THE RELEVANCE OF BLOCKCHAIN BASED VOTING ADOPTION IN GOVERNANCE STRUCTURE. EVIDENCE FROM NIGERIA

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Abstract

A country cannot be truly democratic until citizens can choose their representatives through elections that are free and fair. However, general elections in Nigeria have witnessed varied setbacks from manipulations of election results, vote buying and violence, which often characterised the process that give births to leaders. These challenges have now reduced the number of voting turnout, and thus citizens are calling for technological adoption to make elections transparent and error free. Therefore, we investigate the relevance of blockchain-based voting technology adoption in the governance structure in Nigeria. The study used a semi-structured interview on a sample of sixteen respondents based on technology,

organisation, and environment model, and analysed with Nvivo. Our findings show that, citizens are happy with the voting process of electing their leader but discouraged that their votes will not be counted in getting their voted leader. Interestingly, they will be more interested in casting their vote from their comfort zone if blockchain technology can make the election transparent, and results not manipulated or altered to reflect their desired decision. The study is pioneer to explore from African emerging economy on how election fraud can be eliminated using blockchain based voting.

Keywords: Blockchain, Technology, Voting, Election, Nigeria

INTRODUCTION

The foundational pillar of a democratic system is the election because it empowered the citizen to communicate their decision on who to rule them by voting in the election. To assure the citizens of its credibility, the election ought to be a transparent process devoid of any malpractices. There have been efforts to make the election process a transparent, secured, and verifiable one, as approaches to the election have been progressing either positively (in developed nations) or negatively (in underdeveloped nations) with time, and there have been and there has been a great need to enhance efficiency in the system of voting in Nigeria by the citizen.

Focus of this research is to investigate the relevance of adopting blockchain-based voting into Nigeria's electoral system. Previous studies conducted on blockchain mainly focused on developed countries, ignoring the developing and emerging countries (Chang et al., 2020, Johnson, 2019). Empowered by this, we examine blockchain and corporate governance from African emerging economy and provide a theoretical foundation that will be built on for future studies.

Nigeria was chosen for this study for the following reasons. Firstly, Nigeria's economy is largest in Africa with an estimated GDP of $445B in 2022 (NBS 2022). Secondly, Fintech development has grown rapidly in the Nigeria market, attracting Fintech investments with over $200million, and expected to grow to $543million by the end of 2022 with over 170 registered fintech companies (Evans and Oni, 2022). Particularly, blockchain has gained significant recognition with the country having core developers, miners, content producers, verifiers (or node operators), token holders, and network users (Tapscott et al., 2019). Notwithstanding, policy makers and academics have highlighted and predicted blockchain as a technology that supports correct all the malpractices facing the Nigeria Independent National Electoral Commission (INEC) during general elections as Nigeria goes to polls on February, 2023 (Kannoly et al., Mookherji et al., 2022, Solanki and Meva, 2021). Hence, Nigeria environment is appropriate to explore blockchain technology in voting governance.

The study adopted the semi structured interview, drawn from the private and public sector in Nigeria with years of experience as a blockchain developer, researcher, financial industry, and the Independent National Electoral Commission. Findings show that blockchain-based voting could transform the electoral body in Nigeria when adopted and this implies that Nigeria will be laying the standard for a transparent electoral process in Africa.

Being the first study to be carried out in a developing country and Africa with focus on how a transparent process could be attained in conducting general elections in Nigeria, it is aim at contributing to previous research carried out in developed countries and to stress the need for its adoption because of the benefits that will be attained in its adoption.

The paper is structured based on the following: The next section discusses the literature, followed theoretical framework. Section 3 presents the methodology. Section 4 reports the results, findings, and discussions. The final section concludes the paper, subsequent with policy and theoretical implications.

LITERATURE REVIEW

Blockchain Technology Adoption

Blockchain is a shared ledger that is immutable and facilitates the process of a transparent recording of transactions and tracking assets in a business network (Dubovitskaya et al., 2017, Yermack, 2017). The first Blockchain was conceptualized by (Nakamoto, 2008), who used a Hash cash-like system to add blocks to the chain without any trusted third party (Narayanan et al., 2016). Blockchain is a swiftly evolving financial technology that transforms the way transactions are being made; Blockchain is a decentralized system, whose security chain is lengthy ((Hassani et al., 2019; Sestino and De Mauro, 2021). (Baudier et al., 2021) reckon that Blockchain technology could improve governmental data management by disintermediating transactions, therefore minimizing openings for corruption. Interest in Blockchain technology has been growing since the idea was conceived in 2008 by Nakamoto. this growing interest was a result of its significant features that deliver transparency, security, anonymity, and integrity of data without the interference of a third party or organization in control of the transactions, therefore it has produced interesting areas of research, specifically from the standpoint of technical benefits, challenges and limitations (Yaga et al., 2019, Yli-Huumo and Smolander, 2017). Considered 'Distributed Ledger Technology (DLT), Blockchain is often known as the technology behind cryptocurrency (Bhargava, 2019, Sheth and Dattani, 2019).

