Blockchain In Procurement: The Missing Link to Curbing Corruption, while Promoting
Economic Development & Democracy in Nigeria

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ABSTRACT

Nigeria possess the potential to exist as a thriving democracy and economic power in Africa. There, however, is one major issue that inhibits Nigeria from doing so—corruption. Corruption permeates itself through nearly every facet of Nigerian government. In fact, corruption is so pervasive in Nigeria, many citizens have lost faith in Nigerian government. Moreover, the most corrupt area in Nigerian government—like most governments—is in procurement. Procurement is a government's most important function, involving massive transfers of funds and exchanges of goods from governments to private parties. Utilizing blockchain in procurement can increase supply chain transparency and improve the contract award process. Blockchain—at a basic level—can operate as a public, tamper-evident, electronic ledger capable of performing self-executing contracts. Accordingly, Nigeria utilizing blockchain in procurement will curb corruption through increased transparency. Increased transparency and decreased corruption undoubtedly will lead Nigerian citizens to develop renewed faith and trust in the Nigerian government—a key component to a stable democracy. Additionally, blockchain will also enable Nigeria to realize economic gains through refined and efficient procurement. Blockchain can transform Nigeria.

I.   Introduction

Nigeria has everything. Nigeria has fertile land, rich human and physical capital, and "universities that in the years after independence were the envy of Africa."[1] But, a debilitating disease plagues Nigeria—corruption. Nigeria, "a country where 87 million people live in extreme poverty—more than any other country on earth,"[2] needs economic development, public accountability, and progress. The last thing Nigeria needs is a scandal that "could have been lifted from the pages of an espionage thriller" involving "[g]iant oil companies, offshore accounts, ex-MI6 agents, champagne lunches, a former Nigerian president, and allegations of hundreds of millions of dollars paid as bribes."[3] In fact, "the amount distributed as bribes [in this scandal] is more than the entire Nigerian healthcare budget for 2018."[4]

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[1] TOM BURGIS, THE LOOTING MACHINE WARLODS, TYCOONS, SMUGGLERS, AND THE SYSTEMATIC THEFT OF AFRICA'S WEALTH 71 (2015).
[2] Ben Chapman, *Shell faces one of the biggest corporate corruption cases in history over $1.3bn Nigerian oil field*, THE INDEP., Sept. 6, 2018.
[3] *Id.*
[4] *Id.*

Below, this Note will address the Shell Eni Oil scandal—a scandal indicative of the gross corruption within Nigerian procurement.

The Shell Oil controversy began in 1998, when Dan Etete ("Etete"), the Nigerian oil minister at the time, awarded the OPL 245 oil field—which roughly held 25 percent of Nigeria's discovered oil reserves—to Malabu Oil and Gas ("Malabu"), a company Etete controlled.[5] Though Malabu was obligated to pay the Nigerian government $20 million for the license to the OPL 245 oil field, it only paid roughly $2 million.[6] In 2001, Shell was in negotiation with Etete and Malabu to acquire a 40 percent interest in the oil field. Then, newly democratically elected, President Olusegun Obasanjo annulled Malabu's license to the oil field.[7] Shell, in 2002, won the exclusive right to run the oil field.[8] This created controversy around who truly owned title to the oil field. To quell the controversy, Shell and Eni made a deal in 2011 to pay the Nigerian government $1.3 billion for joint ownership of the oil field.[9] As part of the deal, the Nigerian government paid a startling $1.1 billion to Malabu so they would drop its claim to the oil fields and pay other bribes.[10] Whereas, the Nigerian government retained only approximately $200 million—which is

Flow of Funds

Prosecutors allege Shell and Eni agreed to pay $1.3 billion to Nigeria for the rights to a valuable offshore oil field, knowing that the government would funnel $1.1 billion of that amount to a company called Malabu to be used for bribes.
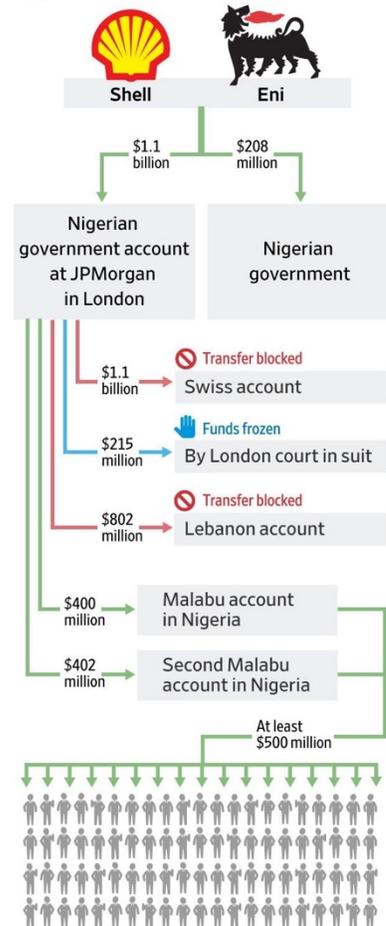
Allegedly distributed in kickbacks and bribes to more than 100 recipients including figures at Malabu, Nigerian president Goodluck Jonathan, other Nigerian politicians and Eni executives.

Source: Nonpublic court documents

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[5] *Id.*

[6] Sarah Kent & Eric Sylvers, *Inside the Bribery Scandal Sweeping Through the Oil Industry*, WALL ST. J., Feb. 13, 2018.

[7] *Id.*

[8] *Id.*

[9] Chapman, *supra* note 2.

[10] Kent and Sylvers, *supra* note 6; Ben Chapman, *supra* note 2.

less than 20 percent of the entire purchase price of the oil field.[11] Figure 1, to right, breaks down

the flow of funds from the deal; where at least $500 million went to paying kickbacks to high

level officials.[12] Despite the monetary settlements, a trial for this case is still raging in an Italian

court. Top former and current Shell, Eni, and Nigerian executives face potential prosecution on

criminal corruption charges.[13] This Note will address how blockchain could have prevented this

fiasco.

Nigeria, like other emerging African nations, faces massive corruption. Corruption is the

antithesis and greatest deterrence to democracy and progress. And while the   *Figure 1*

lifeline of any government is procurement, unfortunately, procurement is the medium through

which corruption occurs—particularly in emerging African nations. Utilizing blockchain in

procurement in Nigeria will increase transparency because, through blockchain, the public and

the world will be aware of every penny spent, transaction made, and every party involved in

procurement transactions. It is a public and self-authenticating ledger. Blockchain works by

logging transactions, which ensures the parties are who they say they are; the seller owns the

object; the buyer has a means of paying for it; and the object of the transaction corresponds with

what is bought. Every transaction is recorded. This is crucial. Moreover, Nigeria is a quickly-

emerging nation with unlimited potential: hence, other countries—such as China—are investing

in Nigeria. Nigeria possesses the potential to become a world power, but this cannot occur on a

foundation of corruption, as that begets instable democracy. Implementing blockchain in

procurement will deter corruption because of the increased transparency and authentication in

contracting. Proper procurement ensures better government regulation, which leads to enhanced

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[11] Kent and Sylvers, *supra* note 6.
[12] *Id.*
[13] Chapman, *supra* note 2.

growth: Thus, a Nigerian nation that emerges with a robust economy, stable democracy, and free of corruption.

