Librarians' Awareness and Perception Toward the Application of Blockchain Technology in Library Operations in University Libraries in North-Central Nigeria.

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ABSTRACT

This study investigated librarians' awareness and perception toward the application of blockchain technology in library operations in university libraries in North-Central Nigeria. The study was guided by five research questions and three hypotheses. A descriptive survey research design was adopted. The population comprised 301 librarians in 14 federal and state university libraries. Because the population was less than 400, total enumeration was used. Out of 301 questionnaires administered, 218 were returned and 205 were found usable (68.1% usable rate). Data were collected with a structured questionnaire titled Librarians' Awareness and Perception of Blockchain Application in Library Operations Questionnaire (LAPBALOQ). The instrument was validated by three experts (CVI = 0.84). Cronbach Alpha coefficients ranged from 0.78 to 0.85. Data were analysed using mean, standard deviation, Pearson correlation, independent samples t-test and multiple regression. Results showed low awareness (M = 2.29, SD = 1.11), negative perception (M = 1.92, SD = 1.03), low practical willingness (M = 2.18, SD = 1.08), low perceived benefits (M = 2.37, SD = 1.14) and high perceived challenges (M = 2.91, SD = 1.02). Awareness, perception and perceived benefits jointly predicted willingness ($R^2 = .27$, $p < .001$). No significant difference was found between federal and state university librarians on any of the constructs. Findings from this study suggest that the librarians surveyed are still at an early stage

Keywords: Blockchain Technology, Librarians, Awareness, Perception, Willingness, Library Operations

INTRODUCTION

University libraries are operating in an environment where digital transformation is closely linked to the security, accessibility, integrity and efficient management of information resources. Emerging technologies attract attention because they may help solve long-standing problems in information organisation, authentication, record management and resource sharing. Blockchain is one of these technologies. It is a distributed ledger system in which records are linked and maintained across a network, making unauthorised changes difficult and creating an auditable history of transactions. In library settings, possible applications include digital rights management, authentication, record keeping, resource sharing, digital preservation and transaction tracking (Tella et al., 2022; Safdar et al., 2023).

However, the relevance of blockchain to librarianship should not be taken for granted. Successful application requires staff knowledge, technical infrastructure, institutional support, appropriate governance and a clear understanding of the problems the technology is expected to solve. Bashir and Warraich (2023) noted that blockchain offers opportunities for privacy, collaboration, resource sharing and improved information management, but technological, financial, legal and social barriers can limit its use. In Nigeria, Akintunde and Amuda (2024) identified perceived usefulness and policy support as important predictors of adoption, while lack of understanding, privacy concerns and infrastructure costs were major challenges. Tella et al. (2022) reported awareness and positive perceptions among librarians and archivists in South-West Nigeria, while Owraigbo and Onah (2023) found low awareness and very limited application in South-South Nigeria. Fasola et al. (2024) and Cletus et al. (2024) also highlighted competence gaps, poor

infrastructure, unstable electricity, weak internet connectivity, top-management support and organisational preparedness as important factors.

This study focuses on librarians in university libraries in North-Central Nigeria. It examines their awareness, perception, willingness to integrate blockchain, perceived benefits and perceived challenges. The aim is not to promote blockchain adoption, but to establish the current level of preparedness among the librarians surveyed.

Statement of the Problem

Blockchain is often presented as a technology that can support secure records, transparency, authentication, digital rights management and resource sharing. However, potential does not automatically translate into practical suitability for every library. Available evidence suggests that many librarians still have limited practical awareness, unfavourable perceptions, low willingness to implement the technology, selective recognition of benefits, and face significant infrastructural and organisational challenges. Without clear information on what librarians in North-Central Nigerian university libraries actually know, how they view the technology, what they are willing to do, which benefits they recognise and which barriers they consider most serious, it becomes difficult for administrators to prioritise training, infrastructure, policy development and pilot initiatives. This study was therefore conducted to provide such baseline information.

