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Internet of Things Adoption by Library Personnel in Southwestern Universities: A Perception Study of Performance and Effort Expectancies

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ABSTRACT

The implementation of the Internet of Things (IoTs), a collection of information systems powered by Internet technologies, is crucial for library operations in the information systems era. The majority of research concerning the implementation of IoTs in library operations consists of blog posts or opinion articles. Limited empirical research has investigated the use of IoT in library operations, particularly within university libraries in southwest Nigeria, via the lens of expectation theory. The study examined effort expectation and performance expectations as determinants affecting the use of IoTs by staff in university libraries in southwest Nigeria for normal tasks and service delivery. The correlational variant of the descriptive survey was used. A validated questionnaire (r = 0.78) was used to gather data from 187 library staff members across the 10 participating universities in the study. The research included statistical approaches, including frequency counts, percentages, means, and standard deviations. The available types of IoTs library personnel use were WIFI (wireless fidelity) ($\bar{x}$ = 3.78), web-based OPAC ($\bar{x}$ = 3.51), library apps ($\bar{x}$ = 3.42), social media (Facebook, WhatsApp, X, Telegram and so on) for marketing library services ($\bar{x}$ = 3.40), library software ($\bar{x}$ = 3.38), close circuit television ($\bar{x}$ = 3.28) and smart sensors (like Bluetooth for printing, metal and smoke detectors) ($\bar{x}$ = 3.14). Collaborative writing ($\bar{x}$ = 3.49), online copy cataloguing ($\bar{x}$ = 3.44), rendering selective dissemination of Information (SDI) to users remotely ($\bar{x}$ = 3.39) and preserve and conserve library information resources ($\bar{x}$ = 3.38) was the main purpose the library personnel use the IoTs. WIFI ($\bar{x}$ = 4.56), web-based OPAC ($\bar{x}$ = 4.25), library software ($\bar{x}$ = 3.38), and social media platforms ($\bar{x}$ = 3.82) were used on a daily basis. The use of IoTs enhanced library routines highly ($\bar{x}$ = 3.34) against the threshold of 2.5. The perceived effort expectancy of IoTs was high ($\bar{x}$ = 3.25) and performance expectancy ($\bar{x}$ = 3.50) were high against the 2.5 mean threshold. The challenges to IoT's adoption included poor internet connection and power outages. IoT's adoption for library routines was perceived as effortless, while its perceived performance was high. Therefore, libraries should strive to maintain the current stride in adoption level, while the management of university libraries should reduce the bottlenecks hindering IoTs adoption.

Keywords: Effort Expectancy, Performance Expectancy, Determinants, Internet Of Things Use, Library Personnel

INTRODUCTION

The integration of information and communication technologies (ICTs) has influenced the dynamics of the twenty-first century, as libraries and other institutions throughout the globe are fast evolving through the adoption of cutting-edge technology and the Internet of Things (IoTs). Having observed tedious routines and services in university libraries, one could conclude that the effectiveness and efficiency level of library personnel in universities is reducing at a fast rate that the change in information needs, insufficient budget, categories of users, and information carriers has contributed immensely to low in productivity level of library personnel in universities southwestern Nigeria.

Ashton (1999) used the phrase IoTs to refer to technologies that employ sensors, electronics, and software to link objects to one another via the Internet. This allows for the presentation of smart products and apps that facilitate more consumer interactions (Sintef & Norway, 2014). Bansal, Arora, and Suri (2018) discussed the start of a new

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age for libraries in their study titled IoTs. They affirmed that the web, detectors, and RFID enable the IoT to facilitate data collection and transmission across a network autonomously, without human intervention. Their research indicates that the IoTs' core functions—identification, sensing, and communication—operate on three levels.

Libraries can monitor, track, inform, link, and manage their resources with the use of smart devices made possible by embedded technologies like sensors, radio frequency identification, and the internet. These include software, Bluetooth, wireless fidelity (WIFI), library apps, smart CCTV, and radio frequency identification tags. The aforementioned technologies facilitate routines and services and boost library staff productivity (Shashidhara, 2023). Through a worldwide network of smart objects, these technologies provide opportunities to link people, machines, and processes. A university library fully equipped with IoT devices would optimise staff performance, ensuring that users, whether near or distant, can effortlessly access high-quality information services using IoT technologies, including library applications, software, and smartphones. Having seen how smart technologies, such as smartphones and smart CCTV, are utilised in libraries, library staff can virtually respond to customer enquiries and keep an eye on the flow of information resources throughout the building. These technologies assist in preventing certain library patrons from engaging in deviant behaviour, such as damaging books for personal use or damaging library property.

The world has become a global village thanks to technology, where individuals from all over the globe can easily connect, share, relate, communicate, and trade data without much damage. Using their linked computers or cell phones, library staff may communicate with consumers remotely via social media, library apps, and library software thanks to these smooth wifi connections (Alasa & Quadri, 2022). With the aid of these smart gadgets, patrons may digitally reserve books, put a hold on a book, and pay fines into their library accounts. The library application is a massive IoTs gadget that lets library staff provide remote orientation, user education, library tours, and other reference services to patrons. It also makes the job easier and more efficient. In addition, library applications assist in providing its customers with selected resources and cutting-edge services digitally.