Before delving into how blockchain can and should be used in procurement to curb corruption and spur economic development in Nigeria, this Note will explain how procurement works in Nigeria and the corruption that plagues emerging nations like Nigeria. From there, this Note will address how blockchain works. This is not a detailed explanation of how to technically implement or create a blockchain platform, but rather discusses its origination, operation, and uses. A technical understanding is not necessary to utilize a blockchain system. For example, many internet users do not know how the internet technically functions but understand how to utilize the internet. If interested in the technical aspects, the World Bank Group has published a report on the technical aspects of how a government can implement blockchain in procurement.[14] Moreover, the note will then elaborate on exactly how procurement processes can utilize blockchain. Finally, this Note addresses how the implementation of blockchain in Nigerian procurement can curb corruption and spur economic development.

II.   Nigerian Procurement & Corruption Background

Moving forward, it is important to obtain a base level understanding of Nigerian procurement to understand how blockchain can improve the current procurement system—particularly through curbing corruption. Prior to 2007, the word procurement had no place in Nigeria's lexicon. [15] Rather, what was operational were departments of purchasing and supply responsible for buying and storing items that were later issued to various ministries and departments. Contracts were awarded by government officials without an established legal framework; this

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[14]*See generally*, Dr Ramanathan Somasundaram, *Regional: Development of a Global e-Government Procurement Architecture using Blockchain Technology* 53 (2018).
[15] Dr. Bayo Arowolaju, INTERVIEW ON NIGERIAN PROCUREMENT & CORRUPTION (2018).

was subject to abuse and corruption, which led to the intervention of the World Bank and public procurement reforms—like the Public Procurement Act of 2007.[16] For the first time, in 2007, Nigeria adopted the Nigerian Public Procurement Act PPA")[17], which is based on the United Nations Commission on International Trade and Law ("UNCITRAL") model procurement law.[18] So, now, Nigeria has a procurement system that mirrors countries across the world—including the United States. The PPA "governs the procurement of goods, construction works, services, and disposal of state assets, and also consultancy services."[19] Unfortunately, despite the Procurement Act of 2007, corruption is still a major issue in Nigeria.

a.   Corruption in Nigeria

Every nation in the world grapples with some form of corruption—including the United States.[20][21] Corruption, however, is a difficult concept to understand at times, because it is very fluid.[22] Acts that constitute corrupt acts can vary from country to country, depending on several factors like religion, ethics, and other societal norms.[23] For example, paying a small fee for a routine contract in some nations is regarded as a corrupt practice, but other nations may regard it as a normal cost of doing business. Despite the fluidity of corruption, Matthew Page—a nonresident scholar at the Carnegie Endowment for International Peace—contends: "[t]here has been a global cry and coordinated efforts to tackle this social evil through the creation and

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[16] *Id.*

[17] PUBLIC PROCUREMENT ACT, (2007).

[18] *See generally*, Sope Williams-Elegbe, *THE REFORM AND REGULATION OF PUBLIC PROCUREMENT IN NIGERIA*, 41 PUB. CON. L.J. 339, 346 (2012).

[19] *Id.*

[20] Jacob Olufemi Fatile, *Corruption and the Challenges of Good Governance in the Nigerian Public Sector*, 1 AFRICA'S PUB. SERV. DELIVERY AND PERFORMANCE REV. 46, 47 (2012).

[21] *See, e.g.*, Craig Whitlock, *The man who seduced the 7th fleet*, WASH. POST, May 26, 2016.; Nicholas Kusentz, *Only three states score higher than D+ in State Integrity Investigation; 11 flunk*, CENT. FOR PUB. INTEGRITY, Nov. 9, 2015.

[22] Fatile, *supra* note 19, at 48.

[23] *Id.*

implementation of anti-[corruption] laws and policies across nations."[24] For example, a major

U.S. anti-corruption law—which is replicated by countries across the globe—is the Foreign

Corrupt Practices Act (the "FCPA"). According to the United States Department of Justice: The

FCPA makes it unlawful for certain "classes of person and entities" to exchange "anything of

value" for the purpose of influencing the decision of a foreign governmental official.[25]

Moreover, some nations are eradicating corruption effectively: Whereas, Nigeria,

unfortunately, is struggling in its own campaign.[26] Even though the Nigerian government has

consistently implemented new laws and programs to combat corruption since 1971, government

officials find ways to subvert these new laws and continue corrupt practices.[27] Thus, in Nigeria,

"there has been a geometrical growth in the rate of corruption in."[28] For example, President

Olusegun Obansanjo implemented the Independent Corrupt Practice and or other Related

Offences Commission (ICPC) and Economic and Financial Crimes Commission (EFCC) in 2000

and 2004 respectively to combat corruption and corruption related offenses.[29] Critics, however,

view these bodies as toothless enforcement mechanisms; or pawns used by the party in power to

prosecute corrupt opponents, while turning a blind eye to their own corruption.[30]

Transparency International, a non-governmental organization (NGO), aimed at fighting

corruption across the globe, publishes a corruption index that ranks 180 countries "by their

perceived levels public sector corruption according to experts and businesspeople" on a scale of

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[24] *Id.* at 47.
[25] The United States Department of Justice, FOREIGN CORRUPT PRACTICES ACT (2015),
https://www.justice.gov/criminal-fraud/foreign-corrupt-practices-act (last visited Jan. 7, 2019).
[26] Fatile, *supra* note 19, at 47.
[27] *Id.*
[28] *Id.* at 47.
[29] *Id.* at 52.
[30] Matthew Page, *A New Taxonomy for Corruption in Nigeria*, CARNEGIE ENDOWMENT FOR INT'L PEACE,
https://carnegieendowment.org/2018/07/17/new-taxonomy-for-corruption-in-nigeria-pub-76811 (last visited Jan. 7,
2019).