Current studies have shown that blockchain can be used for various purposes and for-profits and non-profit organizations (Murray et al., 2021). Blockchain could be used as a smart contract, in financial service industries and insurance, and supply chains can be used for video

game monetization such as crypto kitties (Elrom, 2019) and even in government. Therefore, Blockchain may lead to far-reaching changes not only the corporate firms but also in public governance (Hewa et al., 2021, Murray et al., 2021, Yermack, 2017)

Undeniably, (Heires, 2016) in her research on the ''Risk and rewards of blockchain technology'' mentioned that in the past ten years, foremost firms such as Samsung and IBM have instigated the test and work with the blockchain technology. Currently, Bank of America has filed and started the process of enlisting thirty-five related blockchain patents right. Investment banks to a total of thirty including Citigroup, Goldman Sachs, Barclays, and UBS have formed the R3 CEV consortium to explore the potential of blockchain technology in reducing the operational cost of business. Furthermore, she added that leading stock exchange firm NASDAQ is not left out as they are already in partnership with Visa-backed start-up firm, the Chain in launching Linq, which is a new exchange firm that trades private firm's shares, and it is powered by the blockchain technology.

The Financial industry has been at the forefront in accessing and embracing fully this innovative technology as it has gotten the potential that has introduced efficiency and brought greater transparency to their transactions (Harvard Business review 2017).

Pilkington, (2016) in his research on the principles and applications of blockchain technology added that blockchain has the potential to cause a change to financial organisations and possess the characteristics of allowing people to create trust quicker. Over the past few years, Blockchain has really become widespread owing to the upsurge of bitcoin. Nevertheless, this technology is not restricted to the financial environment alone, as would be seen later in this study, blockchain has the features to be used in other fields such as the government sector, the supply chain, and logistics.

There have been prior studies on blockchain and banks and financial industry in developed nations but there is a small number of research on blockchain in Africa and motivating factors for private organizations and governments to adopt blockchain (Flovik et al., 2021). Therefore, blockchain has not been effectively utilized in voting process in underdeveloped countries as will be further discussed in the study.

Governance and Blockchain

Blockchain research in governance started in 2015 and from 2017, concentration in this topic has increased dramatically (Casino et al., 2019, Eghe-Ikhurhe and Bonsu-Assibey, 2022). The best area of employing blockchain in governance is in elections and voting systems (Baudier et al., 2021) as the fundamental issue in the electoral system in Nigeria is that over time it has shattered the citizens' trust in the electoral process (Kerr and Lührmann, 2017).

Countries such as Sierra Leone, the United States, Japan, Russia, South Korea, and Estonia have successfully experimented with blockchain-based voting in elections and the findings exposed the benefit a nation could get in implementing blockchain-based voting (Agbesi and Asante, 2019, Johnson, 2019, Racsko, 2019). Developers of the blockchain technology and researchers have identified key areas of concern that need solutions during election voting which are: Transparency as to the capacity of blockchain to guarantee the honesty of the process, the ability of the public to verify the election process and outcomes, the anonymity of participants, third party audit of the election result and individual verification of their own votes (Baudier et al., 2021, Hardwick et al., 2018).

There are two emergent methods of blockchain application research in voting as discussed by (Adeshina and Ojo, 2019, Baudier et al., 2021). The first examines the use of blockchain for voting as a procedure, such as blockchain-based e-voting, launched in 2014 in Moscow. This method uses a central Oracle database, that has 92 million votes that were cast on a varied range of topics, and a positive outcome of transparency in real-time in the process was attained (Baudier et al., 2021) while the other method evaluates the use of blockchain application for non-intrusively supportive e-voting; which is, supporting voting procedures as a trusted third party that connects the three key players in elections which are; all voters that are eligible; the organizers that are in charge of the election process who verifies and records the data of all voters that are eligible and relate with voters throughout the election period; and the inspectors that confirm the organizers' power and limitation, a positive outcome of cost reduction was attained (Adeshina and Ojo, 2019, Baudier et al., 2021).

Blockchain-based voting could guarantee that part of the work done by organizers and inspectors uses decentralized, transparent, and anonymous, procedures, as the system supports self-tallying (Adeshina and Ojo, 2019, Wang et al., 2021).

