comprises of forty-one (41) staff members of the Polytechnic Digital Library. Total enumeration sampling technique was used. Questionnaire was used for data collection. Data collected was analyzed by descriptive statistics using tables, frequency counts and simple percentage. Findings affirmed inadequate RFID devices and ICT infrastructure for RFID technology implementation in the Polytechnic Digital Library Ado-Ekiti. Majority of the respondents indicate a high level of difficulty in integrating RFID technology with existing Library Automation System.(LAS) Other factors indicated as barriers to RFID implementation in the Library include high cost of RFID devices, inadequate training and orientation of Staff, lack of written RFID implementation policy and choosing unreliable and inexperienced RFID vendor to technically support the library for successful RFID technology implementation. Findings also indicated high level of respondents' agreement with RFID technology implementation success factors such as training and orientation of staff and choosing of reliable and experienced vendor for technical support.

Keywords: Radio Frequency Identification, Barriers, Success Factors, RFID Infrastructure.

Introduction

Radio Frequency Identification (RFID) Technology is one of the Automatic Identification and Data Capture (AIDC) technologies being adopted in Libraries to offer smart, enhanced and improved services. According to Yusof and Saman (2016), RFID automatically collect data about the objects and update the data into a computer system without human intervention. Hahn (2017), Nolm & Olson (2016), opines that Libraries use RFID basically for circulation operations and theft detection system. The technology offers tracking capability to locate equipment, supplies and people in real time and provide efficient and accurate access to library transactions such as book search, borrow and book return. Radio Frequency Identification (RFID) is an electronic information technology that utilizes wireless radio waves and microchip technology to transmit, identify, trace, sequence and confirm various objects (Liu and Chen, 2009). According to Min (2014), RFID is an example of Internet of Things (IOT) technology-enabled by interconnected networks where entities (human and devices) could communicate smoothly whenever needed.

Literature Review

According to Shahid (2005) basic infrastructure and RFID devices required for a functional implementation of RFID and other factors to consider when planning RFID technology implementation in Libraries include RFID tags to be fixed inside a book back cover or directly on Library material such as CDs, Videos; Reader (Hand held reader or inventory wand) used for inventory taking and verifying that Library materials are shelved correctly; Antenna built into a door frame to receive tag data from persons/things, material passing through the door; Server which is the heart of RFID system working as communication gateways; Conversion station where Library data is written to the tag; Staff work station at circulation area used to charge and discharge Library materials; Self-check-out station used to check-in Library materials without staff assistance; Self-check-in station used to check-in Library materials without staff assistance; Exit sensors to verify that all materials leaving the Library has been checked out; Book drop reader used to automatically discharge Library materials and re-activate



security; Sorter and conveyor, which is the automated system for returning material to proper area of the library; RFID label printer used to print the labels with an individual bar-code and library logo.

Statement of the Problem

Few researches have been carried out on infrastructure availability, barriers and factors responsible for successful implementation of RFID in Polytechnic Libraries in Nigeria. This paper therefore, explored infrastructure availability, barriers and success factors for implementation in the Polytechnic Digital Library Ado-Ekiti Nigeria. Preliminary investigation shows that RFID technologies adopted by the Library is perceived to be highly useful when implemented and applied to a variety of library operation such as check-in/check-out of Library materials without the intervention of library staff, theft prevention/detection and stock verification. Despite the numerous benefits RFID offers the library, it has been observed that the technology has not been fully optimized by the Library for service delivery as operation has remained the normal conventional norm.

Research Questions

1. What are the types of RFID infrastructure available for RFID technology implementation in the Polytechnic Digital Library Ado-Ekiti, Nigeria?
2. What constitute barriers to adoption and implementation of RFID technology in the Polytechnic Digital Library Ado-Ekiti, Nigeria?
3. What is the success factors required for successful implementation of RFID Technology in the Polytechnic Digital Library Ado-Ekiti, Nigeria?

Methodology

The research design adopted for this paper is descriptive survey. Descriptive survey design allows researchers to describe the characteristics of a population or differences between two or more populations. Researchers can also make predictions based on the correlation survey data. This design is adequate for this paper because of its dependability in terms of anonymity of respondents which propels them to give accurate answers to questions.

