LEGAL AND REGULATORY STANDARDS FOR THE ADOPTION OF BLOCKCHAIN TECHNOLOGY IN THE NIGERIAN CAPITAL MARKET

BY

CLINTON ESOSA OSEMWENGIE

U1732751

A Ph.D. THESIS SUBMITTED TO THE ROYAL DOCKS SCHOOL OF BUSINESS AND LAW

UNIVERSITY OF EAST LONDON IN FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DOCTORAL DEGREE IN BUSINESS AND LAW (PhD)

SEPTEMBER 2024

CERTIFICATION

I **CLINTON ESOSA OSEMWENGIE (U1732751)** hereby certify that save for the references made to other people's work as duly acknowledged herein, this entire thesis is the product of my personal research, and it has neither in whole nor in part been presented for another degree elsewhere.

APPROVAL

We certify that this thesis was completed and written by **CLINTON ESOSA OSEMWENGIE** (U1732751) in fulfilment for the award requirements for the award of the Doctoral degree in Business and Law (Ph.D.)

Professor. Iwa Salami **----------**

(Director of Studies)

Professor Vasileios Fouskas **----------**

(Second Supervisor)

DEDICATION

The global financial landscape has witnessed significant evolution since the 2007-08 financial crisis, with disruptive technologies playing a pivotal role in this transformation. Blockchain technology, in particular, has been recognised as a revolutionary innovation capable of redefining the interactions between regulators, operators, and participants within financial markets. Given the potential advantages and challenges this technology presents, it is crucial for regulatory frameworks to be adequately prepared for the changes blockchain can bring to the capital market.

This work offers a forward-looking and pragmatic examination of the regulatory challenges Nigeria's capital market faces as it considers the adoption of blockchain technology. In light of the recommendations outlined in this analysis, I dedicate this work to regulators, operators, and participants in emerging financial markets who share a vision of fostering an efficient, world-class capital market that leverages cutting-edge technologies such as blockchain to drive growth and innovation.

ACKNOWLEDGEMENTS

All thanks be firstly to God almighty for making this journey become a reality. This work represents the culmination of my personal efforts, made possible by the guidance and support of remarkable individuals who have played integral roles in its successful completion. It is my honour and privilege to express my sincere gratitude to those who have contributed to this research endeavour in various capacities.

To my loving wife Isioma and our cherished sons Esosa and Ehigie, I extend my deepest appreciation for your unwavering love, support, and understanding throughout this journey.

I owe a tremendous debt of gratitude to my parents, Hon. (Justice) Nosa and Felicia Osemwengie, for their invaluable financial, moral, and spiritual support that ensured the highest quality of work. Your encouragement has been a guiding light throughout my life. I also thank my wonderful siblings, Benedicta, George, and Adesuwa, for your constant presence and steadfast belief in me.

Words cannot adequately convey my appreciation for my esteemed project supervisor, lecturer, and mentor, Prof. Iwa Salami, Professor of Financial Law and Regulation and Director of the Centre of FinTech at the University of East London. Her unwavering commitment to my growth and development in this emerging field of law, her instrumental guidance throughout the research process, and her insistence on excellence have been truly transformative. I am humbled by the opportunity to have learned from her vast knowledge and expertise in this field. I am immensely thankful for her invaluable guidance and constructive feedback at every stage of this research journey. May she continue to be richly blessed.

My gratitude extends to the regulatory experts who kindly shared their opinions and offered support through our insightful discussions. Notable among them are Timi Agama, Director General of the Nigerian Securities and Exchange Commission, Franca Egwueke, the Company Secretary and General Counsel of the Nigerian Clearing Limited; Claire McCafferty, Former Dean of the London Institute of Banking and Finance and Director of Academic Programme at the University of Cambridge; and Ina Alogwu, Group Director of Digital Transformation at Asset and Resources Management Holding Company (ARM Holdco).

I would like to express my heartfelt appreciation to the Cambridge Centre for Alternative Finance at the University of Cambridge for providing me with the invaluable opportunity to contribute to their study in collaboration with the World Economic Forum on the Global COVID-19 Fintech Market Impact and Industry Resilience Study through the Fintech internship program. This enriching experience exposed me to key industry players in the Fintech space and broadened my understanding of the sector's diverse and rapidly evolving dimensions. I also extend my appreciation to the Centre of Fintech, University of East London for

granting me the exposure to the various dimension of Fintech through the various symposiums and workshops on emerging technologies and its impact on financial services.

Special thanks are due to Mr. Joe and Mrs. Rose Okoro for their unwavering and generous support during this project. They are one of the pioneers of this successful journey. To my dear friends and colleagues Mabiaku Ikaye, Prosper Nwachukwu, Ernest Osemwengie and Ademola Herbert Soile-Balogun, I extend my sincerest appreciation for your steadfast friendship and encouragement throughout this research journey. Your belief in me and my work has been a source of strength and inspiration.

Finally, I acknowledge the countless others who have played a part in shaping this research, whether through direct contributions or simply by being a source of inspiration and encouragement. Your support has been invaluable, and I am eternally grateful.

LIST OF STATUTES

Nigeria

Companies and Allied Matters Act 2020

Cybercrime (Prohibition, Prevention Etc.) Act 2015

Data protection Act 2023

Investment and Securities Act 2007

SEC Consolidated Rules and Regulations, 2013

SEC Rules on Issuance, offering platforms and custody of digital assets 2022

The Constitution of The Federal Republic of Nigeria, 1999 (as amended)

Other Countries

Alternative Investment Fund Managers Directive 2011

Data Protection Act 2018

Financial Conduct Authority Client Money and Assets Rules 2022

Financial Services and Markets Act 2023

General Data Protection Regulation 2018

issuance, offering platforms and custody of digital assets 2022

Market Abuse Regulation 2014

The Commodity Exchange Act 1936

The Open-Ended investment Companies Regulations 2001

The UK European Market Infrastructure Regulation 2012

Uncertificated Securities Regulations 2001

Undertaking for Collective Investment in Transferable Securities 2009

LIST OF CASES

Nigeria

Central Securities Clearing System & Anor v. Bonkolans Investment Ltd & 5 Ors (IST/OA/03/2003)

CSCS & Anor v. Bonkolans Investment Ltd & 5 Ors (IST/OA/03/2003)

Dr. Okam Kalu Ugwu v. SEC & 4 Ors (Suit No: IST/EN/OA/2014)

Esiaba Iheanyi Alozie v. Ikenna Igboamaeze, SEC & 570 Ors

Eze Okorocha v UBA PLC & ORS (2011) 1 NWLR PT. 1228 P. 348

FIS Securities Ltd v Securities and Exchange Commission

Hon. Tribunal in Prof. Anthony Asiwaju vs. SEC & Anor, Suit No. IST/LA/OA/05/16 (unreported)

Nospetco Oil & Gas Ltd v Olorunnimbe (2012) 10 NWLR (Pt. 1307) 115

Prof Anthony Asiwaju v. SEC & Anor IST/LA/OA/05/16 (Unreported)

Resort Savings & Loans Plc & 3 Ors v SEC IST/APP/4/14 (Unreported)

Securities and Exchange Commission v. Big Treat Plc & Ors (2019) LPELR-46520

Securities and Exchange Commission v. Oni Alasibekan (2008) LPELR at 4937.