However, it has been noted that the enormous advantages of using the IoTs in libraries in developed nations do not materialise in developing nations because the effort required and the practicality of the technologies contribute to their low usage in developing nations and sub-Saharan Africa (Makwana, 2021). This study adjusted the effort expectancy and performance expectancy elements of the Unified Theory of Acceptance and Use of Technology (UTAUT) model to examine their influence on the adoption of IoT technologies by library staff in southwestern Nigeria.

Venkatesh et al. (2003) contend that the perceived ease of use in the Technology Acceptance Model (TAM), which assesses the simplicity of using a system or technology, is intricately linked to the effort expectancy of the UTAUT model. The amount of power needed to run an appliance or device is known as the effort expectancy. The indicators for measuring effort expectancy of use of IoTs are ease of use, comprehensiveness, timeliness, convenience and perceived ease of use by library personnel (Giesing, 2003; Quadri, 2019).

Conversely, Ho, Stephens, and Jamieson (2003) defined performance expectation as the degree to which technology users believe that employing a particular gadget would be advantageous. The TAM and this concept are closely connected. The following criteria are used to assess this variable: Expected value, motivation from within and without, comparative advantage, and expected results from the deployment of IoT technology by library staff. The two elements of the UTAUT model significantly impact the use of IoT technology (smart CCTV, smartphones, library apps, smart smoke and fire alarms, software, web PAC, and Radio Frequency Identification) by library professionals at Southwestern University. In order to determine the variable of the topic, the research question guided the study.

Research Questions

This research will examine the following questions:

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1. What are the available types of IoTs library personnel used in Southwestern, Nigeria?
2. For what purpose do the academic librarians use the IoTs in university libraries in Southwestern, Nigeria?
3. What is the frequency of use of the IoTs by library personnel in Southwestern, Nigeria?
4. Does the use of IoTs improve the routines, duties, and services provided by library staff in Southwestern Nigeria?
5. What challenges do library professionals in Southwestern Nigeria encounter in using the Internet of Things (IoT)?
6. What performance expectations do library staff have when using IoTs??
7. What is the performance expectation of IoT among librarians in Southwestern Nigeria?

LITERATURE REVIEW

The IoTs, according to Sintef and Norway (2014), is the technology that makes it possible for devices and things to be linked through sensors, electronics, and software. A greater variety of customer interaction will be made possible by

those components, which will help to engage, relate, and communicate with current smart gadgets and applications. Through the use of unique IDs and data transmission capabilities, the IoTs is a networked ecosystem that eliminates the need for human-to-human and human-to-machine contact.

Alagumalai and Natarajan (2020) examined the IoTs in the context of libraries, demonstrating that information literacy and the advocacy of library resources and services effectively engaged respondents via the library website and social media. The libraries investigated used Facebook, Instagram, LinkedIn, X, and YouTube to meet the informational needs of their patrons. The study found that Instagram and LinkedIn were utilised by the majority of respondents. Social networking sites like Facebook and Instagram let users quickly get their questions answered, which speeds up the process of finding and sharing knowledge. This saves time for both users and academic librarians. This aligns with Ranganathan's fourth law, which posits that a library should save time for its users.

Sun (2012) used RFID technology with the IoTs to investigate its application in logistics. The study found that in order to accomplish complete visual control of commodities, businesses may use IoT devices like RFID, laser detectors, and infrared technology for tracking of supply chains and anti-counterfeiting. The IoTs also help with other non-service library duties, including marketing and promotion, event planning, collection, description, storage, analysis, and selection. The IoT may be used by university libraries to keep track of books that have been checked out, organise self-guided tours, increase interest in special collection exhibitions, provide contactless payment methods, confirm equipment availability, and provide more detailed information about collections. An example of how the IoTs is being used in libraries is the following content: RFID-enabled self-checkout beacons and floor pressure pads to monitor users' movements and provide contextual information, wristbands that function as library cards, etc.

Omeluzor, Oyovwe-Tinuoye, and Abayomi (2016) investigated the use of internet-based networks for service delivery in libraries in Southeast Nigeria. A selective sampling method was used to study 167 university librarians. According to the survey, librarians like helping patrons with references, giving library tours, and promoting service delivery 143(86%) and communicating with library users 127(76%) via online social networking. The ease of use and benefits librarians enjoy from Facebook and X in delivering reference services.

The usage of RFID technology in Northern Indian libraries and information centres has been investigated by Singh and Mahajan (2014). They stated that despite being in the initial stages of implementing RFID technology, they are already reaping its advantages, such as reduced queues at the circulation desk, extended circulation hours without additional personnel, enabling library staff to focus more on user-oriented services, and a decreased number of staff needed to manage circulation.

Cheung et al. (2023) also corroborated this conclusion, indicating that RFID technology was used in the library for the purpose of safeguarding resources. Rachmawati, Bukhori, Majidah, Hidayatullah, and Waris (2020) conducted

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an explanatory study design to examine mobile banking use through the UTAUT model, gathering data from 190 respondents, then analysed using the Statistical Package for Social Sciences (SPSS). The research indicated that the behavioural intention of Bank Jatim Surabaya mobile banking clients is positively and significantly affected by effort expectations. The mobile banking UI is accessible and easy to use, according to this evaluation. Both performance expectancy (β=0.278, t=5.375, p<0.05) and effort expectancy (β=0.179, t=3.179, p<0.05) were shown to be significant predictors by the regression analysis. Expectations for effort and performance have a big impact on the willingness to use the device.

