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TECHNOLOGY CATEGORY

PERCEPTION OF AN EMERGING TECHNOLOGY IN LIBRARIES: THE BLOCKCHAIN TECHNOLOGY IN CIRCULATION MANAGEMENT

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ABSTRACT

Purpose of the study: The research investigated availability and perception of blockchain technology in libraries in South-South, Nigeria.

Problem statement: The security of the resources charged out in the Circulation Division of the library is very paramount. Here comes the blockchain technology which has been vouched for as a platform that promotes the integrity of the Circulation Unit of any library that adopts it. This is because blockchain data cannot be altered without others in the chain knowing about the alteration. The statement of the problem in question form is: what is the state of blockchain technology in terms of availability in university libraries in South-South, Nigeria.

Methodology: The study used a descriptive survey design, with a population of 114 librarians from 8 federal university libraries in South-South, Nigeria. After administering and retrieving questionnaires, 102 were found usable. The data were analyzed using frequency count, mean statistics, and standard deviation on a 4-point Likert scale.

Results of the study: The study reported non availability of blockchain technology in the libraries studied, but the respondents have positive perception of the technology. The challenges to adoption includes: inadequate bandwidth as it concerns internet connectivity, no institutional policy instructing/requiring university libraries to use blockchain technology in service delivery, inadequate power supply and technophobia amongst others.

Conclusion and policy recommendation: The study suggested implementing awareness programs on blockchain and emerging technologies. It recommended that University Library Management should encourage staff to adopt a positive attitude toward emerging technologies. Additionally, it advised the Nigerian Universities Commission (NUC) to establish a policy for adopting and deploying emerging technologies in university libraries.

Keywords: *blockchain technology, blockchain technology perception, University libraries, South-South, Nigeria*

INTRODUCTION

Despite being a relatively young technology, blockchain has an intriguing and lengthy history.

Blockchain technology is a distributed, decentralized ledger that records who owns what

digitally (Sharma & Batth, 2020). Because blockchain data cannot be altered, it is a real value for sectors such as commerce, cybersecurity, healthcare, and libraries through the Circulation division.

According to Daley (2022), the original notion of blockchain was first proposed by Stuart Haber and Wakefield Scott Stornetta in 1991. They proposed the idea of a cryptographically secured chain of records, or blocks. Twenty years later, the technique was well-established and widely used. Blockchain saw a turning point in 2008 when its creator, Satoshi Nakamoto, gave the technology a defined model and purposeful application. In 2009, the first blockchain and cryptocurrency (a digital currency that is anchored on blockchain technology and enables peer-to-peer (P2P) transactions) were formally introduced, marking the beginning of blockchain's influence in the computer industry. Bitcoin, ether, BNB, including USDT are some outstanding examples of well-known cryptocurrencies.

Blockchain technology can significantly enhance library systems by improving metadata management, ensuring the highest level of security for user data, and facilitating resource sharing over the internet (Obim, Ukwueze, & Nwadike, 2023; Hussain, 2018). With the advancements of the Fourth Industrial Revolution (4IR), blockchain has permeated various sectors, including education, and is particularly impactful for libraries, which act as information hubs. Ogunyankinnu (2025) suggests that implementing smart contracts and blockchain technology in Nigerian libraries could offer substantial benefits, such as reducing transaction costs and improving collection development processes by eliminating middlemen and automating book supplier verification. Moreover, real-time data insights and faster payments would enhance inventory management and operational efficiency. By increasing productivity and removing bottlenecks, blockchain could elevate Nigeria’s competitiveness and position its libraries as key global players.

Blockchain expert Tunde Ogunyankinnu (2025) has emphasized how blockchain technology has the ability to completely change Nigerian supply chains - it covers the manufacturing, sourcing, shipping, and delivery of goods and services from raw materials to final customers. The scholar clarified that organizations can automate crucial procedures like order processing, inventory control, and payment approvals by utilizing blockchain-powered smart contracts. Smart contracts are self-executing digital contracts that can automate and enforce obligations on blockchains like Ethereum and BNB Smart Chain. On blockchains like Ethereum and

Binance Coin (BNB) Smart Chain, smart contracts are digital agreements that execute themselves and automate and enforce terms.

