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Awareness and Utilization of Blockchain Technology in Managing Students' Records in Federal Universities in Enugu State, Nigeria

ENEOVO John Ifeanyi

Department of Computer and Robotics Education, University of Nigeria, Nsukka. Email: ifeanyi.eneovo@unn.edu.ng, ORCID: 0000-0002-3928-3250

Abstract

The study investigated the awareness and utilization of blockchain technology in managing students' records in federal universities in Enugu state, Nigeria. Four research questions guided the study. The population for the study was 4 respondents from verification record unit, University of Nigeria Nsukka. The study adopted descriptive survey research design. The instrument for data collection was an adapted structured questionnaire. The data collected for the study was analysed using mean and standard deviation. Findings from the study revealed that majority of staff in the records unit have low level of awareness of blockchain technology in managing students' records in federal universities in Enugu state, Nigeria; as well have very low utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria. It was therefore recommended among others that advocacy on the awareness of blockchain technology in managing students' records seminars, and symposium in federal universities in Enugu state, Nigeria.

Keywords: Blockchain Technology; Students Record; Universities; Awareness; Utilization; Service Delivery

Introduction

Over the years, technologies have been evolving to aid educational institutions. As technology continues to evolve, education also evolves in line with technological innovation to meet the demand of the 21st century learners. One of such technological innovations that have emerged to revolutionize today's educational sector blockchain is technology. Blockchain technology is a digital ledger that records and verifies transactions across office computers. It is a secure and transparent way to record transactions and stores data across multiple computers or nodes. According to Elsayed (2023).blockchain technology is a distributed ledger that stores data on multiple computers across a network which makes it very difficult to hack or tamper with the data. That is, it is a distributed ledger that duplicates and

distributes transactions across the network participating of computers in the blockchain. Ravikiran (2023) opined that blockchain technology is a structure that stores transactional records of the public in several databases in a network connected peer-to-peer through nodes. Every transaction in this ledger is authorized by the digital signature of the owner, which authenticates the transaction and safeguards it from tampering. Ravikiran further stated that blockchain technology is a method of recording information that makes it impossible or difficult for the system to be changed, hacked, or manipulated. Bhosale and Jamsandeka (2022) were of the view that blockchain is technology designed to make it a impossible to hack the system or forge the data stored on it, thereby making it secure and immutable.

Blockchain technology is an electronic ledger, decentralized database which contains blocks of information encrypted by algorithms, where every transaction is unaltered and every block identifies secure decoded signature (Ray, 2018). A blockchain is a distributed, immutable, and decentralized ledger at its core that consists of a chain of blocks and each block contains a set of data (Ravikiran, 2023). In this context. blockchain technology is a decentralized and distributed ledger that records transactions and data in a secure and immutable manner. The structure of a blockchain is designed to ensure the security of data through its consensus mechanism which has a network of nodes that agree on the validity of transactions before adding them to the blockchain.

The real purpose of blockchain technology is to address the problems of double records without need of a central server (Anisiuba, 2020). Furthermore, the characteristics of blockchain technology transparency, ensure integrity, and resistance to unauthorized alterations, making it an attractive solution for including finance, numerous sectors, supply chain, healthcare, and, most notably, education. All records in the whole network cannot be tampered and any falsification can be detected easily. It traceability improves the and the transparency of the data stored in the blockchain. Blockchain technology uses cryptography to secure data; and users employ cryptography keys to perform different types of digital interactions over the peer-to-peer network. Cryptography keys consist of private key and public key that help in performing successful transactions between two parties. That is, the public and private keys are used to sign and verify transactions, ensuring that only authorized users can participate. Completed transactions are cryptographically signed, time-stamped and sequentially added to the ledger.

Records cannot be corrupted or otherwise changed unless the participants agree on the need to do so. That is, once a transaction is recorded on the blockchain, it becomes very difficult to alter or delete. Blockchain technology can be categorized into three types: public or permission less blockchain, private or permission blockchain, and consortium blockchain (Zheng, Xie, Dai, Chen and Wang, 2017; and Turkanović, Hölbl, Košič, Heričko, and Kamišalić, 2018). Firstly, public blockchains are open to anyone and are decentralized. Anyone can participate in the network, validate transactions, and create smart contracts. Secondly, private blockchains are restricted to a select group of participants. Access and permissions are controlled, and consensus may be achieved through a more centralized process. Thirdly, consortium blockchains are middle ground between public and private blockchains. They are operated and validated by a group of organizations rather than a single entity. Consortium blockchains are used in situations where multiple organizations need to collaborate, such as in supply chain management. The choice of blockchain type depends on like security requirements, factors scalability, decentralization, and the specific needs of project the or organization. Blockchain technology had gained attention for its widespread cyber security capabilities. It has the potential to revolutionize various industries bv increasing transparency, reducing fraud, and enabling trust in environments where intermediaries were previously required.