Population of the Study

The population of the paper is all categories of staff in the Polytechnic Digital Library, Ado Ekiti consisting of the entire forty-one (41) members of staff.

Sample Size and Sampling Technique

Total enumeration sampling techniques was adopted for the paper because of the population size which is small.

Instrument for Data Collection

The instrument for the collection of data for this paper is a structured questionnaire titled "Infrastructure Availability, Barriers and Success Factors for RFID Implementation in the Polytechnic Digital Library Ado-Ekiti, Nigeria" developed by the researcher to obtain data for the paper after an extensive review of related literature on RFID Implementation. Data collected were analyzed using descriptive statistics such as tables, frequency counts and simple percent

Hypothesis

1. There is no significant relationship between adequate supply of RFID infrastructure and successful RFID implementation in the Polytechnic Digital Ado-Ekiti, Nigeria.

RFID Infrastructure Availability in Libraries

Basic Components of RFID technology outlined by Bhattacharyya (2017) consist of four main components and other associate components and devices. The four major components of RFID are:

- RFID tags/security tags or transponder which are electronically programmed with unique information
- Readers or sensors used to query tags
- Antenna/gate sensor/exit security which is the detection system
- Application server/decoding station on which the software that interfaces with the Checklist for planning a successful RFID implementation in libraries outlined by Radha (2019) include: RFID Reader issue/Return counter, gate antennas to monitor and detect theft, student ID Card with RFID tags enabled, kiosk for self-issue and renewal, drop box for automatic return and, handheld Reader for stock taking.

Availability of RFID Infrastructure

Availability of RFID infrastructure according to Adu-Bobi and Boamah (2019) is a contextual factor in the implementation of RFID in developing countries such as Ghana and Nigeria. Non-availability of Digital and RFID infrastructure

is considered a critical factor constituting barrier to successful implementation and maximizing the potentials of RFID in Academic Libraries.

RFID Implementation Barriers

Major barriers to RFID implementation according to Butters, (2008), Adu-Bobi & Boamah, (2019) are: Technological limitation, Prohibitive costs, poor power supply, privacy concerns, interference. Other constraints of RFID and other emerging technology implementation in libraries identified and highlighted by Okunlaya (2022) include: Inadequate technical staff, Complexity of technology interface, slow bandwidth, High cost digital infrastructure, Inadequate funding, Omoadoni (2019) summarized challenges of RFID implementation as High cost, Frequency Block, Chances of removal of exposed tags, exit gate sensor problems, User privacy concern, Reader collision, Tag collision, Interoperability challenges. The cost of a fully functioning RFID

system requires tags, reader, infrastructure, middleware, printers and so on that can cost an organization millions of dollars.

RFID Implementation Success Factors

Factors perceived as influencing successful adoption and implementation of RFID include Technological Compatibility, Perceived Effectiveness, Organization Size, Upper Management Support, Trust between Enterprises, Technical Knowledge, Competitive Pressure Level, Levels and Government Supports. All of these factors are perceived to have significant positive effect on RFID adoption and successful implementation.

Table 1:

Table 1 contain all categories of staffers in the Polytechnic Digital Library. However, the numbers of staff including their designation is indicated below:

Category of Library Staff by Designation and Number in Post

Category of Staff	Number in Post
Librarians	12
Library Officers	6
Library Assistants	4
ICT Technologists	2
Administrative Officers	8
Bindery Officers	5
Multimedia officers	1
Ad-hoc Staff	3
TOTAL	41

Source: Polytechnic Digital Library Staff List

Out of forty-one (41) copies of questionnaires distributed, thirty-eight (38) were retrieved and found usable for the paper.

Question 1: What RFID Technology Components and Devices are available in the Polytechnic Digital Library?