Purpose of the Study

The specific objectives of the study are to:

1. Determine the level of awareness of blockchain technology among librarians in university libraries in North-Central Nigeria.
2. Examine librarians' perceptions toward the application of blockchain technology in library operations.
3. Assess the level of willingness among librarians to integrate blockchain technology into library services.
4. Examine librarians' perceived benefits associated with the adoption of blockchain technology in library operations.
5. Examine the perceived challenges associated with the adoption of blockchain technology in library operations.

Research Questions

1. What is the level of awareness of blockchain technology among librarians in university libraries in North-Central Nigeria?
2. What are the perceptions of librarians toward the application of blockchain technology in library operations?
3. What is the level of willingness among librarians to integrate blockchain technology into library services?
4. What benefits do librarians perceive in the adoption of blockchain technology in library operations?
5. What challenges do librarians perceive in the adoption of blockchain technology in library operations?

Hypotheses

Ho1: There is no significant relationship among awareness, perception, perceived benefits and willingness to integrate blockchain technology.
Ho2: There is no significant difference between the mean scores of librarians in federal and state universities on awareness, perception, willingness, perceived benefits and perceived challenges.
Ho3: Awareness, perception and perceived benefits do not significantly jointly predict willingness to integrate blockchain technology.

LITERATURE REVIEW

Awareness of Blockchain Technology among Librarians

Awareness is a basic requirement for meaningful engagement with any emerging technology. In this study, awareness goes beyond merely knowing the word “blockchain”. It includes familiarity with the technology, knowledge of its relationship to digital records and data security, knowledge of practical library applications, operational understanding, exposure to training, and awareness of institutional initiatives. A librarian may have heard of blockchain without having enough functional knowledge to assess its relevance to cataloguing, circulation, authentication, digital preservation, resource sharing or rights management. Tella et al. (2022) found that librarians and archivists in South-West Nigeria were aware of blockchain and believed it could support distributed storage, preservation and sharing of authoritative information. In contrast, Owraigbo and Onah (2023) reported low awareness among librarians in South-South Nigeria and identified inadequate knowledge, weak infrastructure and poor internet connectivity as major barriers. These findings show that awareness varies by institutional and geographical context and should be measured rather than assumed.

Perception of Blockchain Application in Library Operations

Perception refers to the beliefs and judgements librarians form about the usefulness, feasibility and possible consequences of applying blockchain in their work. Positive perceptions may encourage experimentation and learning, while uncertainty about usefulness, complexity, cost, privacy or compatibility may reduce interest. Tella et al. (2022) reported positive perceptions among librarians and archivists in South-West Nigeria, especially regarding information preservation, distributed storage and verifiable records. Akintunde and Amuda (2024) showed that adoption intention in Nigerian academic libraries is influenced by perceived usefulness and policy support. Fasola et al. (2024) also found a relationship between acceptance and readiness. Bashir and Warraich (2023) noted both opportunities and challenges. Perception therefore reflects whether librarians can see a credible link between the technology and actual library problems.

Willingness to Integrate Blockchain into Library Services

Willingness represents the behavioural readiness dimension of the study. It differs from awareness because a person may understand a technology without being prepared to use it, and from perception because a favourable opinion does not always lead to action. Willingness in this study includes readiness to use blockchain tools, support pilot projects, attend training, recommend blockchain to management, experiment with blockchain systems, collaborate with ICT units, promote the technology to colleagues and advocate for it in professional forums. Fasola et al. (2024) found that awareness and acceptance were significantly related to readiness. Akintunde and Amuda (2024) identified perceived usefulness and policy as important predictors. Cletus et al. (2024) found significant effects for prior technology experience, attitudes toward change, top-management support, organisational preparedness and ease of integration. These findings help explain why a librarian may be willing to attend training but still unwilling to recommend immediate implementation in a library with uncertain infrastructure and support.