Blockchain technology also has the potential to revolutionize the education system by making it more secure, transparent, efficient, and accessible. Blockchain technology is used in the educational sector to securely store and verify digital credentials and transcripts, student identity and record management, blockchain based payments, intellectual data management and smart contracts. According to Machado, Sousa and Rocha (2020), blockchain technology allows the use of verification procedures and reduces fraudulent of academic degrees and transcripts. These digital records can be stored on a blockchain, allowing students and employers to easily and instantly verify the authenticity of an individual's educational background without relying on traditional, timeconsuming verification processes. Academic records stored on a blockchain are tamper-proof and cannot be altered. This ensures the integrity of students' academic achievements, reducing the risk of fraud. Also, blockchain can facilitate the international recognition of degrees qualifications, as records and are accessible globally, and the verification process becomes more standardized and efficient.

Furthermore, blockchain's transparent and immutable nature plays a pivotal role in upholding academic integrity. Blockchain technology can be applied to intellectual property management, for the tracking of first publication and citations, without the need for a central authority to manage these databases. Choudhury and Abraham (2018) pointed out that researchers can establish the authenticity and originality of their work by time stamping research publications and academic achievements blockchain. Additionally, on the blockchain-based solutions can aid in and preventing plagiarism, detecting thereby maintaining the credibility of academic institutions. As blockchain technology continues to evolve, its potential impact on education grows exponentially.

Blockchain can simplify administrative processes in educational institutions by automating tasks like student registration, payment processing, and course enrollment. Elsayed (2023) is of the view that blockchain could be used to automate many of the tasks that are currently performed manually in education, such as tracking student progress and managing educational records. The automation of administrative processes through smart contracts can lead to significant cost educational institutions. savings for Atienza-Mendez and Bayyou (2019) also pointed out that blockchain technology improves traceability, increased efficiency, reduced costs and improves processing speed. The efficiency gains in processes like fee payments and grade management result in cost reductions and faster turnaround times. By reducing manual labour and paperwork, institutions can optimize resource allocation and redirect personnel to more value-added tasks. Therefore, the exploration of blockchain in education holds great promise for revolutionizing the way individuals learn, and validate knowledge teach. and competencies.

Statement of the Problem

Blockchain technology is one of the most promising technologies in this era because every economy must keep pace with modern technology. This modern technology is highly needed in the universities for transparency, securing of vital information, certificate verification, strengthening tutorial services registration, payment methods and online accreditations. Unfortunately, one of the key issues confronting the Nigerian educational institutions today is data security issues. The problem of certificate forgery in Nigeria is worsening and is likely to persist unless a reliable system for verifying certificates is put in place. Currently, certificate verification in Nigeria heavily depends on paper-based databases and documentation, making the process cumbersome, time-consuming, and expensive in terms of administration. Scandals involving fake credentials by public figures submitted during screening processes have gone undetected, highlighting the inefficiency and lack of

trustworthiness of manual verification methods. As a result, educational institutions suffer damage to their reputations as they are implicated in these fraudulent activities.

certificate As forgery continues to proliferate. adopting certificate a verification system that is effective, efficient, trustworthy, and user-friendly for both institutions and employers is a reasonable course of action. Blockchain technology is highly needed in education sector to eradicate forgery at all levels. That is why the researcher believed that if adopted into the Nigerian education sector, blockchain technology will revolutionize education system. Hence, this study attempts to fill this gap by conducting a comprehensive investigation on the awareness and utilization of blockchain technology in managing students' records in federal universities in Enugu state, Nigeria.

Purpose of the Study

The main purpose of this study is to investigate the awareness and utilization of blockchain technology in managing students' records in federal universities in Enugu state, Nigeria. Specifically, the study sought to:

- 1. Find out the awareness level of blockchain technology in managing students' records in federal universities in Enugu state, Nigeria.
- 2. Determine the extent of utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria.
- 3. Ascertain the challenges affecting the awareness and utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria.
- 4. Determine the strategies to ameliorate the awareness and utilization of blockchain

technology for effective service delivery in federal universities in Enugu state, Nigeria.

Research Questions

- The following research questions were formulated in line with the specific purposes to guide the research study:
- 1. What is the awareness level of blockchain technology in managing students' records in federal universities in Enugu state, Nigeria?
- 2. What is the extent of utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria?
- 3. What are the challenges affecting the awareness and utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria?
- 4. What are the strategies to ameliorate the awareness and utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria?