Tan (2013) used the UTAUT theoretical framework to identify the variables influencing Taiwanese users' utilisation of English e-learning websites. Utilising the Statistics Product and Services Solution (SPSS), the research gathered data from 176 respondents in a population sample. Regression and correlational analyses were performed on the data. The findings indicated that performance expectation significantly affected users' inclination to employ English online courses (β=0.346; p <.001). This indicates that students are more likely to use an English electronic instruction website if they expect it will improve their results. The two studies revealed that the increase in behavioural intention to use technology is influenced by performance expectation, defined as the perceived utility derived by the user from its usage.

Al-Momani, Mahmoud, and Ahmad (2018) examined the variables affecting Jordanian telecom consumers' adoption of IoTs services. 176 clients' data were gathered, and SPSS was used for analysis. According to the results, the most crucial element is IT expertise, which is followed by cost, usefulness, simplicity of use, security and privacy, and trust. A new technology's ease of use is influenced by technological know-how. A statistically significant level (p<0.05) was identified for attributes including usefulness (β=1117, p<0.05), ease of use (β=0.128, p<0.05), IT proficiency (β=0.334, p<0.05), and behavioural intention (β=0.947, p<0.05). The use of the IoTs is significantly impacted by these factors.

Abrahão, Moriguchi, and Andrade (2016) used the UTAUT framework in a survey study design to examine the intention to embrace mobile payment among mobile consumers of a telecoms firm in Southeastern Brazil. Data were collected from a valid sample of 605 respondents using a questionnaire. Using structural equation modelling, the research found that 76% of participants articulated their behavioural intentions, which were explained by perceived

risk, social effect, desired outcomes, and activity aspirations. The technology's apparent effectiveness and ease of use encourage library employees to utilise it. Moreover, a positive association was identified between ease of use and the desire to use mobile banking (R=0.232), suggesting that user-friendliness and a seamless experience may significantly enhance this relationship.

A research on the use and appreciation for OPAC services among B.tech students at the Engineering School of Tezpur University in India was carried out by Gohain and Saikia (2013). The findings showed that 51.03% of the 199 respondents stated they often used the OPAC to find and get information sheets from the shelves. The study's findings indicated that users appreciated and gained advantages from using OPAC, since it facilitates efficient information retrieval independently, without the need for library personnel's help.

Ahmad (2018) used the Allama Iqbal Library at the University of Kashmir as a case study to investigate RFID technology in libraries. The sample for the empirical investigation consisted of 482 individuals in total. The study asserts that the introduction of RFID and the modernisation of other library operations and services in underdeveloped nations are still significantly hampered by high prices and a lack of understanding about how to make the most of digital equipment. The study found that 62.65% of users are satisfied with RFID technology, 28% are very satisfied, and just a small percentage of the population being studied expressed dissatisfaction.

Tella, Durodolu, and Olawuyi (2021) assessed how Nigerian students used cell phones to access library resources and services. 385 people made up the research sample. Respondents were given questionnaires, and the results were evaluated using straightforward percentages. According to the survey, 158 (41%) of the respondents said they use

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their smartphones to post or ask a reference librarian a question in order to get the information they need, and 107 (27.2%) said they use their smartphones to borrow, charge, discharge, and pay fines when necessary. This suggests that using smart devices to access library reference services reduces stress and time, and library users are satisfied.

Gupta and Singh (2018) focused on customers in their study on IoT and user-friendly facilitators in academic libraries. Data was gathered via questionnaires and evaluated using an online survey. According to the study's results, 76.2% of librarians reported having technical difficulties while using IoTs technology in their daily work, 61.9% reported having a staffing shortage, and finally, libraries have financial difficulties. Because most university libraries struggle with funding cuts from the parent institution, these threats lead to a low level of technological integration in libraries. This affects the standard of most university libraries in sub-Saharan Africa to compete with their colleagues in Europe and the western part of the world. Dollah, Fakeh, Iberahim, Sani, Paiman, Amin, Malik, and Ali (2018) investigated the variables influencing the application of digital reference services in Malaysian academic libraries and found that effort expectation had no appreciable effect on this usage at the p-level of p>0.05..

Jackman (2014) assessed 600 undergraduate students' adoption of mobile learning using the UTAUT model as a paradigm. The findings demonstrated a favourable correlation between the willingness to adopt mobile learning and both enabling circumstances (r=.47) and effort expectation (r=.27). The researcher also conducted a regression analysis and used beta values for enabling situations (β =.277), performance expectations (β =.303), and effort expectancy (β =.139) to show the relative importance of the UTAUT variables. As a result, it was shown that performance expectations strongly impacted respondents' intention to utilise a mobile device for mobile learning the most.

Rachmawati, Bukhori, Majidah, Hidayatullah, and Waris (2020) evaluated mobile banking usage employing the UTAUT model, applying an explanatory study methodology. 190 respondents provided data, which was then analysed using SPSS. The study discovered that performance expectations had a positive and substantial influence on behavioural intention in online marketing. (t value=5.375; p<0.05). This is evident in most countries that adopt mobile banking and the benefits accrued to the use of the technology are immeasurable, as people can transact via the platform with one another without any barrier, irrespective of the location or currency. This result supported the findings of the research published by AbuShanab *et al.* (2021 and Quadri (2019).