0 to 100.[31] On this scale: zero corresponds with a nation exhibiting high levels of corruption, whereas 100 corresponds with a nation experiencing no corruption.[32] In 2018, Nigeria ranked 144th out of 180 countries in this index and received a score of 27 out of 100.[33] As a point of comparison, the average score in 2018 was 43 out of 100, and Iran scored of 28 out of 100.[34] Appropriately, Nigerian scholars claim corruption is evident in nearly every transaction made in Nigeria.[35] Corruption in Nigeria takes many forms: "from massive contract fraud to petty bribery; from straight-up embezzlement to complicated money laundering schemes; from pocketing the salaries of nonexistent workers to steering . . . . jobs to relatives and friend[s]."[36] The following sections will address different examples of corruption in Nigeria.

i.   Political Corruption

To understand the extent of corruption in Nigeria, one must understand the multiple sectors in Nigeria and how corruption in each sector fuels an overall corrupt state.[37] First, Nigeria faces massive corruption in its political and institutional sectors.[38] The two main political parties—All Progressives Congress (APC) party and the opposition People's Democratic Party (PDP)—are "non-ideological organizations" that "[b]oth rely on misappropriated public funds to finance election campaigns."[39] Further, the parties do not "value[] internal party democracy, allowing money and high level interference to corrupt candidate selection processes."[40]

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[31] TRANSPARENCY INT'L - NIGERIA, https://www.transparency.org/country/NGA (last visited Nov. 2, 2018).
[32] *Id.*
[33] *Id.*
[34] *Id.*
[35] Fatile, *supra* note 19, at 47.
[36] Page, *supra* note 30.
[37] *See generally*, *Id.*
[38] *Id.*
[39] *Id.*
[40] *Id.*

In addition, Nigeria's federal, state, and local elections face massive corruption. The Independent National Electoral Commission (INEC), the electoral body that oversees elections in Nigeria—spent nearly $550 million on the 2015 election.[41] Whereas the country's political parties spent nearly $2 billion campaigning. As a point of comparison, in the 2016 U.S. general election both parties spent $2.6 billion campaigning.[42] Nigeria and the U.S. spent nearly the same amount campaigning, when Nigeria's GDP per capita—a measure of the living conditions in a nation[43]—is $1,968.6 million; and the U.S.'s GDP per capita is nearly 60 times greater at $59,531.7 million.[44] This is a shocking revelation, because Nigeria, a country with drastically worse living conditions than the U.S., spends the same amount of money on campaigns. Furthermore, millions of dollars spent on the 2015 Nigerian campaigns went to election rigging and bribes.[45] Current Nigerian President, Muhammadu Buhari recently tweeted:

> "I have made it clear to Government officials that there will be no money from the treasury for use in the 2019 campaign. I will not authorize that. One of the legacies I would like to leave behind is the clean-up of campaign financing in Nigeria. We cannot and will not share money from the treasury to prospective voters. Nigerians have long sought for change and only the All Progressives Congress (APC) can deliver — and is delivering — that change. Our people can no longer be swayed by money politics."[46]

In fact, the EFCC contends Diezani Alison-Madueke—a former petroleum minister—spent $115 million to bribe members on INEC to sway the election in the PDP's favor in 2015.[47] The EFCC

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[41] *Id.*

[42] *Statistical summary of 24-month campaign activity of the 2015-2016 election cycle*, FEC.GOV, https://www.fec.gov/updates/statistical-summary-24-month-campaign-activity-2015-2016-election-cycle/ (last visited Jan 8, 2019).

[43] Will Kenton, Per Capita GDP, INVESTOPEDIA, https://www.investopedia.com/terms/p/per-capita-gdp.asp (last visited Jan 13, 2019).

[44] *GDP per capita (current US$) | Data*, WORLD BANK, https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=NG-US (last visited Jan. 11, 2019).

[45] Page, *supra* note 30.

[46] Muhammadu Buhari (@mbuhari), TWITTER (Jan. 9, 2019, 1:39 PM), https://twitter.com/mbuhari/status/1083085809329287169?s=11.

[47] Page, *supra* note 29; *N23 billion Diezani bribe: INEC staff pleads guilty to receiving N30 million*, PREMIUM TIMES NIGERIA (2017), https://www.premiumtimesng.com/news/headlines/228000-n23-billion-diezani-bribe-inec-staff-pleads-guilty-receiving-n30-million.html (last visited Jan. 13, 2019).

is also currently prosecuting Daar Communications—owner of Africa Independent Television—and its chairman for accepting ₦2.1 billion ($12.4 million in 2015 dollars) in public funds diverted into then president Goodluck Jonathan's reelection campaign."[48]

ii. Journalistic Corruption

A free-press is a pillar of good democracy. Even though Nigeria has free-press, it is riddled with corruption; journalists find themselves wrapped in the pockets of wealthy politicians.[49] In fact, "[o]ver 75 percent of journalists surveyed as part of a 2013 study admitted to accepting such financial gifts."[50] Nigerian journalist blame the corruption in their field on lack of sustenance, which forces some journalist to compromise their ethics for money.[51] Hence, editors and publishers take bribes to alter their news coverage and stifle stories that cast a negative light on some politicians.[52] A corrupt press is disastrous for a democracy, because the press are crucial safeguards of democracy.[53] This is why in 1786 Thomas Jefferson penned, *"Our liberty depends on the freedom of the press, and that cannot be limited without being lost."*[54] Without a strong press as an institution that sheds light on corruption, corruption spreads—cultivating in the darkness.

iii. Procurement Corruption

Lastly, "[m]alfeasance involving government contracts is perhaps the most common and lucrative type of official corruption in Nigeria today."[55] Government officials use procurement as means of amassing their own personal wealth or for their associates who they award contracts

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[48] Page, *supra* note 30.
[49] *See Id.*
[50] *Id.*
[51] *Id.*
[52] *Id.*
[53]
[54] *Id.*
[55] Page, *supra* note 30.

to.[56] Unfortunately, there are few measures in place to prevent contracts from being awarded to individuals with whom government officials have conflicts of interest with. The Corporate Affairs Commission (CAC), has an online database containing registration numbers, names, addresses, and incorporation dates on companies bidding for government contracts.[57] But, to find out key information that sheds light on conflicts of interest—like information on the companies' directors and shareholders—a lawyer must pay a fee to do an in-person inquiry at a CAC office.[58] Also, according to an EFCC investigator, "[t]here is an element of bid manipulation in every fraudulent contract."[59]

Frequently, officials make the bidding process seem competitive by asking business associates to bid on a contract at higher prices—making it appear that a contract had multiple bidders at higher prices, when it only had one or few actual bidders.[60] Additionally, according to Dr. Bayo Arowolaju—a former Director General for Ekiti State Bureau of Public Procurement in Nigeria—corruption manifests itself through contractors paying bribes to officials to accept late bids.[61] Corruption also surfaces during bid evaluations by officials who rate a favored bid higher or better than others.[62] In addition, corruption manifests through shady contractors borrowing equipment from other contractors, then placing the equipment on the site of a project to appear as if they are working and have the materials to do the work, but then fleeing after payment without completing the project.[63] The government contract process also is consumed by unnecessary bureaucracy, delays, abandoned projects, and unsatisfactory goods and services.[64]

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[56] *Id.*
[57] *Id.*
[58] *Id.*
[59] *Id.* (internal quotations omitted).
[60] *Id.*
[61] Dr. Arowolaju, *supra* note 15.
[62] *Id.*
[63] *Id.*
[64] Page, *supra* note 30.