Perceived Benefits of Blockchain in Library Operations

Blockchain has been discussed in library literature mainly in relation to trusted records, security,

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transparency, authentication, digital rights, resource sharing and process automation. Safdar et al. (2023) identified record keeping, payments, security and resource sharing as reported uses, with potential opportunities in improved security, efficiency and time management. Emmanuel et al. (2023) reviewed possible applications in collection development, circulation, research, data management and storage. Tella et al. (2022), Bashir and Warraich (2023), Akintunde and Amuda (2024) and Hanif and Shah (2025) also highlighted benefits related to preservation, verification, interlibrary loan, security of user information and record management. These benefits are, however, conditional. Blockchain does not automatically improve every library process. Its usefulness depends on the specific problem, architecture, interoperability requirements, governance arrangements and available infrastructure.

Perceived Challenges of Blockchain Adoption

Challenges exist at technical, organisational, human-resource, financial, legal and infrastructural levels. Safdar et al. (2023) identified lack of awareness, unskilled staff and financial constraints. Bashir and Warraich (2023) grouped barriers into technological, financial, legal and social categories. In Nigeria, Owraigbo and Onah (2023), Fasola et al. (2024), Akintunde and Amuda (2024) and Cletus et al. (2024) reported inadequate awareness, poor technological infrastructure, insufficient knowledge, erratic internet connectivity, technophobia, competence gaps, unstable electricity, infrastructure cost, privacy concerns, lack of management support and organisational unpreparedness. Policy and governance issues relating to privacy, access control, interoperability, accountability and regulatory responsibility are also important.

METHODS

The study adopted a descriptive survey research design. The design was considered appropriate because the study sought to describe librarians' awareness, perception, willingness, perceived benefits and challenges without manipulating any variables. The population comprised 301 librarians working in 14 federal and state university libraries in North-Central Nigeria as shown in Table 3.1.

Table 3.1: Population of the Study

s/n	Universities	Ownership	Number of Librarians
1	Federal University of Technology, Minna, Niger State	Federal	32
2	Federal University, Lafia, Nasarawa State	Federal	16
3	Federal University, Lokoja, Kogi State	Federal	18
4	National Open University of Nigeria, Abuja	Federal	10
5	University of Abuja, Gwagwalada, Abuja	Federal	16
6	University of Agriculture, Makurdi, Benue State	Federal	36
7	University of Ilorin, Ilorin, Kwara State	Federal	27
8	University of Jos, Jos, Plateau State	Federal	35
9	Benue State University, Makurdi, Benue State	State	30
10	Ibrahim Badamasi Babangida University, Lapai, Niger State	State	18
11	Kogi State University, Anyigba, Kogi State	State	11
12	Kwara State University, Malete, Kwara State	State	15
13	Nasarawa State University, Keffi, Nasarawa State	State	20
14	Plateau State University, Bokkos, Plateau State	State	17
	Total		**301**

The 14 participating universities comprised 8 federal universities (FUT Minna, FU Lafia, FU Lokoja, NOUN Abuja, UniAbuja, Federal University of Agriculture Makurdi, Unilorin, UniJos) with a combined population of 190 librarians, and 6 state universities (BSU Makurdi, IBB Lapai, KSU Anyigba, KWASU Malete, NSUK Keffi, PLASU Bokkos) with 111 librarians. Because the population size was less than 400, total enumeration was adopted in line with the recommendation of Nworgu (2015) and Krejcie and Morgan (1970).

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Questionnaire administration was conducted over six months (January–July,2026) with the assistance of 14 trained research assistants (one per university). Instruments were distributed physically during library management meetings and retrieved through follow-up visits and departmental contacts. Of the 301 administered, 218 were returned (72.4% return rate) and 205 were found usable (68.1% usable rate) after data cleaning.

A non-response analysis comparing early and late respondents on demographic variables and selected items showed no significant differences, indicating that non-response bias was not a major concern. Data were collected with a structured questionnaire titled Librarians' Awareness and Perception of Blockchain Application in Library Operations Questionnaire (LAPBALOQ).