Using the UTAUT model, Lee and Shin (2019) carried out an empirical study on customers' adoption of IoT services. The study analysed 224 survey responses using structural equation modelling, or SEM. The findings indicated that the most significant predictor is the standardised performance expectancy's beta value (β=0.619; p<0.05). This suggests that using IoT technology has a significant positive impact on customers. Consequently, it implies that consumers' satisfaction or utility with the technology has a major impact on how they utilise IoTs.

Using the UTAUT model, Chen, Ha, Tai, and Chang (2020) investigated how prepared Taiwan's construction sector was to adopt the IoT concept. The research included the distribution of questionnaires to 282 participants, and the data were analysed using structural equation modelling. The study's results indicated that performance anticipation positively influences consumers' propensity to use IoTs, as proven by the standard coefficient and significance level of performance expectancy (β=0.45 and Sig. p 0.004<0.05). Additionally, the results suggested a significant and positive correlation between behavioural intention and performance expectancy. This implies that since the IoTs technology is beneficial and useful for their technical endeavours, users will use it more. Rachmawati, Bukhori, Majidah, Hidayatullah, and Waris (2020) used an explanatory research design, gathering data from 190 respondents and analysing it using SPSS. The research focused on analysing mobile banking utilisation through the lens of the UTAUT paradigm. The study revealed that effort expectation positively influences consumers' inclination to use mobile banking for routine transactions (t value=3.179; p<0.05).

Performance expectation, effort expectancy, and enabling circumstances were all empirically examined by Onadapo and Oyewole (2018) as variables impacting postgraduate students at the University of Ibadan in Nigeria's use of smartphones for mobile learning. Regression and correlation analysis were used to examine the data from the 186

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respondents who were selected for the research. The majority of postgraduate students often utilised their smartphones for mobile studying on a weekly basis, according to the study's findings. The results showed that a significant percentage of postgraduate students studied weekly on their mobile phones. For the use of smartphones for mobile learning, it was found that the performance expectation ($\bar{x}$ = 16.97), effort expectancy ($\bar{x}$ = 12.57), and enabling conditions ($\bar{x}$ = 15.39) were all reasonable. All independent factors had a significant positive correlation with smartphone utilisation for mobile learning (PE, r=.527*; EE, r=.724*; and FCs, r=.514*). Significantly, across all independent factors, performance (β=0.189) emerged as the most effective predictor of smartphone utilisation for mobile learning.

Alharbi and Drew (2014) investigated the factors affecting Griffith University students' intent to adopt m-learning in Australia using the UTAUT and Information Systems (IS) success models. The findings of the research showed a favourable relationship between behavioural intention and performance expectations, effort expectancy, and social influence. Similarly, the quality of information and system quality were connected with students' happiness about m-learning, in accordance with the IS success model. This indicates that performance expectation is a critical aspect influencing the utilisation of any technology or system since it shapes individuals' behavioural intentions to use technology.

Asim, Arif and Rafiq (2022) examined IoT applications in Pakistani libraries through a mixed-methods exploratory sequential. The study was conducted in two stages: the first included interviewing carefully chosen university librarians, and the second involved gathering information from 122 librarians across Pakistan. The study found that a lack of a highly connected, interconnected, and seamless setting, a lack of financing, a lack of a working policy and strategic plan, and a lack of technical staff were the primary obstacles to IoT adoption in the chosen libraries. Salisu (2024), who investigated the use and awareness of IoT in Kwara State using a census approach to research all 85 respondents using a questionnaire as the data collection instrument, supported this conclusion. The research indicated the absence of technical experts, the expense of computerised security measures, and the intricacy of software.

METHODOLOGY

It makes use of the descriptive research design. 120 academic librarians from both publicly and privately owned universities in southwest Nigeria made up the study's sample. There are 7 federal Universities, 10 state universities, and 27 privately owned Universities in Nigeria. However, 2 federal and 8 private universities were selected for the study. The excluded universities have not fully been equipped with IoTs technologies at least at the peripheral level, such as the installation of infrared doors, barcode readers for accessioning and cataloguing, and integrated library software. Table 1 contains a list of the participating universities.

Table 1: List of universities used in the study

S/N	NAME OF UNIVERSITY	NUMBER OF ACADEMIC LIBRARIANS
1.	University of Ibadan, Ibadan Oyo State	32
2	Covenant University, Ogun State	18
3	University of Lagos, Lagos State	20
4	Lead city University, Ibadan Oyo State	9
5	Elizade University, Ilara Mokin, Ondo State	6
6	Babcock University, Ilisan Remo, Ogun State	11
7	Crawford University, Igbesa, Ogun State	2
8	Afe Babalola University, Ado Ekiti	10
9	Redeemer University, Ede, Osun State	6
10	Adeleke University Ede, Osun State	6
	TOTAL	**120**

Data Source: Contact persons within the universities (2022)

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All 120 academic librarians at selected libraries in southwest Nigeria were assessed using the total enumeration approach. The study adopted the Venkatesh, Morris, Davis and Minor adjustments were made to the Davis (2003) UTAUT questionnaire to accommodate the library's setting. The following sub-scales were used. Section A of the questionnaire contains respondents' demographics and items in this section are open and closed-ended questions. Section B: Types of IoTs available (α = 0.827), Section C: Purpose of IoTs use (α = 0.918), Section D: Frequency of use of IoTs (α = 0.710), Section E: Use of easiness (α = 0.701), Section F: Quality of services IoTs enhances

(α = 0.942), Section G: Effort expectancy (α =0.710), Section H: (α =0.711) and Section I: (α =0.720) pre-tested using 30 copies at Nimbe Adedipe Library, Federal University of Agriculture, Abeokuta, Ogun State. Within three weeks, the research instrument was distributed and gathered. Descriptive statistics, including percentages, frequencies, means, and standard deviations, were used in the analysis.

