

# LEX FUTURUS GROUP

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## INTERNATIONAL LAW FIRM ASSOCIATION

Blockchain & Decentralised Ledger Training,  
Consultancy Services and Legal Advisory

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WHY THE USD2.5BILLION  
CENTRAL BANK OF NIGERIA (CBN)  
AND PEOPLE'S BANK OF CHINA (PBoC)  
CURRENCY SWAP DEAL MUST BE IMPLEMENTED ON THE  
BLOCKCHAIN/DISTRIBUTED LEDGER TECHNOLOGY

## RESEARCH PAPER



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## About Author & Lex Futurus Group

Lex Futurus Group was born when Boulevard collaborated with lawyers from Malaysia and Russia during the Introduction to Digital Currencies & Blockchain DFIN-511 (MOOC) course in 2017 at the University of Nicosia (UniC), Cyprus, Europe. Lex Futurus Group had since grown to add on two more lawyers as both inside and outside consultants from the United Kingdom (UK) & the United States (US).

Boulevard has worked in brick and mortar law firms on both civil and criminal litigation; did solicitor's work such as real estate landed property transaction documentation & compliance, and a host of others, before Lex Futurus Group happened. In the full stack blockchain/DLT training, consultancy services and legal advisory space, Boulevard has trained national securities regulators viz Securities and Exchange Commission (SEC), Nigeria on legal issues in both global and domestic regulation of crypto-assets; collaborated on international standards and guidelines for Initial Coin Offerings (ICOs) and blockchain token generation events; did a pro bono consultancy work for the SEC Nigeria on regulatory framework proposal for Initial Coin Offering (ICO); advised on ICOs, STOs, and IEOs, written utility token legal opinions, blockchain securities

regulation multi-jurisdictional legal opinions, articles on blockchain securities, and regularly speaks at conferences, meet-ups and events on crypto-assets, global & domestic regulation and everything DLT law & smart contracts in the capital market use case scenario.

Boulevard has made a comment contribution on International Organization of Securities Commissions (IOSCO)'s Consultation Report titled: "Risks, Issues and Regulatory Considerations Relating to Crypto-Asset Trading Platforms". Giles Ward, a Senior Policy Advisor at the IOSCO General Secretariat duly acknowledged the comment on behalf of the international standard-setting body, with a promise to review it in developing IOSCO's Final Report, and revert should IOSCO have any follow-up questions.

The Standard Organization of Nigeria (SON) has under advisement an application to register Boulevard to represent Nigeria at the International Organization for Standardisation (ISO) ISO/TC 307 on internationally acceptable standards for blockchain, other distributed ledgers and smart contracts being worked on by the 164-members strong international standards-setting body.



### Proofreading

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## Executive summary



*"Payment systems built around distributed ledger technology (DLT) operate by maintaining identical copies of the history of payments among the participant nodes in the payment system. Cryptocurrencies are perhaps the best-known example of the application of DLT, but the applicability of the technology is much broader. Payment systems based on DLT are compatible with oversight by the central bank, and several central banks have conducted successful trials of interbank payments. In these trials, payment system participants transfer digital tokens that are redeemable at the central bank and use DLT to transfer them to other system participants. Decentralised consensus is achieved through agreement of a supermajority of the participants (typically 75-80%) who collectively validate payments."*

*Excerpt from a slide presentation by Professor Hyun Song Shin, Economic Adviser and Head of Research, Bank of International Settlements (BIS) made 9th November, 2018 at the University of Chicago Becker Friedman Institute, United States of America (USA).*

The Central Bank of Nigeria (CBN) and People's Bank of China (PBoC) have negotiated and agreed to by-pass the United States dollar as the international trade settlement currency between the two countries Nigerian and People's Republic of China (PBoC). They have instead chosen to swap each other's non-backed, sovereign fiat paper currencies Naira and Renminbi in a deal worth USD2.5BILLION to settle trades for a period of three years renewable, subject to any further mutual consent agreement between the parties.

This White Paper looked through the legacy banking settlement infrastructure and the distributed and decentralised ledger system for payment and settlement, with the attendant merits

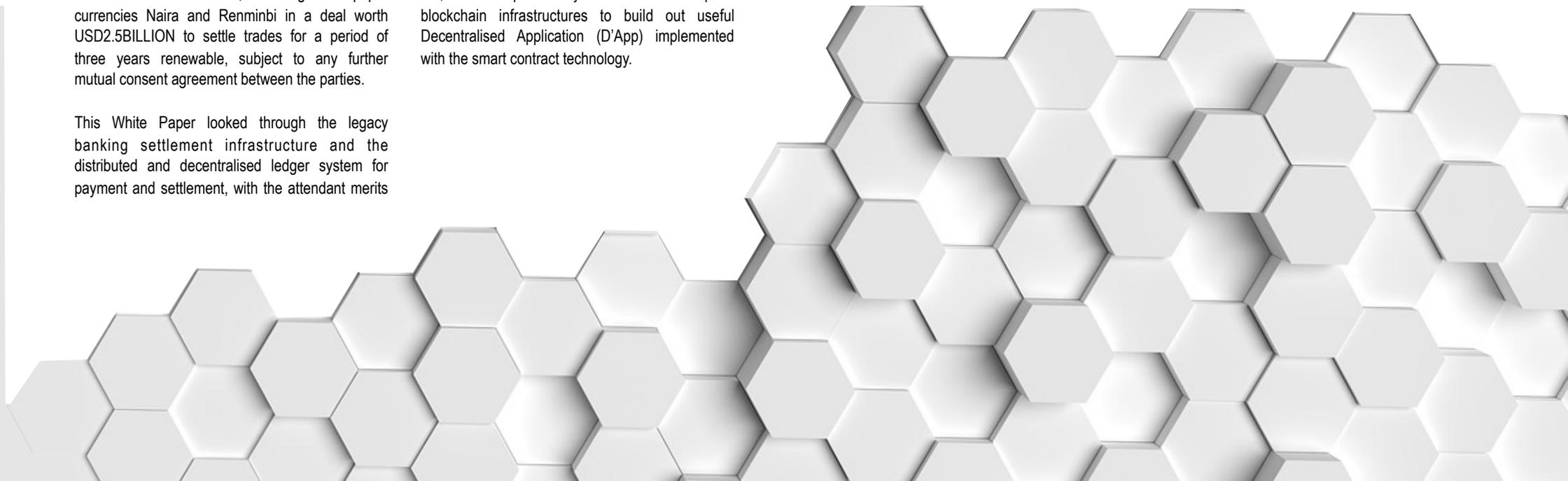
and benefits to diversify in innovative various ways. In conclusion the paper recommends that because of the benefits inherent in the distributed ledger technology systems, the Central Bank of Nigeria (CBN) should come up with its own blockchain technology, build a Proof of Concept (PoC) to test out, or team up with any of the extant enterprise blockchain infrastructures to build out useful Decentralised Application (D'App) implemented with the smart contract technology.

## Introduction

Today, process corruption remains the bane of systems all over the world, and Nigeria is not different. Transparency and accountability remain the highest priced, and most elusive commodities. Thus, the nation-states, international financial institutions, banking institutions, and organisations ready to make concrete progress have started to embrace and explore a multi-purpose and many use case technology called blockchain/Distributed Ledger Technology (DLT) through research, development, adoption and implementation. The blockchain technology overtime has tremendously proved its huge potentials to address the hitherto unachievable goals and ideals of decentralisation, transparency, accountability, disintermediation through cryptographic security, and trust-minimization in transactions and governance.

The Central Bank of Nigeria (CBN) and the People's Republic of China (PBoC) inked a USD2.5 billion bilateral currency swap deal to facilitate and increase trade volume and relations between Nigeria and China. This currency swap deal is a

veritable use case for the blockchain, if the deal management and execution are primed for success through transparency, accountability and subsequently process corruption avoidance. This is essential, so that the money swap deal does not go the way of previous deals that have been casualties to process corruption in the past. Nigeria specifically should propose the implementation of a private and permissioned blockchain, or any other blockchain governance model, for the purpose of the currency swap deal with the People's Republic of China (PBoC). China is already ahead of the global adoption curve in the blockchain/Distributed Ledger Technology (DLT) and exploring its use cases which include the financial technology cryptocurrency, State record management, smart city, trade finance, supply chain management, in order words, transfer of anything of value on the Internet of Value (IoV) etc. Nigeria at the moment is on the downside of the global blockchain adoption curve. Governments, corporations and citizens are not building useful decentralised blockchain applications and products at the expected accelerated speed rate.



## Details of the Currency Swap Deal Toot Court

After a negotiation period that reportedly lasted for more than two years, the Central Bank of Nigeria (CBN) and People's Bank of China (PBoC) on the 27th April, 2018 signed a Bilateral Currency Swap Agreement (BCSA) of 15 billion Chinese Yuan (CNY), equivalent to NGN720 billion and USD2.5 billion respectively. The deal is expected to last for an initial period of three years. According to its statutory mandate under the Banks and Other Financial Institutions Act (BOFIA) LFN 2004 (as amended), and Central Bank of Nigeria (CBN) Act, 2007, the CBN published a regulatory guidelines titled Regulations for Transactions with Authorised Dealers in Renminbi, wherein it introduces and explains the transactional background, purpose of the bilateral currency swap deal, eligibility, mode of payment, conduct of intervention, discretion on rates, charges, applicability of existing guidelines, amendments and enquiries. Below are some of the condensed highlights of the regulatory guidelines:

- i. CBN and PBoC are allowed to make liquidity available in their respective currencies to facilitate trade and promote investments between China and Nigeria, via purchase, sale, subsequent repurchase and resale of the Chinese Yuan (CNY) against the Nigerian Naira (NGN), and vice versa.
- ii. The CBN on her part is expected to conduct bi-weekly bidding sessions of the Renminbi, which is made available to authorised dealers, who are deposit money banks and merchant banks for the cash-backed transaction purposes.
- iii. Purpose of the currency swap deal is the facilitation of direct trade and investment financing between People's Republic of China (PRC) and the Federal Republic of Nigeria (FRN) without third party currency involvement like the United States' Dollar (USD).
- iv. The currency swap deal makes possible the purchase and repurchase, sale and resale of the Chinese Yuan (CNY) using the Nigeria Naira (NGN) and vice versa.
- v. The authorised dealers qualified to access the Chinese Yuan (CNY) are required to maintain Renminbi account with a correspondent bank, whether onshore or offshore China.



What is a blockchain?

## What is a blockchain?

The blockchain technology, also known as Distributed Ledger Technology (DLT), is a decentralised, globally shared and growing public ledger of transactions secured with cryptographic encryptions and cyber-attack proof complex mathematical problem solution built on a consensus algorithm. It works through random alphanumeric character generations that consume energy hashrates. It is a set of blocks/ records of transactions, where each block is linked to the other with a cryptographic hash function.

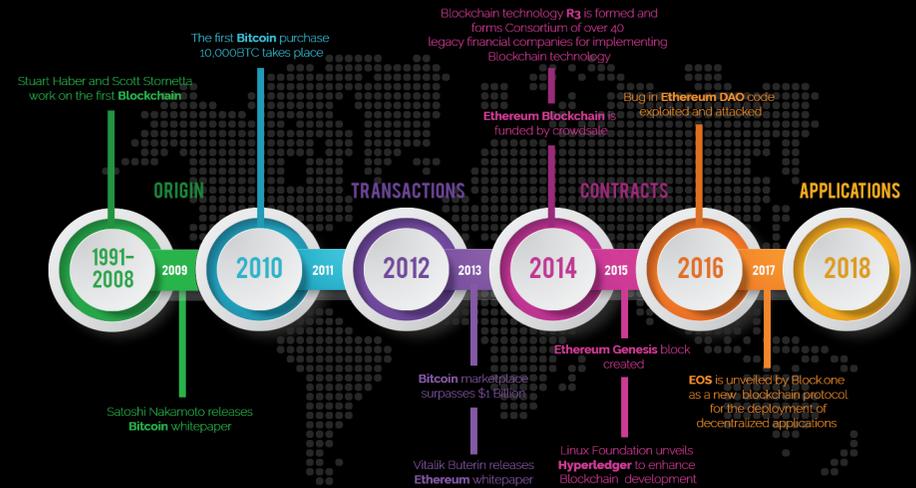
The first use case implementation of the blockchain as a Distributed Ledger Technology (DLT) is known as bitcoin. The ecosystem or the blockchain is also called Bitcoin (with the capital "B"). Bitcoin as a Financial Technology (Fintech) is the first successful cryptocurrency, having been preceded by several unsuccessful attempts. Bitcoin is a decentralised cryptocurrency that solves the double spend debacle. The 4th Anti-Money Laundering Directive (4th AMLD) European Union (EU) captures the definition of cryptocurrencies, otherwise known as digital currencies, "virtual currencies", and a number of other fluid terms in the following:

“ Article 3 is amended as follows: (c) the following point ... is added: ...“ virtual currencies” means a digital representation of value that is neither issued by a central bank or a public authority, nor necessarily attached to a fiat currency, but is accepted by natural persons as a means of payment and can be transferred, stored or traded electronically

The first bitcoin transaction was executed on the bitcoin ledger (blockchain) the 3rd of January, 2009 from the Genesis Block (also Block 0) between Hal Finney and Satoshi Nakamoto (the pseudonymous person who invented Bitcoin). The Bitcoin blockchain is regarded today as the legacy chain. The process through which bitcoin is created is called mining. Mining is a computational process of calculating the hash in a given mathematical difficulty.