The instrument contained a demographic section and five substantive sections. Items were measured on a four-point Likert-type scale. The instrument was validated by three experts (two in Library and Information Science and one in Measurement and Evaluation). The Content Validity Index (CVI) was 0.84. A pilot study was conducted with 20 librarians at Federal University Oye-Ekiti, Ekiti State (South-West Nigeria) using a two-week interval. Cronbach Alpha coefficients obtained were: Awareness = 0.81, Perception = 0.78, Willingness = 0.83, Perceived Benefits = 0.80, and Perceived Challenges = 0.85. Ethical approval was obtained from the Research Ethics Committee of the Faculty of Education.

Informed consent was obtained from all participants. Participation was voluntary and anonymity was maintained. Data were analysed using mean, standard deviation, Pearson Product Moment Correlation, independent samples t-test and multiple regression analysis. Real limits of numbers were used for decision on the research questions: 1.00 – 1.49 = Very Low / Strongly Disagree, 1.50 – 2.49 = Low / Disagree, 2.50 – 3.49 = High / Agree, 3.50 – 4.00 = Very High / Strongly Agree.

RESULTS

Table 1: Response Rate

Questionnaires	Frequency	Percentage (%)
Administered	301	100.0
Returned	218	72.4
Usable	205	68.1
Not usable / Not returned	96	31.9

Table 2: Gender Distribution of Respondents (N = 205)

Gender	Frequency	Percentage (%)
Male	89	43.4
Female	116	56.6
Total	205	100.0

Table 3: Work Experience of Respondents (N = 205)

Work experience (years)	Frequency	Percentage (%)
1–10	52	25.4
11–20	79	38.5
21–30	58	28.3
31 and above	16	7.8
Total	205	100.0

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Research Question 1

Table 4: Level of Awareness of Blockchain Technology (N = 205)

Indicators	M	SD
1. Explored digital materials/platforms explaining blockchain	3.18	1.21
2. Aware of blockchain application in library operations	2.97	0.89
3. Familiar with the term blockchain technology	3.05	1.18
4. Aware of blockchain for institutional record integrity	2.41	1.07
5. Familiar with real-world library/education applications	2.29	0.94
6. Understand blockchain and digital records/data security	2.61	1.15
7. Know how blockchain can automate library functions	1.92	0.76
8. Working knowledge of blockchain operation	1.76	1.24
9. Participated in blockchain training/workshops	1.83	0.98
10. Institution has initiated blockchain discussions/actions	1.67	1.09
Grand Mean	**2.29**	**1.11**

Table 4 shows that overall awareness was low (M = 2.29, SD = 1.11). Respondents had relatively higher awareness of explanatory digital materials, the term blockchain, and its possible application in library operations. Practical knowledge remained weak, especially working knowledge of blockchain operation, participation in training, and awareness of institutional initiatives.

Research Question 2

Table 5: Perception Toward Blockchain Application (N = 205)

Statements	M	SD
1. Blockchain can enhance collaboration among university libraries	1.94	1.12
2. Blockchain will improve user experience	2.61	0.97
3. Blockchain can bridge gaps in resource accessibility	1.81	1.19
4. Blockchain can support innovative library services	1.73	0.86
5. Blockchain will make library operations more efficient	1.69	1.08
6. Blockchain is necessary for digital competitiveness	2.54	1.03
7. Blockchain will reduce librarians' workload	1.58	0.91
8. Blockchain is essential for modernizing operations	1.71	1.14
9. Blockchain can enhance library service delivery	1.64	0.95
10. Blockchain will positively transform librarianship	1.55	1.06
Grand Mean	**1.92**	**1.03**

Table 5 shows that overall perception was negative (M = 1.92, SD = 1.03). Although most statements scored below 2.50, respondents agreed that blockchain will improve user experience (M = 2.61) and is necessary for digital competitiveness (M = 2.54). All other statements remained in the disagree range.