FINDINGS AND DISCUSSION

The study's findings are presented in this section in response to the research questions.

Research Question 1:

What are the available types of IoTs library personnel used in Southwestern, Nigeria? In determining this, 9 items were itemized with the response format of Available (A), Available Not Used (ANU), To be Available (TBA) and Not Available (NA). Table 2 below presents the results.

Table 2: Available types of IoTs library personnel use

Items	A	ANU	TBA	NA	$\bar{x}$	ST.D
My library is equipped with and uses a Radio Frequency system/equipment e.g., RFID doors, and RFID tags in books.	87(56.5%)	24(12.8%)	19(10.5%)	57(30.5%)	2.75	1.317
My library has a smart sensor-equipped system e.g Bluetooth, for printing services, a metal, smoke detector and a fire alarm in case of a hazard.	107(57.2%)	34(18.2%)	11(5.9%)	35(18.7%)	3.14	1.169
My library has a WIFI (wireless fidelity) seamless internet connection.	156(83.4%)	22(11.8%)	7(3.7%)	2(1.1%)	3.78	0.561
My library has a smart Closed Circuit Television (CCTV) for monitoring activities in the library.	125(66.8%)	21(11.2%)	10(5.3%)	31(16.6%)	3.28	1.145
My library is equipped with Web-based OPAC (WEBPAC) for literature search services.	142(75%)	13(7.0%)	18(9.6%)	14(7.5%)	3.51	0.947
My library has Library Applications for conducting orientation and providing user information services.	133(71.1%)	18(9.6%)	17(9.1%)	19(10.2%)	3.42	1.020
My library has Social media (Facebook, WhatsApp, X and Telegram, etc.) for marketing library services.	130(69.5%)	21(11.2%)	16(8.6%)	20(10.7%)	3.40	1.028
My library has Cloud computing for storage facilities e.g. Institutional Repositories.	106(56.7%)	21(11.2%)	23(12.3%)	37(19.8%)	3.05	1.219
My library has Software (KOHA, Alexandria, etc) for web-based services.	133(71.1%)	15(8.0%)	16(8.6%)	23(12.5%)	3.38	1.073
ARITHMETIC MEAN					**29.71**	**9.479**

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Table 2 above revealed a high mean score that library personnel have equipped and use radio frequency identification systems such as RFID doors, RFID tags, cloud computing, software, smart CCTV, Library applications, Webpac, and Smart sensors like smart fire and smoke detectors in their libraries. This therefore shows that the IoTs is available and used in the studied university libraries.

Research Question 2: For what purpose do the library personnel use the IoTs? In order to ascertain this, 10 items were listed with 5-point Likert rating scales. Below are the findings.

Table 3: Purpose of using IoTs by the library personnel

Items	Agreement		Disagreement		X	STD
	N	%	N	%		
I use the IoTs for both independent and collaborative browsing of library collections.	179	95.7	8	4.3	3.49	.651
I use the IoTs for collecting fines, charging and discharging books to library users.	138	73.8	49	26.2	3.02	.956
IoTs use enables me to gather materials needed in preparing seminar and conference papers.	171	91.4	16	8.6	3.36	.693
I use IoT technologies for conducting library orientation for users.	162	86.6	25	13.4	3.26	.797
I use IoTs to obtain and search for materials to aid users' queries.	162	86.6	25	13.4	3.30	.807
I use the IoTs for notifying users of current awareness services.	167	89.3	20	10.7	3.33	.739
The IoTs enables me to render selective dissemination of Information (SDI) to users remotely.	173	92.5	14	7.5	3.39	.690
I use the IoTs to monitor library resources and users in the readers' services section of the library.	157	84	30	16	3.25	.799
I use the IoTs for online copy cataloguing.	172	92	15	8	3.44	.748
IoTs use enables me to preserve and conserve library information resources.	168	89.8	19	10.2	3.38	.741
Arithmetic Mean					**33.22**	**7.621**

Note: *SA and A were aggregated to be AGREE, SD and D were aggregated to be DISAGREE*

Table 3 revealed a high mean score for the purpose of IoTs use by library personnel. The overall mean also indicated a high mean score for all ten items. The table shows that library staff utilise technology to charge customers for information resources, collect fines, and dismiss them.

Research Question 3: What is the frequency of use of the IoTs by library personnel? This was determined using 9 items with Daily, Weekly, Monthly, Rarely and Never response forms.