Thomas Kingsley Securities Ltd & Anor v. Meristem Registrar Ltd (SUIT NO: IST/LA/OA/02/16) (unreported)

UBN Plc (Registrars' Dept.) v. SEC (2004) 1 NISLR 115

Other Countries

Bristol & West Building Society v. Mothew [1988] Ch 1

Burland v. Earle [1902] AC 83

Commodity Futures Trading Commission v. Dillon Michael Dean and The Entrepreneurs Headquarters Limited, Corp. d/b/a Coin Drop Markets, No. 2:18-cv-00358 (E.D.N.Y. Jan. 18, 2018).

Commodity Futures Trading Commission v. My Big Coin Pay, Inc., No. 1:18-cv-10077 (D. Mass. Jan. 16, 2018).

Commodity Futures Trading Commission v. Patrick K. McDonnell and CabbageTech, Corp. d/b/a Coin Drop Markets, No. 1:18-cv-00361 (E.D.N.Y. Jan. 18, 2018).

Donoghue v Stevenson [1932] AC 562

Foss v. Harbottle (1843) 2 Hare 461

Helmsworth Investment Ltd & Anor v. BGL Securities Limited IST/LA/OA/01/2014

In the Matter of Coinflip, Inc., d/b/a Derivabit, and Francisco Riordan, CFTC Docket No. 15-29 (Sept. 17, 2015).

LIST OF ABBREVIATIONS

ASCI -	Australian Securities and Investment and Commission
BoE-	Bank of England
CMO-	Capital Market Operators
CBDC-	Central Bank Digital Currency
CBN-	Central Bank of Nigeria
CSCS-	Central Securities and Clearing System
CSD-	Central Securities Depositories
DLT-	Distributed Ledger Technology
DSS -	Digital Securities Sandbox
FCA-	Financial Conduct Authority
FMI-	Financial Market Infrastructure
IOSCO-	International Organization of Securities Commission
NCMP-	Nigerian Capital Market Master Plan
NGX-	Nigerian Exchange Company
OECD-	Organization for Economic Cooperation and Development
SEC-	Securities and Exchange Commission
STP-	Straight Through Processing

TABLE OF CONTENT

CHAPTER TWO: BLOCKCHAIN TECHNOLOGY IN FINANCE: CHALLENGES AND OPPORTUNITIES

CHAPTER THREE: BLOCKCHAIN ADOPTION IN FINANCIAL MARKETS: POTENTIALS AND CHALLENGES

CHAPTER FIVE: IN DEFENCE OF A SOUND AND QUALITATIVE REGULATORY FRAMEWORK FOR BLOCKCHAIN ADOPTION IN THE NIGERIAN CAPITAL MARKET

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

ABSTRACT

The capital market is instrumental to the economic development process of African states. A key enabler of such development is the use of emerging technologies such as blockchain technology and its transformative role in driving an efficient market. This research investigates the potential adoption of blockchain technology within the Nigerian capital market and assesses whether the Nigerian regulatory framework possesses the necessary standards for blockchain technology adoption. Drawing from Douglass North's institutional economics theory, the study underscores the importance of strong institutions, including laws and regulations, in fostering market development.

The research is motivated by Nigeria's current push to adopt blockchain technology in the public sector, as outlined in its National Blockchain Policy to drive efficiency. This thesis argues that for blockchain technology to thrive in the Nigerian capital market, the regulatory framework needs to possess the requisite regulatory standards to realise the unique attributes of the technology and to address any implications on the market. This thesis draws on the experience of the United Kingdom's regulatory framework and its approach to the deployment of blockchain in its financial market as a yardstick to test the adequacy of the regulatory framework of the Nigerian capital market. The findings from the research reveal that Nigeria's current regulatory framework lacks the necessary standards to tackle the challenges and implications of blockchain technology implementation.

The work submits that the Nigerian capital market should not race towards the adoption of the technology due to the ailing state of its regulatory framework. This submission stems from the position that an adoption of blockchain technology would not cure inherent defects in its regulatory framework. The research concludes by offering recommendations for Nigerian policymakers to establish the necessary legal and regulatory standards to facilitate the successful integration of blockchain technology within the country's financial market.

CHAPTER ONE

INTRODUCTION

> "*Until new technologies coalesce around uniform standards, and until consumers and investors generally accept new technologies as safe and effective ways of doing business, the potential benefits will not be fully realised"*[1]
>
> US, Securities and Exchange Commission

1.1. Background to the study

Capital markets have been adjudged as a driver for economic growth and development in modern economies.[2] This is of strategic importance for emerging markets like Nigeria because it serves as a crucial avenue for the mobilization of capital from investors to government and businesses to drive real economic growth.[3] To ensure effective accumulation of capital and to prevent economic downturn, countries try to ensure that their capital markets are efficient and well developed. A key enabler of such development is the use of emerging technologies.[4] It has been posited that one of the prominent emerging technologies that can drive efficiency in the capital market is blockchain technology/ Distributed Ledger technology.[5]

Blockchain technology is a decentralised distributed ledger technology that records transactions and maintains records in a secure and transparent manner. It consists of a continuously growing list of records, called blocks, which are linked and secured using cryptographic algorithms. Each block contains a

---

[1] U.S. Securities and Exchange Commission, (1997) *Report to the Congress: The Impact of Recent Technological Advances on the Securities Markets,* available at: https://www.sec.gov/news/studies/techrp97.htm (accessed 11 March 2021).

[2] Tadesse, S. (2004). The Allocation and Monitoring Role of Capital Markets: Theory and International Evidence. *The Journal of Financial and Quantitative Analysis*, 39(4), 701–730.

[3] There are studies that have attempted to establish the Nigerian capital market as a catalyst for its economic growth. See; Greg Ekpung. E and Uchenna. O (2013) The Impact of Capital Market and Economic Growth in Nigeria, *Public Policy and Administration Research* 3(9), pp. 7-15

[4] Distributed Ledged Technology, Artificial Intelligence, Machine learning, Cloud computing. See among the legion of literatu on this point: International Labour Organization (2022), *Digitalization and the future of work in the financial services sector,* available at: *https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/meetingdocument/wcms_824708.pdf ;* Cai. C.W (2018) Disruption of financial intermediation by FinTech: a review on crowdfunding and blockchain, *Accounting & Finance 58 965–992.*

[5] This is a technology that has arguably been used to support the emergence of a new class of financial products and services and is attributed to transforming the alternative financial sector European Crowdfunding Network (2019) *Exploring DLT and Blockchain for Alternative Finance: A Collection of Case Studies,* available at: https://eurocrowd.org/wp-content/uploads/2021/05/ECN_Exploring-DLT-and-Blockchain-for-alternative-finance_Nov2019.pdf (accessed 11March 2021); On the global growth of alternative finance, see the high-level empirical study conducted in Cambridge Centre of Alternative Finance (2020) *The Global Alternative Finance Market Benchmarking Report Trends, Opportunities and Challenges for Lending, Equity, and Non-Investment Alternative Finance Models, available at: https://www.jbs.cam.ac.uk/wp-content/uploads/2020/08/2020-04-22-ccaf-global-alternative-finance-market-benchmarking-report.pdf* (accessed 11 March 2021)

cryptographic hash of the previous block, forming an unbroken chain of records that is resistant to modification or tampering.[6] It differs from traditional ledgers which are centralized systems that record and maintain financial or transactional data in a structured format and typically managed by a single entity. This mode of recording data is adjudged to be risky because it may introduce single points of failure or create room for manipulation since data in the ledger is centrally controlled.[7]

To appreciate the value propositions of the technology to the capital market, it is imperative to understand how the current arrangement in the market is and how the technology can be of impact. The current structure of the market process is highly fragmented, costly and time consuming. For instance, the number of intermediaries in each ambit of a transaction cycle in a typical equities transaction from the buyer perspective, from trade to settlement, involves not less than five financial intermediaries/infrastructure. i.e., a broker or issuing house, an exchange, clearing member, central counter party (CCP), Central Securities Depositories (CSD) and a bank. Each of these players are required to maintain their own independent record of transactions, securities and other relevant data: all of which would need to be reconciled to ensure their veracity. The trade life cycle and custody chains often involve a series of intricate processes, characterized by a multitude of intermediaries who maintain their own exclusive databases. This results in significant data redundancy, as various parties store overlapping information regarding the same transactions. Consequently, this complex system presents increased opportunities for potential misappropriation or misuse of data.