RFID technology components and devices available in the Polytechnic Digital Library

Antenna built into the door frames

	Frequency	Percent	Valid Percent	Cumulative %
Valid Available	9	23.68	23.63	23.68
Not Available	29	76.32	76.32	100.00
Total	38	100.00	100.00	

Server (RFID System) working as communication gateways

	Frequency	Percent	Valid Percent	Cumulative %
Valid Available	2	5.26	5.26	5.26
Not Available	36	94.74	94.74	100.00
Total	38	100.00	100.00	

Exit sensors used to verify that all materials leaving the library has been checked out

	Frequency	Percent	Valid Percent	Cumulative %
Valid Available	10	26.32	26.32	26.32
Not Available	28	73.68	73.68	100.00
Total	38	100.00	100.00	

Findings in Table 2, 3, & 4 indicates that majority of respondents indicate non-availability of RFID devices and components in the polytechnic digital library.

The barriers to adoption and implementation of RFID technology in the polytechnic Digital Library, Ado Ekiti?

Question 2: What exist as barriers to adoption and implementation of RFID Technology in Polytechnic Digital Library, Ado-Ekiti?

Options: Strongly Agree (SA) Agree (A) Disagree (D) Strongly Disagree (SD)

The cost of RFID Implementation is high

	Frequency	Percent	Valid Percent	Cumulative %
Valid SA	37	97.36	97.36	97.36
SD	1	2.63	2.63	100.00
Total	38	100.00	100.00	

There is inadequate training and orientation of staff on RFID implementation

	Frequency	percent	Valid Percent	Cumulative %
Valid SA	38	100.00	100.00	100.00
SD	0	0.00	0.00	100.00
Total	38	100.00	100.00	

Table 5 & 6 reveals majority of the respondents indicates high cost of implementation, inadequate training and orientation of staff on RFID implementation.

The success factors for RFID Technology Implementation in the Polytechnic Digital Library, Ado Ekiti?

Question 3: What are the success factors for RFID Technology Implementation in Polytechnic Digital Library Ado-Ekiti?

NB: Strongly Agree (SA) Agree (A) Disagree (D) Strongly Disagree (SD)

Clear vision statement and policy on RFID technology implementation by top library Management.

Well planned project timeframe for RFID technology implementation

	Frequency	Percentage	Valid Percentage	Cumulative %
Valid SA	36	94.74	94.74	94.74
SD	2	5.26	5.26	100.00
Total	38	100	100.0	

Training and orientation of library staff and Library users

	Frequency	Percent	Valid Percent	Cumulative %
Valid SA	38	100.00	100.00	100.00
SD	0	0.00	0.00	100.00
Total	38	100.00	100.00	



The Barriers to Adoption and Implementation of RFID Technology

One of the major barriers of RFID Implementation is high cost. Many libraries in Nigeria cannot implement the RFID technology for this reason. 97.36% of the respondents are of the view that the cost of implementing RFID is capital intensive. Only 2.63% disagree that the technology is less expensive.

Success for RFID Technology Implementation

Well planned project timeframe for RFID Technology implementation

The implementation of RFID technology can only be successful if there are well planned project timeframe for the implementation and training and orientation of library staff and Library users.

Summary of Findings

Based on the findings, this paper affirms inadequate RFID devices and ICT Infrastructure for RFID implementation in the Polytechnic Digital Library Ado-Ekiti. One of the major barriers of RFID Implementation is high cost as 97.36% of the respondents are of the view that the cost of implementing RFID is capital intensive. Findings also indicated agreement with RFID success factors such as training and orientation of staff and choosing for technical support for RFID technology implementation in the Polytechnic Digital Library Ado-Ekiti

Conclusion

The paper on infrastructure availability, barriers and critical success factors for RFID implementation in the Polytechnic Digital Library Ado-Ekiti, Nigeria reveals inadequate RFID devices and ICT Infrastructure for RFID implementation in the Library. High cost of implementation and Lack of staff training and orientation are notable barriers to a successful implementation of RFID in the Library.

Recommendations

Based on the submission above, the following are recommended for a successful implementation of RFID technology in Polytechnic Digital Library, Ado-Ekiti:

1. Well planned project time frame for RFID technology implementation for the library.
2. Re-appraisal and re-award project to reliable and experienced vendor for RFID technology implementation.

3. Effect active communication with the institutions' Chief Executive on RFID implementation project through regular progress report.
4. Embark on training and orientation of library staff and library users on RFID use.

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