b. Impact of Corruption

In sum, Nigeria is plagued with corruption. But it is not enough to understand the sources of corruption in Nigeria—one must also understand the impact of the corruption. Nigeria's public sector is "characterized largely by ineffectiveness and inefficiency" and it is primarily caused by the corruption that permeates throughout Nigeria.[65] Nigerian scholars attribute corruption as "the source of many socio-economic and political problems that have militated against the attainment of economic development, equity, social justice, political integration and stability as well as democracy in Nigeria."[66] Federal services are plagued with corruption, and Nigeria lost nearly $400 billion from 1966 to 1999 because of corruption.[67] In 2016 alone Nigerian officials received nearly $4.6 billion in bribes.[68]

The corruption in procurement makes life hard for Nigerians. The power sector lost nearly $64.7 billion (in 2015 dollars) to corruption.[69] Despite Nigeria having the largest output of African energy exports: "it generates only enough electricity to power one toaster for every forty-four of its own people."[70] Further, 62 percent of Nigerians live on less than $1.25 a day, but operating a generator costs a Nigerian about two times more than the average Briton pays for electricity.[71] In addition since the corruption in government contracts leads to contracts being awarded to individuals that often perform unsatisfactory jobs, thus, some projects tend to fail. In fact, "[c]atastrophic building collapses kill scores of Nigerians each year because contractors use substandard materials and bribe inspectors to ignore their shoddy work or lack of permits."[72]

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[65] Fatile, *supra* note 19, at 47.
[66] *Id.*
[67] *Id.* at 47.
[68] Page, *supra* note 30.
[69] *Id.*
[70] BURGIS, *supra* note 1, at 64.
[71] *Id.* at 64.
[72] Page, *supra* note 30.

Corruption in Nigeria only helps the public officials who receive bribes. Corruption then

exacerbates inequality, because wealth transfers only amongst affluent public officials and

private contractors—leaving the average Nigerian without a means to compete, nor with public

programs or a stable infrastructure to help offset the massive poverty.[73] For the sake of the

Nigerian people: Nigeria must do something about corruption, quickly and effectively, and thus

should implement blockchain in its procurement system.

III. Blockchain Background
a. What is Blockchain

First, the following sections will address the beginnings of blockchain: a platform that

originated for the cryptocurrency bitcoin. Then, the next sections will address how blockchain

works from a very high level. Lastly, the remaining sections will address the various uses of

blockchain—specifically its application in procurement.

i. Origination of Blockchain

Blockchain originally emerged as a platform for bitcoin.[74] Imagine making an electronic

payment to another party without the payment needing to go through a third party, like a bank—

a peer-to-peer transfer of money.[75] When people engage in financial transactions through third

parties, there are "inherent weaknesses."[76] The "inherent weaknesses" rest in relying on third

parties and the transaction costs associated with these transactions.[77] For example, when sending

money overseas, there are usually large transaction costs associated.[78] Further, the key issue is

ensuring the purported seller is who they say they are and actually have the bargained for good

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[73] *See* Fatile, *supra* note 19, at 54.
[74] SATOSHI NAKAMOTO, *Bitcoin: A Peer-to-Peer Electronic Cash System* (2008).
[75] *The great chain of being sure about things*, THE ECONOMIST, Oct. 31, 2015.
[76] NAKAMOTO
[77] *Id.*
[78] ECONOMIC IMPLICATIONS OF REMITTANCES AND MIGRATION, (Dilip K. Ratha ed., 2006).

or service.[79] For our electronic payments and transactions to occur, we must bare these

transaction costs and trust the parties involved.[80] But at times, transaction costs are too high and

we cannot trust parties. Bitcoin—a decentralized peer-to-peer payment network—reduces these

transactions costs and the amount of trust one must have with the transacting party.[81] Through

bitcoin, parties can make payments without relying on banks and automatically verify the

authenticity of the purported seller and their goods or services. This is what Satoshi Nakamato,

the unknown creator(s) of bitcoin had in mind when they released its white paper on blockchain

and bitcoin in 2008.[82]

ii. How Blockchain Works

Bernard Marr—an international best-selling author and strategic advisor to businesses

and governments—describes blockchain, at its most basic level, as a computer file used for

storing data.[83] The data stored varies on the use of the blockchain. For example, the data could

contain information for a particular transaction like the information of the purchaser, the seller,

and the good or service; self-executing contract terms; or information regarding a specific item,

such as the owner of the deed to a house.[84] Each file or block contains one transaction or set of

transactions, engrained with identifying codes.[85] Then, each subsequently validated transaction

creates another block that links the earlier transaction and codes—creating a chain, a blockchain

or electronic ledger.[86] This allows parties to trace transactions and items from their origin and

verify authenticity because a block will not be added to the blockchain unless the transaction is

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[79] NAKOMOTO.
[80] *Id.*
[81] *Id*.
[82] The great chain of being sure about things, *supra* note 3.
[83] Bernard Marr, *What Is Blockchain? A Super Simple Guide Anyone Can Understand*, BERNARD MARR & CO.
[84] The great chain of being sure about things, *supra* note 3.
[85] Nakamoto, *supra* note 23.
[86] The great chain of being sure about things, *supra* note 3.

validated as authentic.[87]   When each block is added, every user or node's blockchain is updated to reflect it, thus, creating an open network of information.[88]

There are three key characteristics of blockchain: (1) decentralization, (2) cryptography, and (3) openness.[89] First, blockchain is decentralized. Most computer files are stored on one computer. With blockchain, however, the files are distributed amongst any computer (or node) connected to the network.[90] Blockchain is comparable to a shared drive. Unlike a shared drive, however, there is no single owner that can control or edit the files. Instead, to change or edit a file (a block in the chain), consensus must exist amongst the users in the network that store their own separate and identical files (blockchain).[91] If there is no consensus, the change will not occur. Now, the second key characteristic of blockchain—cryptography.

Blockchain uses asymmetric cryptography to encrypt and authenticate the data within the chain.[92] Imagine Alice wants to pay Bob for a sandwich using bitcoin. Bob has a private key attached to his wallet and uses the private key to generate a public key for the specific transaction. Bob sends his public key to Alice. Alice uses her private key to encrypt the bitcoin and transaction information, which creates a digital signature and a digest of the information.[93] (The transaction information also includes the earlier transactions or blocks associated to the cryptocurrency.) Then Alice uses Bob's public key to encrypt the digest and sends it to Bob. Bob uses his private key to decrypt the digest and authenticate whether the transaction is a valid transaction on the blockchain. If it is valid, nodes on the network confirm the transaction. The

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[87] JAMIE BERRYHILL, THEO BOURGERY & ANGELA HANSON, *Blockchains Unchained: Blockchain Technology and its Use in the Public Sector*, OECD WORKING PAPERS ON PUBLIC GOVERNANCE, 13 (2018).
[88] *Id.* at 18.
[89] Marr, *supra* note 78.
[90] *Id.*
[91] *Id.*
[92] *Id.*
[93] Digital signatures are like thumbprints or signatures unique to a party that bind a party to a specific transaction.

transaction would be invalid if Alice altered any of the information about the cryptocurrency, including any of the past transactions, because this would create a different digest. So, when Bob's private key authenticates the transaction, it will see that someone altered the transaction and reject the transaction. Blockchain is a distributed ledger so, all of the nodes go about the same process of authenticating the specific transaction to verify its validity.