For this lengthy and duplicative process, the investor who is the beneficiary of the process incurs delay in the settlement of transaction, which at the Nigerian capital market currently settles at 2 to 3 days. Also, the investors have to bear the numerous cost imposed by each of the financial intermediary/infrastructure in facilitating the transaction. Furthermore, the numerous intermediaries in the process also imposes surveillance and supervisory burden on the regulator who has to ensure that all players adhere to the conduct of business rules at each stage of the transaction cycle.

The forgoing are some of the pain points in the current market structure. Blockchain technology holds significant potential to address the prevailing challenges in capital markets by streamlining processes, reducing the need for intermediaries, and decreasing settlement times. This transformative potential can

[6] Nakamoto, S. (2008). Bitcoin: A Peer-to-Peer Electronic Cash System. Available at: fhttps://bitcoin.org/bitcoin.pdf (accessed 11 March 2021)
Drescher, D. (2017). Blockchain Basics: A Non-Technical Introduction in 25 Steps. CreateSpace Independent Publishing Platform.
[7] Guo, Y., & Liang, C. (2016). Blockchain Application and Outlook in the Banking Industry. Financial Innovation, 2(1), 24.

lead to increased efficiency, cost savings, and enhanced security in the financial sector. In the context of capital markets, blockchain can serve as a single source of truth by providing an immutable and transparent distributed ledger of transactions. This eliminates the need for multiple records kept by various intermediaries, ensuring that all parties have access to accurate and up-to-date information. By establishing a shared, trustworthy record, blockchain can significantly enhance efficiency, security, and trust among market participants, reducing the likelihood of discrepancies, fraud, or errors in the capital market ecosystem.

While developed markets have largely been at the forefront of exploring blockchain technology's potential in capital markets[8], the transformative role it can play is gradually gaining traction among policymakers and industry stakeholders in emerging markets in Africa.[9] The unique challenges faced by such a market i.e., limited access to capital, inefficient market infrastructure, and weak investor protection, provide an opportunity for blockchain technology to offer innovative solutions that can leapfrog traditional systems. To this end, the value proposition of blockchain technology/ distributed ledger technology (DLT)[10] such as its ability to make operational processes more efficient, transparent, streamlined, resilient and permit the tokenization of securities on the blockchain, is collectively perceived as a tool that can address this scale of deficiencies inherent in such markets.[11]

The Nigerian capital market stands as a prime example of a market that could significantly benefit from the adoption of blockchain technology. With a current market capitalization of $34.455 billion USD as of July 2024[12], the implementation of blockchain technology holds the potential to drive liquidity and efficiency within the Nigerian capital market, ultimately serving as a catalyst for economic growth and development.[13]

---

[8] The Future of Distributed Ledger Technology in Capital Markets – BCG. Available at : https://media-publications.bcg.com/The-Future-of-Distributed-Ledger-Technology-in-Capital-Markets (accessed 15 March 2023)

[9] Thegeya, A. (2023). The Economics of Blockchain Within Africa. In S. Goutier & D. K. Das (Eds.), African economics: A collective learning and innovation approach. Springer Singapore.

[10] The term blockchain technology and DLT are used interchangeably here in many literatures. However, they are interrelated but distinct concepts. DLT is an umbrella term used to designate multiparty systems that operates in an environment with no central operator or authority. Blockchain technology falls under this category and is a subset of DLT.

[11] Wyman, O. (2016) *Blockchain in Capital Markets: The Prize and the Journey*. available at: https://www.oliverwyman.com/content/dam/oliver-wyman/global/en/2016/feb/BlockChain-In-Capital-Markets.pdf (accessed 14 March 2022)

[12] CEIC (2024) Nigeria Market Capitalization, Available at https://www.ceicdata.com/en/indicator/nigeria/market-capitalization#:~:text=What%20was%20Nigeria's%20Market%20Capitalization,table%20below%20for%20more%20data. (accessed 26 August, 2024)

[13]There are studies that have attempted to establish the Nigerian capital market as a catalyst for its economic growth. See; Greg Ekpung. E and Uchenna. O (2013) The Impact of Capital Market and Economic Growth in Nigeria, *Public Policy and Administration Research* 3(9), pp. 7-15; Nwude, C., 2007. The Impact of Capital Market Regulation on the Nigerian Economy. *Zenith. Economic Quarterly*, 2(11), pp.36-43.

One key advantage of integrating blockchain technology is its ability to tokenize securities and fractionalize them. This process would lower entry barriers, making a variety of asset classes more accessible to Nigeria's vast population. In turn, increased accessibility could motivate a larger portion of the populace to invest in the capital market. Additionally, the fractionalization of assets would empower investors to easily diversify their investment portfolios by accessing certain asset classes that traditionally require higher investment amounts or involve more complex processes.

Moreover, blockchain technology's capacity for shortening settlement cycles from T+3 to T+1 can lead to same-day settlement of transactions. This expedited settlement process not only enhances efficiency within the market but also reduces settlement failures. These improvements have the potential to attract younger Nigerian investors to participate more actively in the capital market, further boosting liquidity – a crucial factor for economic growth and development. By leveraging the innovative features of blockchain, Nigeria can foster greater financial inclusion, enhance liquidity, and drive overall market efficiency, thereby contributing to long-term economic progress and stability.

Furthermore, enhancing market integrity through the trust component of blockchain technology can significantly contribute to the development of a robust and reliable market infrastructure, which is crucial for attracting foreign participation in the Nigerian capital market. Although Foreign Portfolio Investment (FPI) has shown growth, reaching US$309.8 million in 2023Q4 with an 8.6 percent increase year-on-year,[14] there is still room for improvement by fostering greater transparency and market integrity. Blockchain technology's inherent trust mechanisms, such as its cryptographic security can ensure the immutability of transactions and create an environment where market participants can confidently engage in trading activities. By providing transparency and reducing counterparty risk, blockchain can significantly strengthen the overall market infrastructure and boost investor confidence.

However, as revolutionary as the technology is, the underpinning theory for the development of the capital market through the use of such technology requires that its regulatory framework is strong and robust. it is a culmination of these positions that brings to the fore the need to understand the regulatory landscape for the successful adoption of this technology. This position leads to an interrogation regulatory framework of the Nigerian capital market to determine the readiness to adopt the technology.