Methodology

The study adopted descriptive survey research design. The study was carried out in records units of federal universities in Enugu state, Nigeria during the 2022/2023 academic session. The population for the study was 4 respondents from records verification unit of University of Nigeria Nsukka. There was total population sampling due to the fact that the targeted group was small and of manageable size by the researcher. The instrument for data collection was an adapted structured questionnaire from Owraigbo and Onah, (2023) re-titled "Blockchain Technology in Managing Students' Records Ouestionnaire (BTMSRQ)", by the researcher. The instruments were modified to suit the specific purposes of this study.

BTMSRQ is а 33-item structured questionnaire. Research question one has a 4-point rating scale (Very High Level, VHL = 4; High Level, HL = 3; Low Level, LL = 2; and Very Low Level, VLL = 1); research question two has a 4-point rating scale (Very High Extent, VHE = 4; High Extent, HE = 3; Low Extent, LE = 2; and Very Low Extent, VLE = 1; research question three and four have a 4-point rating scale (Strongly Agree, SA = 4; Agree, A = 3; Disagree, D = 2; and Strongly Disagree, SD = 1) respectively. BTMSRQ was subjected to face and content validity by three experts from the Department of Computer and Robotics Education, University of Nigeria, Nsukka. The experts were requested to review the suitability, conformity, content. and language of the instrument for data collection. Observations and suggestions made by the experts were used to improve the quality of the instruments.

The reliability of the instrument was established using Cronbach Alpha reliability method. A total of 2 respondents from Enugu State University of Science and Technology record verification unit, which is not part of sample for the study, though shared similar characteristics and common abilities with those involved in the study, was used for the trial testing. The data collected was analyzed for internal consistency yielded a reliability index of 0.93 which indicated high very The reliability. instrument was administered by the researcher through personal contacts; and the consent of the respondents was voluntarily given. The data collected for the study were analysed using mean to answer each of the research questions, and standard deviation to determine the closeness or otherwise of the opinions of the respondents from group mean. Any item with a mean value of 2.50 and above was high level for research question one, high extent for research question two, and agreed for research question three and four respectively; while items with mean values less than 2.50 were low level for research question one, low extent for research question two, and disagreed for research question three and four respectively for the item questionnaire.

Results

Research Question 1: What is the awareness level of blockchain technology in managing students' records in federal universities in Enugu state, Nigeria?

S/N	Items	Ń	~	SD	Decision
1	Blockchain technology can be used to keep records of students various	4	1 25	0.50	Low
	degrees awarded in a university		1.23	0.50	Level
2	Blockchain technology can be used to track students transcripts and	4	2.00	0.82	Low
	certificates		2.00		Level
3	Blockchain technology can be used to verify students transcripts and	4	1 75	0.50	Low
	certificates		1.75		Level
4	Blockchain technology can be used to keep tracks of the entire holding	4	1.50	0.58	Low
	of the university			0.58	Level
5	Blockchain technology can serve as an archive of the university	4	2 25	0.50	Low
			2.23	0.50	Level
6	Blockchain technology can be used to share information among different	4	1 75	1 50	Low
	sections of the university		1.75	1.50	Level
7	Blockchain technology can be used to track students' progress reports	4	1 50	1.00	Low
			1.50	1.00	Level
8	Blockchain technology can be used to keep records of registered students	4	2.00	1 / 1	Low
	in an academic session		2.00	1.41	Level
	Cluster Details	4	4 1 75	0.85	Low
			1.75	0.05	Level

Table 1: Mean and standard deviation on awareness level of blockchain technology inmanaging students' records in federal universities in Enugu state, Nigeria.

Key: N = Number of Respondents, = Mean, SD = Standard Deviation; Source: Researcher's field work, 2023

Table 1 shows that all the items have mean scores below 2.50. The respondents accepted all the items as low awareness level of blockchain technology managing students' records in federal universities in Enugu state, Nigeria. The standard deviation of all the items ranged from 0.50-1. 50 showed that the respondents were close in their responses to the items. The cluster mean of 1.75 is an

indication that the respondents agree that all the items were low awareness level of blockchain technology in managing students' records in federal universities in Enugu state, Nigeria.

Research Question 2: what is the extent of utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria?

 Table 2: Mean and standard deviation on the extent of utilization of blockchain

 technology for effective service delivery in federal universities in Enugu state, Nigeria.