Table 4: Frequency of using the IoTs by library personnel

Items	Daily	Weekly	Monthly	Rarely	Never		
	N (%)	N (%)	N (%)	N (%)	N (%)		
I use a radio frequency identification system/equipment for tracking un-discharged books.	58(31)	17(9.1)	15(8)	36(19.3)	61(32.6)	3.13	1.68
My library uses sensors like smoke and fire alarm detectors to control hazards in the library.	59(31.6)	28(15)	17(9.1)	29(15.5)	54(28.9)	2.95	1.65
I use wifi for a seamless internet connection.	142(75.9)	23(12.3)	10(5.3)	9(4.8)	3(1.6)	1.44	0.91
I use a smart closed circuit Television for monitoring and controlling deviant	98(52.4)	22(11.8)	15(8)	22(11.8)	30(16)	2.27	1.56

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activities in the library.							
My library uses Web base OPAC (WEBPAC) to ease access and retrieval of information by users.	126(67.4)	22(11.8)	8(4.3)	23(12.3)	8(4.3)	1.75	1.24
I use library applications to orientate and conduct user education.	92(49.2)	25(13.4)	21(11.2)	35(18.7)	14(7.5)	2.22	1.41
I use social media e.g. Facebook, WhatsApp, and X, to market library resources.	95(50.8)	27(14.4)	19(10.2)	29(15.5)	17(9.1)	2.18	1.42
My library uses Cloud computing as a storage facility.	82(43.9)	26(13.9)	17(9.1)	28(15)	34(18.2)	2.50	1.59
My library uses software (KOHA, Alexandria, etc.) to share information resources with other libraries.	101(54)	29(15.5)	12(6.4)	16(8.6)	29(15.5)	2.16	1.52

Table 4 shows how often library staff use IoTs. Of the respondents, 142 (75.0%) confirmed using WiFi for internet access, 126 (66.4%) said they use WebPAC to assist their patrons, 101 (54%) said they use software for resource sharing every day, and 61 (32.6%) said they never use FRID. This indicates that most library staff use the accessible IoTs primarily on a daily basis, as stated in the aforementioned table.

Research question 4: Does the use of the IoTs enhance routines, tasks and services rendered by library personnel? High, Moderate, Low and Poor were used to adjudge the 10 listed items. Table 5 presents the results.

Table 5: IoTs use as it enhances library routines

Items	High	Moderate	Low	Poor	X	St. D
Inter-library loan services	95(50.8)	57(30.5)	19(10.2)	16(8.6)	3.24	.949
Selective Dissemination of Information Service	111(59.4)	56(29.9)	16(8.6)	4(2.1)	3.47	.742
Online Copy Cataloguing Service	122(65.2)	52(27.8)	10(5.3)	3(1.6)	3.57	.672
Monitoring and tracking services	88(47.1)	66(35.3)	23(12.3)	10(5.3)	3.24	.868
Reference interview services	90(48.1)	71(38)	16(8.6)	10(5.3)	3.29	.837
Charging and discharging services	98(52.4)	64(34.2)	18(9.6)	7(3.7)	3.35	.806
Ordering services	83(44.4)	74(39.6)	12(6.4)	18(9.6)	3.19	.929
Online reservation of the book services	87(46.5)	70(37.4)	18(9.6)	12(6.4)	3.24	.874
Current Awareness Services	97(51.9)	73(39)	13(7.0)	4(2.1)	3.41	.715
Orientation and Information services	98(52.4)	74(39.6)	9(4.8)	6(3.2)	3.41	.731
ARITHMETIC MEAN					**33.41**	**8.123**

Table 5 reveals the services the IoTs are used for and how they enhance the routines and tasks of library personnel. The result shows an overall high mean score, indicating a high level of how its use enhances quality routines, tasks and services of library personnel. It is obvious from the above table that IoT utilisation has tremendously improved the services of university libraries to a high extent.

Research Question 5: What is the effort expectancy of IoTs use by library personnel? In order to ascertain this, 10 items in all were listed with 5-point Likert scales. The result is shown below.

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Table 6: Effort expectancy of IoTs use by library personnel

Ease of Use					Mean	S.D
Item	**Agreement**		**Disagreement**			
	N	**%**	**N**	**%**		
My interaction with IoTs technologies is clear and easy to understand.	182	97.3	5	2.6	3.49	.571
Developing my computer abilities to utilise the IoTs at work would be simple for me.	185	98.8	2	1	3.42	.536
I would have no trouble learning how to utilise the IoTs.	183	97.8	4	2.1	3.41	.554
I found IoTs technologies easy to use.	181	96.8	6	3.2	3.42	.594
It would be easy for me to become skillful system explicator.	180	96.3	7	3.7	3.39	.579
Timeliness						
Using the IoTs enables me to conserve time for other activities.	179	95.8	8	4.3	3.40	.625
Speedy information retrieval makes the use of IoTs technologies less time-consuming	177	94.6	10	5.4	3.40	.626
Comprehensiveness						
I find the IoTs less cumbersome	158	94.5	29	15.5	3.13	.828
Perceived Ease of Use						
The implementation of IoTs technology lacks user-friendliness.	97	51.9	90	48.1	2.50	1.104
IoTs technologies require much mental effort.	134	71.6	53	28.4	2.93	.889
ARITHMETIC MEAN					**32.49**	**6.906**

Note: *SA and A were aggregated to be AGREE, SD and D were aggregated to be DISAGREE*

Table 6 above indicates a substantial overall mean score for the effort expectation associated with the usage of IoTs by library workers. The average score of effort expectation markers (ease of use, timeliness, comprehensiveness, and perceived ease of use) was elevated. This suggests that the library staff exerted considerable effort to facilitate the use of the IoT inside the library.