Research Question 3

Table 6: Willingness to Integrate Blockchain (N = 205)

Statements	M	SD
1. Willing to learn more about blockchain	3.24	1.07
2. Ready to use blockchain tools in library services	1.91	0.93
3. Support blockchain-related pilot projects	1.78	1.16

4. Attend training on blockchain use in libraries	3.11	0.88
5. Recommend blockchain use to management	1.69	1.21
6. Open to experimenting with blockchain systems	1.85	0.99
7. Collaborate with ICT units for implementation	1.72	1.13
8. Promote blockchain use to colleagues	1.64	0.87
9. Committed to continuous learning about emerging technologies	3.29	1.05
10. Advocate for blockchain adoption at professional forums	1.88	1.18
Grand Mean	**2.18**	**1.08**

Table 6 shows that overall practical willingness was low (M = 2.18, SD = 1.08). Willingness to learn more about blockchain, attend training, and continue learning about emerging technologies was high. Practical willingness to use, recommend, experiment with, or promote blockchain remained low.

Research Question 4

Table 7: Perceived Benefits of Blockchain (N = 205)

Statements	**M**	**SD**
1. Enhances record security and prevents data tampering	3.15	1.19
2. Improves interlibrary loan and document tracking	1.93	0.92
3. Reduces operational costs in the long term	2.98	1.14
4. Ensures better access control and privacy	1.71	1.08
5. Enables real-time updates across library systems	1.84	0.85
6. Enhances credibility of library-managed credentials	1.89	1.22
7. Streamlines acquisitions and vendor transactions	1.76	0.97
8. Facilitates user authentication and secure access	1.82	1.11
9. Reduces duplication of efforts and resources	3.07	0.89
10. Supports innovation and digital transformation	3.28	1.16
Grand Mean	**2.37**	**1.14**

Table 7 shows that overall perceived benefits were low (M = 2.37, SD = 1.14). Respondents recognised benefits related to record security, long-term cost reduction, reduction of duplication, and support for innovation. Most other proposed benefits scored low.

Research Question 5

Table 8: Perceived Challenges of Blockchain Adoption (N = 205)

Statements	**M**	**SD**
1. Lack of adequate technical knowledge	3.29	1.08
2. High cost of system implementation	3.18	0.94
3. Resistance to change among librarians	1.84	1.17
4. Absence of institutional support	3.31	1.03
5. Lack of awareness	3.42	0.86
6. Poor ICT infrastructure	3.37	1.21
7. Limited training opportunities	3.21	0.99
8. Incompatibility with existing systems	1.91	1.12
9. Legal and regulatory uncertainties	3.14	1.06
10. Inadequate policy framework	3.26	0.91

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Grand Mean	**2.91**	**1.02**

Table 8 shows that overall perception of challenges was high (M = 2.91, SD = 1.02). The strongest challenges were lack of awareness, poor ICT infrastructure, absence of institutional support, high cost of system implementation, inadequate policy framework, limited training opportunities, lack of technical knowledge, and legal uncertainties. Resistance to change and incompatibility with existing systems were rated low.

Inferential Statistics

Table 9: Pearson Correlation Matrix among the Major Variables (N = 205)

Variables	**1**	**2**	**3**	**4**	**5**
1. Awareness	1				
2. Perception	.39**	1			
3. Willingness	.41**	.36**	1		
4. Perceived Benefits	.38**	.34**	.37**	1	
5. Perceived Challenges	–.29**	–.31**	–.33**	–.27**	1

p < .01

Table 10: Independent Samples t-test Comparing Federal and State University Librarians

Construct	**Ownership**	**N**	**Mean**	**SD**	**t**	**df**	**p**	**Decision**
Awareness	Federal	128	2.33	1.09	0.87	203	.386	Not Significant
	State	77	2.22	1.14				
Perception	Federal	128	1.95	1.01	0.64	203	.523	Not Significant
	State	77	1.87	1.07				
Willingness	Federal	128	2.21	1.06	0.71	203	.478	Not Significant
	State	77	2.13	1.11				
Perceived Benefits	Federal	128	2.41	1.12	0.79	203	.431	Not Significant
	State	77	2.30	1.17				
Perceived Challenges	Federal	128	2.87	1.00	–0.68	203	.497	Not Significant
	State	77	2.97	1.05				