Blockchain and Election Voting

Many studies have recorded that the recurrent issues in elections include incorrect/ incomplete lists of voters because of voided names and uncleared typing of voters register, partial or fragmented ballots distribution and sometimes disorganised tabulation of vote (Boucher, 2016; Kahan and Rock, 2007). Blockchain is fast becoming a question-less and much needed major technological advancement in innovative Information Technology that is on same level with machine learning and big data (Li et al., 2020). Some developed empire and nations such as the United States, Europe, Japan have implemented diverse types of processes in conducting election all through the history of humanity. The improvement of computer technology and the internet has unlocked the door and has introduced different forms of

Election Voting systems (Vo-Cao-Thuy et al., 2019) and some countries such as the United States, Korea, Sierra Leone have implemented their electoral process using the innovative technology; the blockchain and findings of their study echoed the positive features of blockchain that gives confidence to the citizen who wanted to use blockchain-based voting (Curran, 2018)

According to (Yahaya and Bello, 2020), past elections conducted in Nigeria have always been associated with violence resulting to loss of lives. Nigeria is seen as the giant of Africa (Bala and Tar, 2021)with a GDP of $440B as at the end of 2021 according to the Nigeria bureau of statistics (Ajayi and Oguntomi, 2022)endowed with both natural and human resources is considered a pace setter in Africa politics. In all of its endowment, Nigeria is bankrupt of good leaders because of malpractices in getting leaders during election (Arogbofa, 2022)

Some causes of fraud and malpractices in the electoral processes during elections in Nigeria include double voting, falsification of results in elections, coercion, and duplication of ballot papers that always leads to violence and killings after results are announced (Onapajo, 2015) harnessing the potentials of the blockchain disruptive ledger technology into Nigeria's electoral system will gain attention significantly, (Zambrano et al., 2017; Hassani et al., 2019) thus making blockchain-base voting as lasting access to a transparent election process in the utmost hierarchy of governance in Nigeria.

Since Nigeria gained her independence in 1960 till date, there has been struggling in producing the leaders that the people voted for or/and having the leader that reflects the decision of the citizen at the election pooling boot, but it has been the case of recycling all past leaders from independence to rule the citizen against their decision (Onapajo, 2015).

Many studies regard the absence of trust and transparency in electoral voting system in Nigeria. During general elections, several concerns arise, for example vote's security, audit of votes, and absence of transparency, accessibility and transporting of electoral materials and hacking of political party's emails. Today these are the major concerns that is faced in Nigeria's general election (Boucher, 2016, Yermack, 2017)resolved that blockchain can be proposed as the solution. Every democratic system is formed by an election (Dogo et al., 2018). Election malpractices have been a major part of the general election across Nigeria (Temitope and Ahmad, 2017). It smacks the trust of the citizen in the system and produces an atmosphere of distrust amongst the people (Nwolise, 2007), blockchain-based voting is being embraced by some nations such as Japan, the United States, Sierra Leone, and Russia as it creates a structure that can be trusted with enhanced transparency devoid of obstructing the efficiency of the system, as it produces results in real-time without alteration and Nigeria can adopt same in its electoral system and set the standard for other underdeveloped nations (Dogo et al., 2018),

Leonardo Gammar CEO of Agora that built the first fully functional blockchain voting platform speaking in an interview in 2018, reveals that blockchain-based voting is the only technology that has been shaped and can deliver an end-to-end provable and fully transparent voting solution for this future in Africa. Leonardo concluded the interview with these words '*if you believe that most countries will use some form of digital voting 50 years from now, then blockchain is the only technology that has been created which can provide an end-to-end verifiable and fully transparent voting solution for that future*''.

Blockchain technology has the capacity to overcome all electoral fraud and violence as it introduces a decentralised nodes for a transparent electoral voting system. According (Baudier et al., 2021, Dimitriou, 2020) a safe electoral system of voting must conform with these six requirements; firstly, Certify that the privacy of the identities of all voters, ensuring that it is impossible to associate a vote to a voter; secondly, count correctly all valid votes; thirdly, invalid votes should be identified and removed(Baudier et al., 2021, Hsiao et al., 2017)Fourthly, Validate a voters' legality to be part of the election; fifthly, confirm that voters are able to vote only one time and, lastly, confirm the results are not revealed before the conclusion of voting to prevent manipulating the remaining voters. (Baudier et al., 2021)