S/N	Items	Ν	0	SD	Decision
9	Blockchain technology is utilized to keep tracks of the entire holding of	4	1 25	0.50	Low
	the university students records		1.25	0.50	Extent
10	Blockchain technology is utilized to keep records of student progress in	4	1.75	0.96	Low
	the university		1170	0.70	Extent
11	Blockchain technology is utilized to keep records of student transcripts	4	2.00	1 4 1	Low
	and credentials in the university		2.00		Extent
12	Blockchain technology is utilized to facilitate inter and intra university	4	1.50	0.58	Low
10	verification of students transcripts and certificates				Extent
13	Blockchain technology is utilized in keeping records of registered	4	2.00	0.82	Low
1.4	number of students in an academic session	4			Extent
14	Blockchain technology is utilized in tracking of students transcripts	4	2.25	0.96	Low
15	Discharterin technology is used to second stars and solidate and solidate	4			Extent
15	Blockchain technology is used to secure, store and validate academic	4	1.75	0.96	LOW
16	It provides a transporant and tempor resistant system for varifying and	4			Low
10	sharing advestional records	4	1.50	1.00	Low
17	Blockshein technology reduced costs of varification cartificates and	4			Law
17	transcripts	4	2.00	1.41	Evtent
	Cluster Datails	4			LAUNT
	Cluster Details	-	1.78	0.96	Extent

Table 2 shows that all the items have mean scores below 2.50. The respondents accepted all the items as low extent of utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria. The standard deviation of all the items ranged from 0.58-1.41 showed that the respondents were close in their responses to the items. The cluster mean of 1.78 is an indication that the respondents agree that all the items were low extent of utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria.

Research Question 3: Challenges affecting the awareness and utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria.

Table 3: Mean and standard deviation on challenges affecting the awareness and utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria.

S/N	Items	Ν		SD	Decision
18	Lack of awareness of blockchain technology	4	3.25	0.50	Agree
19	Inadequate funding of the university electronic record system	4	2.50	1.29	Agree
20	Inadequate technological infrastructures in university records unit to support the utilization of blockchain technology	4	2.50	0.58	Agree

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21	Inconsistent electric power supplies in university to support the utilization of blockchain technology	4	2.50	1.00	Agree
22	Inadequate skills to apply blockchain technology in the university records unit for effective and efficient service delivery	4	3.25	0.50	Agree
23	Poor internet connectivity in the university	4	3.50	1.00	Agree
24	Technophobia among staff of university records unit	4	2.50	1.00	Agree
25	Lack of sponsorship to national and international				Agree
	seminar/conference/workshop on the utilization of emerging technologies	4	3.25	0.96	
	in automation of students records				
	Cluster Details	4	2.91	0.85	Agree

Table 3 shows that all the items have mean scores above 2.50. The respondents accepted all the items as challenges affecting the awareness and utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria. The standard deviation of all the items ranged from 0.50-1.29 showed that the respondents were close in their responses to the items. The cluster mean of 2.91 is an indication that the respondents agree that all the items were challenges affecting the awareness and utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria.

Research Question 4: What are the strategies to ameliorate the awareness and utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria?

Table 4: Mean and standard deviation on strategies to ameliorate the awareness and utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria.

S/N	ITEMS	Ν		SD	Decision
26	Creating adequate awareness of blockchain technology among staff of records unit in university	4	3.25	0.96	Agree
27	Members of staff should cultivate the attitude of embracing emerging technologies for effective and efficient service delivery	4	3.25	0.50	Agree
28	Training of staff on skills required to adopt blockchain technology for students' records service delivery in the university	4	3.25	0.50	Agree
29	Provision of strong internet connectivity in university is required	4	2.50	1.00	Agree
30	Sponsorship of staff to national and international seminar/conference/workshop on the utilization of emerging technologies records keeping	4	3.25	0.96	Agree
31	Provision of adequate funding of the university electronic records system	4	3.25	0.50	Agree
32	Provision of steady electric power supply in university to encourage the utilization of blockchain technology	4	2.75	0.96	Agree
33	Provision of adequate technological infrastructures in university records unit to support the utilization of blockchain	4	3.50	1.00	Agree
	Cluster Details	4	3.13	0.80	Agree