Research Question 6: What performance expectations do library staff have when using IoTs? To achieve this, the same scale used in research question 4 was equally repeated here. However, 11 items were listed in research question 5, hence, the reason for not including it here is to avoid tautology.

Table 7: Performance expectancy of use of IoTs by the library personnel

Relative Advantage					Mean	S.D
Item	**Agreement**		**Disagreement**			
	N	**%**	**N**	**%**		
In my daily service delivery, I think IoTs technologies would be a helpful system or piece of equipment.	184	98.4	3	1.6	3.66	.497
If I use the IoTs I would have more chances to improve my career.	184	98.4	3	1.6	3.60	.543

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Time would be saved by using IoTs technology, allowing me to engage in other daily tasks.	182	97.3	5	2.7	3.57	.548
The IoTs would bring me greater convenience.	183	97.9	4	2.1	3.56	.578
The IoTs increases my productivity.	183	97.9	4	2.1	3.57	.538
Intrinsic and Extrinsic Motivation						
I could do jobs more rapidly if I used the IoTs.	183	97.9	4	2.1	3.54	.561
Using the IoTs would help improve my academic knowledge.	180	96.3	7	3.7	3.48	.571
Using the IoTs would help in improving my personal knowledge.	183	97.9	4	2.1	3.49	.542
Outcome Expectation						
I use the IoT technologies to ease or assist administrative tasks (e.g., tracking and monitoring of users in the library.	172	92	15	8	3.37	.710
I develop a personal online platform through IoT technology to enhance learning *(e.g. online seminars, lectures, etc.)*	174	93.1	13	6.9	3.34	.672
I find IoTs technologies useful in controlling deviant users in the library.	172	92	15	8	3.32	.712
IoTs use enhances the effectiveness of service delivery.	183	97.9	4	2.1	3.49	.562
ARITHMETIC MEAN					**41.99**	**7.034**

Note: *SA and A were aggregated to be AGREE, SD and D were aggregated to be DISAGREE*

Table 7 indicates a significant mean score for library personnel's performance anticipation about the utilisation of IoTs. Also, the mean score for performance expectancy indicators (relative advantage, intrinsic and extrinsic motivation, and outcome expectation) was at a high level. It is summarized that the level at which the library personnel perform regarding IoT was satisfactory.

Research question 7: Challenges facing the use of the IoTs by library personnel? In order to determine this, the same scale used in research question 5 was equally repeated here. However, 9 items were listed in research question 6, hence, the reason for not including it here is to avoid tautology.

Table 8: Challenges facing the use of the IoTs by library personnel

Items	Agreement		Disagreement		X	St. D
	N	%	N	%		
Poor internet connection in the library.	133	71.1	54	28.9	3.02	.992
Lack of computing skills.	114	60.9	73	39.1	2.79	.970
Frequent power outages in the library.	133	71.1	54	28.9	2.99	.981
Exorbitant subscription expenses.	134	71.6	53	28.4	2.91	.906
Accidental loss of data or damage to equipment.	122	65.2	65	34.8	2.85	.921
Insufficient instruction regarding the application of IoT technology.	128	68.4	59	31.6	2.83	.886
Technophobia or fear of the use of technology.	112	59.9	75	40.1	2.72	.956
Insufficient technical support.	140	74.8	47	25.2	2.91	.906
I am not interested in using IoTs technologies.	61	32.7	126	67.3	2.95	1.038
ARITHMETIC MEAN					**25.97**	**8.556**

Note: *SA and A were aggregated to be AGREE, SD and D were aggregated to be DISAGREE*

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Table 8 indicated a significant overall mean score regarding the problems encountered by library workers in using IoTs. Poor internet connections with the highest mean score of 3.02, followed by frequent power outages with a 2.99 mean score, exorbitant subscription expenses, as well as insufficient technical support, had a mean score of 2.91, were some of the highlighted challenges encountered by the library personnel when using IoT in university libraries. Other challenges were equally depicted in the table. There is no denying that there were some snags in the library staff's usage of IoT since the majority of them confirmed that issues included inadequate internet access, an epileptic power supply, a lack of computer skills, and other issues.

DISCUSSION

The study findings revealed a high mean score for the availability of IoTs technologies for communication, identification, and sensing of resources in libraries. These IoTs uses include social media, RFID, smart CCTV, Smart sensors, and software in university libraries. This research supports the results of Alagumalai and Natatrajan (2020), who pointed out that libraries utilise the IoTs to sell their goods and services using social media, library apps, and library websites, as well as to reach their patrons with literacy instruction. The authors reported that 24.56% of respondents use library websites and social media such as Facebook, Linkedln, X and YouTube for marketing their products and services, which was also aligned (Ogedengbe & Quadri, 2020). Makwana (2021) and Cheung et al. (2023) attested that IoT, such as RFID Tags, RFID access control, sensor, and facial recognition technology, were available in modern libraries. Also, reported that 35.96% of respondents used video monitor displays to monitor and track library resources.