Blockchain voting access can be likened to a lasting peace in the utmost hierarchy of government at all places.
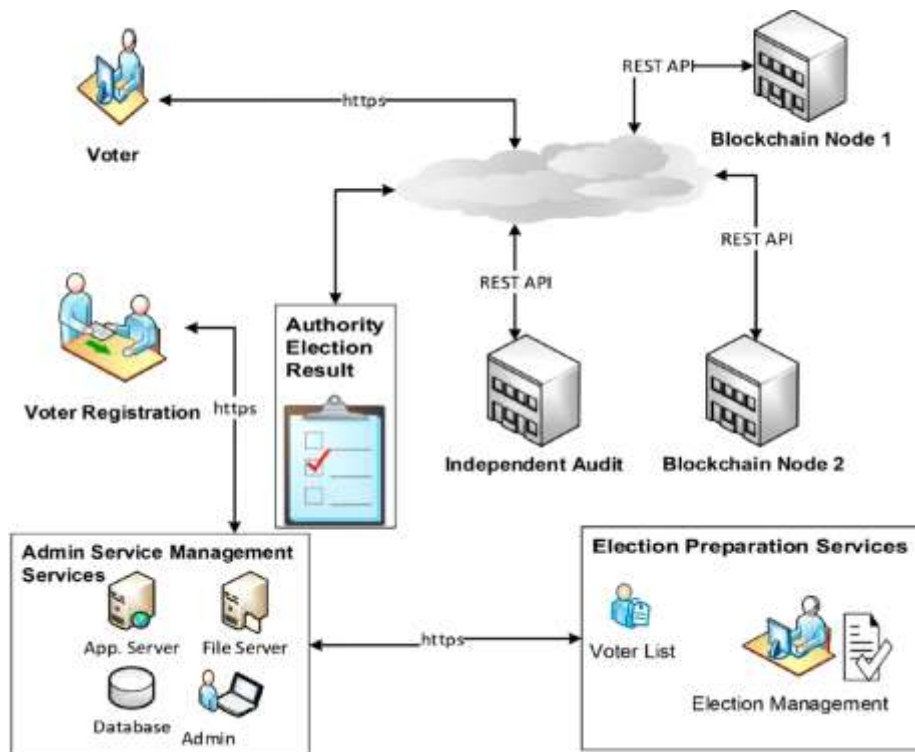

Figure 1 Blockchain Based Voting system achitectural diagram (Abayomi et al 2019)

Requirements for the Adoption of Blockchain Based Voting In Nigeria Electoral System

Blockchain technology provides new possibility to erode the issues associated with election malpractices; with blockchain technology, hundreds of thousands of votes can be cast and processed per second that will be transparent, secured, and verifiable. Hence, there is a need for an enabling atmosphere for its adoption into the electoral system in Nigeria; the basic requirements to enable the adoption of blockchain-based voting in general elections in Nigeria are as follows:

Eligibility

A Nigerian citizen who are the potential users/ participants are required to be registered with a unique identifier introduced and recognized by the federal government (Abayomi-Zannu et al., 2019)such as the National Identity number or the Bank Verification Number to be eligible to cast a vote. As the system will use biometrics authentication to confirm that only registered citizen is given access to cast a vote and prevent any person from voting twice

Verifiability

A citizen can verify that their vote was successful as an ID (hash) will be provided after voting. With this ID in form of hash can be used to track and verify that their vote was counted in the election. This method is associated with one of the benefits of blockchain and its role in attaining a transparent electoral process as this study is aimed at pushing for the adoption of blockchain in Nigeria electoral system.

Privacy

Since an identifier with a unique number is generated for a voter through their Bank Verification number or their National Identity Number to enable them to participate in the blockchain based voting; there is need to protect their vote. So, with blockchain technology, privacy of a voter is requirement as it enable the citizen to cast their vote from the comfort of their home without their identity reveal. Additionally, with blockchain technology, a citizen can vote their choice and still be protected from being traced as it uses a cryptographic process to ensure anonymity, especially if the person is under duress to vote for a specific candidate.

Smart Devices

According to a report by statistia.com in 2021, 48.12 percent of the population in Nigerian used the internet through mobile device and this amount to over a hundred million eligible voter citizens and was projected to increase to 659.7 percent by 2026. Going by the

statistics of the 2019 presidential election where there were only 28,614,190 votes cast of the 82,344,107 registered eligible voters. It, therefore, means that Nigeria currently has more smart devices than the number of registered eligible voters.

Theoretical Framework

In this paper, the Technological, Organisation and Environment (Clohessy et al., 2019) is used a theoretical lens. According to Kovic, (2017), executing a blockchain-based voting system indicates that a prepared technology is associated with democracy principles. There has been a plethora of research on using blockchain to vote but these studies have deficiencies in either their empirical analysis or a tested theoretical background. (Yermack, 2017) examined blockchain and corporate governance and discovered that blockchain can be used in all elections as it has been used in Sierra Leone, Japan, United States and Russia; and considered appropriate to the traditional method of voting. However, the study dearth an empirical analysis and a tested theoretical framework model.

This study is tailored to the pattern of (Chang et al., 2020) study on how *blockchain can impart financial services with an experts' overview*. However, the theoretical pattern in their study tolls the pattern of the Theory of planned behaviour (TPB). Their study focuses on the views of experts in different sectors and from developed and developing economies drawn from finance, media, education, and information technology. The theory of planned behaviour was in line with the adoption of blockchain in financial services.