101 Blockchains

## THE HISTORY OF BLOCKCHAIN TECHNOLOGY



URL: <https://101blockchains.com/history-of-blockchain-timeline/#prettyPhoto>

Created by 101blockchains.com



## Features of Blockchain

### Features of Blockchain and Benefits of Implementing the Currency Swap Deal on the Blockchain

1. Transparency,
2. Accountability,
3. Cryptographic security,
4. Cheap and fast transaction time,
5. Decentralisation,
6. Disintermediation,
7. Data immutability,
8. Tamper-proofing,
9. Financial inclusion,
10. Trust-minimisation,
11. Authentication,
12. Traceability,
13. Timestamp
14. Consensus algorithm

# 1. Transparency

Implementing the currency swap deal between the Central Bank of Nigeria (CBN) and the People's Bank of China (PBoC) on the blockchain can guarantee absolute transparency and accountability, which hitherto are somewhat lacking in the affairs of banking and financial institutions and governance systems across the world.

Dubai Smart Office on the Dubai Smart City project plans to bring to the world in 2020 a distributed ledger technology governance infrastructure, where transactions self-execute and self-verify with blockchain smart contract for its clarity, absence of downtime, non-vulnerability to counterparty risks, and decentralised two-way cryptographic hash function system. Among others, this will serve the purpose of offering public utility services to citizens, residents, and tourists to the northeastern United Arab Emirates (UAE) capital city on the blockchain technology, effectively facilitated with smart contracts.

Due to the blockchain architectural build, transactions executed on blockchain guarantee total transparency, as the information is recorded in an open and credible manner. The level of transparency that blockchain technology allows has never existed within the financial ecosystem hitherto. With blockchain implementation for payments and settlements, customer fund mismanagement is ancient history, as data sharing is open, accessible, traceable, transparent and verifiable. This way, potential financial crisis, management collapse and process corruption can be averted.

A common illustration of blockchain standard transparency is the Bitcoin Block Explorer, an online blockchain browser that displays in human-readable form contents of blocks, transaction IDs, histories and balances of addresses. It is a piece of software connected to the blockchain, which allows anyone with an Internet connection to track in real-time,

interactions or transactions facilitated with cryptocurrencies on the blockchain, to include the source detail.

In line with the transparent blockchain infrastructure, the Fifth Anti-Money Laundering Directive (5th AMLD) by the European Parliament, the financial securities regulator on the continent is mandated to monitor cryptocurrency transactions to prevent money laundering and terrorist financing. This occasions linking cryptocurrency wallet addresses directly to the actual identity of the wallet users or owners as the case may be. Virtual currency exchange platform providers and wallet service providers are required to comply with the legislative measure, which came as a response to the EU cryptocurrency industry calling for regulation to grant credibility, transparency and legitimacy to the industry.

In its healthcare platform use case, a patient can, with ease, observe, view or verify their medical data history, claims, transactions, and overdue payments, or make any enquiries whatsoever on the blockchain both conveniently and transparently, provided they have both Internet and computer device access.

The first bitcoin wallet address `1A1zP1eP5QGefi2DMPTfTL5SLmv7DivfNa`, associated with the Genesis Block mined on the Bitcoin blockchain, and where the first 50 bitcoins for block reward were sent on the 3rd January, 2009 is still, today both veritable and available with all its detail as number of transactions, total receipts, final balance, timestamps, and others, including new transaction data all transparently visible. And this will continue as long as the Bitcoin blockchain architecture or data structure remains a continuously synced, syncategorematic, updated and thus growing cryptographic distributed ledger.



## 2. Accountability

Since transactions on the blockchain leave trails and data history which are both auditable, immutable and thus guarantee integrity, blockchain perfectly fits in as a peer-to-peer digital accountability standard. This accountable environment ensures trust assurance and faith among the participants having the knowledge that process corruption is impossible, except of course the famous 51% attack, which even though it happens, cannot cause a reversal on the Bitcoin blockchain transactions which have been on the growing chain since the dawn of time. The worst a 51% attack success can achieve is a mischief with the current blockchain transaction. The previous transactions would be irreversible. The below further explains the accountability standard on the blockchain, especially when process on the blockchain is implemented with smart contract:



*The implementation of smart contracts may help to improve substantially the traceability, transparency, and accountability that are problematic in the bilateral or multilateral development aid arena. Transparency through smart contracts can help to reduce the mismanagement and misappropriation of donor funds and to stop fraud and corruption tangled with corporates and governments.*

## 3. Cryptographic security

Security of transactions executed on the blockchain is guaranteed, through the cryptographic Hashing system. The network participants each has assigned a private key:



*Unfortunately for those ambitious hackers, blockchains are decentralized and distributed across peer-to-peer networks that are continually updated and kept in sync. Because they aren't contained in a central location, blockchains don't have a single point of failure and cannot be changed from a single computer. It would require massive amounts of computing power to access every instance (or at least a 51 percent majority) of a certain blockchain and alter them all at the same time. There has been some debate about whether this means smaller blockchain networks could be vulnerable to attack, but a verdict hasn't been reached. In any case, the bigger your network is, the more tamper-resistant your blockchain will be. At a glance, blockchains have some desirable features that would help to secure your transaction data.*

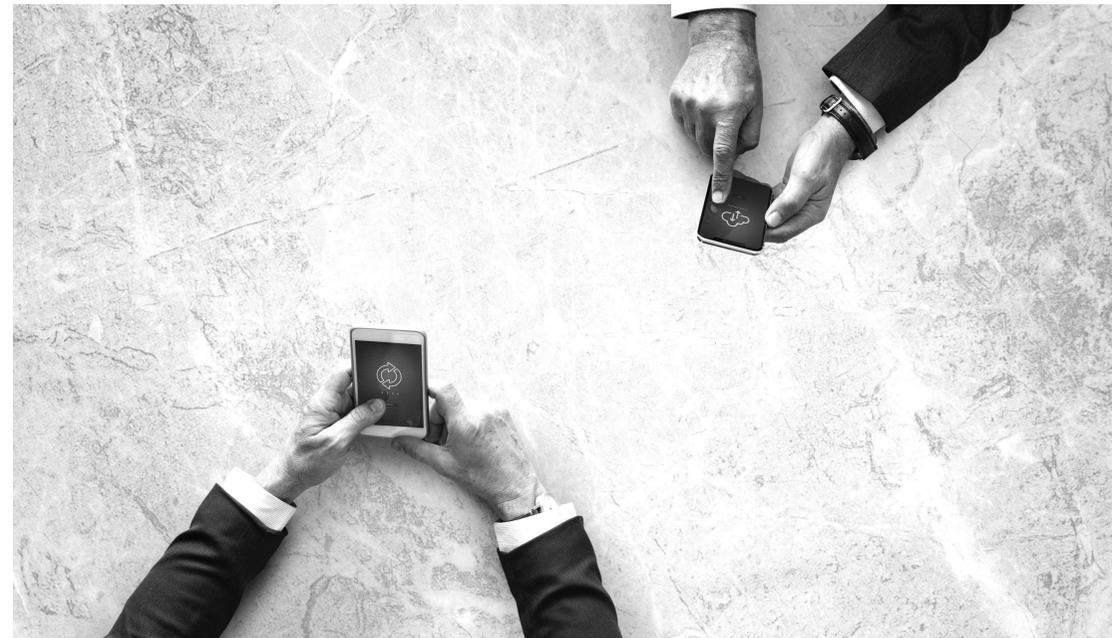
## 4. Fast Transaction Time and Cheapness

Speedy transaction settlement time is another feature, and a potential benefit of the blockchain. Outside the usual, blockchain allows for a cloud-based, cross-border, cheap and fast transaction settlement that obviates the need for any physical data centre. With 1,667 transactions per second (txps), Visa's VisaNet payment network is the fastest known legacy electronic payment infrastructure. Thus, in a 24 hour period, this payment network performs an aggregate of one hundred and fifty million transactions.

Ternio, the world's fastest blockchain, has the capacity to perform more than one million transactions per second (txps). In a day, that is eight billion transactions, on a decentralised, distributed and secure network. Unlike the Visa payment network, the Ternio blockchain does not have a central point of failure. Some of the other blockchains with cryptographically secure two-way hash function transaction abilities are NEO, on which ten thousand

transactions per second (txps) can be performed. Zilliqa performs fifteen thousand transactions per second (txps). Ripple blockchain performs fifty thousand transactions per second (txps). And many other blockchains are being developed and geared toward the derivation of a solution to the scalability issue, with which most blockchains are plagued. Another variant of Distributed Ledger Technology (DLT), the Hashgraph, touted as the "gold standard of cyber safety", performs 250 thousand transactions per second (txps).

Remittance costs annually is a great deal. According to the World Bank, global remittance cost in 2018 is USD613 billion. With the advent of distributed ledger technology cross-border funds transfer system, affordable, and inbuilt with low and minimal transaction fee, existing and incumbent payment systems and financial information transfer institutions are in transition period.



## 5. Decentralisation

Blockchain networks are both decentralised and distributed by design, as this is a core value proposition of both the blockchain architecture and infrastructure. Every participant node on the blockchain network has and maintains an identical copy of the transaction ledger, and thus requires no central authority for validation or otherwise, but validator nodes, or block producers depending on the particular blockchain network vocabulary. This cryptographic distributed ledger replicated is the same for everyone, since it is constantly updated, validated and uniformised. This is in contradistinction to the legacy system, which is centralized and undistributed; a central authority controls activities and retains an absolute power, and therefore easily vulnerable and open to both abuse and misuse.

There are nodes spread all across the world who on the blockchain ecosystem create, process, verify and validate transactions, and thus maintain data accuracy, which in essence ensures that there is no central point of failure, as every node is responsible for the maintenance of the network security and safety through a consensus algorithm. A typical blockchain, an example of which is the Bitcoin blockchain, is decentralised by design:



*The idea of decentralization. By design, the blockchain is a decentralized technology. ... A global network of computers uses blockchain technology to jointly manage the database that records Bitcoin transactions. That is, Bitcoin is managed by its network, and not any one central authority.*

## 6. Disintermediation

The import of disintermediation on the distributed ledger for transactional purposes is that a middlemen or Trusted Third Party (TTP) is virtually not needed anymore, as the system operates on the basis of trust-minimisation. Nitin Gaur, Director at IBM Blockchain Labs puts it thus



*Disintermediation is defined as reduction in the use of intermediaries between producers and consumers, for example by investing directly in the securities market rather than through a bank. Historically, in the case of the financial industry, every transaction has required a counterparty in order to process the transaction. By definition, disintermediation goes hand in hand with disruption; after all, we are removing the middlemen and changing (in some cases, radically) the business model and incentive economies pegged to mediation.*

Satoshi Nakamoto simply explained the concept in an email as:

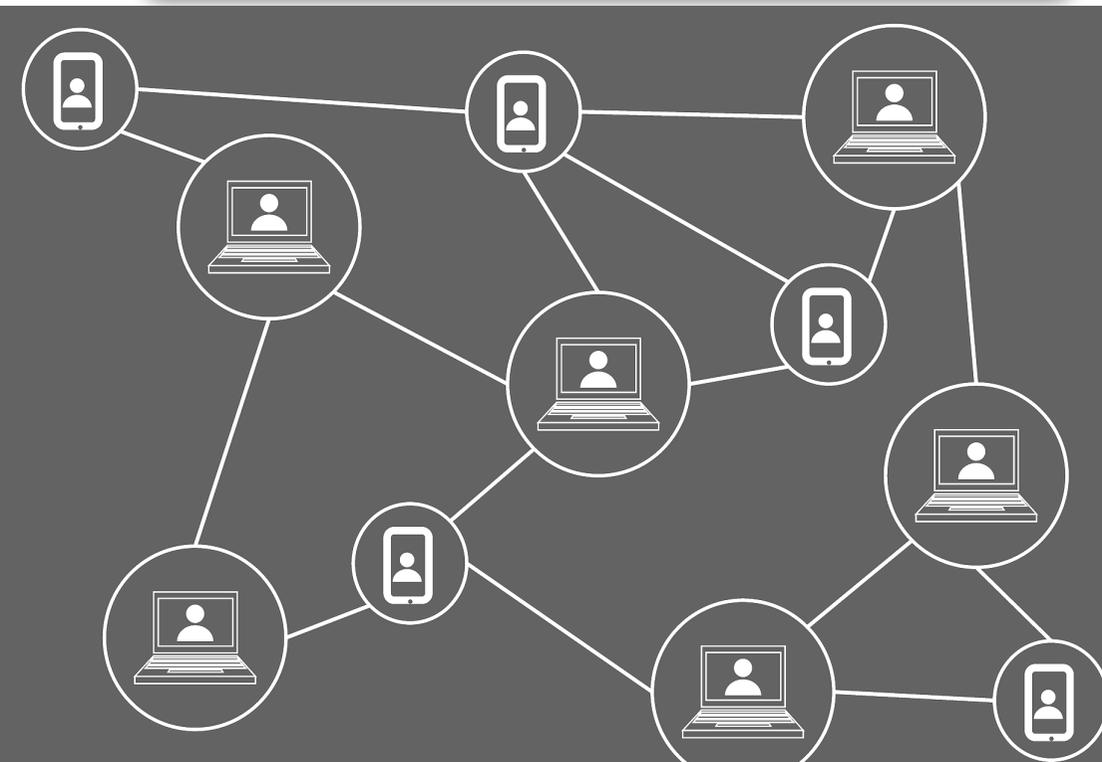


*...a new electronic cash system that's fully peer-to-peer, with no trusted third party.*

Arifa Khan's Decentralised Global Capital Market Platform (DGCAMP) is a global capital raising and exchange ecosystem focussed on the disintermediation of investment banks in the securities issuance process, and thus is a good example for disintermediation with blockchain smart contracts. The below further illustrates the disintermediation occasioned by blockchain algorithms:



*Even without a currency, the blockchain algorithms by themselves are priceless. The algorithms protect the blockchain and eliminate the need for middlemen. All a middleman does is prevent funny business, but an algorithm does it better.*



## 7. Data immutability

Blockchain transaction data are immutable, unlike spreadsheets and other legacy databases which are mutable, as distinguished from cryptographic distributed ledgers, an example for which the Bitcoin blockchain is again quite useful.