According to Abid (2021), blockchain-integrated automated solutions replace manual, paper-based processes using smart contracts, which execute tasks like order processing, inventory control, and payment approvals once predetermined conditions are met. This automation saves time, reduces errors, eliminates intermediaries, and improves efficiency, transparency, and trustworthiness in the library sector, setting the stage for significant growth. By automating procedures and ensuring transparency, smart contracts make library systems more effective and reliable for all involved. Arsdale (2015) envisions a scenario where book suppliers are paid immediately upon confirmation, with the entire process securely documented on the blockchain, preventing disputes and maintaining trust. Blockchain's core feature, transparency, provides real-time, immutable records of transactions, crucial for tracking products in supply chains and enhancing accountability (Ogunyankinnu, 2025). This study explores how blockchain technology is perceived and used for efficient circulation control in university libraries in South-South, Nigeria.

Statement of the Problem

The library is set up to fulfill certain functions and these functions will largely determine the nature of the resources, how they are to be utilize, and above all the security of the resources charged out in the Circulation Division of the library. Here comes the blockchain technology which has been vouched for as a database platform that promotes the integrity of the Circulation Unit of any library that hosts it. This is because blockchain data cannot be altered without others in the chain knowing about the alteration; it is a real value for sectors such as commerce, cybersecurity, healthcare, and libraries through the Circulation division. The statement of the problem put in question form is: what is the perception of librarians regarding blockchain technology platform availability; and its use for circulation control in public university libraries in the South-South, Nigeria.

Research Objective(s)

The main purpose of the study is to examine the availability, perception and utilization of blockchain technology for effective Circulation Division Management in university libraries in the South-South, Nigerian. Specifically, the study sought to:

i. Check up availability of blockchain technology platform for the management of Circulation Division information in university libraries in South-South, Nigerian.
ii. Investigate librarians' perception of blockchain technology in university libraries in South-South, Nigerian.
iii. Identify the perceived drawbacks associated with the deployment of blockchain technology platform for Circulation Division management in university libraries in South-South, Nigerian.
iv. Proffer perceived strategies that would improve the deployment and utilization of blockchain technology for effective Circulation division management in university libraries in South-South, Nigerian.

Research Questions

The following are the research questions:

i. Do you have blockchain technology platform for the management of Circulation Division in university libraries in South-South, Nigerian?
ii. What are librarians' perception of blockchain technology in university libraries in South-South, Nigerian?
iii. What are the perceived drawbacks associated with the deployment of blockchain technology platform for Circulation Division management in university libraries in South-South, Nigerian?
iv. What are the perceived strategies that would improve the deployment and utilization of blockchain technology for effective Circulation division management in university libraries in South-South, Nigerian?

LITERATURE REVIEW

Availability of Blockchain Technology

The library industry is only one of many industries that have not adopted blockchain technology in Nigeria. South-South Nigerian libraries do not appear to have access to this technology, which has the ability to completely transform how libraries function by improving security and expediting procedures. In keeping with the aforementioned assessment, Mojjada (2023) also pointed out that while the development of blockchain technology has had a significant impact on many disciplines, its application in India, especially in libraries, is falling short of expectations. The capacity of blockchain technology to offer a transparent and safe

data management system is among its most important advantages. Blockchain technology can be utilized by libraries to keep and administer their holdings, guaranteeing that the data is impenetrable and readily available to authorized individuals. Furthermore, the lending and borrowing process can be made more efficient with the help of blockchain technology. According to Abid (2021), libraries can cut costs and time related to traditional lending procedures by putting in place a blockchain-based system that does not require middlemen. The development of a decentralized system for intellectual property and copyright management is another possible use of blockchain technology in libraries.

In addition to ensuring that they are in compliance with copyright regulations, this would allow libraries to manage their holdings more effectively. To sum up, the use of blockchain technology in libraries has the potential to revolutionize how they operate, from improving security to expediting procedures. It will be interesting to observe how Nigerian libraries will use this rapidly developing technology to enhance their offerings and better serve their users.

One is tempted to wonder, though, if Nigerian libraries are prepared to adopt blockchain technology given how far they have come in utilizing technology for library services despite the associated difficulties of power, internet connectivity, and staff acceptance of technology, to name a few. When one considers the quantity of libraries that have implemented and are operating institutional repositories and Library Management Software (LMS), this subject becomes relevant (Fasola, Oyadeyi, & Iyoro, 2024). Quoting Adam and Kaur (2019), the authors noted that 23 Nigerian institutions registered their repositories on OpenDOAR (Directory of Open Access Repositories), and the majority of these repositories are either inoperable or operational twenty-four (24) hours a day.