However, this study uses the Technological Organisation and environment (TOE) framework which is been tested for the adoption of innovation. The Technological Organisation and environment (T-O-E) framework describes the adoption of technology in an organization and its implementation processes. TOE propended by (Tornatzky et al., 1990), is a standard framework that proposes a general established three bits of creativity context factors that describe, influence and forecast the possibility of the implementation of an innovation/technology adoption. These contexts are technology development and adoption which increases operational efficiency (Kauffman and Walden, 2001); Organizational circumstances and reconfiguration along the range of businesses that it supports creates a stronger resource in firms' transactions and business environment relations that are always considered when deciding on the adoption of innovative technology in firms (Cukur and Svensson, 2016). Technology explains adoption in relation to the internal and external pool of technologies of the organization that are perceived to be useful, carry out a pilot test/experimentation, technical and organizational compatibility, complexity, learning curve, and visibility/imagination. Researchers in the past have enlightened that an organization uses

descriptive means to measure organizational culture, the scope of the business support from top management, the human capital quality, and size (Zhu and Weyant, 2003, Dube et al., 2020, Tornatzky et al., 1990). The environmental context tells of the operative inhibitors and facilitators; substantial among these are trade partners' readiness, competitive pressure, government encouragement, sociocultural issues, and technology provision structures such as quality access to ICT consultants. (Tornatzky et al., 1990)

The main issue with the T-O-E framework according to (Awa et al., 2016) is that some of the concepts in its adoption forecasters are presumed to apply more to big organizations, where customers are sure of continuity and fewer complaints, than to Small and Medium Enterprises. Though, the postulate of T-O-E is alike to Actor-Network Theory (ANT) since it highlights the dynamic competencies and shared interplay of technical and social systems. (Latour, 2007) also explains how the social interaction of an innovative shape's the environment it is used. Technology concept signifies all technology used and owned by the firm, those not currently in used as they will all be considered in the adoption of a new innovation of the firm (Collins et al., 1988). Organisation concepts refers to the characteristics and resources available in the firm in relations to the process of adopting an innovation (Damanpour and Schneider, 2006). The environment concepts according to (Damanpour and Schneider, 2006) denotes the sector the firm is operating on, the absence or presence of providers of technology services and the regulatory authorities that exists in the sector. The study is on emphasis on the Nigerian government to adopt the blockchain-based voting in its electoral systems, therefore the T-O-E framework will be best used as it is compatible with the large organization on a going concern basis. The arrival of disruptive technologies such as the blockchain might solve the challenges that is faced by players in present-day voting processes in Nigeria

RESEARCH METHODOLOGY

The instruments for data collection of this study is interview in the perspective of (Chang et al., 2020). We used the semi structured interview which was suitable to get clear explanation from respondents recruited for the study in technological department in both private and public organisations that understand the blockchain technology when employed in conducting general election, personnel of the Independent National Electoral Commission (INEC), Nigerian citizens and from researchers carrying out studies and formulating policies on blockchain-based voting adoption.

The telephone call conversation was used in conducting the interview to get opinions from the eligible participants to give an understanding of blockchain technology. The telephone calls made was between twenty-four minutes to thirty minutes, sixteen interviewees gave their

consent for the study. The sample was drawn from persons who are experiences on the workings of blockchain technology, audit on blockchain and user of blockchain technology with the cryptocurrency trading and on pilot voting in a higher institution in Nigeria.

Additionally, (Chang et al., 2020)also explained that the open-ended questions are more direct, valuable, and vital information that is related to the blockchain can be easily gotten from the open-ended question method of data collection.

The interview transcript is analysed with NVivo 12, and the transcript was based on the framework of the technology-organization-environment (TOE), that includes the adoption and implementation of an innovation by an organisation. TOE is perceived as more advantageous to large organisation with greater assurance of continuity (Clohessy et al., 2019)Nigeria is the most populous Africa country will continue to remain in existence (Akinyemi and Isiugo-Abanihe, 2014, Casimir et al., 2014). TOE is an appropriate method for this study because the grey areas that best explain the adoption and implementation of blockchain based voting by the interviewees will be captured and the various stages of its adoption were also well explained.

Sample Size of Interview

The result of the study is limited because of the number of the sample size used. Snowballing sampling style was used for the study. The researchers invited seventy-six targeted eligible interviewees and fifteen accepted to take part in the study. Eligibility criteria for the study are individuals with experience in blockchain technology, persons that have taken part in piloted blockchain-based voting in Nigeria, and persons that are researchers in blockchain-based voting and implementation in Nigeria. The eligible sample size was drawn from the researcher network on Linkedin. The purpose for selecting these participants was that they are experts in blockchain technology, and research and have been part of a pilot blockchain-based voting conducted by the student Union government in the University of Jos, Nigeria. Thus, making their explanation to the structured interview question from a professional perspective.

Data Collection

In gathering data from eligible participants for this study, seventy-six interviewees were targeted and invited but only fifteen accepted the invitation and were available to provide their knowledge and understanding on blockchain based voting. To protect their privacy, their identities remained anonymous. For two reasons, these interviewees were chosen as suitable for the study; firstly they are professionals in blockchain practice on implementation, adoption and forensic audit on blockchain, and the explanation they give reflects on the present state of why Independent National Electoral Commission should adopt blockchain based voting;

secondly, they are professionals in both private and public sector of the Nigerian economy making their explanation to be diverse based on the sector they have experience from. They were selected from LinkedIn platform and from their network of colleagues.