Even though it is not an absolute statement that any piece of information entered into the blockchain is immutable, changing or rewriting it involves enormous complexities, so that it is nigh impossible to do so in the final analysis:

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*A blockchain is a data structure made up of blocks of data, and they are linked together; hence the chain. Each block is made up of multiple "transactions" or simply, "facts." In the case of Bitcoin, the facts stored describe the transfer of Bitcoin from one address to another. Blockchain software will calculate checksums for each block. Data fed into this calculation includes many things, including the checksum of the prior block. Including the prior block's checksum in the calculation for a new block is what makes rewriting a blockchain near impossible.*

## 8. Tamper-proofing

Because of its underpinnings such as mathematics & cryptographic hash functions like Secure Hash Algorithm (SHA) 256, Proof-of-Work (PoW) blockchain is resistant to tampering. Most, if not all public blockchains, which are not enterprise-grade blockchains are tamper-proof, but the Accenture blockchain, an enterprise blockchain uses the chameleon hash. The chameleon hash enables a

block buried deep down in a chain to be exhumed and replaced. On the Bitcoin blockchain, double-spending is prevented with a peer-to-peer network. No mint or any other third party required. Participants can be anonymous. New coins are minted from a Hashcash style Proof-of-Work (PoW). The Proof-of-Work (PoW) for new coin generation also powers network to prevent double-spending

“

*Abstract. A purely peer-to-peer version of electronic cash would allow online payments to be sent directly from one party to another without going through a financial institution. Digital signatures provide part of the solution, but the main benefits are lost if a trusted third party is still required to prevent double-spending. We propose a solution to the double-spending problem using a peer-to-peer network. The network timestamps transactions by hashing them into an ongoing chain of hash-based proof-of-work, forming a record that cannot be changed without redoing the proof-of-work. The longest chain not only serves as proof of the sequence of events witnessed, but proof that it came from the largest pool of CPU power. As long as a majority of CPU power is controlled by nodes that are not cooperating to attack the network, they'll generate the longest chain and outpace attackers. The network itself requires minimal structure. Messages are broadcast on a best effort basis, and nodes can leave and rejoin the network at will, accepting the longest proof-of-work chain as proof of what happened while they were gone.*

## 9. Financial inclusion

Potentials of blockchain to give financial services access to the unbanked, especially in the developing countries is a huge benefit of the cryptographic distributed ledger. Some of the various ways that this can be done on the blockchain are through “a suite of services including low-cost remittances, savings accounts, cashless payments, peer-to-peer lending and insurance” and cross-border payments.

In a world with a population of 7.7 billion people, almost every adult owns an account in high-income countries. 1.7 billion adults across the world do not own accounts, the lion's share of which comes from low-income countries. Six years ago, 2.5 billion people were unbanked in the world:

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*Six years ago, the World Bank estimated that roughly 2.5 billion adults (15 or older) had no bank deposit, no formal credit, and no means of payment other than cash or barter. Stunningly, in its Global Findex Database 2017 published last month, the Bank now estimates that the number of unbanked adults has plummeted to 1.7 billion. Over the past six years, more than 1.2 billion adults have gained at least basic financial access through a financial institution or their mobile phone.*

According to the Global Findex Report 2017 by the World Bank, 93% of adults in China, 85% of adults in Brazil, and 69% of adults in India are financially included. Nigeria has 4% of the world's unbanked population.





## 10. Trust-minimisation

Trust-minimisation is the reduction of counterparty risk prevalent in digital finance until the invention of the Proof-of-Work blockchain by Satoshi Nakamoto, where the rent-seeking “man-in-the-middle” takes fees to help secure trust. These Trusted Third Parties (TTPs) have been argued to constitute security hole:



*Humanity scales and expands by building platforms, trust minimizing systems, dividing labour, reducing transaction costs, using the price system, and conducting commerce globally.*

*Blockchains are simply a continuation of that pattern, so we need to make sure we design their governance by understanding their underlying principles and maintaining their protocols according to those principles.*

*Scaling and Blockchain Governance  
Posted on March 14, 2018 Author Donald McIntyre*

One of the fundamentals and valuable key deliverables of blockchain as a cryptographic distributed ledger, for instance the Bitcoin blockchain is that it minimizes trusted third parties. This means that only holders of private keys control property, programmes and agreements on the network. There are zero back doors or freezing mechanisms. It is open source and transactions are irreversible on the blockchain. These trust-minimisation features make the blockchain censorship-resistant and immutable. And they are the simple logic and goals of public blockchains for protection and promotion of individual “human rights in the information age”.

## 10. Authentication

The genuineness or truth of transactional facts are automatically guaranteed:



*When a block gets added, the blockchain node will send the data to the network to be verified by all the other nodes, triggering a consensus algorithm for authenticity and coherency (it must be perfect, or it does not get added).*

Upon creating and adding a block, a node on the blockchain network broadcasts the data to the entire network for verification by every node, and therefore triggers an algorithm of consensus, for the purpose to establish data coherence and authenticity. Where a block is found to be invalid, it is discarded, and therefore not added. According to Nick Szabo:



*Blockchains don't guarantee truth; they just preserve truth and lies from later alteration, allowing one to later securely analyze them, and thus be more confident in uncovering the lies. Typical computers are computational etch-a-sketch, while blockchains are computational amber. Important data should be committed to blockchain amber as early as possible, ideally directly from and cryptographically signed by the device in which it was generated, to maximize the blockchain's benefit in securing its integrity*

## 12. Traceability

Data on the blockchain allows transactions to be traced, determined, and followed in real time, while true course of transaction is monitored as events unfold and data is committed to the cryptographic distributed ledger.

In the food industry, logistics, supply chain management, trade finance, accounting, record management, capital market, securities market, payments, agriculture, real estate, criminal investigation and many more, blockchain is being used to trace, identify and unravel data source, access and discover existence and transactional data history::



*A quality guarantee. In the food sector, blockchain is intended to speed up the process for identifying the source of product contamination. ... In fact, Carrefour Group has just launched the first food sector blockchain in Europe to ensure the traceability of its farm chickens coming from Auvergne.*

The below further explains the traceability characteristic of the blockchain in action:



*Blockchain food traceability can revolutionize the industry. Blockchain food traceability is gaining momentum in the global agrifood sector. ... Consumers would have the ability to trace their food from "farm to fork" with a scan of a QR code."*



## 12. Timestamp

The timestamp shows the chronological connection of the transaction blocks on the blockchain. It marks the time in which a transaction is performed on the blockchain. It is more credible and dependable than the traditional equivalent, as the tamper-proof feature maintains that data are not erasable. Further here:



*Each block contains a Unix time timestamp. In addition to serving as a source of variation for the block hash, they also make it more difficult for an adversary to manipulate the blockchain.*

*A timestamp is accepted as valid if it is greater than the median timestamp of previous 11 blocks, and less than the network-adjusted time + 2 hours. "Network-adjusted time" is the median of the timestamps returned by all nodes connected to you.*

In the Bitcoin Wiki, an essay on the Bitcoin Whitepaper by Satoshi Nakamoto explains it thus:



*The solution we propose begins with a timestamp server. A timestamp server works by taking a hash of a block of items to be timestamped and widely publishing the hash, such as in a newspaper or Usenet post. The timestamp proves that the data must have existed at the time, obviously, in order to get into the hash. Each timestamp includes the previous timestamp in its hash, forming a chain, with each additional timestamp reinforcing the ones before it.*

## 14. Consensus

Blockchain works with consensus algorithm; a system of decentralised consensus where the open source code network can be contributed to, by every participant node, and the ledger cannot be changed without the input or contribution of the majority of participant nodes involved in the blockchain network protocol:



*Consensus algorithms are mechanisms that are used to achieve agreement on a single data value, and thus obtain reliability in a network that can involve unreliable participants."*

*In addition to the essential guarantee of agreement on a single data value, consensus algorithm impliedly achieves reliability in a network that can involve unreliable participants. Consensus algorithm disintermediates trust on the Bitcoin blockchain for instance, and thus ensures that there is no single source of failure, or central point of failure. Trust is removed from a centralised entity and replaced with consensus, or collective trust system through algorithmic rules. Andreas Antonopoulos called this: "Consensus = rules without rulers".*

## How a Transaction Works on the Blockchain

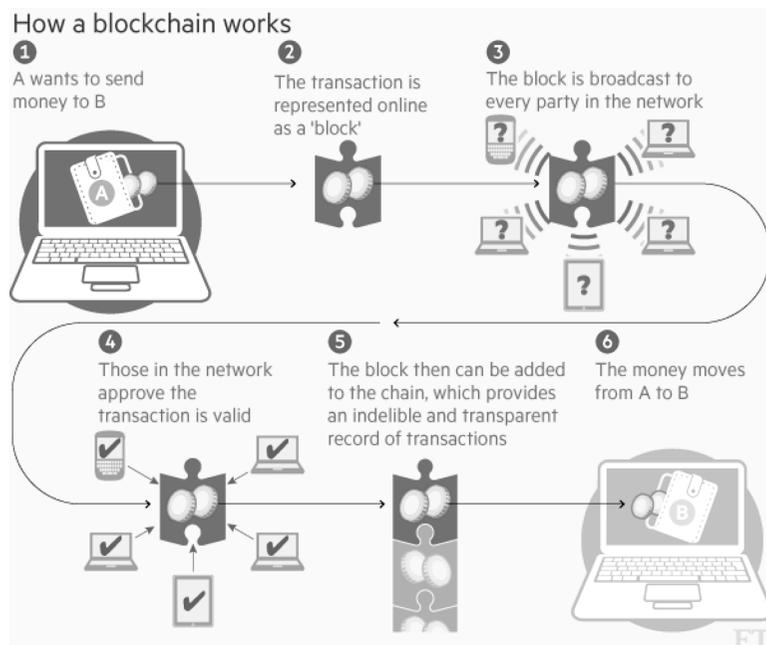


Photo-credit: webforum.org

The above photo illustration explains how a typical transaction on the blockchain works.

The transaction stages are further reproduced hereunder:

Where **A** wants to send money to **B**, a block will be propagated. The block can contain more than a transaction. It will be represented online as a block, and the "block" is therefore broadcast to every party on the network. The network nodes will approve that the transaction is valid, after which the block can be added onto the chain (the continuously growing ledger of transaction--blockchain). The money moves finally from **A** to **B**, and the transaction is therefore finally completed.

## Payment Infrastructure in Use by Central Bank of Nigeria (CBN) to Move Value

Existing digital architecture and electronic payment infrastructure used by Central Bank of Nigeria (CBN) are the legacy databases. It is a centralised ("central point of failure") system, vulnerable to cyber-attacks, inefficient and lacks both public and private key pair decentralised consensus algorithm cryptographic security protocol, as obtained with regard to the Distributed Ledger Technologies (DLTs), the blockchain, or other cryptographic database technologies like Hedera Hashgraph ("gossip about gossip" protocol) (close source and patented), Directed Acyclic Graph (DAG), R3's Corda, Ripple ("centralised"), IOTA Tangle, and the likes..