[14] Nigerian Economic Summit Group (2024) *Foreign Investment Inflows into Nigeria weakens in 2023*. Available at: https://www.nesgroup.org/blog/Foreign-Investment-Inflows-into-Nigeria-weakens-in-2023#:~:text=The%20decline%20was%20orchestrated%20by,risks%20and%20elevated%20production%20costs. (accessed 25 August 2024)

1.2 Theoretical framework.

This research is premised on the broad theoretical principle that strong and quality institutions constitute the necessary foundation for economic development of nations. The quality of institutions has become a focal point in understanding the dynamics of economic growth, as well as in explaining the differences in economic outcomes across nations. Analysing the impact of institutions on economic development and growth of a nation can provide valuable insights into how institutional quality affects capital markets, and how it can be improved to bolster economic performance. Institutional quality is characterized by a combination of factors, including the presence of formal regulations, the efficient enforcement of these rules, and the reliability of the legal institutions responsible for upholding them. Together, these elements contribute to the overall effectiveness and integrity of an institution..[15] This theoretical principle provides the backbone upon which technological developments in the capital market can thrive.

This theoretical principle is instrumental to this work particularly as it concerns the use of technology for capital market development in emerging nations like Nigeria where institutional quality are adjudged to be weak. Leading institutional economists like North Douglass established as far back as 1978 the role of strong institutions for market development and economic performance in his seminal work *Institutions, Institutional Change and Economic Performance*.[16] North argument is that this constitutes the necessary foundation for development like technology to thrive.

North's influential ideas have significantly impacted both economics and political science, contributing to the emergence of the new economic history. His emphasis on the role of institutions has made a lasting impression on development studies. North's work has served as the intellectual foundation for the prevailing good governance agenda.[17] North provided a seminal definition of institutions as "the rules of the game, or more formally the humanly devised constraints that shape human interaction."[18] Notably, he highlighted that a society's actual incentive structure comprises not only formal institutions (such as constitutions and property rights) but also informal constraints (including social norms, conventions, and codes of conduct) and enforcement characteristics. This comprehensive perspective on institutions underscores the importance of understanding the complex interplay between various socio-economic and political factors in shaping human behaviour and economic outcomes. It challenges researchers and

[15] Rodrik, D., Subramanian, A., & Trebbi, F. (2004). Institutions Rule: The Primacy of Institutions over Geography and Integration in Economic Development. *Journal of Economic Growth*, 9(2), 131-165; Kaufmann, D., Kraay, A., & Mastruzzi, M. (2010). The Worldwide Governance Indicators: Methodology and Analytical Issues. Hague Journal on the Rule of Law, 3(2), 220-246.; North, D. C. (1991). Institutions. Journal of Economic Perspectives, 5(1), 97-112.
[16] North, D. C. (1990). *Institutions, Institutional Change and Economic Performance*. Cambridge University Press.
[17] Faundez, J. (2014). Douglass North's Theory of Institutions: Lessons for Law and Development. Hague Journal on the Rule of Law, 6(1), 49-73.
[18] North (1990) p3.

policymakers to look beyond formal rules and regulations and consider the broader cultural, historical, and social contexts in which institutions operate.[19]

North's work underscores the significance of institutions in determining the success or failure of economic development strategies. By emphasizing the role of institutions in reducing transaction costs, promoting cooperation, and fostering innovation, North has made a compelling case for the need to prioritize institutional reform as a means of achieving sustainable economic growth and improving overall well-being. North's conceptualization of institutions and their impact on economic performance has had far-reaching implications for both scholarship and policymaking. His insights continue to inspire new research and inform debates on the most effective ways to promote economic development and social progress.

Drawing inspiration from Douglass' work, a litany of literature in finance and law fields have attempted to establish the essential elements of strong institutions within the context of capital markets.[20] In the context of capital markets, these institutions include legal frameworks, regulatory bodies, and financial infrastructure, among others.[21]

The importance of strong institutions in capital market development can be understood through several key aspects such as a robust legal framework that ensures the protection of property rights and the enforcement of contracts, which in turn fosters investor confidence and encourages market participation; Strong regulatory institutions that help to maintain market integrity and stability by overseeing market participants' activities, enforcing compliance with rules and regulations, and addressing potential risks and vulnerabilities; Well-developed financial infrastructure, such as trading platforms, clearing and settlement systems, and payment systems that enable efficient and secure transactions, fostering market liquidity and facilitating capital allocation; Effective institutions that promote transparency and disclosure requirements that provides investors with the necessary information to make informed decisions which helps to enhance market confidence; Strong institutions that support the development and enforcement of good corporate governance practices by ensuring companies act in the best interests of shareholders and stakeholders, which ultimately contributes to market stability and investor trust.

These qualities are itemised and discussed individually below:

---

[19] Faundez, J. (2014)

[20] The World Bank Group (2020) Capital Market Development: A Primer for Policymakers, *World Bank, Washington, DC. World Bank.;* The World Bank Group (2020) *Capital Markets Developments: A Primer for Policymakers,* available at: https://www.ifc.org/wps/wcm/connect/a1bcbfc3-a203-4d5b-b64a-b82a80df11a5/PrimerforPolicymakers-PublicRelease.pdf?MOD=AJPERES&CVID=no.kJ3u (accessed 12 March 2022)

[21] Laeven, L (2014) *The Development of Local Capital Markets: Rationale and Challenges*, International Monetary Fund Working Paper 14/234

1.2.1. Enforcement of property rights and contracts

The role of strong institutions in capital market development is crucial, as they contribute to fostering investor confidence, reducing transaction costs, and promoting long-term investments. Key components of institutional quality include clear property rights, legal protection of shareholder rights, efficient contract enforcement, and a well-functioning legal system that offers remedies for breaches. [22]

Clear property rights form the foundation of a robust legal system. Well-defined property rights provide certainty for investors by clarifying ownership, usage, and disposal rights, including intellectual property rights. This clarity encourages investment by ensuring investors can enjoy the benefits of their investments without fear of expropriation or unauthorized use.

Legal protection of shareholder rights is another critical aspect of institutional quality. Strong institutions safeguard and enforce shareholders' rights, including voting rights, dividend entitlements, and access to information. These protections foster equity investment, promote sound corporate governance practices, and result in more efficient capital allocation.

Furthermore, efficient contract enforcement is vital for capital market development as it promotes trust among market participants. A robust court system capable of adjudicating disputes promptly and impartially facilitates this process, reducing the risks associated with contract breaches and fostering long-term investments. This efficiency encourages market participants to engage in mutually beneficial transactions, stimulating capital market growth.

A well-functioning legal system that offers remedies and compensation mechanisms for investors in the event of property rights or contract breaches is equally important. Legal remedies, such as damages, specific performance, injunctive relief, and other forms of redress, help mitigate potential losses and maintain confidence in the capital market. By providing avenues for recourse, these mechanisms ensure that investors' rights are protected, fostering a more stable and reliable investment environment.

In conclusion, strong institutions play a pivotal role in fostering investor confidence and promoting the development of capital markets by enforcing property rights and contracts, ensuring legal protections, and providing avenues for recourse. By addressing these key components of institutional quality, nations can create a solid foundation for sustainable capital market growth.