Blockchain is a particularly ground breaking technology because it provides unlimited security, fraud prevention, and transparency. Blockchain technology, made popular by its connections to cryptocurrencies and NFTs, has developed into a management tool for a wide range of international enterprises (Daley, 2022). Blockchain technology is currently revolutionizing gaming, safeguarding healthcare data, bringing transparency to the food supply chain, and generally altering the way we handle ownership and data on a big scale.

Since the circulation section is the first area most library users interact with, it shapes public opinions of the entire university library. As such, it is known as the library's image creator. Aina (2004) asserts that circulation control, which includes, among other things, charging and discharging information resources, renewing borrowed materials, reserving books, sending overdue notices, and registering new users, is an essential function of the library.

According to Arsdale (2015), circulation control includes the following library operations: greeting new patrons, charging and unloading books, sending out overdue notices, reserving books, getting ready for book repairs, inventorying books in circulation—with a focus on those on open shelves—and making loans or reservations. Since they serve as the initial point of contact for patrons who are visiting the university library for the first time, these services are essential and important in libraries. Every library operation revolves around the circulation of materials, which is essential (Adebowale, et al., 2013).

Blockchain technology offers an efficient and secure solution for circulation management in libraries, overcoming the challenges of manual control and record loss. It operates as a digital database where secure information blocks are connected in a "chain" through complex mathematical puzzles. Daley (2022) highlights that the decentralized nature of blockchain prevents any single entity from manipulating the system, ensuring an accurate, tamper-proof record of past actions. This makes it an ideal tool for enhancing the security and reliability of library circulation systems.

Perception of Blockchain Technology

Blockchain, also known as distributed ledger technology (DLT), uses a decentralized network and cryptographic hashing to make any digital asset's history transparent and unchangeable. Blockchain technology is described as a collective, immutable record that facilitates the process of documenting transactions and tracking resources in a corporate network (International Corporate Machine (IBM), 2022). According to Hussain (2020), distributed ledger technology (DLT), which records transactions with an unchangeable cryptographic signature called a hash, is the foundation for blockchain technology. Also, Zayyad (2022) and Asaf, Rehman and Kim (2020) defined blockchain as a collection or sequence of transaction records organized into blocks that represent a portion of a register or ledger that is shared among peers who rely on it as a safe and dependable source of information for determining the legitimacy of the records or ledger.

The reason the system is named blockchain is that every block in the ledger is linked to the one that comes after it, creating a chain of linked blocks that contain relevant records. Blockchain technology can be utilized in a library setting to store information on registered customers, unchangeable records of books on the open shelves, and reservations or loans that can be quickly shared with other library departments for efficient service delivery. According to Abid (2021), blockchain technology can address a variety of library-related issues because

it is best suited for distributed, temperature-resistant information storage. The author went on to say that without many technological obstacles, blockchain can be used in library settings to collect, store, and distribute reliable information. This suggests that blockchain technology, when applied properly, can enable safe transactions in the University libraries' circulation area. Blockchain technology can be used by university libraries to speed up, secure, and streamline the laborious and stringent operations in the circulation department, enabling more effective circulation management.

Blockchain technology is expanding and changing quickly, according to Carrie (2019). Librarians, particularly those working in university libraries that serve a large number of patrons, need to be aware of the advantages and disadvantages of using blockchain technology in libraries. The author went on to say that blockchain technology will be useful for the distribution, preservation, and archiving of information in libraries. According to Abid's (2021) theory, blockchain technology has the potential to safeguard user records and enhance user biodata privacy. The cooperation between library patrons and librarians can be exponentially improved using blockchain technology. In order to accomplish efficient circulation management, every university library must incorporate and make use of blockchain technology to carry out the laborious tasks in the circulation department.

Blockchain technology offers numerous advantages for library circulation control, including improved security, transparency, and faster transaction processing. However, there is limited empirical research on its application in university libraries, particularly in South-South, Nigeria. Studies by Abid (2021), Ahram et al. (2017), Mondal (2021), and Lemieux (2016) emphasize the potential of blockchain to enhance security, cost savings, and information integrity in library services. Despite these benefits, adoption in libraries remains underexplored.