### i. Real Time Gross Settlement (RTGS)

For the operation and management of payment and settlement risks inherent in value transfers and transactions, i.e. large value payment activities, the Central Bank of Nigeria (CBN) like most of the rest of the central banks, reserve banks, and monetary authorities all over the world, leverages the Real Time Gross Settlement (RTGS) on the SWIFT's communication network for money and securities transfer transaction purposes. The RTGS facilitates seamless payment infrastructure interoperability in both domestic and international payment systems for the Central Bank of Nigeria (CBN), commercial banks and other financial institutions. This is in conformance with best practices regarding value payment and services management operations set by the Bank for International Settlements (BIS) for critical payment infrastructure global standards. The RTGS is mostly implemented for large value payment transactions interbank, national and international.

The CBN RTGS (Central Bank of Nigeria Interbank Fund Transfer - CIFT) interfaces with (T24 System), the core banking application. It has the direct participation of all the Deposit Money Banks (DMBs) and Discount Houses (DHs) in Nigeria. An improved system of the RTGS is currently in use by the Central Bank of Nigeria (CBN), deployed alongside the Central Securities Depository (CSD).

The RTGS interfaces with the Scripless Securities Settlement System (S4) for the dual purposes of payment and delivery. This means that before the movement of securities from the seller's portfolio to the buyer's portfolio, the Scripless Securities Settlement System (S4) communicates with the RTGS for the purpose of confirmation that the buyer is in sufficient funds in its account. After this confirmation, funds movement from the buyer's account to the seller's account takes place. When the process is confirmed, RTGS communicates back to the Scripless Securities Settlement System (S4) to effect the movement of the securities from seller's portfolio to buyer's portfolio. The S4 is used for securities transaction settlements.

## ii. Nigeria Interbank Settlement System (NIBSS)

The RTGS enables Straight-Through-Processing (STP) between the Central Bank of Nigeria (CBN) and the core banking application. CBN maintains that Straight-Through-Processing (STP) is put in place to enable beneficiaries of 3rd party transfers get value delivered into their accounts immediately after transaction completion. There is also a linkage with approved external systems like the Nigeria Interbank Settlement System (NIBSS), owned by the Central Bank of Nigeria (CBN), and all licensed Deposit Money Banks (DMBs), which transmits the net settlement position of banks from the clearing to the RTGS.

The RTGS is implemented on the Society for Worldwide Interbank Financial Telecommunication (SWIFT)'s message communication network system for cross-border interbank payment by the Central Bank of Nigeria (CBN). This is a cardinal point of the CBN's Payment System Vision 2020 (PVS2020). The SWIFT network are designated messaging types used to effect interbank payment system transactions. The service codes MT910, MT900 etc. are used for confirmation of settlement or for error message purposes.

There are also the Nigeria Interbank Settlement System Electronic Fund Transfer (NEFT), Nigeria Interbank Settlement System Instant Payment (NIP), Unstructured Supplementary Service Data (USSD), Automated Teller Machine (ATM), Point of Sale (PoS) terminals, financial technology payment service solutions, and other electronic payment systems with features similar to the existing electronic payment infrastructure in use by the monetary and financial service institutions in Nigeria, as electronic funds transfer means.

Payment for retail services, to wit: cards, cheques, funds transfers, mobile money, and ATMs, among others, cleared by the Nigerian Interbank Settlement System (NIBSS) and net settlement positions of the financial settlement institutions are posted on the Real Time Gross Settlement (RTGS).

## iii. Scripless Securities Settlement System (S4)

Scripless Securities Settlement System (S4) is regulated by the Business Rules and Guidelines made March 2017 by the Central Bank of Nigeria (CBN). Aside being a system that holds securities in a dematerialised format, it enables securities transfer based on book entry.

The S4's functions are set out in Rule 2, 2.1 of the Business Rules and Guidelines thus:

- «(i). Safekeeping: Securities would be warehoused in dematerialised or electronic form
- (ii). Deposit and Transfers: It provides functionality for deposit and transfer of securities. It also covers the underwriting process or listing of new issues in a market.
- (iii). Interest and principal processing.
- (iv). Pledging of securities.
- (v). Issuance of the Government and CBN Securities in electronic form;
- (vi). Auction processing;
- (vii). Maintenance of all records for authorised transactions;
- (viii). Settlement of various transactions based on DvP or FoP principles;
- (ix). Automatic payment of interest and maturity proceeds on due dates.
- (x). Maintain a central register of securities on the accounts of all Participants in the system;
- (xi). Assign and cancel identification for

investment instruments according to laid down rules and regulations;

- (xii). Notify the issuers and holders of securities about the position of their accounts;
- (xiii). Keep separate records for each Participant;
- (xiv). Manage records of Participants account, including personal data in case of third party;
- (xv). Settle the liabilities arising from the transactions with securities;
- (xvi). Provide data to comply with the disclosure duty in line with the CBN Reporting Standard;
- (xvii). Perform other services that may arise from the ownership and transactions with securities and its operations;
- (xviii). Other services: The system supports additional services aside from those considered as core services. These services include Securities Lending and Borrowing, Repo Settlement and information dissemination.»



## Cross-Border Payment Infrastructure in Use in the People's Bank of China (PBoC)

A law promulgated in 1995, and amended in 2004; Law of the People's Republic of China on Negotiable Instruments (Law on Negotiable Instruments) regulates and governs a broad range of items that encompass payment, "endorsement, acceptance, guarantee, and claim related to drafts, promissory notes and cheques", alongside the definition of rights and obligations of parties involved in activities that entail negotiable instruments. The Regulations of the People's Republic of China on Administration of Renminbi promulgated in 2000 made provision "for the design, printing, issuance, withdrawal and circulation of RMB". This law defines as well, rights and obligations of individuals who use the RMB. The provisions for stipulation of amount and use of RMB are enshrined in another Chinese statute; the Interim Regulation on Cash Management, which was promulgated in 1988.

Among other payment systems, the largest financial market infrastructure Cross-Border Interbank Payment System (CIPS) is owned and operated by the People's Bank of China (PBoC). This payment system otherwise known as China Interbank Payment System (CIPS) offers clearing and settlement services for participation on the payment network in trades and transactions that involve Renminbi (RMB) for payment settlement across borders.



### i. Phase 1 of the CIPS

As at the Phase 1 of the CIPS on the 8th October, 2015, the first batch direct participants on the CIPS network were 19 Chinese and foreign banks (some set up on mainland China), and also, 176 indirect participants from across the six continents; 47 countries and regions. According to the CIPS World Service in the Phase 2, there is now a total of 31 direct participants and 768 indirect participants (588 in Asia, including 317 Chinese mainland indirect participants, 93 in Europe, 25 in North America, 17 in Oceania, 17 in South America and 28 in Africa). As at March, 2018, the business scope of the CIPS has expanded to encompass 148 countries and jurisdictions.

The CIPS, which as an important financial market infrastructure, developed in line with international standards, like the Central Bank of Nigeria (CBN), also utilises the SWIFT network international financial messaging services, and uses the Real Gross Settlement System (RTGS) to connect banks and institutions across Asia, Africa, Europe and the Americas. It provides fund clearing and settlement services to domestic and foreign participants in line with the RMB internationalisation policy of the Government of the People's Republic of China (PRC). The CIPS complements the RTGS with the Deferred Net Settlement (DNS) to meet participants' diverse demands, and thus facilitates both adequate and efficient cross-border e-commerce transactions through financial market connectivity around the globe.

### ii. Memorandum of Understanding (MoU) Between SWIFT and CIPS

According to a Memorandum of Understanding (MoU) signed between the Cross-Border Interbank Payment System (CIPS) and Society for Worldwide Interbank Financial Telecommunication (SWIFT), the CIPS utilises the SWIFT messaging network method to connect with SWIFT's members for the purpose of providing a robust network which allows institutions worldwide to send and receive financial transaction information in a secure, reliable and standardised environment.

It is also noteworthy that SWIFT, which has operated in the People's Republic of China (PRC) for more than 30 years, has over 400 financial institutions and corporations which are connected to its financial messaging services platform, while 1,700 financial institutions have made RMB transactions using the SWIFT network.

### iii. CIPS Makes No Payment Order

While the CIPS makes funds transfer possible, it transmits no payment order. Payment order is settled by correspondent accounts maintained by institutions between each other, and among one another. Any financial institution that seeks to do a banking transaction exchange must of necessity have a prior banking relationship, either by being a bank or by affiliation of itself with one or more banks to have access to the particular banking business features sought to be deployed.

This was the practice until in July 2015, an announcement was made to the effect that the Cross-Border Interbank Payment System (CIPS) would be reduced to enabling only cross-border trade deals facilitated with the yuan, and no longer used to effect capital-related transactions. This in essence delays billions of dollars' worth of transactions including securities purchases and Foreign Direct Investment (FDI), which otherwise would have used the Cross-Border Interbank Payment System (CIPS) as a vehicle.

It was reported though, that this plan was a second setback to the arrangement to provide unified network deal settlement in yuan after it was visited by technical problems which delayed its launch. Other measures to open up the financial market infrastructure in China have been inhibited by factors such as the stock market crash in 2015 of the Chinese market.

The CIPS offers complementary network for trade-related settlement deals involving Chinese currency to an incongruous variety of pieces or parts, which include Chinese clearing banks across the world, until improvements and innovations were brought about by the CIPS Phase 2.

In spite of the technical clogs recorded in the Phase 1, the CIPS through its Phase 2 arm today continues to grow in line with the RMB internationalisation policy, as more financial institutions and banking participants join the payment and settlement network.

## Other Payment Systems in the People's Republic of China (PBoC)

Other payment and settlement infrastructures in use in China are China's National Advance Payment System (CNAPS), the National Electronic Interbank System (NEIS) (an equivalent of the Nigerian Interbank Settlement System (NIBSS)), High Value Payment Systems (HVPS), and Bulk Electronic Payment System (BEPS). There are also local clearing houses and interbank payment systems operated by Chinese commercial banks, payment gateways, credit card system, Automated Teller Machines (ATMs), Point of Sale (PoS) terminals, and other similar payment systems as financial technology payment solutions.

## Society for Worldwide Interbank Financial Telecommunications (SWIFT) and Blockchain/DLT

SWIFT is the largest financial co-operative organisation in the world, with over 11,000 banks, securities organisations, market infrastructures, and corporate customers from more than 200 countries and territories who use its cross-border financial messaging services platform. In 2015, the SWIFT's messaging platform had sent cross-border financial messages in the amount of USD150 trillion in value. SWIFT does not hold or clear securities or involve in actual funds transfers. What SWIFT does is send payment orders for onward settlement by correspondent accounts maintained by institutions between each other, who utilise its both intra- and inter-border financial information messaging service platform.

While the existing SWIFT payment infrastructure can be likened to the blockchain in its financial industry use case scenario, it is in essence, a permissioned and centralised system vulnerable to malicious attack vectors, unlike the Decentralised Ledger Technology (DLT). The possible malicious attack vectors are sybil attack, brute force attack, 51% attack, any other social engineering attack, denial of service attack, or the human weakest link in the chain attack. Thus, there have been reports of the SWIFT architecture being hacked and funds being stolen as a result. Some of the most recent events

involve the Union Bank and Cosmos Bank, all of India where the SWIFT's cross-border financial messaging service platform was illegally accessed by international hacking groups. Compared with blockchain, hacking a blockchain is near impossible, essentially because it is a decentralised ledger solution, where "trust" data is shared among the network participant nodes because they each have the original, verified and validated copy of the blockchain transaction ledger. By this alone, the blockchain capacity to free up capital and get people financially included in the financial service activities and thus participating is enormous, and holds so much promise.

Because of the stark reality that the blockchain technology threatens the existing and legacy businesses built on centralised solutions with astronomical disruption prospects, it would be naturally expected that there would be an opposition to blockchain proliferation, research and development. But then, not much resistance from the incumbents, as they are finding both creative and innovative ways to maximize and leverage the potentials of the blockchain technology for business efficiency, security, reliability, expansion, inclusion and among other relevant areas.

### i. SWIFT and Hyperledger Fabric

SWIFT is a founding and board member of the 250+ -strong Linux Foundation's Hyperledger Fabric, a global collaboration for open source "business blockchain projects", with focus "on the development, deployment and use of open, transparent, reliable and interoperable enterprise blockchains". SWIFT and Accenture in a paper analysed the opportunities, challenges and key success factors of DLT in the financial services industry. The paper was jointly published on the 20th April, 2016. The DLT assessment paper accessed gaps between old and new solutions, and identified eight critical factors that need to be addressed for DLT to achieve industry-wide adoption. Strong governance, data controls, compliance with regulatory requirements, standardisation, identity framework, security and cyber-defence, reliability and scalability issues were the subject-matter areas covered in the paper.

Because of its corporate behemoth size, SWIFT was once considered the largest middleman at the greatest risk of disintermediation, as occasioned by the whirling Distributed Ledger Technology (DLT) revolution. The non-profit interbank communication organisation had since moved swiftly. In line with its mission to collaborate and build open source blockchain technology, and other DLTs for financial service optimisation, SWIFT did a Proof of Concept (PoC) test on the blockchain by moving funds stored in nostro-vostro accounts for international transactions onto the blockchain, for the purpose of freeing up said funds to investment, nostro-vostro database reconciliation, cross-border liquidity management issue resolution, and among others.