Another way to conceptualize how asymmetric cryptography works is to think about Alice depositing money to Bob in a locked box with an open slit. Bob gives Alice the locked box, but he does not give her the key to the box. Alice deposits the money in the box and a ledger detailing this transaction and past transactions. Then, she gives the box back to Bob. Bob then uses his key to open the box and take the money and check the ledger. Bob then cross references his ledger to make sure all the transactions match up. If the ledgers do not match, Bob will know something is wrong with the transaction.

This security protects against fraud and prevents someone from altering or fabricating the blockchain (or ledger). Blockchain, however, is not immutable or tamper proof—it is tamper evident. A "51 percent hack" can alter a blockchain.[94] This occurs when 51 percent of the users or nodes on the network are used to alter a particular chain.[95] First, however, in a public blockchain, it is nearly impossible for this to occur because it would require millions of unknown users to collaborate.[96] Second, in a private blockchain, only authorized users can make changes, so it is possible to identify who made the change. Lastly, if the changes did occur in a blockchain: Whether public or private, the blockchain would reflect a change in the blocks.

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[94] BERRYHILL ET AL., *supra* note 15, at 18.
[95] *Id.*
[96] *See Id.*

The last and most important characteristic of blockchain is openness.[97] In a public

blockchain every transaction made is visible to all users on the blockchain.[98] Since anyone with

an internet connection can join a public blockchain—it is open to the world. In a private

blockchain, anyone with permission to view the blockchain can view the transactions.[99] This

openness increases transparency, thus increasing accountability.

iii. Public v. Private

Public and private blockchains function effectively in the same way. The difference lies

in who can engage in transactions, view, and edit the blockchain.[100] Anyone with an internet

connection can view, engage in transactions, and potentially edit the blockchain in a public

blockchain.[101] Moreover, in a public blockchain, all the participants are anonymous—

identifiable only by their public keys.[102] Public blockchains usually have an incentive system to

encourage users to join and validate transactions. The largest public blockchain to date is

bitcoin.[103]

Private blockchains, however, can be programmed to require permission to edit and/or

view the blockchain and make transactions.[104] Moreover, private blockchains require less

energy output to operate the blockchain, because they do not need mass consensus from a

multitude of nodes (computers) to authenticate the transactions.[105] Private blockchains may have

the best use for the public sector because they "can greatly enhance accountability, as

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[97] Marr, *supra* note 11.
[98] BERRYHILL ET AL., *supra* note 15, at 19.
[99] Marr, *supra* note 11.
[100] The difference between public and private blockchain, , BLOCKCHAIN UNLEASHED: IBM BLOCKCHAIN BLOG (2017), https://www.ibm.com/blogs/blockchain/2017/05/the-difference-between-public-and-private-blockchain/ (last visited Nov 17, 2018).
[101] *Id.*
[102] BERRYHILL ET AL., *supra* note 15, at 18.
[103] *The difference between public and private blockchain*, *supra* note 29.
[104] BERRYHILL ET AL., *supra* note 15, at 19.
[105] *Id.* at 18.

transactions can be transparent to everyone, while only authorized users are able to actually record new transactions."[106] In a private blockchain, all the users are known.[107] Thus, a private blockchain can serve as an effective and reliable electronic ledger—tracing transactions and the parties conducting them from the inception to the present. Thus, allowing the owner to keep track of their transactions and identify irregularities.

iv. Current Uses of Blockchain

Blockchain can fundamentally change how private parties, businesses, and governments engage in transactions. Hence, blockchain has many new uses, besides serving as a platform for bitcoin. Most importantly here, its implantation in procurement. The following sections address some, but not all of the current uses of blockchain.

1. Cryptocurrency

It is important to make the distinction between blockchain and cryptocurrencies like bitcoin. In its inception, blockchain was a platform used to support the cryptocurrency bitcoin, which launched in 2009.[108] Other cryptocurrencies soon followed suit, particularly after bitcoin amassed immense value. Blockchain is to cryptocurrencies like bitcoin, as is the internet is to email—a platform. Likewise, imagine blockchain as a phone operating system and cryptocurrencies as a phone application—one of many applications on the operating system. Cryptocurrencies are a means of conducting peer-to-peer payments without a third part intermediary, like a bank.

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[106] *Id.* at 19.
[107] *Id.* at 18.
[108] Marr, *supra* note 78.

2. Smart Contracts

Cryptocurrencies, however, are not blockchain's only application. Blockchain can revolutionize government procurement with smart contracts. Karim Lakhani and Marco Iansiti, professors at Harvard Business School, claim "'[s]mart contracts' may be the most transformative blockchain application at the moment."[109] Smart contracts are contracts that self-execute once the conditions of the contract are met.[110] In a smart contract, "a series of necessary and binding steps must take place before the outcome is reached, or the contract ends"—providing "a digital workflow process."[111] Smart contracts retain all the benefits of blockchain while also fostering greater efficiency by diminishing the processing time associated with the execution of the contract.[112] For example, a government contract to purchase computers: The schedule for the contract is $10,000 for 100 computers every three months. Under a smart contract, at each three-month interval, the moment the goods are received, the contract is executed and money is sent to the government contractor. Contractors could even equip the packages with GPS functionality, which automatically inputs the receipt of the good upon arrival at the government agency's location.[113] Ethereum is the most developed blockchain platform for smart contracts to date.[114]

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[109] Marco Iansiti & Karim R. Lakhani, *The Truth About Blockchain*, HARV. BUS. REV. (2017), https://hbr.org/2017/01/the-truth-about-blockchain (last visited Oct 28, 2018).
[110] BERRYHILL ET AL., *supra* note 87, at 19.
[111] *Id.* at 19
[112] *See Id.* at 19
[113] Iansiti and Lakhani, *supra* note 110.
[114] BERRYHILL ET AL., *supra* note 87, at 19.

v. How Governments Are Using Blockchain

Blockchain initially gained prominence through the financial sector because of cryptocurrencies.[115] But, blockchain is now spreading through the public sector. In fact, "at least 46 countries around the world have launched or are in the planning stages to launch over 200 [b]lockchain-related initiatives."[116] For example, Dubai recently partnered with IBM to develop the world's first government-backed blockchain platform.[117] Sheikh Hamdan Bin Mohammed Al Maktoum wants Dubai's entire government to operate on blockchain, becoming the world's first paperless government.[118] The first areas where Dubai will implement blockchain are in health records, securing the diamond trade, title transfers, business registration, digital wills, tourism engagement, and improved shipping.[119] In addition, American agencies are also seeking to implement blockchain to enhance various operations—particularly in procurement.[120] In a speech at the Blockchain Forum on October 10, 2017, Deputy Secretary of State, John J. Sullivan stated,

> "Blockchain has the potential to become a transformative technology of our lifetime. . . and is expected to play a major role in trade, business, healthcare management, and finance, and we hope at the State Department as well. . . . [S]peaking on behalf of the U.S. Government, we want to educate ourselves about how we can better leverage Blockchain technology. . . . [W]e're excited about the many ways Blockchain technology could also increase transparency and accountability here at the State Department and across the federal government."[121]

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[115] *Id.* at 20

[116] *Id.*

[117] Alkesh Sharma, *From 45 days to seconds: Smart Dubai, IBM introduce Middle East's first government-backed blockchain platform*, THE NATIONAL, Oct. 31 2018.