[22] Acemoglu, D., Johnson, S., & Robinson, J. A. (2005). Institutions as a fundamental cause of long-run growth. In P. Aghion & S. N. Durlauf (Eds.), Handbook of economic growth (Vol. 1, pp. 385–472). Elsevier. ; La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. W. (1997). Legal determinants of external finance. Journal of finance, 52(3), 1131-1150.

1.2.2 Regulation and supervision

Regulation and supervision play a pivotal role in fostering the development of capital markets by preserving market integrity, promoting transparency, and mitigating potential risks and vulnerabilities. These institutional functions contribute to the overall stability and efficiency of the market, thereby instilling investor confidence and fostering sustainable growth.[23]

A well-designed and comprehensive regulatory framework is fundamental for ensuring fair and orderly market operations. This framework comprises rules and guidelines that govern various aspects of market participants' activities, such as market entry requirements, capital adequacy standards, trading practices, and reporting obligations. By establishing clear expectations and boundaries, a robust regulatory framework enhances competition, promotes market efficiency, and bolsters investor confidence.

Furthermore, competent and diligent supervision is vital for maintaining compliance with established regulations and addressing any instances of misconduct. This is important as strong supervisory oversight contributes to market stability by identifying and addressing potential issues early on and preventing the escalation of systemic risks. In this regard, it is imperative that the regulators adopt a proactive approach to supervision so as to be able to identify and mitigate potential risks that may affect the stability of the market. This would usually involve assessing the impact of macroeconomic factors, monitoring market liquidity, and evaluating the resilience of market infrastructure. This method of supervision should however be done on a continuous basis to ensure the confidence of investors and maintain the integrity of the market.

It should be noted that in today's interconnected global financial system, effective regulation and supervision necessitate cooperation and coordination among national and international regulatory bodies. This collaboration involves sharing information, harmonizing regulatory standards, and coordinating supervisory actions to address cross-border risks and vulnerabilities. By working together, regulators can ensure the overall health and stability of the global capital markets.

1.2.3. Market infrastructure

Well-developed financial infrastructure facilitates efficient and secure transactions, fostering market liquidity and facilitating capital allocation.[24] Key components of market infrastructure that contribute to these objectives include trading platforms, clearing and settlement systems, payment systems, central securities depositories (CSDs).

[23] The World Bank (2020)

[24] Beck, T., & Levine, R. (2005). Legal institutions and financial development. In Handbook of new institutional economics (pp. 251-278). Springer, Berlin, Heidelberg; World Bank. (2001). Finance for growth: Policy choices in a volatile world. World Bank Publications.

Trading platforms, such as stock exchanges, serve as centralized marketplaces for buying and selling securities. They are crucial in establishing market transparency and facilitating price discovery by bringing together supply and demand forces. The deployment of advanced trading technologies and efficient order execution on these platforms contribute to market liquidity and reduce transaction costs.

Additionally, having an efficient clearing and settlement systems ensures the smooth and secure transfer of securities and funds between buyers and sellers. These systems manage the confirmation, reconciliation, and final transfer of securities ownership and the corresponding payment obligations. Having a robust clearing and settlement processes minimize counterparty risk, enhance market efficiency, and foster investor confidence.

Also, Central securities depositories (CSDs) should maintain accurate records of ownership and facilitate the transfer of securities efficiently. These acts contribute to market stability and bolster investor protection.

The foregoing activities of the market infrastructures should be complemented with a secure and reliable payment system as it plays a crucial role in facilitating the transfer of funds between market participants, enabling efficient settlement of transactions. This infrastructure includes electronic payment networks, real-time gross settlement systems, and other payment mechanisms that support the functioning of the capital market.

1.2.4. Transparency and disclosure

Transparency and disclosure play a critical role in fostering investor confidence and maintaining the overall efficiency of capital markets. These practices entail the provision of essential information that allows investors to make well-informed decisions and evaluate the performance, risks, and prospects of various market participants. Key aspects of transparency and disclosure include corporate disclosures, prospectus requirements, continuous disclosure obligations and regulatory reporting,[25]

Expanding on the afore-listed points, it is imperative that publicly listed companies disclose financial and non-financial information as this would enable investors to assess their performance and prospects. This encompasses periodic financial statements, management discussions and analysis, and relevant details on corporate governance practices, related-party transactions, and significant events.

Furthermore, when companies issue new securities, they must provide a prospectus containing comprehensive information on the terms of the offering, the issuer's financials, business operations, risks,

[25] See: Bushman, R. M., & Smith, A. J. (2001). Financial accounting information and corporate governance. Journal of accounting and economics, 32(1-3), 237-333; Bhattacharya, U., & Daouk, H. (2002). The world price of insider trading. Journal of finance, 57(1), 75-108.

and other pertinent data. A detailed and accurate prospectus empowers investors to make informed investment decisions and contributes to market integrity.

Companies should also comply with continuous disclosure obligations by regularly disclosing material information that may impact the price of their securities. This includes periodic financial reports as well as ad-hoc disclosures related to significant events, such as mergers and acquisitions, management changes, or other developments that may affect the company's performance or prospects.

Market participants, including financial institutions and intermediaries should be subject to various reporting requirements to ensure regulatory compliance and promote market transparency. This includes periodic reporting on financial performance, capital adequacy, risk management practices, and other relevant data.

A culmination of the discussed acts can help strengthen the integrity of the market.

1.2.5. Corporate governance

Robust corporate governance practices by strong institutions are crucial in ensuring that companies act in the best interests of their shareholders and stakeholders, thereby contributing to market stability and fostering investor trust. Key components of corporate governance include the board of directors, shareholder rights and engagement, executive compensation and incentives, audit and risk management, and corporate social responsibility and sustainability.[26]

Strong institutions in the context of corporate governance require the establishment and maintenance of competent boards that can guide companies toward long-term success. It is important that the board comprise a balance of executive and non-executive directors who possess the necessary skills, experience, and independence to provide effective oversight.

Furthermore, shareholder rights and engagement are essential aspects of corporate governance and a reflection of strong institutions. In that regard, shareholders should have the ability to participate in key decisions, such as the election of directors and approval of significant transactions. Strong institutions facilitate communication between companies and their shareholders, empowering them to hold management accountable for their decisions and promoting responsible corporate practices.

Another crucial reflection of a robust corporate governance is aligning executive compensation with the company's long-term performance and shareholder interests. This is crucial for promoting responsible

[26] See : La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. W. (2000). Investor protection and corporate governance. Journal of Financial Economics, 58(1-2), 3-27; Claessens, S., & Yurtoglu, B. B. (2013). Corporate governance in emerging markets: A survey. Emerging Markets Review, 15, 1-33.

management. Strong institutions should establish guidelines for executive compensation, including performance-based incentives, which encourage management to act in the best interests of the company and its shareholders.

Additionally, it should be noted that independent audits and effective risk management practices contribute significantly to market integrity and stability. Strong institutions ensure that companies have robust internal control systems and that their financial statements are audited by independent and competent auditors. This helps to prevent financial misreporting and fraud, bolstering investor confidence in the capital market.

Lastly, it is important to highlight that In an increasingly complex business environment, companies are expected to consider the environmental, social, and governance (ESG) impact of their operations. Strong institutions promote the integration of ESG factors into corporate strategies and decision-making processes, encouraging companies to adopt sustainable practices and contribute to long-term value creation.