## ii. SWIFT gpi DLT PoC Applications

Two DLT PoC applications were built into the SWIFT gpi, as sandboxes on the Hyperledger Fabric codebase. One uses data that had been anonymised for production from counterpart banks to provide owner of account and the servicer of account with a complete view of every nostro-vostro account that they own or serve. The second PoC blockchain application performed a simulation of back-office procedure. It enabled the cloud-hosted participant nodes to move funds from multiple accounts into a single distributed ledger. In spite of the success of the pilot blockchain applications, concerns were expressed regarding the likely vulnerability of blockchain cryptographic security standard to quantum computing.

Quantum computing, an emerging computing subfield, which is itself at an embryonic development stage, is a branch of computing that increases reduction speed rate in chip sizes. It also accelerates operation speed. It is about giving the biggest performance boost to the computer technology. This is brought about by the basic idea of the obliteration of barriers, through the harnessing and maximisation of “counterintuitive physics of subatomic particles” to boost computer technology performances of the modern computers. Though still years away before its primetime, Quantum Resistant Ledgers (QRLs) are in Research & Development (R&D). In the corporate slides of companies like JPMorgan, quantum computing gets an honourable mention, and hard focus. Last year, venture capital investment value was USD241million. This was reported by CB Insights. Three Ph.D. physicists in

Israel launched the Quantum Machines startup to build operational and control layer for quantum computing, with USD5.5 million seed investment capital. Quantum computing is coming.

In the blockchain PoC simulation, limitations were observed, such as the readiness of members already invested in centralised solutions to pivot to blockchain as the decentralised open source solution. SWIFT had maintained that the road to blockchain implementation is yet long, despite the multiple objectives achieved by the blockchain PoC test, majorly because its over 11,000 members will not derive equal benefit if implemented at the moment, as they are heavily invested in centralised database solution, which in turn makes transition a cumbersome affair.

## iii. Founding and Validating Banks for the SWIFT's gpi DLT PoC

Already supported by six banks, other third-party banking institutions that validate the SWIFT gpi DLT PoC result were 22 additional banks, which include JPMorgan Chase, Deutsche Bank, ABN AMRO Bank, ABSA Bank, BBVA, Banco Santander, China Construction Bank, China Minsheng Banking, Commerzbank, Erste Group Bank, FirstRand Bank, Intesa Sanpaolo, Lloyds Bank, Mashreq bank, Nedbank, Rabobank, Société Générale, Standard Bank of South Africa, Standard Chartered Bank, Sumitomo Mitsui Banking Corporation, UniCredit and Westpac Banking Corporation.

## iv. More Exploration of the Blockchain by SWIFT

Apart from the above effort, SWIFT partners with 7 Central Securities Depositories (CSDs) to explore the Distributed Ledger Technology (DLT) for post-trade settlement, to wit; proxy voting, which has hitherto been a global financial market issue unresolved.

The financial market infrastructure providers with who SWIFT executed the MoU are Argentina's Caja de Valores, U.S.-based Nasdaq Market Technology, Switzerland-based SIX Securities Services, Abu Dhabi Securities Exchange, Russia-based National Settlement Depository, Chile's Deposito Central de Valores, South Africa-based Strate. These seven CSDs constitute themselves into a working group to explore financial market implementation of the Distributed Ledger Technology (DLT) for the purpose of introducing new market efficiency through post-trade settlement issue resolution and proxy voting solution. With the MoU, SWIFT's intention is to bring CSDs around the world together so that the shared pain points and commonalities can be hard-focussed upon for both collective and overall interest of the global industry. And most importantly, find a business standard-compatible distributed ledger technology implementation for SWIFT's ISO 20022. The SWIFT's Head of Standards further echoed this sentiment thus:



*To ensure interoperability and smooth migration, it is crucial that new technologies support existing common standards such as ISO 20022. The promise of technology on paper is great, but it is currently missing a key component around standardization.*

There is an International Technical Committee for Blockchain Standards (ITCBS) which comprises of 42 participating countries like China, U.K., Canada, U.S., Germany etc., and 12 other observer countries like Kenya, Hong Kong, Philippines etc. This Committee is otherwise known as ISO/TC 307 Committee. Its mandate is to find common ground and provide internationally recognised and harmonised standardisation for blockchain technologies, other distributed ledger technologies and smart contracts

## Blockchain/Distributed Ledger Technology (DLT) Adoption and Implementation by the People's Republic of China (PRC)

The China engagement and involvement with blockchain, which is thorough-going and continues to gather momentum at a great speed, has seen and continues to see billions of United States dollars and Renminbi in development and investment capital. The People's Bank of China (PBoC) has a research going over three years into cryptocurrencies, the first use case implementation for the blockchain technology. This is part of its masterplan to introduce its own Central Bank Digital Currency (CBDC) based on the blockchain technology. The Institute of Digital Money within the PBoC is set up for the purpose of this research.

On September 4, 2017, a joint announcement by seven central regulators in China banned Initial Coin Offering (ICO), yet another important blockchain use case, which has disrupted and continues to disrupt the global, financial and capital market space as a cross-border business capital formation strategy.

The regulators which include Cyberspace Administration of China (CAC), State Administration for Industry and Commerce (SAIC), China Banking Regulatory Commission (CBRC), China Insurance Regulatory Commission (CIRC), Ministry of Industry and Information Technology (MIIT), China Securities Regulatory Commission (CSRC) and People's Bank of China (PBoC) had issued the Preventing Financial Risks from Initial Coin Offerings (ICOs) joint statement because according to them, the public financing method is irregular, lacks Chinese government approval and investor fund protection mechanism through bespoke regulation. The Cyberspace Administration of China (CAC) has a published draft policy proposal titled "The Regulation for Managing Blockchain Information Services".

### i. China in the Race for Global Blockchain Adoption

Even though China is top of the global blockchain adoption list, its Ministry of Industry and Information Technology (MIIT) continues to drive more adoption and implementation by bringing more Chinese companies on the blockchain bandwagon; making the blockchain adoption its central official policy, urging its Information Technology (IT) sector to unite under one banner, in line with its hope that this would usher in a collective, industrial scale blockchain application development, adoption and implementation. MIIT also created National Blockchain Distributed Accounting Technology Standardisation Committee to develop State-level standards for reference framework, interoperability, smart contracts and specification for data format. In its race for comprehensive embracement of blockchain and cryptocurrency, China blockchain adoption and implementation drive, all hands are on deck, as the Chinese government, corporatocracy, citizenry and academia are involved and continue to get more involved.

According to a publication by Parq of late, the People's Republic of China (PRC) sees blockchain adoption as a race, and itself as the leader in the race. It has been reported that China could reduce the global influence of the United States, if it applies the blockchain technology adoption to its One Belt One Road Initiative. The Chinese Communist Party has a book out titled "Blockchain--A Guide for Officials", while the Chinese cabinet-level ministries work on country-wide common standards for blockchain adoption in

the country. With designs on blockchain-based "smart cities", of which China plans to build 1,000, China is ahead of the global blockchain adoption curve. One of China's most successful "smart cities" is Xiong'an declared by President Xi Jinping as a special economic interest zone October 2017. China's Ping An Insurance, one of the world's largest insurance company groups, has a "White Paper on Smart Cities," advocating for blockchain technology, Artificial Intelligence(AI), Big Data, and cloud computing.

## ii. People's Bank of China (PBoC) Owns the Highest Number of Blockchain Patents in 2017

On the Global Enterprise's Blockchain Patent Ranking (Top 100) for 2017, the three bank branches of the People's Bank of China (PBoC) come top with combined 68 blockchain-related patents. The three branches are the PBoC's research institute for digital currency, institute of printing technology and the subordinate enterprise ZhongChao Credit Card Industry Development Co. Ltd. They respectively ranked 3rd, 8th and 18th with 33, 22 and 13 blockchain-related patents to make 68 patents approved in all. Enterprises based in China took 49%, followed by the United States with 33%. 7 Chinese companies came among the top ten list.

Speeding up the blockchain adoption effort, the People's Bank of China (PBoC) promoted, organised and coordinated the "Bay Area Trade Finance Blockchain Platform", currently undergoing trial operation. The aim is to build an open financial system and trade ecosystem across Guangdong, Hong Kong, Macau Bay Area and Shenzhen. Other Chinese institutions involved in the project are Bank of China, China Construction Bank, and China Merchants Bank. The trade finance blockchain offers the following solutions:



*The Bay Area Trade Finance Blockchain Platform can effectively promote the formation of market trust mechanism, help solve the problem of financing difficulties for SMEs, and better serve the real economy; help banks to conduct business authenticity audits and reduce business costs. Improve business efficiency, prevent and control business risks; help regulatory authorities to enrich regulatory tools, and effectively strengthen financial supervision; help to enhance information sharing between departments and jointly build a trade finance ecosystem.*

## iii. China's Complicated Relationship with Blockchain

In spite of the complicated relationship that China has with cryptocurrencies; having banned Initial Coin Offerings (ICOs) once, and even taken other drastic and prohibitive regulatory actions against cryptocurrency mining, mining equipment manufacturing companies, and cryptocurrency exchanges, it is crystal-clear that the government seems to be against the distributed ledger technology innovation and revolution. This is not so, as the Chinese government only wishes to harness its potentialities, and maximize it for its national development, among other relevant purposes. The Chinese government published a guide which it titled "What the Blockchain Can and Cannot Do". Yet, the rate at which the Chinese government adoption and implementation accelerate is astounding. The China State TV known as CCTV uses the following words in reference to blockchain:



*Blockchain is the second era of the Internet.  
The value of blockchain is 10 times that of the Internet.  
Blockchain is the machine that produces trust.*



## **Blockchain/Distributed Ledger Technology (DLT) Adoption and Implementation by the Federal Republic of Nigeria (FRN)**

The Nigerian government has done almost next to nothing in terms of adoption and implementation, or even enforcement action, regulatory measure whatsoever put in place, by any of its agencies, or any public awareness initiative regarding the blockchain and other Distributed Ledger Technologies (DLTs); or even setting up and funding Research and Development (R&D) into the blockchain and other DLTs to have a Proof of Concept (PoC) for instance, and thus explore how they can be harnessed and leveraged to make government and governance more efficient, accountable, transparent, and or even the monetary system sound. In other words, blockchain and other Distributed Ledger Technologies (DLTs) are yet to break into the mainstream Nigeria society.

Apart from having issued notices and warnings a number of times to the unsophisticated retail investors and citizens who buy and invest in cryptocurrencies and Initial Coin Offerings (ICOs), which are a few of the many blockchain use cases in the financial services industry, the Central Bank of Nigeria (CBN) had done next to nothing in terms of launching a blockchain/DLT initiative, awareness creation, education or Research & Development (R&D) team. This is compared to scores of central banks, currency boards or money authorities elsewhere, who are actively researching, engaging and contemplating Central Bank Digital Currencies(CBDCs) and other 10 banking institution use cases which are within the blockchain/DLT context.

First of the notices issued by the CBN was a circular on January 12, 2017, which the central bank directed to banks and other financial institutions regarding virtual currency operations in Nigeria. Another was a statement signed by the central bank's Acting Director, Corporate Communications, Isaac Okoroafor. The emphasis was on the vulnerability of cryptocurrency investments and dealings, as no existing regulation specifically provides legal remedies in case there is an incident of a cryptocurrency exchange business collapse, cyber-attack and other such events happening. There was another press release by the central bank made the 28th February, 2018. It stated categorically that "Bitcoin, Ripple, Monero, Litecoin, Dogecoin, Onecoin", and virtual currency exchanges such as NairaEx do not come within the CBN licensing and regulation as they stand.

### i. The Most Popular Financial Use Case for Blockchain Which is the Cryptocurrency is Not the Legal Tender in Nigeria

At a Vanguard Economic Forum Series where the financial technology industry discussion point took the centre stage, the CBN maintained that the cryptocurrency technology is not a legalised payment system in Nigeria, as no financial sector regulator anywhere in the world has included it in its formal aspect of the financial services sector.

The CBN Governor, represented by the Director, Banking and Payment System Department of the CBN, Dipo Fatokun said:



*We have not seen any country where cryptocurrency is regulated.*

The CBN, though it approves of the blockchain technology, and other DLTs, disapproves of the cryptocurrency technology. The reasons for this

disapproval are that there is no issuing authority, and this makes cryptocurrency regulation a difficult task. Another reason adduced is cryptocurrency valuation, which according to CBN Governor, has been quite difficult, going by the first downline; the bitcoin; limited in supply, and therefore cannot fulfill monetary requirements.

While the Securities and Exchange Commission (SEC) Nigeria had inaugurated a committee to look into the financial technology industry, no such positive and progressive step has been forthcoming from other regulatory agencies in Nigeria. The Capital Market Committee of the Securities and Exchange Commission (SEC) Nigeria had inaugurated a market wide financial technology committee with terms of reference to come up with a roadmap for financial technology companies in Nigeria.