Respondents' profile

Respondents' profile is presented in Table 1. It shows that the respondent's age range is between 26 to 50 years, their years of experience range from 1 to more than 10 years and their expertise are forensic audit of blockchain technology, developer of blockchain technology, pioneer of a pilot study of blockchain-based voting, researcher of blockchain-based voting adoption and implementation in Nigeria.

Table 1: Respondents' Profile

S/N	AGE	SEX	EDUCATION	EXPERIENCE	SECTOR
R1	36-50	M	Post Grad	Above 10yrs	Private (Finance)
R2	26-35	M	Post Grad	6-10 years	Private (Blockchain technology platform investigator)
R3	36-50	M	Post Grad	Above 10 years	Private (Lecturer/Researcher)
R4	36-50	M	Graduate	Above 10 years	Private (Finance)
R5	26-35	F	Graduate	6 – 10 years	Private (Researcher)
R6	36-50	M	Graduate	Above 0 years	Private (INEC Consulting firm)
R7	36-50	M	Graduate	6 – 10 years	Public (NITDA)
R8	26-35	M	Graduate	1-5 years	Private (Researcher)
R9	26-35	M	Graduate	6 -10 years	Private (Consultancy)
R10	26-35	M	High School	1 – 5 years	Entrepreneur (Blockchain developer)
R11	26-35	M	Graduate	6 – 10 years	Private (Blockchain developer)
R12	26-35	F	Graduate	1 – 5 years	Entrepreneur (Blockchain consultant)
R13	26-35	M	Graduate	1 – 5 years	Private (Enaira platform developer)
R14	26-35	M	Graduate	1 – 5 years	Public (INEC)
R15	26-35	F	Graduate	1 -5 years	Private (Consultancy)

INEC – Independent National Electoral Commission

NITDA - National Information Technology Development Agency

ANALYSIS & RESULTS

Presently in Blockchain based voting adoption, there are hidden knowledge that can be connected to its rapid advancement and sustainability that will have a positive impact on the electoral body on the outcome and the citizens.

Some information and main advantage of an innovation can only be unveiled when that innovation has passed the testing criteria with a pilot test and backed by the appropriate regulatory body. For example, an innovation can be accepted with an approach that is beneficial, sustainable, and ethical issues are taken into consideration. However, professionals and practitioners were chosen to give their opinion on these issues and recommend the possibilities of its adoption.

The main aim of this study is to identify the opportunities, challenges, and implementation of blockchain-based voting by the Independence National Electoral Commission (INEC).

These fifteen interviews carried out on this study represents the explanation of the benefits, challenges, and implementation of blockchain-based voting that shows a better understanding of this innovation and explain what INEC will need to get ready if adopting blockchain-based voting in the 2023 general elections.

The findings on blockchain based voting adoption benefits, challenges and implementation is presented in table 2 below in relation with the TOE.

Table 2: Blockchain Based Voting Advantages And Disadvantages

BLOCKCHAIN BASED VOTING	FIRST ORDER CONCEPT	SECOND ORDER	AGGREGATES DIMENSION
Blockchain based voting when compared to manual or e-voting is secured, immutable, reliable if adopted transparent and trusted. All interviewees shared same opinion on this question.	The technology will change decision making	Organisation's acceptance might be slow	Environmental acceptance of its adoption
Blockchain is beneficial in attaining a flawless, free and fair election process, (R1) Reduce cost of election budget Saves time and very convenient when adopted. (R2)	Produces results in real time	Produces leaders that reflects the vote of citizen	

Knowledge gap, advocacy, expert consultants are part of the challenge that will be encountered when adopting this innovation by the Nigerian government (R9)	Training and creating awareness	Experts and professionals	
If blockchain based voting is not adopted by INEC killings during election cannot be stopped(R9) Blockchain has got the capabilities to erase and/or minimised all electoral violence during general election in Nigeria (R13)	Vote at the comfort of your home without going out	Provide a kind of authentication for citizens to vote with their phones	

According to R1, R3, blockchain cannot be used in the next general elections in 2023 as they explained that the government has not put in place the basic facilities to effectively adopt these innovations such as internet connectivity and electricity and that the time is too short to get them in place.

R1 explains that blockchain technology cannot be used in the 2023 election, because it is not possible; the time is too short, there is advocacy part of it; selling a transparent technology to a government that do not embrace transparency will be difficult and need series of dialogue, and technological aspect of its implementation that will need longer time to set up and the big question is if the citizen are ready for it, is the electoral body transparent enough to accept it?

''Blockchain cannot be used because of the challenges of power, internet connection, that the country, even is the urban area have got power and internet connectivity, most rural area in Nigeria do not have these therefore making it difficult to use it in the February 2023 election as the time is close'' (R3, male).