[118] Saqr Ereiqat, *Blockchain in Dubai: Smart cities from concept to reality*, BLOCKCHAIN UNLEASHED: IBM BLOCKCHAIN BLOG, Apr. 10, 2017.

[119] Pete Rizzo, *Dubai's Global Blockchain Council Unveils First Pilot Projects*, COINDESK, May 30, 2016.

[120] *See generally*, Selva Ozelli, *US Government Implements Blockchain Programs to Improve Transparency and Efficiency*, COINTELEGRAPH, Jan. 23, 2018; HOUSE SCIENCE, SPACE, AND TECHNOLOGY SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY AND OVERSIGHT HEARING, (2018).

[121] John J. Sullivan, Remarks at the Blockchain Forum, http://www.state.gov/s/d/17/274725.htm (last visited Nov 20, 2018).

b. How Governments Can Utilize Blockchain in Procurement

Blockchain can revolutionize procurement. The best use for blockchain in procurement is through a private blockchain that allows the public to view but not edit the blockchain. Public procurement entails the purchase of goods or services by a government from private parties.[122] It generally refers to when a government is acting in the capacity of a consumer. Procurement, however, can sometimes embody the sale of government assets by a government. It is the life blood of any developed nation. In fact, the 35 countries, including the United States, who are members of the Organization for Economic Co-operation and Development ("OECD") spend nearly 12 percent of their GDP on public procurement.[123] The United States recently experienced a government shutdown, where more than 1 million government contractors were furloughed.[124] Procurement has such a large impact on the United States that during the government shutdown in 2018–19: The United States lost $200 million a day and its economic growth reduced by 0.13 percent every week the shutdown lasted.[125] Since procurement is such a crucial component of a nation, the OECD states that governments are expected to carry out public procurement "efficiently and with high standards of conduct in order to ensure high quality of service delivery and safeguard the public interest."[126] This means that good procurement requires efficiency, transparency, and integrity, which blockchain can help promote.

The following sections will address how blockchain can enhance procurement supply chain transparency and traceability. And how blockchain can improve the contract awarding process.

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[122] Public procurement - OECD, http://www.oecd.org/gov/public-procurement/ (last visited Jan 21, 2019).
[123] *Id.*
[124] Ari Natter, *Government Contractors to Lose Out on Shutdown Pay, Dragging Down Economy*, BLOOMBERG, Jan. 17, 2019.
[125] *Id.*
[126] Public procurement - OECD, *supra* note 123.

i.   Supply Chain Transparency/Traceability[127]

One of the most important utilizations of blockchain in procurement is enhancing the

supply chain traceability and transparency of transactions between a government and private

contractors.[128] Through blockchain, governments can track goods and transactions from their

origin. A recent example of this in the private sector is Walmart using blockchain to find the

source of romaine lettuce that caused an E. coli outbreak in the United States.[129] There are many

steps in the supply chain that make it hard to track down one food item.[130] Thus, it usually takes

at least seven days to find a contaminated food item—but with a blockchain system, it can take

as little as 2.2 seconds to find the source of the contamination.[131] The enhanced traceability that

blockchain brings surely can serve any government well. Moreover, so can the added

transparency it brings. Since all the transactions are permanently logged on the blockchain, the

government and the public—depending on the setup of the blockchain—can trace exactly which

parties were awarded contracts, what good or services the contracts were awarded for, and how

much the contracts were awarded. In addition, this increased transparency could also lead to

increased bid protests, which serves as another method of procurement accountability, because

disappointed bidders will have more clear and public information regarding the awarded

contract: reducing or speeding up bid protests.

ii.   Improve Contract Award Process

Information is powerful, particularly information that is easily and readily available. With

more readily accessible information, governments can ensure they are engaging in transactions

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[127] A natural byproduct of enhanced transparency and traceability in a procurement system is enhanced integrity.
[128] BERRYHILL, ET AL., *supra* note 87.
[129] Matt Smith, *In Wake of Romaine E. coli Scare, Walmart Deploys Blockchain to Track Leafy Greens*, WALMART https://news.walmart.com/2018/09/24/in-wake-of-romaine-e-coli-scare-walmart-deploys-blockchain-to-track-leafy-greens (last visited Jan 19, 2019).
[130] *Id.*
[131] *Id.*

with responsible parties, particularly in countries like the United States, where the responsibility of the contractor is a factor considered in awarding a contract. The United States federal government has a database called the Federal Awardee Performance and Integrity Information System ("FAPIIS") that holds date like "contract terminations, past performance, responsibility determinations, administrative agreements, or criminal, civil, or administration actions involving the contractor."[132] Governments can incorporate the date on databases like the FAPIIS into a blockchain so the government and the public will have everything they need to know about a contractor. Faster responsibility determinations lead to faster contract awards. This also will increase efficiency, another important goal of good procurement.

The General Services Administration ("GSA")—a United States agency that oversees the management and operation of other government agencies—believes blockchain can shorten the time frame for its contract award process.[133] Smart contracts can drastically shorten the contracting process—allowing governments to engage in more contracts. Governments can configure the terms of a smart contract to automatically execute once the good or service is received in accordance with the specifications. The enhanced efficiency created will also save governments a tremendous amount of money, because it will cut down transaction costs. In sum, blockchain can lead to a more efficient and cost-effective procurement process.

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[132] Jessica Tillipman, *THE FOREIGN CORRUPT PRACTICES ACT & GOVERNMENT CONTRACTORS: COMPLIANCE TRENDS & COLLATERAL CONSEQUENCES*, BRIEFING PAPERS 25 (2011).
[133] Joe Kim, *Blockchain: A Path to Unblocking Government Procurement Processes*, THE AMERICAN CITY & COUNTY; PITTSFIELD (2018).