### ii. Informal and Formal Sector Cryptocurrency and Blockchain Adoption and Implementation in Nigeria

The lack of awareness, education, understanding, research, prevalence of doubts, misconceptions, and fear of the blockchain technology implications in Nigeria hinder the blockchain technology adoption, growth and implementation. The Nigeria-based Interswitch Group, a digital payment and commerce company that caters to payment needs across Africa launched its supply chain financing module on the Microsoft Corporation's Azure Blockchain Workbench. The blockchain application provides solutions such as framework for speedy contract execution which requires bank guarantee for Small and Medium Enterprise (SME) businesses.

Before Interswitch launches its blockchain application, the legacy model is that small businesses wait for months to procure bank guarantees for supply contracts, or in most cases, they get turned back because there is no verifiable credit history of trade and business financing. This problem is solved by the blockchain through digitisation of the process between banks and corporates regarding trade financing assistance provision for entrepreneurs and business owners.

Only the informal business sector in Nigeria is making any concrete attempt that resembles blockchain adoption and implementation. In the face of lack of enthusiasm and awareness, any attempt to adopt and mainstream the blockchain and cryptocurrency technologies for processes by government in Nigeria is not encouraged. Nigeria is both objectively and substantially a highly prohibitive jurisdiction from a public policy standpoint regarding the adoption of the blockchain, DLTs, and smart contracts.

Other than say, the recent Securities and Exchange Commission (SEC) financial technology committee initiative Fintech Roadmap, there is no any known plan announced to the public to roll out consultation, introduce and announce guides, guidance, make regulation for blockchain securities, bitcoin-denominated derivatives such as futures, and other

market commodities in the crypto-asset class; security token exchange, crypto-assets exchange regulation, Initial Coin Offerings (ICOs), Security Token Offerings (STOs), Initial Exchange Offerings (IEOs), and Token Generation Events (TGEs)--if they fall within the extant regulatory remit--and other emerging and promising blockchain-based potential and functional use cases, even for those outside the monetary and financial services industry. Areas such as healthcare, public record keeping, land registry property title management, agriculture, energy, logistics, construction, oil and gas, supply chain management, voting, crime investigation, real estate, accounting and many other use cases have not been maximally explored as both potential and functional distributed ledger technology use cases.

After a Proof of Concept (PoC) that lasted for nine months, the Nigeria Customs launched a Decentralised Application (D'App) through the Oracle Blockchain Cloud Service, built on the Hyperledger Fabric. The purpose is to drive revenue growth, and coupled with operational efficiency such as transparency, accountability. The Nigeria Customs eyes 50% growth in revenue with the blockchain technology implementation for its operation, as it strategises to optimise its digital public services, to build global trust for Nigerian businesses, through authentication and provenance for custom excise processes on the blockchain technology. Other earlier customers to leverage on the Oracle Blockchain Cloud Service platform are Intelipost, CargoSmart, Arab Jordan Investment Bank, Certified Origins, MTO, Neurosoft, Softbang, TradeFin, Solar Site Design and Indian Oil.

In spite of the lacklustre attitude from the government, a pocket of blockchain startup businesses keep cropping up everywhere; all in the effort to drive, adopt and implement the Internet commerce protocol through useful use-ready application suites or through those still in the works.



# Blockchain and Cryptocurrency Adoption and Implementation by Central Banks, Banks, Other Financial Institutions and Corporates Across the World

## Central Banks

Blockchain solution adoption by central banks, organisations and financial institutions around the world is becoming very fast and the accelerated development spreads like wildfire. There is a long endless list. Inexhaustible as it is, more adoption and blockchain solution implementation through the many use cases of blockchain keep gathering enormous momentum.

The Eastern Caribbean Central Bank (ECCB), which is a monetary authority for eight island economies under the Eastern Caribbean Currency Union (ECCU) has a pilot program Proof of Concept (PoC) testing for the adoption of its own blockchain-based digital currency the Eastern Caribbean Dollar. The eight countries are the Commonwealth of Dominica, St. Vincent and the Grenadines, Saint Kitts and Nevis, Saint Lucia, Montserrat, Anguilla, Grenada, Antigua and Barbuda. It specifically plans to:



*develop, deploy and test technology which focuses on data management, compliance and transaction monitoring system for Know Your Customer, Anti-Money Laundering, and Combating the Financing of Terrorism....The pilot will also focus on developing a secure, resilient digital payment and settlement platform with embedded regional and global compliance; and the issuance of a digital EC (Eastern Caribbean) currency which will operate alongside physical EC currency.*

Somewhere in May 2018, news broke that Marshall Islands, a sovereign State and member of the United Nations (UN) signs a Bill into law, which introduces a national cryptocurrency as its sole currency. Sovereign State adoption and implementation of blockchain and cryptocurrency is quite a novel idea to sovereign legacy monetary systems all over the world. Nonetheless, a number of countries lead the way, through their central banks, currency boards, monetary authorities and reserve banks. As stated earlier, several of these have experimented through DLT Proofs of Concept (PsoC) with distributed ledger technology payment systems, to wit; the Central Bank Digital Currencies (CBDCs), which though has been argued that they need not necessarily be blockchain-based cryptocurrencies. Some have advocated that central banks should start the issuance of electronic money to override bitcoin and altcoins.

Prof. Nouriel Roubini argued that “CBDCs would likely replace all private digital payment systems, regardless of whether they are connected to traditional bank accounts or crypto-currencies.” Since less and less cash is being used in countries like Sweden and China, as a result of which digital payment systems become more attractive and appealing, the prospects for CBDCs keep getting brighter. A Bank of International Settlements report jointly produced by the Markets Committee and Committee on Payments and Market Infrastructures (CPMI) March 2018 gives “a high-level overview of the implications for payments, monetary policy and financial stability” that could be occasioned by the introduction of Central Bank Digital Currencies (CBDCs).

## (i) First Sovereign State Adoption and Implementation of Blockchain-Based Cryptocurrency

Venezuela is a South American country, and the first country in the world to adopt and implement a distributed ledger based national fiat cryptocurrency technology the el petro. The first el petro token launch announcement came December 2017, and its pre-launch started on the 20th February, 2018, while the main sale of the first sovereign State cryptoactive officially launched 29th October, 2018 and directly purchased by any government, corporate or citizen from any part of the world through Venezuela’s treasury at the website, or via any of the government-approved crypto-assets exchange offices. Other countries though have nursed the cryptocurrency adoption dream, Venezuela as a child of circumstance bells the cat, and in a very comprehensive manner, due entirely to its multiple digits hyperinflation situation, where its paper based fiat currency system went to zero, and the country had to seek both solace and salvation for its economy in the cryptocurrency technology based monetary system and digital payment.

Venezuela launched its sovereign fiat cryptocurrency--designed to be devaluation-proof--the el petro in an Initial Coin Offering (ICO), and pegged the value of its national paper fiat currency bolivar to the el petro. The bolivar is devalued by 95%. The value of the el petro is pegged at USD67.70 per 1 el petro (1 PTR) tokensale price, and at the international oil market, being the price for a barrel of petroleum at the time. The el petro, which is also an attempt at a stablecoin, is backed by Venezuela’s Orinoco Oil Reserves, gold and diamond reserves.

A token of el petro (1 PTR) sells for USD67.70 at the token lunch sale period. Venezuela had planned to raise USD5billion from the token lunch effort which would go into its sovereign wealth fund, complement its sources of foreign exchange earnings, recover its economy and ultimately grant it unfettered access to the international crypto-asset market.

The Government of Venezuela acts as the sole regulator of the sovereign crypto-asset el petro, and all other crypto-assets, through the National Superintendency of Cryptoactives (Sunacrip), who is put in charge, and it oversees el petro token emission and trading. Central Bank of Venezuela (Banco Central de Venezuela, BCV) issues and maintains fixed exchange rate for the Venezuelan bolivar, including the entire paper fiat monetary policy control. A fixed exchange rate, sometimes called “pegged exchange rate” in the basket of currencies, is the one currency value fixed against the value of another currency, or against a measure of value in the mode of gold. The el petro is not a central bank money, and is therefore not a liability of the central bank of Venezuela. El petro is not a result of public currency creation and operations by the central bank, and thus, is not subject to the legacy monetary policy restrictions applicable to central bank fiat monies. The Venezuela country proposes to present the sovereign cryptoactive to the Organisation of Petroleum Exporting Countries (OPEC) in 2019, as its unit of account for its petroleum resources.

## (ii) Other Central Banks

Central Banks around the world have conducted surveys, commissioned a series of research, and set up pilot studies into CBDC issuance prospects. Bank of International Settlements (BIS) also known as “the central banks’ bank”, has released a number of reports on the prospects. Financial stability issues during policy normalisation in the event that central banks adopt and implement Central Bank Digital Currencies (CBDCs), as a kind of monetary policy response to both contagious and pernicious onslaughts of the blockchain and cryptocurrency technologies have been the fulcrum of this effort. In a paper, the BIS stated that blockchain-based decentralised cryptocurrencies could continue to enjoy more smooth interconnection with the legacy financial system, and thus become a real threat to the extant financial system, in terms of stability and integrity, if the authorities fail to take pre-emptive approach through assertive, monetary policy actions.

In a document titled “Cryptocurrencies: Looking Beyond the Hype”, published by BIS, which analysed the history of blockchain technology from hard forks to soft forks, new cryptocurrency proliferation, cryptocurrency market volatility, scalability, mining concentration, it concludes that “however sophisticated”, the cryptocurrency distributed ledger technology is a “poor substitute for the solid institutional backing of money”. And furthered that distributed ledger technology implementation for processing daily retail payment transactions “could bring the internet to a halt”. Though argumentatively, the BIS report sounds a little less objective; not taking into perspective, a number of factors that include fast and accelerated developments and improvements in the distributed ledger technology space. In spite of this, central banks continue to explore the blockchain technology, and even stated that they are in development, research and investment into other technologies, with the aim to achieve the same goals as the blockchain technology.

Central banks through R&D on merits and demerits of Central Bank Digital Currencies (CBDCs) have considered the feasibility and possibility of issuing them, and making them available to everyone in the spirit of financial inclusion. What this means is that everyone would have a direct bank account with the central bank, so that the commercial banks are

disintermediated. It has been argued that central banks can take over digital payments, without using blockchain/DLT. Though digital payment systems like PayPal, Venmo, Alipay, WeChat, PayTM and M-Pesa have nothing to do with the blockchain and cryptocurrency technologies, they lack the essential attributes such as decentralisation, transparency, accountability, cryptographic security, cheapness, speed etc. that endow the blockchain and cryptocurrency technologies with the be-all and end-all computer security status, efficiency and effectiveness.

The International Monetary Fund (IMF) weighed the pros and cons of central bank CBDC issuance, with preoccupation on domestic implications. An IMF Staff Discussion Notes titled: “Casting Light on Central Bank Digital Currencies” analyses the designs for possible CBDC, potential benefits, alongside their cost implications, and their possible impacts on the policy, stability for finance and integrity of the legacy monetary system. The Notes considered possibility of a distributed ledger technology implementation of the CBDCs.

Managing Director, IMF Christine Lagarde spent thoughts on the CBDC adoption prospects on a number of occasions. In the Singapore Fintech Festival, her paper looked into the motivation for central banks to issue digital currencies. It sets out benchmark for Central Bank Digital Currencies (CBDCs), whose features are similar to that of cash, and thus explores the implications of issuance, with focus on “central bank seigniorage, monetary policy, the banking system and financial stability, and payments”. In the final analysis, CBDC with a significantly different benchmark from typical digital currency is given a consideration.

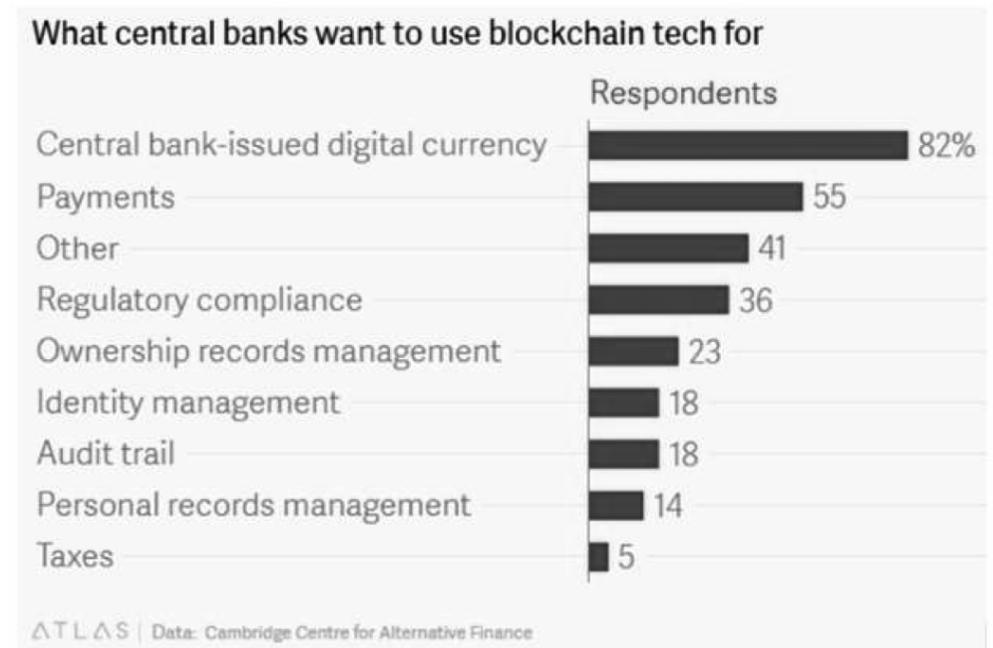
There have been individual efforts by various central banks, other than the case of Venezuela, where its legal tender the bolivar was displaced and replaced with the el petro, the first fiat sovereign cryptocurrency. Central banks have closely monitored blockchain and cryptocurrency technologies, and are moving from opposition and apathy to adoption and implementation of the blockchain technology through Distributed Ledger Technology (DLT) Proofs of Concept (PsoC) as pilot testing for banking operations and processes.