However, R2 has a varied opinion as he explains that *''blockchain can be used in 2023 election if the government really want to use it; but the country is not ready to use it and suggests that Blockchain is only the remedy out of the shambles the country is in right now''.*

R2 opinion is being supported by R9 and R10 as they explained that it will erase any manipulation of election results.

''Blockchain is a transparent technology that cannot be easily altered, to alter a block that was inputted yesterday will means to remove all the blocks that has been imputed since yesterday and meanwhile todays own has been adding up and the system cannot be stopped, therefore,

to manipulate election result will be that the system will be stopped before you can alter anything" (R2 male).

''since the election will not involve any paper writing, there will not be any falsification of results and the results will just be transmitted electronically and all observers of the process will see as the votes are coming in" (R9, male).

''Blockchain will erase manipulation and fraud often seen in Nigeria election, at University of Jos where blockchain was used for the student union executive election in February 2020, we have 70% students participation in the election, many of the students voted from the comfort of their homes and the organiser were at the students union secretariat monitoring the process as the votes keeps rolling in and displayed in an electronic board visible to all other observers that were present in the secretariat. When the cut off time has elapsed, the winner was seen in the displayed electronic board" (R10, male).

R10 being a pioneer of using blockchain based voting in the student union government election in University of Jos student union election in Plateau state, reckon that Pilot test running of the innovation.

Just as was used at the University of Jos should be carried out by the management of INEC in a council or local government election.

The reason for test running it, according to R10 was to watch out for any element that might hinder the smooth process and get the experts that set up the system to work on it. He added that it was a 98% success when used in 2020 (before the covid19 lockdown in February) Student Union Election in University of Jos as there was no challenge, more students voted from the comfort of their hostels and classrooms, the students used their matriculation number as identity verification, and were able to monitor the result as voting was done and the results displayed as soon as the cut off time of the election elapse.

Blockchain based voting will deliver the results and dividends of democracy (Braun, 2020) to Nigeria and Africa at large.

On the top three benefits of using blockchain based voting by INEC, R13, R14 and R15 explained that INEC will get transparency, credibility and trust when it is adopted.

R12 and R10 explained that the top three benefit INEC will get when adopting blockchain based voting is reduction in budget for election, immutability and getting election results in real time unaltered.

The 2019 Nigeria general election was #234.5 billion naira (£521.1 million pounds) (Onapajo, 2020). R10 further explains that when blockchain based voting is adopted, Nigeria will save 60% of the amount spent in the 2019 general election.

PROPOSITIONS

This section summed blockchain based voting overview and explanations as discussed in this study. The current issues of voting in Nigeria and challenges that were pointed out by the interviewees and their responses on how these challenges could be tackled when INEC has adopted blockchain-based voting. These will be presented in two propositions, and they will be in line with the contribution of the study and current realities on Nigeria's political circumstances.

Proposition 1

Blockchain based voting being an innovation that is not common in the Africa's space will face some challenges of its adoption by INEC. However, when adopted will produce the core dividend of democracy which is giving power to the people.

TOE is best used to explain this proposition on adoption of blockchain as a core dividend of taking the power to the citizen. It is an innovative technology that needs an expression through an organisation which is the INEC and the environment to perform its adoption which is Nigeria. This study shows that the advantage of adopting and implementing blockchain based voting by INEC outweigh the disadvantage. This will project Nigeria in a positive light in Africa for transparency and credibility in its process of electing her leaders.

The challenges of adopting blockchain based voting in Nigeria can be characterised into two major parts which is corruption and advocacy. Blockchain based voting has got the capacity to produce a violence free election in Nigeria when adopted, however, the power outage is a major concern in Nigeria presently because of corruption and bad leadership.

Another aspect of corruption explained by interviewees is the inability of leaders to manipulate election results. INEC might be reluctant to easily want to adopt blockchain-based voting because they will not get a kickback for manipulating election results in favour of the highest bidder.

Advocacy was picked as a challenge in adopting blockchain-based voting. Training and education of the stakeholders on the workings and how to effectively use it during elections will take some time. Human naturally is resistant to change and needs to be convinced about why it should be adopted.

Proposition 2

R2 (Male) Rigging, votes buying, coercion, ballot box snatching, violence, and killings are some of the current issues associated with elections in Nigeria. The young people that form almost half of the Nigerian population fear coming out to cast their vote for fear of being hurt or maybe killed during election.

The TOE theory is used to explain this proposition; the reason for the TOE theory was for a change of technology or adoption of an innovation. When an existing technology lack the capacity to deliver its benefit there will be need for an adoption of another.

Considering all the issues associated with election in Nigeria, the citizen will want to embrace an innovation that is transparent, trusted, secured, and immutable. However, like any innovation that an organization wants to adopt, there is a need for it to be introduced, accepted by the appropriate law, and tested for compliance with the international standards, training to cover the knowledge gap and general publicity and awareness of it within the geographical environment.