Table 4 shows that all the items have mean scores above 2.50. The respondents accepted all the items as strategies to ameliorate the awareness and utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria. The standard deviation of all the items ranged from 0.50-1.00 showed that the respondents were close in their responses to the items. The cluster mean of 3.13 is an indication that the respondents agree that all the items were strategies to ameliorate the awareness and utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria. **Discussion of the Findings** The data presents the awareness level of blockchain technology in managing students' records in federal universities in Enugu state. Nigeria. The findings revealed that majority of staff in the records unit have low level of awareness of blockchain technology in managing students' records in federal universities in state, Nigeria. The findings Enugu revealed that majority of staff in the records unit were not aware that blockchain technology can be used to: keep records of students various degrees awarded in a university; track students transcripts and certificates; verify students' transcripts and certificates; keep tracks of the entire holding of the university; serve as an archive of the university; share information among different sections of the university; track students' progress reports; and keep records of registered students in an academic session. The findings were in line with that of Owraigbo and Onah (2023) which revealed that majority of librarians in university libraries have low level of awareness of blockchain technology for effective library service delivery in libraries South-South, university in Nigeria. Similarly, the findings support the finding of Carrie (2019); and Kushwaha and Singh (2020) who stated that majority of librarians have low awareness of the potentials and capabilities of blockchain technology in libraries.

The findings revealed that the extent of utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria is low because blockchain technology was not utilized to: keep tracks of the entire holding of the university students records: keep records of student progress in the university; keep records of student transcripts and credentials in the university: facilitate inter and intra verification university of students transcripts and certificates; keep records of registered number of students in an

academic session; track of students transcripts; secure, store and validate academic credentials, certificates, and degrees; provides a transparent and tamper-resistant system for verifying and sharing educational records; and reduce costs of verification certificates and transcripts. The findings of the study were in conformity with the findings of Owraigbo and Onah (2023) and Obim (2022) who found out that the extent of utilization of blockchain technology for effective service delivery by librarians is very low as a result of low level of awareness.

The findings revealed that the challenges affecting the awareness and utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria were: lack of awareness of blockchain technology; inadequate funding of the university electronic record system; inadequate technological infrastructures in university records unit to support the utilization of technology; blockchain inconsistent electric power supplies in university to support the utilization of blockchain technology; inadequate skills to apply blockchain technology in the university records unit for effective and efficient delivery; service poor internet connectivity in the university; technophobia among staff of university records unit; and lack of sponsorship to national and international seminar/conference/workshop on the utilization of emerging technologies in automation of students records. The findings were in line with the findings of Owraigbo and Onah (2023) and Obim (2022) who found out that inadequate skills and competence, technophobia, inadequate technological facilities, lack of awareness, among others were the same challenges facing the effective utilization of blockchain technology in university libraries

The findings revealed that the strategies to ameliorate the awareness and utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria were: creating adequate awareness of blockchain technology among staff of records unit in universities; members of staff should cultivate the attitude of embracing emerging technologies for effective and efficient service delivery; training of staff on skills required to adopt blockchain technology for students' records service delivery in the university; provision of strong internet connectivity in university is required; sponsorship of staff to national international and seminar/conference/workshop on the of emerging technologies utilization records keeping; provision of adequate funding of the university electronic records system; provision of steady electric power supply in university to encourage the utilization of blockchain technology; and technological provision of adequate infrastructures in university records unit to support the utilization of blockchain. The findings of the study were in conformity with the findings of Owraigbo and Onah (2023) and Abid (2021) who suggested that adequate funding among others is very much needed to enhance the utilization of blockchain technologies in libraries.

Conclusion

In conclusion, the findings of the study revealed that there was low awareness level of blockchain technology among staff in the records unit for managing students' data which resulted in low extent of utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria. It was concluded that the challenges also affecting the awareness and utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria were: inadequate funding of the university electronic record system; inadequate technological

infrastructures in university records unit to support the utilization of blockchain technology; inadequate skills to apply blockchain technology in the university records unit for effective and efficient service delivery; technophobia among staff of university records unit; and many more.

It was suggested that creating adequate awareness of blockchain technology among staff of records unit in university; training of staff on skills required to adopt blockchain technology for students' records service delivery in the university; sponsorship of staff to national and international

seminar/conference/workshop on the utilization of emerging technologies records keeping; provision of adequate funding of the university electronic records system; among others were strategies to ameliorate the awareness and utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria.

Recommendations

The following recommendations were made based on the findings of the study:

- 1. Advocacy on the awareness of blockchain technology in managing students' records should be intensified through workshops, seminars, and symposium in federal universities in Enugu state, Nigeria.
- 2. University administration should sponsor their staff training and retraining on blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria.
- 3. Creating enabling environment such as provision of steady electricity supply, strong internet connectivity and many more, are required to the utilization of blockchain technology for effective service delivery in federal universities in Enugu state, Nigeria.
- 4. University administration should come up with a policy mandating as well enforcing record units to be utilizing blockchain technology for visibility as well as

effective service delivery in federal universities in Enugu state, Nigeria. **References**

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