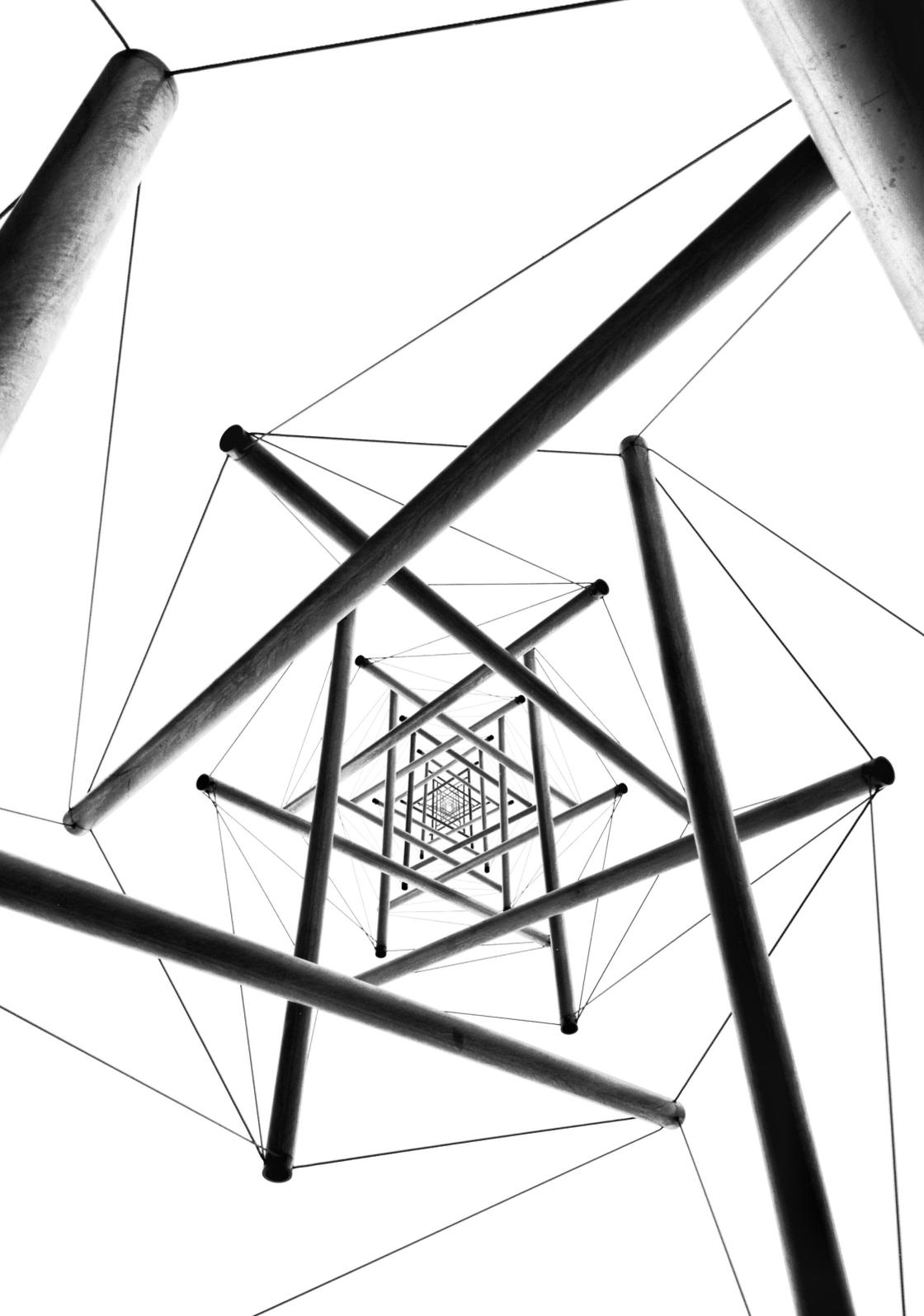
Central banks in the United States (US), United Kingdom (UK), Canada, Australia, Singapore, South Africa, France, Sweden and China investigate and experiment with the blockchain technology. Notably in December 2016, the central bank of the United States, officially known as the Federal Reserve System published a paper titled “Distributed ledger technology in payments, clearing, and settlement”.

At the Money20/20 event, the title: “Cryptocurrency, the central (bank) question” was considered by representatives from the Bank of England, Bank of Lithuania, Bank of Canada, and the Swiss National Bank. In June 2016, central bankers from 90 countries converged and brainstormed on how the blockchain technology could be harnessed for banking operation efficiency. A US Federal Reserve Governor Lael Brainard had stated in 2016 that the blockchain technology “may represent the most significant development in many years in payments, clearing and settlement”.

Though banks in the past have taken a wait-and-see approach toward the blockchain technology, the narrative is changing over a very brief period of time, as the wheel of development accelerate so fast, and banks are gearing up to have a bite on the cryptocurrency pie, destined to disrupt modern money mechanics and global payment services market. According to the 2017 Global Blockchain Benchmarking Study, 80% of a group of 25 central banks, who were surveyed for, among other issues, their purpose for research into the blockchain technology had included in their number of interests, utilising the blockchain technology to issue their own Central Bank Digital Currencies (CBDCs).

Apart from the innovations, payment service efficiency and other positive characteristics of the blockchain technology, the interest of central banks in the blockchain technology has often been informed, and for the most part, inspired by eagerness, excitement and willingness of the commercial banks, and other financial institutions to harness the potentialities of the cryptographic Distributed Ledger Technology (DLT) for the purpose to ease their internal operations and processes, and cross-border transaction settlement overhauling of their antediluvian back-office infrastructure.





### (iii) Banks, Other Financial Institutions and Corporates

**Corporates:** The list of corporate blockchain adoption is arguably inexhaustible. And upon this, adoption and implementation keep on the growth path. Some of the public and corporate enterprise-grade open source and closed source platforms for blockchain development, and Blockchain-as-a-Service (BaaS) are IBM blockchain, Amazon, Accenture, R3's Corda, a platform that boasts of 200 members and partners across multiple industries, the 270-member strong Hyperledger Fabric, Ripple, Bitcoin, and the 500-member strong Enterprise Ethereum Alliance (EEA), a standards organisation that seeks to build permissioned business applications on the Ethereum Virtual Machine (EVM), a Turing-complete public blockchain. There are many other blockchains public, permissioned, private, hybrid, stateful and stateless.

With more enterprise grade adoption of the blockchain technology, the technology continues to gather momentum and gain more prominence, especially when considered that enterprise and corporate adoption and implementation used to be an issue for the blockchain technology. Other most notable issues are scalability and interoperability. These too are getting solved, as the blockchain technology becomes more modified, improvised and made more suitable through continuous technological innovation, adoption and implementation.

Accenture unveiled an interoperability solution which solved the issue about the inability of blockchains to communicate with one another. Accenture solved this issue through the introduction of an "interoperability node". This "interoperability node" is able to "house the business logic of different blockchains". According to Accenture, the "interoperability node" interconnects and interoperates enterprise blockchain platforms like Hyperledger Fabric, R3's Corda, JPMorgan's Quorum, and Digital Asset (DA) through the provision of communication lines between two or more Distributed Ledger Technologies (DLTs) by the inclusion and integration of their individual business logic which contains the guidelines, policies and standards by which the DLTs have agreed to both interconnect and interoperate. This interoperability node solution that makes blockchains communicate sees first use cases such as supply chain management, trade finance, and insurance, which operate on different platforms, but can interoperate as a result of the interoperability node solution to the blockchain interoperability issue. Various blockchains scale, due to needed innovation and adoption.

The 50 largest public companies in the world are exploring the blockchain technology, while it has also been reported that the 10 largest public companies in the world are exploring the blockchain technology. Alibaba and Tencent are large corporations headquartered in China, and beyond, who also adopt and leverage the blockchain technology. Alibaba comes among the leading enterprises in the world with the highest number of blockchain patients. Alibaba has a logistics system based on the blockchain technology whose aim and objectives are to track information that relates to production details, inspection, third party verification, transport methods and customs. Baidu has asset-backed securities issued on the blockchain smart contract, which are listed on the securities exchange in Shanghai, China.

In the 2018 edition of Forbes Global 2000, ten of the largest publicly quoted companies in the world are either testing out or already deploying blockchain solutions for their businesses. The companies listed are Industrial and Commercial Bank of China (ICBC), the largest publicly quoted company in the world, which uses the blockchain technology as a means for its customer digital certificate verification system. JPMorgan, which built its own blockchain architecture Quorum on the Ethereum blockchain uses the technology for its cross-border funds transfer daily business among other use cases. According to its Chairman Jamie Dimon, JPMorgan moves USD 6 trillion in daily transaction volume across the world on the Quorum blockchain.

According to the 2018 US Economic Report, ten of the largest supply chain management organisations in the United States, including Walmart use the blockchain technology in their daily business operations to track and trace food supplies, make shipment and delivery happen in real time, while cutting cost, time and increasing overall business efficiency.

Big technology companies like Google, Amazon, Bank of America, Mastercard, IBM and Microsoft make blockchain-related patent applications, and either get approval or denial, but all the same, these megacorporates keep piling up blockchain patents. These parents like in the case of Google, are to serve the purpose for Google to build its blockchain infrastructure for use cases such as the recording of signatures and data verification on Google's vast databases. Bank of America, which has scores of blockchain patents, seeks to implement the technology for legitimate transaction settlement and prevention of illegitimate transaction on its growing financial ecosystem.

Mastercard filed 27 blockchain patents in January, 2018, but inside source revealed that the company already has scores of blockchain patents under its belt, the use cases of some of which are blockchain implementation for consumer protection and transaction process acceleration among others, for its credit card and affiliated financial service businesses. Amazon, the e-commerce company filed cryptocurrency-related patent regarding its cloud computing services, where it plans to accept cryptocurrency payments for cloud computing services; the Amazon Web Services (AWS).

As published by the United States Patent and Trademark Office (USPTO), the Bank of America, which has filed over 50 blockchain- and cryptocurrency-related patents till date, got a new patent for cryptocurrency aggregation system for storing cryptocurrency holdings of its clients in enterprise accounts. This is achieved through the private keys associated with the accounts of its customers, and public keys determination and generation of "vault keys" for the purpose of crypto-asset storage. This obviates the need for Bank of America's clients to go through a third party like cryptocurrency exchange for currency conversion, custodianship and therefore simplifies the process, even as it removes the attendant transaction fee cost.



## (a) Banks

The World Bank in its concerted effort to harness the powers and potentials of the blockchain technology had launched a Blockchain Innovation Lab in June, 2017. Its blockchain use case areas of preoccupation include land administration, healthcare, cross-border payments, supply chain management, education, and carbon market trading.

The Ripple blockchain, a scalable, secure ledger that interoperates with different networks, is a global network that keeps growing and expanding, as banks, payment service providers, digital asset exchanges optionally process and provide liquidity in XRP; the native payment token for transactions which are executed on the RippleNet; they thereby create healthy cross-border payment competition for customer service optimisation. The Ripple payment settlement network consists of 100+ banks and payment service providers across the world, with a global reach of 55 countries worldwide.

There are hundreds of banks across the world, who are either going through the blockchain Proofs of Concept (PsOC) phase, adoption, and implementation or using the blockchain for many other purposes, or yet at the planning stage with the blockchain. In July, 2018, IBM trialed a blockchain platform LedgerConnect for banks to access and build blockchain applications. A number of banks and other financial institutions were involved in the Proof of Concept (PoC). The platform covers areas that include Know Your Customer (KYC), derivatives post-trade settlement, data reconciliation, market data, and collateral management. Certain corporates with focus on driving enterprise blockchain adoption have been able to turn around the company's fortunes after years of revenue decline, and IBM is a good example of this.