IV. Nigeria Should Utilize Blockchain in Procurement to Curb Corruption, Spur Economic Development & Stabilize Democracy

Corruption is the antithesis to democracy. Corruption is a cancer; a cancer that, for years, metathesized through every fabric of Nigerian life—slowly killing the country and reducing the standard of living of its people. Life in Nigeria will only become harder unless the government does something more effective to rid the country of corruption and spur economic development. Implementing blockchain in Nigeria's procurement system—arguably the most corrupt area of the Nigerian public sector—can curb corruption and spur economic growth in Nigeria. In fact, Nigerians are already urging the country to adopt blockchain.[134] Countries across the world are realizing the benefits of blockchain and are rushing to learn more and implement it within their nations. Nigeria should do the same. In fact, in theory, Nigeria is one of the best places to implement blockchain. One of the highlights of blockchain is that it is a decentralized platform that allows for greater transparency. Statistics demonstrate Nigerians view their government as very corrupt—partly, because it indeed is corrupt.[135] Blockchain will decentralize power from the central government by increasing accountability in the transaction's engaged by the government. Even in the United States, the founding fathers—particularly the Anti-Federalist— would have supported technology like blockchain that decreases the size and power of the federal government and gives more power to the people. If Nigeria implements blockchain in its procurement, blockchain will: (1) improve procurement, (2) enhance oil and natural resource management, (3) renew accountability and faith in Nigerian government, and (4) increase economic outcomes, while decreasing inequality in Nigeria.

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[134] Emma Okonji, *Nigeria: Govt Urged to Adopt Blockchain Technology to Boost FDI*, THIS DAY (LAGOS), July 6, 2018.
[135] Transparency International - Nigeria, *supra* note 31.

a. Improved Procurement

    i. Self authentication

First, when the Nigerian government starts operating on blockchain, they can either start from nothing and then start logging transactions as they accrue—which may be the best path because of the sheer amount of corruption in past transactions. Another option is logging within the blockchain as much accurate information they have on past transactions, like information on: the private contractors, the terms of the contracts, the price of the contracts, who brokered the contract, etc. There are databases already in existence, which the Nigerian government can use to supplement their information—like the CAC.

1. Contract Award Phase (Stage)

At the contract award stage, Nigerian officials can use the information recorded on blockchain to assess many key indicators such as: whether there are any conflicts of interest amongst the contracting officer and the private contractor; whether the private contractor has performed poorly in past contracts; whether the private contractor is a real entity and not a shell used by a company to channel corrupt payments; or whether bid inflation is occurring by looking at past prices of the contracts and looking further into the potential existence of conflicts of interests; and much more. Officials will immediately possess nearly all the information they need to prevent corruption in the contract award phase. Even if an official acts with corrupt intent, the blockchain will record all of their actions—leaving an illuminated trail for anti-corruption officers to follow and then prosecute. This illuminated trail could support more disappointed bidders engaging in bid protests. With more knowledge, comes more power—providing more parties the ability to exercise their rights. According to Dr. Arowolaju—bid protests are rights not commonly utilized by disappointed bidders. Blockchain can change this.

Moreover, blockchain can also completely prevent some forms of corruptions at the contract award stage, such as when contractors pay bribes to officials to accept late bids. If bids are solicited through blockchain—instead of physically submitted in person—contractors are not able to bribe officials to accept late bids. All late bids would automatically be denied. Even if a bid was accepted late—a blockchain would make note of this, giving room for potential bid protests and oversight by anti-corruption officials. In fact, Dr. Arowolaju recommends this. He implemented an e-procurement system in his state, because he contends corruption and bribery are more likely to occur whenever individuals must engage in face to face contact to facilitate a procurement process and any related transactions.[136]

2. Performance

Additionally, blockchain can provide the same advantages to Nigerian officials in the contract performance phase. First, procurement that occurs through blockchain will ensure that the funds are automatically directed to the proper accounts. Frequently, public funds are diverted from their proper destinations to private accounts. The Shell Eni Oil scandal is an informative example of this. Over a billion dollars were diverted to private accounts to pay bribes instead of going to the Nigerian government. In other instances, such as when the government is paying for goods or services, funds are diverted into shell companies, which on their face appear proper. Utilizing blockchain, however, will expose fraud shell companies and track payments. This increased transparency will deter bad actors—like Etete and the other officials and private actors involved in the sale of the OPL 245 oil field—from engaging in fraudulent transactions. While monitoring transactions on a blockchain—the moment funds are sent to an improper account—

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[136] Dr. Bayo Arowolaju, *supra* note 15.

anti-corruption officials can notify authorities and begin an investigation. Engaging in corruption then becomes very risky. Thereby, stifling it before it occurs.

Moreover, blockchain can also ensure goods and services are in fact procured. A big issue in Nigerian procurement is the abandonment of projects and the delivery of poor-quality goods and services. Using smart contracts, Nigerian officials can set specific terms, like conditioning the automatic trigger of payment on the proper performance of the specifications of the contract. This will help ensure the procurement is according to the specifications, because if the specifications are not met, the automatic payment conditions will never trigger. Thus, officials will not have to worry about abandoned projects, because contractors will not receive their payment until the project is completed and verify that it meets the approved specifications. The Nigerian people will benefit tremendously from the increased quality of goods and services procured (produced) because of the enhanced compliance blockchain will create.

ii.   Supply Chain Transparency/Traceability

The information on blockchain can help enforce anti-corruption laws like the Public Procurement Act. Anti-corruption officials will have a much easier time seeking out corruption. Monitoring transactions on the blockchain will give them plenty of information needed to support and direct their investigations. Further—even if Nigerian anti-corruption officials do not utilize the blockchain to buttress their anti-corruption enforcement—foreign countries and international agencies and organizations can use it to keep Nigeria accountable. For example, it could help the United States Department of Justice or Security and Exchanges Commission crack down on FCPA enforcement—particularly the "Books and Records" provisions of the FCPA. Nevertheless, even if Nigerian government officials attempt to engage in corruption and input nefarious accounts or incorrect data—anti-corruption officials will possess the ability to trace all

transactions. A blockchain will ensure every transaction is traceable, open, and transparent. A blockchain will ensure every cent is accounted for. In the long run, the traceability of transactions will aid the returning of mismanaged public funds back to the Nigerian government and its people.[137] The billions of dollars of public funds paid in bribes, which were once lost, will now be recoverable and can be funneled back to support the needs of Nigerian citizens—instead of making corrupt officials and contractors richer. Consequently, the governments will spend less to achieve more.

b. Enhance Oil & Natural Resource Management

Roughly 77% of Nigeria's total government revenues comes from the oil sector.[138] Oil is vital to the economic growth and development of Nigeria. Thus, critical that Nigeria implements measures to decrease corruption in the oil sector—while enhancing efficiency. Currently, the oil sector is riddled with corruption. Oil blocks for explorations are corruptly allocated by government officials to friends and relations without considerations for expertise, competence and experience. Corruption ruins transactions such as this. But adoption of blockchain in procurement will enhance compliance and oversight, which can help ensure that officials sell oil fields for reasonable prices to responsible parties. Thus, preventing scandals like the Shell Oil scandal.

c. Renew Accountability and Faith in Nigerian Government

Blockchain offers increased accountability, which can rebuild faith in good governance. Thus, enhancing a fundamental component of good and sustainable democracy—the citizens