Perceived Challenges to Blockchain Technology Use in Libraries

A few obstacles that hinder the use of blockchain technology in university libraries, particularly for circulation control, appear to be librarians' lack of knowledge of the technology, their lack of proficiency in its application, their lack of access to adequate technology for using blockchain technology in libraries, and their poor internet connectivity, among other issues (Chukwusa, 2020; Chukwusa, 2017; Chukwusa, 2020). According to Obim, Ukwueze and Nwadike (2023), staying current with emerging technologies in libraries is difficult because of

a number of issues, including staff members' lack of training in these areas, insufficient funding, inadequate technology, and librarians' reluctance to adopt these tools.

The administration of university libraries should raise staff awareness of blockchain technology through training and retraining, provide adequate technological infrastructures, adequate funding, and hire technologically skilled individuals (Onohwakpor, 2014), among other measures, in order to improve the use of blockchain technology in university libraries, particularly for circulation control. According to Abid (2021) and Zhang (2019), libraries should take into account the staff members' technical expertise, the available technology, funding for the purchase of standard infrastructures, and proactive personnel. According to Frederick (2019) and Obim, Ukwueze and Nwadike (2023), integrating any new technology in libraries or any other institution or organization demands a sizable budget, underscoring the importance of proper funding in boosting the adoption of emerging technologies in libraries.

Blockchain technology, while widely discussed, faces challenges in adoption, particularly in Nigerian libraries, despite its potential to enhance security and track library records. Ogunyankinnu (2025) and Chukwusa and Onohwakpor (2024) highlight the need for stronger data protection regulations, a clear legal framework, and improved digital skills to address these barriers. Smart contracts, a key feature of blockchain, are increasingly being explored to improve library operations.

Strategies/Considerations for adoption

Abid (2021), citing Carrie (2019), highlighted several strategies for integrating blockchain technology into libraries, starting with the importance of assembling a competent project management team, including programmers and creative professionals. Adequate financial resources are essential for the successful implementation of blockchain projects. Libraries must ensure they have sufficient funding to make blockchain solutions practical and cost-effective for data alignment. Additionally, librarians must address potential issues before implementing blockchain technology, focusing on internal staff training and using decentralized methods to protect sensitive information.

Research is ongoing to integrate blockchain technology into library processes with a focus on operational efficacy and efficiency. Bai, Sarkis, and Xue (2024) noted that operational excellence involves optimizing factors like cost, quality, time, and adaptability. Blockchain technology can enhance operational efficiency by improving data sharing, optimizing smart contracts, lowering operating expenses, and boosting security and collaborative efficiency.

Furthermore, blockchain can address operational challenges such as risk management, regulatory oversight, and miscommunication with internal and external partners, extending its benefits to sustainability and social aspects.

Ostern, Holotiuk, and Moormann (2021), citing Lacity (2018), emphasized that businesses should not rush the implementation of blockchain technology without proper planning. To promote better solutions, enterprises should collaborate in consortia to create applications, establish technical standards, and advocate for clearer compliance requirements. Wang et al. (2019) pointed out that most technology adoption research focuses on the implementation stage, overlooking the crucial pre-adoption phase, which involves raising awareness, evaluating disruptive impacts, conducting preliminary research, and creating prototypes. Skipping this phase risks neglecting important strategic decisions and their long-term consequences.

EMPIRICAL REVIEW

There is a dearth of empirical research on the application of blockchain technology for university library services, particularly for circulation management, as this study has already noted. However, organizations that have same supply chain principles were empirically reviewed.

Fasola, Oyadeyi and Iyoro (2024) studied librarians' knowledge, acceptance, and preparedness to use blockchain technology in Nigerian university libraries to provide library services. The study design that was employed was the survey. The questionnaire serves as the data collection tool. The results showed that blockchain technology was known among librarians. Additionally, the vast majority of librarians agreed with and were open to using blockchain technology to provide services. With correlation coefficients of 0.515 and 0.794, respectively, the study demonstrates a significant association between librarians' awareness and acceptance of blockchain technology and their preparedness to adopt it ($r = 0.515$; $r = 0.794$). Additionally, the regression analysis showed that librarians' preparedness to employ blockchain technology is significantly impacted by both their awareness and acceptance of the technology.