Regarding the purpose of IoTs use by library personnel in Southwestern University libraries. It study found that 95.7% of library personnel used the technologies for independent and collaborative browsing of library collection during reference services, Smart devices like phones, tablets, and laptops library personnel to connect with their users and offer any reference services or guide to surf the internet or better still use it to conduct user education. The study also indicated that 86.6% of library personnel used technologies such as library applications to conduct library orientation and user education for new users. The above result agreed with Makwana (2021) and Cheung et al. (2023), who affirmed that IoT, such as RFID Tags, RFID access control, sensors, and facial recognition technology, were used purposely for library routines in modern libraries. This finding corroborated that by Omeluzor, Oyovwe-Tinuoye and Abayomi (2016), who reported that librarians enjoy reference assistance, library tours and promoting services delivery 143(86%) and communication and sending out information to library users 127(76%) from the use of online social networking. The ease of use and benefits librarians enjoy from Facebook and X to deliver reference services contribute immensely to the frequent use of the technologies.

The results from study question three indicated that a significant percentage of the responses 142(75.%) confirmed using Wifi for internet connection, 126(67.4%) using WebPAC to attend to their users, followed by 101(54%) reported using software for resources sharing on daily basis, while 61(32.6) attested that they never use RFID. This result corroborated the findings by Lavanya (2017), who reported IoT (like CCTV camera systems and RFID) among different academic libraries in India and found that CCTV cameras and RFID were the IoT available and were frequently utilized, basically on a daily basis, to monitor the library and other security measures. Similarly, Nath (2021) also attested to the above study by reporting on the electronic security systems (ESS) type of IoT in Indian academic libraries and found that CCTV, ESSs, 3M library gate systems, RFID, movement detectors, and sensors were the available IoT in the library specifically used often.

Regarding the services the IoTs is used for and how it enhances the routines of library personnel. The result shows an overall high mean score, indicating a high level of how its use enhances quality routines, tasks and services of library personnel. This is in tandem with that by Makwana (2021), who echoed that IoT has been deployed in several units of the library for various services such as book rental, inventory, tagging, as well as access control to library management systems (LMS). Asim, Arif, and Rafiq (2022) used an exploratory sequential mixed methods approach with 122 librarians to examine the use of IoT in Pakistani university libraries. Their findings indicated that services such as automated checkout notifications, self-check-in and checkout systems, RFID tags for security, user card

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recognition, and tracking of reading materials were being implemented through IoT, albeit to a limited extent.

The total mean score for effort expectation related to library staff's use of IoTs is high, according to research questions five and six on effort expectancy and performance expectancy of IoT utilisation. Performance expectation indicators (relative advantage, intrinsic and extrinsic motivation, and outcome anticipation) and effort expectancy indicators (ease of use, timeliness, comprehensiveness, and perceived ease of use) had higher average scores. This is in line with a study by Quadri (2019), which examined the impact of ICT proficiency on the exchange of information among 114 librarians at federal university libraries in southwest Nigeria using the UTAUT theoretical framework. The research indicated that librarians' computer technology abilities were positively impacted by effort and performance expectation components. In their research, Subhani, Abdul-Latiff, and Wahab (2023) also verified that there was a substantial correlation between effort expectation and the usage of technological devices by Pakistani SMEs. In their research, Hamzat and Mabawonku (2018) also discovered that performance expectation was a key determinant in Nigerian engineering teachers' utilisation of digital (technology) libraries. Rachmawati et al. (2020) established that effort expectation positively influenced consumers' inclination to use mobile banking for routine activities ($t=3.179$; $p<0.05$). There is a dearth of studies on effort expectancy regarding IoT, those available were technology/computer-related phenomena. Therefore, the researchers delve into technology-related studies to infer the result of the present findings.

The challenges faced in the use of IoT among library personnel revealed poor internet connections, frequent power outages, exorbitant subscription expenses, and insufficient technical support, among others, were the identified challenges to IoT use in the library. The results are consistent with those of Asim, Arif, and Rafiq (2022), who noted a number of obstacles to the adoption of IoT in the libraries that were surveyed. These obstacles included a lack of an intricately built and interdependent setting, inadequate funding, a lack of a functional policy and strategic plan, and a shortage of technical staff. Likewise, Salisu (2024) examined the applications and knowledge of oT in Kwara State using a census methodology to analyse all 85 participants using a questionnaire as the data collection tool. It was reported in the study that lack of technical personnel, cost of computerized security devices and complexity of software were the major challenges encountered by the respondents.

CONCLUSION

The study concluded that IoT technologies like RFID, smart CCTV, and smart sensors, among others, were actually available and purposely used for independent and collaborative browsing, connecting with personal devices to offer reference services. Furthermore, the use of Wifi, webPac to attend to users and software for resource sharing were used on a daily basis. The IoTs has no doubt enhanced services rendered in the library; effort and performance expectancy were found to be high. Poor internet connection, frequent power outages, and insufficient technical support were some of the challenges encountered by the library personnel in using IoT.

Recommendations:

The findings of the research led to the following recommendations:

1. The managerial team of the library should consistently urge staff members to utilise the available IoT for ordinary library tasks. This will make them render quality services geared towards technology to the users.
2. Regular training and re-training of library personnel must be introduced in the case of new technology that may emerge. This training will help them utilise the new technology in the library more easily and efficiently.
3. Funds should be made available to cater for poor connectivity, and irregular power supply and strengthen the technological infrastructure that could improve the use of IoT in the library.
4. Management should consider formulating active policies towards a seamless bureaucracy regarding technology usage so as to improve IoT usage in the library.

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