1.3. Establishing originality

In establishing the originality of this work, it is imperative to state that the existing body of literature on the subject matter is dominated with discussions on the market and regulatory implications for the adoption of blockchain technology into the market infrastructure. Topical concerns relate to how the body of existing financial market laws and regulations will be amended to accommodate distributed ledger technology; a revisitation of the role of market operators; disruption of existing market infrastructure such as clearing houses and settlement depositories in the post trade arm of the market cycle; and other ancillary issues such as liquidity concerns, costs for existing organizations to incorporate blockchain and challenges in integrating the technology with legacy systems.[27]

Furthermore, more of the discussions have been framed around the application of the technology in developed markets,[28] with sparse literature in emerging African markets. To establish originality, it is important that this work breaks away from the established pattern of discussion in developed markets and therefore, begin to drive the conversation towards how emerging capital markets in Africa can adopt the technology. The input of this work would systematically and gradually contribute towards enabling a balance in the body of literature on the subject matter in emerging African markets.

[27] HM Treasury, (2022) UK regulatory approach to cryptoassets, stablecoins, and distributed ledger technology in financial markets: Response to the consultation and call for evidence. Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1066166/O-S_Stablecoins_consultation_response.pdf (accessed 3rd April 2022

[28] Australia, EU, UK among others.

It is important to highlight that one fundamental and foundation point of discussion which has been ignored in the literatures, or possibly not explored, are the regulatory standards needed to first onboard the technology. This is so, given the specific challenges that the technology presents to market infrastructures such as cybersecurity risk, governance, access right issues, among others. It is therefore submitted that one cannot begin to explore areas that the technology will influence without first exploring the regulatory environment that the technology would operate. This is the foundation upon which every other discussion rests and therefore, must be keenly considered. This submission is of more concern for emerging markets like Nigeria where its regulatory framework is argued to be deficient on many grounds. Any discussion before this is tantamount to 'putting the cart before the horse'.

In distinguishing this research from other works on the subject, it is imperative to point out that one of the writings which appears to be close on this area of discussion is the high-level paper developed by the World Economic Forum (WEF). The paper broadly analysed the future of capital markets and the role of the DLT. In that work, the WEF highlighted legal and regulatory risk as a challenge or barrier to adoption.[29] However, the discussion in the work is more generic and does not specifically consider the requisite regulatory standards needed to adopt the technology in emerging financial markets like Nigeria.

Other pieces of literatures have focused on the regulatory approaches to tokenization of securities by policy makers.[30] While these areas are incorporated in the chain of discussion in this work, it is imperative to state that, that is not the sole remit of this work. On this point, it must be admitted that it is difficult to discuss the regulatory standards needed to adopt blockchain technology without straying into the implications that the technology would have on the market.

The foregoing notwithstanding, the argument in this work is that an appraisal of the quality and standards of the financial market regulatory framework is a threshold issue that deserves primary attention, particularly in emerging markets in Africa like Nigeria. Flowing from this stance, the distillable hypothesis here is that '***a sound and robust regulatory framework is a precondition for the adoption of blockchain technology in the Nigerian capital market'.*** The forgoing is premised on successful cases from jurisdictions

[29] World Economic Forum and Boston Consulting Group (2021) *Digital Assets, Distributed Ledger Technology and the Future of Capital Markets*, WEF Insight Report at page 22. Other issues highlighted, but not discussed, were issues of uncertainty on key areas such as: security registry requirements, cross-jurisdictional regulations, anti-trust violations, smart contract enforceability, anti-money laundering (AML) and know- your-customer (KYC), and intellectual property (IP) protection.

[30] OECD (2021), *Regulatory Approaches to the Tokenisation of Assets,* OECD Blockchain Policy Series, available at: www.oecd.org/finance/Regulatory-Approaches-to-the-Tokenisation-of-Assets.htm (accessed 18 November, 2021)

like the UK which has set out regulatory mechanism through its sandbox systems to deploy DLT solution to its capital market. The forgoing is possible because of its sound and robust regulatory framework.[31]

This argument supporting the hypothesis can be appraised by examining the issues inherent in blockchain technology that makes it vulnerable for the Nigerian financial market and the extent to which blockchain will influence the market. Each of these standpoints has an implication on the quality of the Nigerian financial market regulatory framework.

The first standpoint revolves around issues that is innate to blockchain technology which may constitute a barrier to its adoption based on the current state of the Nigerian financial market regulatory framework. Common issues are cybersecurity and data privacy, among others. The other ground revolves around the scope of application of the technology. This is a threshold conversation because, the model adopted would be determined by the quality of the nation's regulatory framework to support the application of the technology. For the Nigerian financial market, this raises serious concerns considering the quality of its regulatory framework. In the context of blockchain implementation, it is more likely that a permissioned blockchain model could be a more suitable initial approach for the Nigerian capital market. This model allows for a certain degree of central control by enabling regulators to monitor and supervise market activities effectively. By striking a balance between the benefits of blockchain technology and the need for regulatory oversight, permissioned blockchains can address the concerns pertaining to Nigeria's current regulatory framework. In a permissioned blockchain model, participants are pre-selected, and their identities are known. This helps to facilitate compliance with Know Your Customer (KYC) and Anti-Money Laundering (AML) regulations. This contrasts with permissionless blockchains, which are entirely decentralized and may pose challenges for regulatory supervision and enforcement in a market with a relatively weaker regulatory framework.

To contextualise the scope of application of this technology in the capital market, the World Economic Forum (WEF) report on the appraisal of the future of capital markets envisaged five case scenarios on the extent to which DLT will affect the role of intermediaries. At one end of the scale, it envisages that DLT would introduce minimal changes to the current market structure by retaining key intermediaries to facilitate market transactions which would operate in parrel with the DLT/blockchain. At the other end of the scale, is a utopian case scenario where DLT system will completely disintermediate the market

[31] The appraisal of the UK's adoption of DLT solution in its capital market is further explored in the latter part of chapter 3

transaction to enable the issuer and the investor t o interact directly on the blockchain without any intermediaries in place.[32]

The models of application would raise issues of operations such as governance model, access, custody of assets and on a broader scale, investor protection. Its implications would have to be situated around a sound regulatory framework to enable the smooth operation of the market process. From a practical perspective, it would mean who has the authority to initiate transactions, possesses the power to update the records in the ledger and view the history of transaction. As recent test cases have shown, examples of tokenised securities on the blockchain uses a permissioned blockchain by giving control to existing market infrastructure. Prime example are the cases in the UK which involved the admission and trading of tokenised equities issued by 20/30 with the London Stock Exchange (LSE) being a platform and a market infrastructure in supervising the transaction on its Turquoise platform. There is also the issuance of tokenized Ethereum denominated bonds by Nivaura, which was cleared and settled on a public blockchain under the UK FCA supervisory regulatory sandbox.[33]

The primary emphasis in this context is that by imposing limitations on roles and responsibilities, designated parties can be held liable for adhering to regulatory requirements. This accountability extends to critical areas such as know-your-customer protocols, anti-money laundering measures, efforts to combat the financing of terrorism, and consumer protection regulations. Ensuring compliance with these standards is best achieved within the context of a robust regulatory environment that clearly defines expectations and obligations. [34] can adequately be catered for within a strong regulatory environment. In light of the standpoints briefly discussed, an outlook of the current operations and structure of the Nigerian capital market reveals, that it is bedevilled with a myriad of problems that undermines its efficiency and by extension, poses a threat towards a successful adoption of blockchain technology[35].