In addition to the advantages that certain early-adopter companies are reaping from blockchain, the technology is becoming more widely known at an accelerated rate. According to data from an APQC (2020) survey of supply chain specialists conducted, 66% of firms in 2019 knew anything about blockchain, a percentage that increased to 80% in just one year. Nevertheless, most organizations were still in the early adoption phases. Why did just 12% of respondents

say they were using blockchain technology or blockchain as a service? Why weren't the 34% of respondents ever considering using blockchain technology? According to the APQC survey, lack of acceptance, skills gaps, user trust, financial resources, and blockchain interoperability were the top five blockchain obstacles that enterprises encountered. Even if more recent Gartner study from 2023 showed that many blockchain-related issues still need to be resolved, it also mentioned two additional recurring themes: the lack of legislative certainty and the speed at which blockchain solutions are brought to market. An APQC survey conducted in 2020, supply chain professionals identified the largest obstacle to blockchain deployment as the absence of adoption by other businesses. Some of the difficulties mentioned by Brown and Melchionna (2023) are inadequate adoption, the skills disparity, user trust and others.

Abad-Segura, et al, (2021) researched blockchain technology for secure accounting management: Research trends analysis. This study aims to investigate current and emerging research lines on blockchain technology for secure accounting management. The growth of articles published between 2016 and 2020 was analyzed using statistical techniques applied to a sample of 1130 records from the Scopus database. The study found that the main reasons for the use of blockchain in accounting are that it lowers risks and the possibility of fraud, enhance efficiency, and obliterate human error, and increases transparency and reliability. As a result, various institutions go for it as a recording and management tool. This study offers the past and future topical angles on this emerging technology; an instrument for decision-making by academics, researchers, and directors of research investment programmes. The seven primary lines of work were identified: blockchain, network security, information management, digital storage, edge computing, commerce, and the Internet of Things.

Obim, Ukwueze and Nwadike (2023) investigated the use of blockchain technology for efficient circulation control in Southeast Nigerian university libraries. The research design used in the study was a descriptive survey. 472 librarians from ten federal and state-owned universities in South-East Nigeria made up the study's population. The complete population of librarians in the research area was examined using the total enumeration technique. The librarians' opinions were gathered via an online structured questionnaire. The frequency count, mean, and standard deviation were used to examine the data. Among other things, the results showed that none of the university libraries in Southeast Nigeria that were examined had a blockchain technology platform. Nonetheless, it was decided that using blockchain technology would help university libraries manage circulation more effectively. The main obstacles to using blockchain technology in university libraries were ignorance, technophobia, a lack of

technical equipment, and a lack of skills and competence. Among other things, the report suggested that university administration set up internal training programs for librarians on blockchain technology. Additionally, sufficient technology should be purchased, and university libraries should have a work atmosphere that is comfortable for librarians.

RESEARCH METHODOLOGY

The design for the study was descriptive survey. The population includes 114 librarians in all the 8 federal university libraries in South-South, Nigeria. Federal universities in the study area were chosen because most of them have come of age and it is expected that they can withstand the financial implication of deployment of blockchain technology in their libraries. The questionnaire was the instrument for data collection; and after administration and retrieval, further subjected to statistical analysis using frequency count and Mean statistics. The total population (114 professional librarians) was used, but after questionnaire administration and retrieval 102 of the questionnaire (sample size) were found useable. Data collection was done using questionnaire that was structured on a 4-point Likert scale. The data retrieved were analyzed by means of frequency count, statistical mean and standard deviation.

RESULTS AND DISCUSSIONS

Table 1 presents the findings on the availability of blockchain technology in the university libraries studied. The data reveals that none of the libraries have adopted blockchain technology, with all 102 respondents indicating that the technology is not available in their institutions. Despite awareness of blockchain, the technology has yet to be implemented for service delivery. This result highlights a significant gap in the adoption of blockchain technology within these libraries, despite its potential to enhance library operations, particularly in terms of security and efficiency.

Table 1: Availability of blockchain technology in the university libraries studied

Variable	**Options**	
	Available	**Not Available**
Availability of blockchain technology	0	102
Total	**0**	**102 (100%)**

Table 1 revealed that on availability of blockchain technology platforms in the university libraries studied; the response rate was negative (102 respondents) representing 100%. The

university libraries are yet to adopt the technology. The study concluded that blockchain technology platforms are not available in the university libraries studied; they are aware of it but yet to be adopted for service delivery.