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[137] Transparency International e.V, RETURNING NIGERIANS' STOLEN MILLIONS WWW.TRANSPARENCY.ORG, https://www.transparency.org/news/feature/returning_nigerians_stolen_millions (last visited Nov 2, 2018).
[138] Maira Martini, NIGERIA: EVIDENCE OF CORRUPTION AND THE INFLUENCE OF SOCIAL NORMS, https://www.transparency.org/whatwedo/answer/nigeria_evidence_of_corruption_and_the_influence_of_social_norms (last visited Nov 2, 2018).

possessing faith in the democratic system. Currently, Nigerians believe their elected officials are highly corrupt and cannot trust them. A democracy cannot function effectively if the people believe their elected officials will act in self-interest opposed to an obligatory duty of public service. When citizens do not believe in the democracy they do not engage in the democracy. Lack of engagement can further exacerbate many of the issues that plague the Nigerian people, because it dampens their voices. It prevents the common people from having their interest advocated for in governmental arenas, like congress. Instead, the wealthy elite promote their own interests, increasing the scope and depth of corruption and widening inequality. Further, "[c]orruption chips away at democracy to produce a vicious cycle, where corruption undermines democratic institutions and, in turn, weak institutions are less able to control corruption."[139]

What makes the United States such an amazing nation is that the Government does whatever it can—for the most part—to put the people and their interest first. This occurs because of the existence of a stable democracy where the people actually participate and are represented in the legislative and executive branch. Presidents and Members of Congress understand that to stay in office—they must produce results for the people. Unlike in Nigeria, where many politicians view their positions as means to amass great wealth and power for themselves and immediate family members. If Nigerians know the government will hold accountable officials that engage in corruption, with the help of blockchain, they will regain faith in a Nigerian democracy. A thriving democracy and good governance tend to go hand-in-hand. In a thriving democracy, there is a strong middle class. The Nigerian government can channel money that once went to financing corruption to other economic areas, allowing Nigeria to develop a stable

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[139] Karin Zeitvogel, *So Much for the Swamp*, WASH. DIPLOMAT, Mar. 2019

infrastructure and build a middle class. This is why Nigeria needs to uproot corruption. This is why Nigeria should implement blockchain in its most corrupt sector—procurement.

      d.   Ability to Utilize Blockchain in Other Areas Once Established

The applications of blockchain are endless. Once implemented, it can branch to other areas to improve the lives of the Nigerian people. Implement blockchain in voting and curb election corruption so that Nigeria, a country with a GDP 60x less than the US, doesn't expend the same amount campaigning—delivering bribes for votes and rigging elections.

      e.   Increase Economic Outcomes and Decrease Inequality in Nigeria

Procurement is life line of any developed nation. In fact, procurement composes a substantial percentage of the GDP of most developed countries. As one can see through the government shutdown that occurred in the United States—mere inactive procurement can result in disastrous effects on an economy. So, if inactive procurement can create bad outcomes—corrupt procurement can and surely does create worse outcomes. This is a key reason why Nigeria has a poor economy. Corruption consolidates power to the elite and wealthy—leaving the poor to fend for themselves, particularly when there are not strong government support initiatives. This creates gross inequality and contributes to a non-existent middle-class.

When contracts are awarded corruptly to elite individuals or when public funds are corruptly diverted from public use to personal accounts: Nigeria's economy and the people suffer. This type of corruption stifles competition and causes businesses to suffer. Without proper competition, prices sky rocket. Costs are passed on to Nigerian consumers and in turn, they pay exorbitant prices for necessities and the public are denied other essential services. For example, Nigeria is rich with natural resources but has an inefficient, unreliable, and expensive power sector. Nigerians largely over pay for their electricity. Gasoline is expensive because it is

imported because of ineffective refinery systems all because of corruption which plays a substantial role in this. Further, when corrupt practices allow contractors to subvert rules and regulations, the integrity of the goods and services suffer if any is left at all. Corrupt contractors build shoddy and substandard roads and buildings even at higher costs—weakening already instable Nigerian infrastructure. Corruption prevents public funds from being used to effectively serve the public. In all, the people suffer when procurement is permeated with corruption. This is why Nigeria should quickly embrace and integrate blockchain into their procurement system to curb corruption.

V.   **Counter-Arguments and Limiting Factors**

a.   Cost and Equipment needed

Blockchain—an electronic platform—undoubtedly will require electricity. Unfortunately, partly due to corruption, electricity and other infrastructure is unstable in Nigeria. To implement blockchain, the Nigerian government must improve its infrastructure. This is necessary not only to implement blockchain effectively, but also to establish a proper framework for a developing nation. An effective government needs running an adequate electricity; most importantly, its people require stable electricity. The Nigerian government has the means of improving electricity output. After all, Nigeria is rich in oil and energy. Notwithstanding that, the Nigerian government can implement solar energy, like Israel's widespread implementation.[140] Currently, Green energy is regaining attention because of global warming. Nigeria could use this as a means of leading the charge to Green energy in Africa, while also using the Green energy to improve their infrastructure and the effectiveness of blockchain. Also, Nigeria could convince the World

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[140] Linda Gradstein, *Israel Pushes Solar Energy Technology*, NPR.ORG, Oct. 22, 2007.

Bank to buy in and support them in this initiative, like they did for Dr. Arowolaju. The World Bank helped him set up and equip the first Public Procurement Office in his state.[141]

  b. Blockchain Is Merely A Tool and Tools are Only as Effective as the Individuals that Wield the Tool

Blockchain will not completely limit corruption because those in charge can always find ways to manipulate the information originally inputted. However, if there is constant monitoring of the blockchain, officials can detect any discrepancies and identify the source of it. Also, some may argue an extremely corrupt government could use a private blockchain to hide shady transactions. This is true. Alas, there is only so much technology can do. In the end, completely curbing corruption will hinge on norm changing amongst Nigerian people—particularly government officials. Implementing blockchain is a step in the right direction, because the enhanced transparency it brings will make it easier to enforces anti-corruption laws—increasing enforcement. Increasing enforcement and then punishment of corruption will serve as a signaling function to Nigerian society that corruption is not tolerated. Therefore, paving the way for increased norm changing due to the fear of prosecution.

VI. Conclusion

Blockchain in procurement will revolutionize Nigeria. It will promote government accountability. Utilizing blockchain will also enable the proper allocation of government funds— allowing for increased expenditures for basic needs for the citizens of Nigeria. Even if the funds are diverted through nefarious means, they are easily traceable, and the proper legal action can commence to recover the funds. Most importantly, blockchain will revolutionize the functioning of the oil sector—ensuring efficiency and honesty in Nigeria's most valuable sector. In all,

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[141] Dr. Bayo Arowolaju, *supra* note 15.

blockchain will lead to increased transparency, adequate appropriation, and spending—thus, curbing corruption, spurring sustainable economic growth, development and democracy in Nigeria.