In line with the foregoing, the assumption is that the benefit of the technology is likely to materialize in a conducive and vibrant regulatory environment. Such environment would increase the confidence of investors and drive its adoption easily by market operators and consumers. However, the current state of

[32] World Economic Forum and Boston Consulting Group (2021) *Digital Assets, Distributed Ledger Technology and the Future of Capital Markets*, WEF Insight Report. See page 27 for further analysis on the degree of decentralization.
[33] the UK 'Financial Conduct Authority (2018) *Regulatory Sandbox accepted firms*, Available at: https://www.fca.org.uk/news/press-releases/fca-reveals-fourth-round-successful-firms-its-regulatory-sandbox (accessed 9 April, 2023).
[34] Bech. M. L, Hancock. J, Rice. T and Wadsworth. A (2020) *On the future of securities settlement, Bank* of International Settlement Quarterly Review pp 67-83
[35] Nneka Rosemary, I. (2015) Challenges Faced by Individual Investors in the Nigerian Capital Market**,** *European Journal of Business and Management*, 7(23) pp 36-41

the market regulatory environment does not inspire this confidence. There are a litany of cases showing inertia on the part of the regulators which gives an indication of a lax regulatory environment. There are also cases decided by the court establishing complicity on the part of market infrastructures and operators. Such acts could pose a roadblock towards a successful adoption of this nascent technology in the Nigeria financial market.

As the conversation on the value proposition of the technology to the Nigerian capital market begins to gain traction, particularly as broadly embodied in the Nigerian blockchain policy, it is important to situate the discussion on how robust its regulatory framework is to embrace the technology. Therefore, it is imperative that the right regulatory atmosphere exist to easily make the technology adoptable, given the challenges that it portends. In line with this position, part of the pack of submissions in this work is that the Nigerian financial market should not race towards the adoption of the technology because of the ailing state of its regulatory framework. This submission stems from the position that an adoption of blockchain technology would not cure inherent defects in its regulatory framework. If anything, it would compound it.

It is against this backdrop that this research work seeks to develop the regulatory standards needed to adopt blockchain technology in the Nigerian financial market.

1.4. Statement of problem.

The central challenge that emerges from the background of the study is the potential inadequacy of Nigeria's financial market regulatory framework in managing the risks and disruptive effects associated with blockchain technology integration. A robust regulatory framework is essential not only for maintaining the overall health and efficiency of the capital market but also for facilitating the safe and effective adoption of innovative technologies such as blockchain.

The current state of the Nigerian capital market regulatory framework poses significant concerns in the quest to adopt blockchain technology. However, a successful implementation of blockchain requires a regulatory environment that can adapt to the rapid pace of technological change while ensuring market stability, investor protection, and the mitigation of potential risks. In the context of blockchain adoption, a well-developed regulatory framework would play a pivotal role in establishing clear guidelines, standards, and oversight mechanisms to govern the use of the technology within the capital market. This would enable Nigeria to harness the potential benefits of blockchain while maintaining the integrity of its financial system and safeguarding the interests of market participants.

Therefore, addressing the weaknesses in Nigeria's financial market regulatory framework is critical in facilitating a smooth transition towards blockchain adoption, ultimately contributing to the market's long-term development and growth.

1.5. Research question

The chief research question that this study seeks to answer is ' whether the Nigerian capital market possesses the requisite regulatory standards needed to adopt blockchain technology into its operations based on the quality of regulatory framework'.

1.6. Aim and objectives of the study

Employing a multidisciplinary approach that combines historical, doctrinal, and comparative analysis, the thesis seeks to examine the subsisting state of the regulatory framework of the Nigerian capital market in order to fashion out the requisite legal and regulatory standards needed to adopt blockchain technology within the Nigerian capital market. This thesis therefore seeks to contribute to the evolving discussion on blockchain technology in emerging financial markets and develops recommendations that will assist policy makers in Nigeria in retooling its legal and regulatory framework to enable it to adopt the technology.

1.7. Research methodology

This research work is expository, critical, and comparative in its approach. It principally employs three forms of research methodology to systemically develop and achieve the aims and objectives of the thesis. These are doctrinal methodology, historical analysis, and comparative analysis.

This work cuts across different forms of discipline such as law, finance, economics, and computer engineering. As an interdisciplinary study - one which involves technical areas like distributed ledger technology (DLT) and blockchain technology - it is almost impracticable to divorce the technicalities and intricacies embedded in the technology from the parameters of this legal study, if a rich and robust study is to be conducted. As such, there is a tendency for the study to be complex.[36] The complexity of an interdisciplinary study echoes with the concerns of some authors who have remarked that "Interdisciplinary research is essential for the study of complex phenomena, and so there is a growing need to understand the factors that facilitate collaboration across diverse fields of inquiry".[37] In view of the

[36] The remarks of Huutonimi is quite instructive here in reflecting the complexity of a study that is interdisciplinary. He noted that "Whenever [a] research crosses boundaries between disciplines, the problem arises that each discipline carries specific and sometimes conflicting assumptions about quality. See. Frodeman. R (2010) *The Oxford Handbook of Interdisciplinarity* in Huutoniemi. K, Evaluating Interdisciplinary research 309-320 Oxford: Oxford Press.

[37] Brown. J, Murray. D, Furlong. K, Coco, E and Dablanco (2021) A breeding pool of ideas: *Analyzing interdisciplinary collaborations at the Complex Systems Summer School.* available at: doi: 10.1371/journal.pone.0246260 (accessed 13

forgoing remarks, It is important to state that while this work is careful not to delve into the technicalities and backend operation of the blockchain technology, it takes a surface approach to the subject by appreciating the fundamentals of blockchain technology such as the scope, applicability, features, myth, misconceptions and its application to the capital market.

While acknowledging the complexity inherent in an interdisciplinary study of this nature, it is imperative to state that this work is mainly a legal study and substantial reliance is placed on legal resources which are predominantly derived from case laws, statute, and regulations. A word or two is necessary on the usage of case laws, particularly those cases delivered by Nigerian courts. Case laws constitutes a fundamental part of this work. It is used to establish two points: the first is that it exposes the institutional lapses inherent in the Nigerian market capital regulatory framework. The second is that it serves as a basis for justifying the argument for the adoption of blockchain technology within the Nigerian capital market while questioning the readiness of its regulatory framework to adopt the technology. The case laws are drawn from decisions delivered by the Investment and Securities Tribunal (IST) and other superior court of record such as the Federal High Court (FHC).

An interesting fact, and possibly a golden thread that runs through cases is that the issues before the court are those that border on breach of professional and statutory duties by market operators i.e., malpractices, unlawful sale and conversion of securities, negligence, breach of duty of care and fiduciary duties. In all of those cases, the court in deprecating the conduct of the relevant operators in question, used the opportunity to restate their functions and their relevance in the capital market and their role to investors. The decision of the courts equally exposes the enforcement lapses of the regulatory body- Securities and Exchange Commission (SEC) - in exercising its powers under its enabling law.[38]

1.7.1 Doctrinal methodology

This is a dominant methodology used in research in law.[39] This method is purely theoretical and involves the systematic evaluation of extant laws and doctrines with the purpose of identifying any gaps or

March 2022); See also John Holland's remarks: "If you're going to do interdisciplinary studies and enter someone else's domain, the least you should do is take their questions very seriously. They have spent a long time formulating them" in Waldrop, M. (1993) *Complexity: The Emerging Science at the Edge of Order and Chaos*. 1st ed Simon and Schuster; 1993.