On availability of blockchain technology in the university libraries studied, the study reported negative response; they are aware of it but yet to be adopted for service delivery. This finding agrees with Mojjada (2023). The library industry is only one of many industries that have not adopted blockchain technology in Nigeria. South-South Nigerian libraries do not appear to have access to this technology, which has the ability to completely transform how libraries function by improving security and expediting procedures. In keeping with the aforementioned assessment, Mojjada (2023) also pointed out that while the development of blockchain technology has had a significant impact on many disciplines, its application in India, especially in libraries, is falling short of expectations. An APQC survey conducted in 2020, supply chain professionals identified the largest obstacle to blockchain deployment as the absence of adoption by other businesses. Some of the difficulties mentioned by Brown and Melchionna (2023) were inadequate adoption, the skills disparity, user trust and others.

Table 2: Mean Response on Perception of Blockchain Technology by Librarians

S/N	Item Statement	SA	A	D	SD	Mean Scores	Standard Deviation
1.	Information resources on loan can be monitored using blockchain technology.	12	87	5	-	3.04	0.40
2.	Blockchain technology can be used for book reservation service in the library.	34	58	-	-	3.04	0.48
3	It can equally be utilized for tracking information materials in the open circulation shelves	15	71	10	6	2.68	0.69
4.	Records of registered patrons can be monitored with blockchain technology.	31	71	-	-	3.30	0.46
5.	The technology can deployed for monitoring information materials that are overdue.	9	89	4	-	3.05	0.37
6.	The technology can be deployed for partnership between cooperating libraries in terms of inter-library loan	27	75	-	-	3.26	0.44
7.	Blockchain technology can be deployed for charging and discharging of information resources in the library	23	69	-	-	2.93	0.43
8.	The technology can be used to keep records of daily transactions statistics in the circulation section of the university library	31	69	2	-	2.94	0.49
9	With blockchain technology the security of information resources is guaranteed.	14	88	-	-	3.14	0.34
	Grand Mean					**3.04**	

Adapted from Obim, Ukwueze & Nwadike (2023)

Results on Table 2 shows that the librarians studied have favourable perception of blockchain technology. This is because the mean score values ranged from 2.68-3.30 which is above the cutoff mean score (2.50). The first 3 in the listed items are 'Records of registered patrons can be monitored with blockchain technology (3.30)', followed by 'The technology can be deployed for partnership between cooperating libraries in terms of inter-library loan (3.26)' and 'With blockchain technology the security of information resources is guaranteed (3.14)'.

The study concluded that the librarians studied have positive perception of blockchain technology.

Empirical literature on perception of librarians on blockchain technology seem scarce, but Abid (2021) noted positively and in corroboration with this study finding that the technology has the potential to safeguard user records and enhance user biodata privacy. The cooperation between library patrons and librarians can be exponentially improved using blockchain technology. In order to accomplish efficient circulation management, every university library must incorporate and make use of blockchain technology to carry out the laborious tasks in the circulation department. Also, an examination of research trends on blockchain technology for safe accounting management was carried out by Abad-Segura et al. in 2021. Network security, information management [library], and digital storage were among the main areas of focus that their investigation found. According to the data, blockchain is being positively seen as a tool for improving the security and effectiveness of accounting systems in a variety of industries.

Table 3: Mean Response of Librarians on Perceived Challenges for the Utilization of Blockchain Technology for Circulation Management in University Libraries in South-South, Nigeria

S/N	Item Statement	SA	A	D	SD	Mean Scores	Standard Deviation
1.	No institutional policy instructing/ requiring university libraries to use blockchain technology in service delivery	56	43	3	-	3.52	0.59
2.	Technophobia	67	24	3	9	3.51	0.91
3.	Inadequate power	74	15	5	8	3.52	0.90
4.	Inadequate bandwidth as it concerns internet connectivity.	89	7	6	-	3.81	0.52
5.	Inadequate technological facilities for utilizing blockchain technology in university libraries.	58	22	14	22	3.41	1.17
6.	Shortage of skilled manpower and competence for using the technology amongst librarians.	62	24	16	0	3.45	0.75
7.	Most librarians' inadequate awareness of the use of blockchain technology in services delivery.	33	45	15	9	3.00	0.91
	Grand Mean					**3.46**	

Adapted from Obim, Ukwueze & Nwadike (2023)

Table 3 revealed that librarians agreed all listed challenges for adopting blockchain technology in university library circulation management were likely. The top challenges, based on mean scores, included inadequate internet bandwidth (3.81), lack of institutional policy requiring blockchain use (3.52), inadequate power supply (3.52), and technophobia (3.51). The challenge with the lowest mean, but still above the cutoff score, was the inadequate awareness among librarians regarding blockchain technology (3.00). This aligns with Ogunyankinnu (2025), who noted that while blockchain technology holds promise for Nigerian libraries, adoption faces significant barriers, including inadequate legal frameworks, data protection regulations, and a lack of digital skills among stakeholders.