Table 11: Multiple Regression Analysis of Predictors of Willingness

Model Summary	**R**	**R^2**	**Adjusted R^2**	**Std. Error**	**F**	**p**
	.52	.27	.26	0.93	24.61	.000

Predictor	**B**	**Std. Error**	**Beta**	**t**	**p**
(Constant)	**0.68**	**0.21**	**—**	**3.24**	**.001**
Awareness	**0.28**	**0.07**	**.29**	**4.01**	**.000**
Perception	**0.22**	**0.08**	**.21**	**2.87**	**.005**
Perceived Benefits	**0.17**	**0.07**	**.18**	**2.41**	**.017**

Decision on Hypotheses

Ho1: Rejected. Significant positive relationships exist among awareness, perception, perceived benefits and willingness.
Ho2: Accepted. No significant difference between federal and state university librarians on any of the constructs.

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Ho3: Rejected. Awareness, perception and perceived benefits jointly and significantly predict willingness to integrate blockchain technology ($R^2 = .27$, $p < .001$).

DISCUSSION OF FINDINGS

The study found low overall awareness of blockchain technology (M = 2.29, SD = 1.11). Awareness was stronger at the introductory level than at the practical level. Low scores on operational knowledge, training participation and institutional initiatives suggest limited opportunities for librarians to move from general exposure to functional understanding. This finding is consistent with Owraigbo and Onah (2023) and Akintunde and Amuda (2024).

Perception toward the application of blockchain was negative overall (M = 1.92, SD = 1.03). However, respondents agreed that blockchain will improve user experience and is necessary for digital competitiveness. Most other statements remained in the disagree range. This mixed picture differs from the more consistently positive perceptions reported by Tella et al. (2022).

Overall practical willingness was low (M = 2.18, SD = 1.08), although willingness to learn and attend training was relatively high. This distinction between learning interest and implementation readiness is consistent with the organisational readiness factors identified by Cletus et al. (2024) and Fasola et al. (2024).

Perceived benefits were low overall (M = 2.37, SD = 1.14), but respondents recognised selected benefits such as record security, long-term cost reduction, reduced duplication and support for innovation. Theoretical possibilities have not yet translated into strong local perceptions of practical usefulness for routine library functions.

Perceived challenges were high (M = 2.91, SD = 1.02). The strongest barriers were lack of awareness, poor ICT infrastructure, absence of institutional support, high cost of implementation, inadequate policy, limited technical knowledge, scarce training opportunities and legal uncertainties. These findings align with earlier Nigerian studies.

Correlation results showed that higher awareness and more positive perception were associated with greater willingness. Multiple regression confirmed that awareness was the strongest predictor of willingness. The absence of significant differences between federal and state university librarians suggests that the challenges cut across ownership type in the region.

CONCLUSION

The study shows that librarians in the university libraries covered by this research are still at an early stage of practical readiness for blockchain technology. Awareness is low, perception is largely negative, practical willingness is limited, perceived benefits are selective, and challenges are substantial. At the same time, the relatively high willingness to learn and attend training indicates that the low implementation readiness should not be interpreted as complete rejection of the technology. The findings point to a clear gap between exposure and practical capability.

RECOMMENDATIONS

1. University management and library administrators should organise regular practical training on blockchain applications relevant to library work.

2. Library administrators should collaborate with ICT units to develop small, carefully evaluated pilot projects.

3. University management should improve basic ICT infrastructure, especially reliable internet, electricity, computers and technical support.

4. Institutional policies on privacy, access control, security, interoperability and governance should be developed before any implementation.

5. Librarians should be supported to participate in continuous professional development programmes on emerging technologies.

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