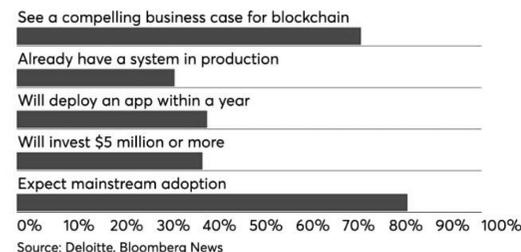
15 global banks partnered with Depository Trust & Clearing Corporation (DTCC) to test the DTCC's blockchain and cloud-based platform for its "credit derivatives Trade Information Warehouse (TIW)" before its release on the main-net. TIW provides:



*TIW provides lifecycle event processing services for roughly 98% of all credit derivative transactions worldwide, worth \$11 trillion. The warehouse's customer base includes major global derivatives dealers and more than 2,500 buy-side firms and other market participants in over 70 countries.*

## Blockchain on the mind

Over 1,000 global executives said in a survey on distributed ledger technology that their companies:



The real core value derivation aim and objectives of the DTCC are operational efficiency enhancement, operational risk reduction and cost lowering in the industry. The DTCC takes a multi-dimensional approach regarding projects and partnering with BaaS platforms like IBM blockchain for management and integration services, Axoni building the distributed ledger technology and smart contracts functionality on the AxCore blockchain protocol, and R3 for solution advisory services.

The TIW occupies a fundamental position of pride and prominence, in regard to virtually every operational detail that includes trade initiation to trade maturity; modifications, amendments, termination, rate resets, corporate actions, including credit derivatives trades, performing lifecycle events, payment calculations and settlement. These are going through an automation process with the smart contract technology implementation.

The second largest bank in Italy and thirteen more other banks underwent a Proof of Concept (PoC) and testing phase for interbank transfer and transaction data reconciliation on the R3's Corda, while the second phase of the project for enterprise blockchain adoption by the banks for everyday utilisation is in the process after the first phase success. The project sought to improve upon interbank transaction through time reduction regarding the sorting and identification of mismatched transactions between banks, process standardisation and single communication protocol implementation, by network node assignment to the participating banks for uploading the bank data.

## (b) Financial Institutions

Some of the global banking financial institutions are Santander, BNP Paribas, Wells Fargo, JP Morgan Chase, Bank of America, Citigroup, Morgan Stanley, and Goldman Sachs all involved in commercial banking and investment banking practices both interact with, adopt and implement the blockchain technology in their daily business operations. Financial institutions from banks, fund managers, mutual funds, hedge funds, national securities exchanges, stock exchanges and insurance companies are moving their core financial operations and investments hitherto conducted on the legacy business infrastructure, from investment management, securities issuance, trading, settlement to clearing onto the blockchain technology. Banks and securities exchanges all over the world compete and struggle to keep pace with the adoption and implementation speed at which financial institutions integrate blockchain technology into their core business operations for maximum optimisation, convenience and simplification among others.

Early to adopt, the National Association of Automated Securities Dealers Association (Nasdaq) built its own private and permissioned blockchain technology named Linq in 2015. It was first implemented for a securities issuance transaction with Chain.com who was the inaugural blockchain securities client for securities transactions by NASDAQ on its Linq blockchain platform.

Further among these financial institutions that are exploring the distributed ledger technology is the Australian Stock Exchange (ASX). ASX evaluated options for replacement of its legacy financial market infrastructure the Clearing House Electronic Subregister System (CHES) in 2015. ASX worked with Digital Asset Holdings, LLC. to develop blockchain application for the clearing and settlement of its investment and securities business. As part of the deal, ASX invested USD14.9 million for 5.0% equity stake acquisition in Digital Asset Holdings, LLC. which later rose to 8.5% with an additional investment. Japan Exchange Group (JPX), Korea Exchange, German bourses Deutsche Börse and Deutsche Bundesbank, India's National Stock Exchange (NSE), Moscow Exchange (MOEX), London Stock Exchange, Luxembourg Stock Exchange, Santiago Exchange, Chile, TMX Group, Toronto-based, Canada, some of who are among the biggest exchanges in the world, and still many more, are on the growing list of blockchain adoption and implementation in its multifarious financial industry use cases.

## Blockchain Technology Sovereign Bond Issuance

Various sovereign States are beginning to issue bonds on the blockchain technology, in order to circumvent the red-tapism, cumbersome bureaucratic process and long delay, usually associated with traditional method. These are the perennial bottlenecks where bond issuance process takes up to two weeks, and in spite of that, is very costly. A growing list of countries that have issued or planning to issue blockchain bonds include Australia, Austria, and Thailand. The Austrian government issued bonds worth 1.15billion euros (\$1.35billion) on the Ethereum Virtual Machine (EVM), the open sourced public blockchain.

The global sovereign bond market capitalisation is put at USD22.116 trillion. This is a substantial proportion of the secondary market. Sovereign bonds as debt securities rank among the safest risk-free investment vehicles. Blockchain eliminates the need for paperwork-based sovereign bond issuance, cuts time involved in bond issuance process, increases secondary market liquidity for the bonds and among others.

Further to the World Bank's concerted effort, and in conjunction with the Commonwealth Bank of Australia, the World Bank through a project named Blockchain Operated New Debt Instrument (BOND-i) issued bonds worth 100 million Australian dollar (\$73.16 million). The bonds are expected to yield a 2.251 percent. Arunma Oteh, former Director-General of the Securities and Exchange Commission (SEC) Nigeria, and Treasurer, World Bank had responded to the successful blockchain implementation for bond issuance thus:



*I am delighted that this pioneer bond transaction using the distributed ledger technology, bond-i, was extremely well received by investors. We are particularly impressed with the breath of interest from official institutions, fund managers, and banks. We were no doubt successful in moving from concept to reality because these high-quality investors understood the value of leveraging technology for innovation in capital markets.*

The Thai Bond Market Association (TBMA) plans to issue bond with the registrar service platform, built on the blockchain technology facilitated with smart contract, and proposes to attach a native utility settlement coin named "Bond Coin". The platform, which the TBMA plans to build with smart contract on a private blockchain, will provide users with the following:



*a digitized settlement database, a bond subscription system, and bond transaction verification. It will also enable issuers, regulators, companies, and investors to have access to interest rates, payments and other bond information*

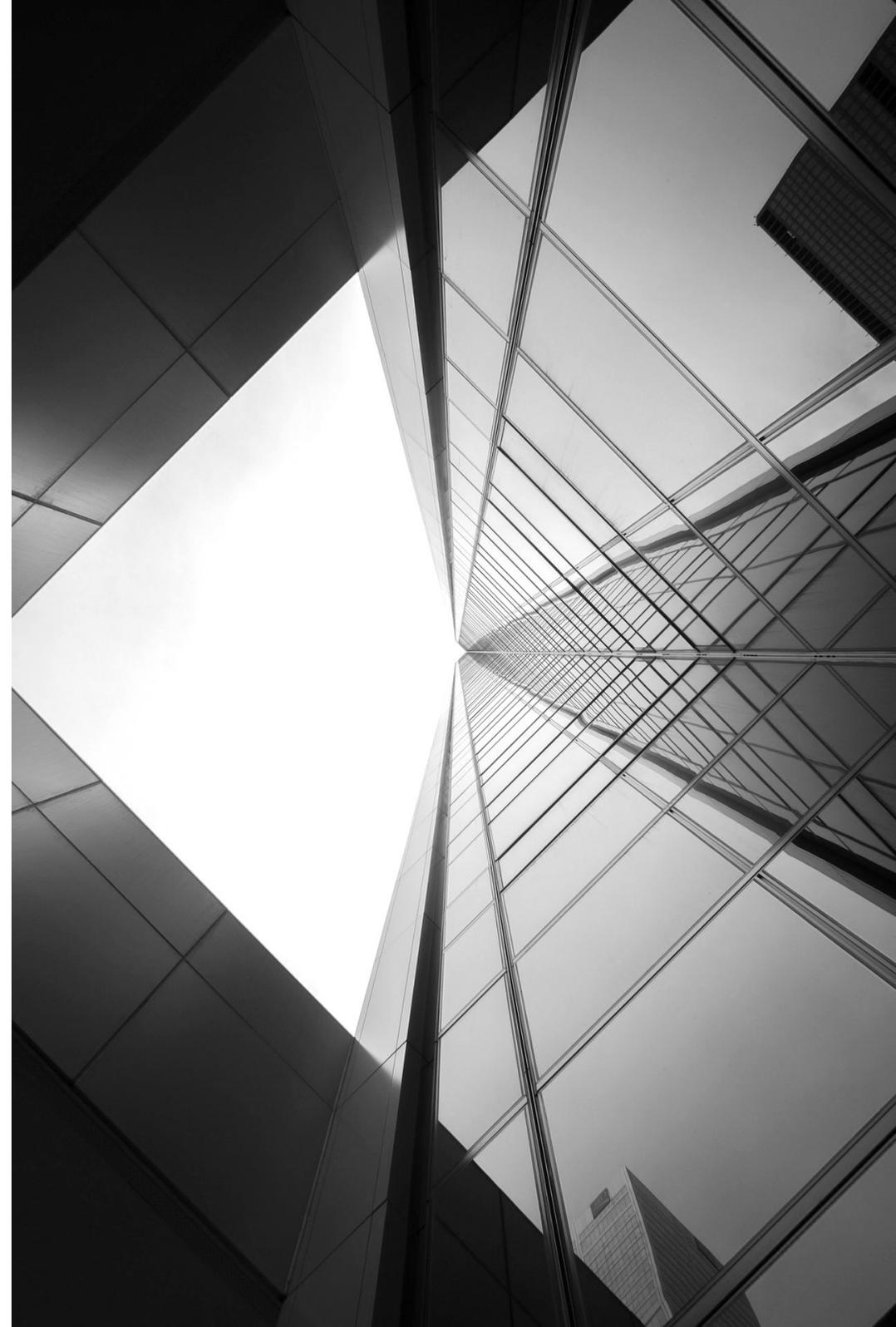


## Central Bank of Nigeria (CBN) Should Build Its Own Blockchain to Facilitate the Currency Swap Deal or Partner With an Existing Blockchain Platform for the Purpose

Going by the very fast, accelerated blockchain adoption and implementation through Proofs of Concept, and subsequent business application, corporates, governments and citizens across the world, the available options for the Central Bank of Nigeria (CBN) is either to build its own blockchain technology, or any other Distributed Ledger Technology (DLT) from the ground up, or partner with any of the blockchain technology platforms for the purpose of building useful blockchain applications, or if the Central Bank of Nigeria (CBN) is up for it, it can, like many other central banking, financial institutions and other corporates, set up its own blockchain solution lab for Research & Development (R&D) and funding for blockchain adoption and implementation.

Outside the Hyperledger Fabric, Microsoft, R3's Corda, Ripple, Bitcoin, Ethereum, and others mentioned and already discussed in this white paper, there are others which the Central Bank of Nigeria (CBN) could partner with to build and implement a blockchain application, and therefore effect frictionless, cryptographically secure, cross-border payment settlement that takes seconds, for process corruption removal purposes, transparency guarantee, traceability, immutability, accountability and among others with respect to the USD2.5billion worth of Naira-Renminbi currency swap deal with the People's Bank of China (PBoC).

ConsenSys is a blockchain company that develops blockchain applications, smart contracts, blockchain software and related technologies. Intellectsoft provides software solutions and focuses on emerging technologies like blockchain. The Intellectsoft Blockchain Lab is involved with a range of blockchain solution services that encompass smart contracts, identity solution and the likes. More lists of the other recommendable ones can be found [here](#).



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## BACKGROUND

Lex Futurus (Nigeria) represented Lex Futurus Group at the Yuan/Naira Currency Swap Sensitization Conference organised by the Central Bank of Nigeria (CBN) in conjunction with the Abuja Chamber of Commerce and Industry (ACCI), Federal Capital Territory (FCT) Abuja, Nigeria, on the 15th August, 2018. Boulevard A. Aladetoyinbo, Esq., the Founding Partner at Lex Futurus (Nigeria) took up the relevant stakeholders on the exigent need to implement the USD2.5 billion currency swap deal transactions between the Central Bank of Nigeria (CBN) and the People's Bank of China (PBoC) on the blockchain technology. This white paper is born as a result of that interaction and engagement with the Central of Nigeria (CBN) at the currency swap deal event.

### Disclaimer

This is a general information white paper. It does not qualify as a piece of professional advice to neither Central Bank of Nigeria (CBN) nor the People's Bank of China (PBoC) to adopt and implement the blockchain technology for currency swap deal execution purpose between the two countries.

The white paper has only a anatomised the inherent implications, and benefits among others, which accrue, and thus shows examples to urge the two central banks, especially the Central Bank of Nigeria (CBN), to consider the blockchain technology adoption option for completing the ongoing currency swap deal with the People's Republic of China (PBoC). Therefore, every foreseen and unforeseen scenario that may arise herefrom, and attract liability is hereby disclaimed mutatis mutandis.

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