The findings also support Obim, Ukwueze, and Nwadike (2023), who highlighted the challenges libraries face in staying current with emerging technologies, including insufficient staff training, limited funding, and resistance to adopting new tools. Rijanto (2024) similarly explored how blockchain could overcome challenges in supply chain finance, addressing issues like accountability and verification through automation and smart contracts. However, Rijanto also stressed the importance of considering integration, technology education, and implementation costs. The study suggested that a comprehensive strategy that accounts for both the benefits and challenges is crucial for successful blockchain adoption in various sectors, including libraries.

Table 4: Mean Response on the perceived strategies to enhance the adoption/utilization of blockchain technology for effective circulation control in university libraries in Southeast, Nigeria

S/N	Item Statement	SA	A	D	SD	Mean Scores	Standard Deviation
1.	Adequate technological facilities should be acquired and installed	54	28	8	12	3.12	1.02
2.	Provision of adequate and constant internet connectivity	32	56	14	-	3.18	0.86
3.	University management should organize in-house training for librarians in the use of blockchain technology.	29	45	5	23	2.78	1.09
4.	Awareness programmes should be instituted as it concerns blockchain and other emerging technologies.	42	46	6	8	3.20	0.86

S/N	Item Statement	SA	A	D	SD	Mean Scores	Standard Deviation
5.	Provision of constant electric power supply.	12	90	-	-	3.18	0.32
6.	University library management should encourage their staff to cultivate positive attitude towards utilizing emerging technologies	9	66	20	7	2.75	0.71
7.	Provision of institutional policy mandating Library Management to adopt and utilize emerging technologies for effective service delivery.	23	54	25	-	2.98	0.69
	Grand Mean					**3.03**	

Adapted from Obim, Ukwueze & Nwadike (2023)

Table 4 revealed that all the proposed strategies to overcome blockchain technology adoption challenges were accepted by the respondents, with a grand mean of 3.03, above the cutoff point of 2.50. The highest-rated strategy was the implementation of awareness programs regarding blockchain and emerging technologies (mean score of 3.20), while the least-rated, but still accepted, strategy was encouraging library staff to cultivate a positive attitude towards using emerging technologies (mean score of 2.75). The responses indicate strong support for initiatives aimed at addressing the barriers to blockchain adoption in university libraries.

This aligns with Ostern, Holotiuk, and Moormann (2021), who emphasized the importance of proactive measures in technology adoption, such as forming consortia, creating technical standards, and ensuring clear regulatory compliance. They warned against rushing into implementation without considering the necessary pre-adoption steps, such as raising awareness, assessing disruptive impacts, and developing prototypes. Wang et al. (2019) similarly noted that technology adoption research often overlooks the critical pre-adoption phase, focusing instead on implementation processes, thereby neglecting strategic planning and preparatory actions that are essential for successful technology integration.

CONCLUSION

The study found that blockchain technology is not yet adopted in the university libraries studied, though librarians are aware of its existence and perceive it positively. Challenges to adoption include inadequate internet bandwidth, lack of institutional policies, power issues, technophobia, and insufficient awareness. The study emphasized the need for awareness programs on blockchain and other emerging technologies. It also recommended that university library management encourage staff to develop a positive attitude toward adopting these

technologies. These measures are crucial for overcoming barriers to blockchain adoption in library service delivery.

RECOMMENDATIONS

The study recommends that the Nigerian Universities Commission (NUC) issue a policy statement on the adoption and deployment of blockchain technology in university libraries, recognizing the evolving role of these institutions. It further suggests that awareness programs on blockchain and other emerging technologies should be actively pursued to enhance understanding and readiness. Additionally, university library management should foster a positive attitude among staff and invest in skill development to ensure effective utilization of these technologies once adopted. These steps are crucial for facilitating the successful integration of blockchain technology in Nigerian university libraries.

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