Before the adoption of blockchain-based voting, INEC needs to contact experts on the usage for advice on implementation, infrastructures needed to set it up and to develop, install, monitor, and control the system.

DISCUSSIONS

The study is to explore the relevance of adopting blockchain-based voting by INEC in the general election in Nigeria. The mode of data collection used in the study is structured open ended questions for interview. Fifteen eligible participants were interviewed for the study, these interviewees were drawn from the public and private sector in Nigeria with experience that ranges from one to above ten years and are professional and their personal details are anonymous for the purpose of the study.

1) *How blockchain based voting can improve the current issues of voting in Nigeria*

The current issues associated with voting in Nigeria ranges from ballot box snatching, votes buying, delay in supplying election materials to pooling unit, manipulation of election results to coercion, intimidation by political tugs.

When blockchain is implemented by INEC, all these issues will be highly mitigated if not eradicated completely. For example, when citizens cast their vote from the comfort of their home, ballot box snatching, ballot papers, and transportation of sensitive election materials will be eliminated.

Even when a person is bribed to vote in favour of candidates, the candidates cannot force the person to vote for him and cannot tell the person's vote from the election result.

2) *How blockchain based voting can be effectively implemented by INEC.*

The main recommendations given by the interviewees prior to the adoption of blockchain based by the Independence National Electoral Commission (INEC), was that INEC should get into consultation with experts blockchain developers from the Stakeholders in Blockchain

technology association in Nigeria (SIBAN), and A and D Forensics who will draw up and design the structures and recommend the equipment needed.

These experts will also install, test run with pilot test in selected locations across the six geopolitical zones in the country to monitor how it works (R1, R10, R13), modify (if need to), before presenting and certifying it fit for use in general election.

INEC should also carry out voter's education to cover the knowledge gap for the citizens, conduct awareness seminars, and have wide publicity on the use of blockchain.

Been an innovation there is need for everyone to understand how it works and what it can do when adopted by INEC and how they can cast their vote on it.

PRACTICAL AND THEORETICAL IMPLICATIONS

This research is focus on how INEC can conduct a transparent election after adopting blockchain based voting. Being the first to explore the importance of adopting blockchain based voting in the Nigeria and African context, the study will be a foundation on literatures that will be consulted for future research studies. Findings in the study reveals that when the INEC and Nigerian government has successfully adopted blockchain-based voting into his governance structure, it will be a standard for the revolution of transparent governance process in West Africa and Africa at large because of the characteristics and benefits of blockchain technology of transparency, time management efficiency, cost reduction, user friendly with trained people etc.

Findings in the study also reveal that '*cost of conducting election will be reduced by 40% when blockchain-based voting has been adopted by the electoral body''* (R8 Male) The excess funds can be channelled to improve another sector of the economy that will help in creating jobs and increasing the country's GDP.

Additionally, blockchain based voting will increase voters' engagement in election process in Nigeria, from the pilot testing that was carried out in University of Jos, it reveals that there was over 90% increase student participation in the Student Union Government election when compared to the previous elections by the institution as it enables citizens to vote from any mobile device from their comfort zones.

Furthermore, Governments will be not the only institutions that can benefit from blockchain based voting. Private institutions employees or shareholders can vote for initiatives within a firm as well. It is therefore very possible to imagine an ownerless business where every single decision will be adopted with an open vote from employees and shareholders alike.

CONCLUSION

Blockchain based voting will be a solution to delivers the core objective of democracy which will be giving power to the people. Currently, the citizens of Nigeria desperately need a total overhaul of the entire leadership of the nation, which was highly demonstrated in October 2020 at the *End Sars* protest across the country demanding justice and equity for the common man. (Ogele, 2021). Producing good leadership is tied to getting the process that produces the leader correctly. Blockchain-based voting has the capacity to produce good leaders through its advantage of transparency, security, and trust, as the election result will reflects the exact decision of leader they voted for. When Nigeria adopts and implements the blockchain based voting, other nations in Africa will follow (Nigeria is the pacesetter in Africa's technological development thus in the best position to create the change in Africa's democratic system as explained by R1, R2, R3, R10 and R13). Starting with the West Africa sub region down to east and central Africa and then to the whole continent.

LIMITATIONS AND FUTURE STUDIES

This study examined the relevance for the adoption of blockchain based voting by the Independence National Electoral Commission in Nigeria. Having explore all benefits and challenges being characterised in the adoption of blockchain based voting, the study is limited by the following two reason and will be a recommendation for future research. Firstly, the size of participants that participated in the study is small which future studies should address, secondly, future studies could use questionnaire and hypothesis is as an addition to structured open ended questions interview, in the data collection process especially for participants that will want to be part but don't want their voice recorded for some personal or security reasons.

Furthermore, it was strongly recommended by the interviewees that INEC should begin consultations with expert especially the team that were involved in piloting blockchain based voting in UNIJOS so that the next general election can be a transparent one.

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