[38] S. 13 Investment and Securities Act

[39] Ibrahim. S, Yusoff. Z and Ayub. Z (2017) Legal Research of Doctrinal and Non-Doctrinal, *International Journal of Trend in Research and Development,* (4) 1 2394-9333 p 493-495

uncertainties.[40] The essence of this is to make propositions for reforms or amendments and justify such propositions with cogent and applicable explanations.[41]This work applies this research methodology by examining the current regulatory framework of the Nigerian capital market. It achieves this by analysing the body of laws governing the market and its array of participants. The purpose is to identify to what extent the market regulatory framework is conducive enough to receive disruptive features and risk that blockchain technology presents to its market infrastructure. This position stems from the argument that a robust regulatory framework is better positioned to embrace changes that the technology poses to the market infrastructure. Therefore, this research method is adopted with the intent to identify the gaps/ drawbacks in the current regulatory framework and make proposals for the requisite legal and regulatory standards needed for the adoption of the technology.

1.7.2 Historical approach

This research methodology encompasses the systematic gathering and unbiased assessment of historical data in order to analyse the potential causes, effects, or trends related to past occurrences. Through this examination, researchers can gain insights to better understand current events and make informed predictions about future occurrences.[42] The purpose of historical approach in a legal study is to help to demystify any legal problem that has an historical inclination. The research method provides a good basis for x-raying how the law has developed over the years with the purpose of determining its relevance to society at large.[43]

This work applies this research methodology by conducting a historical voyage of the institutional, legal and technological development of the Nigerian capital market. This approach is relevant to the thesis because the core of the work rests on establishing to what extent is the Nigerian capital market regulatory framework conducive enough to adopt blockchain technology. For this position to be better appreciated, there is the need to sojourn through the developmental phases of the Nigerian capital market. This approach will help to detect the pitfalls and lapses inherent in the current system and constitute a basis to support the broad argument towards blockchain adoption.

---

[40] Smits. J.M, (2015) What is legal doctrine? On the aims and methods of legal-dogmatic research, *Maastricht European Private Law Institute*, Working paper, No.2015/06, available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2644088 (accessed, 8 March 2022)

[41] Ibid 8

[42] Gay, L. R. (1981). *Educational Research: Competencies for Analysis and Application*. 2nd ed. Columbus, OH:

[43] Rabindra, Kr & Pathak, Rabindra. (2019). *Historical Approach to Legal Research,* Available at: https://www.researchgate.net/publication/336676844_Historical_Approach_to_Legal_Research (Accessed April 4 2022)

1.7.3. Comparative analysis

Comparative analysis involves examining and evaluating the rules and procedures of multiple systems collectively, rather than focusing on a single system in isolation. This approach allows for a more comprehensive understanding of each system's individual strengths, weaknesses, and differences by studying them side-by-side.[44] This methodology of research provides a good basis for a country to learn and improve on their legal systems and jurisprudence based on the practices of another country. This is particularly beneficial for countries that are peer jurisdictions or who have similar systems of law.

This thesis utilises this approach by using the UK capital market regulatory framework as a blueprint for the Nigeria market. The UK financial market serves as a good guide on the theme being discussed. This is because, the UK market has a strong financial market regulatory framework. This is characterised by features such as a strong and effective regulator, sound body of laws, effective court system for adjudication of securities disputes, technological driven market, respect for the rule of law by market players, strong investors protection regime, strong cybersecurity and data privacy rules and systems, among others. Furthermore, it is one of the foremost jurisdictions that has sought to embrace blockchain technology/DLT in facilitating securities transactions and is exploring how it can be fully adopted.

A combination of the forgoing factors presents a veritable basis for the Nigerian market to develop its financial market regulatory framework In line with the standards and quality of the UK. This is because, the hypothesis sought to be proved in this work is that the adoption of blockchain technology can only thrive in a regulatory framework that is sound. As the findings in this work would reveal, the Nigerian financial market regulatory framework is manifestly deficient on several grounds and therefore developing its regulatory framework in line with standards of the UK would position the Nigerian market to enable it to adopt the technology.

The application of this approach is further complemented by examining various comparative indicators to guide its analysis. The work relies on as a guide, and by way of comparative analysis, the assessment methodology devised by the International Organization of Securities Commission (IOSCO) for the regulation of capital markets as a general guide to determine the broad question on the standards of a regulatory framework. The document prescribes certain minimum threshold objectives and principles that capital markets globally should adhere to. By implication, those principles reflect what a robust and sound regulatory framework should portray. The essence for referencing this document is to determine whether the Nigerian capital market regulatory framework reflects the principles contained therein.

[44] Watson A, (1993) *Legal Transplant: A approach to comparative law* 2nd Edition, University of Georgia Press

It is important to state although the United Kingdom and Nigeria are not geographically proximate and their capital markets differ in terms of size, maturity, and regulatory development, the UK's experience with blockchain integration still offers valuable insights for the Nigerian context. Despite the differences between the two markets, the UK's approach to fostering innovation while maintaining robust regulatory oversight serves as a relevant case study for Nigeria as it seeks to adopt blockchain technology in its capital market.

By examining the UK's strategies for balancing the benefits of blockchain technology with the need for strong regulatory safeguards, Nigerian policymakers can draw lessons and adapt these insights to the unique circumstances and challenges of the Nigerian financial market. This would enable Nigeria to leverage the potential of blockchain technology in a manner that is compatible with its regulatory framework and conducive to long-term market development and stability.

1.8. **Research design**

This work is structured into six chapters. The first chapter which is the foundational chapter, commences by setting the direction of the work. It introduces the core issues that unpin this research project such as the importance of the capital market to the Nigerian economy and how blockchain technology drives an efficient market with its disruptive features. Furthermore, it explores some of the key technological developments in the Nigerian capital market. Also, as an introductory chapter, this section utilizes the opportunity to lay out the scope, objective, research methodology , research question and theoretical framework.

Chapter two appraises the concept of blockchain technology and distributed ledger technology. It discusses the historical evolution, features, model, benefits, limitations, and the regulatory approaches to blockchain technology. It forms part of the train of thoughts for the discussion in subsequent parts of the work. Chapter three examines the application blockchain technology in the capital market and how it can disrupt legacy institutions, practices, and processes. It also examines the regulatory approach of the UK in the deployment of blockchain to its capital market . The discussion is a core part of the work and serves as a comparative basis for questioning the quality of the Nigerian regulatory framework and the extent to which it is conducive to adopt this technology.

Chapter four of the work examines the legal and institutional framework of the Nigerian capital market. It reviews the array of laws governing the market, the role and responsibilities of the regulator and the market operators/intermediaries in the system. This section is critical to discussing in detail, the gaps and issues

that exists in its regulatory framework and the issues that may constitute potential drawbacks towards the adoption of blockchain technology in the succeeding part of this work.

Chapter five examines the regulatory standards required for the adoption of blockchain present in the Nigerian markets, viz-a-viz the quality of its regulatory framework. This chapter seeks to justify the hypothesis that a sound and robust regulatory framework as a prerequisite for the adoption of blockchain technology in the financial market. The arguments developed therein provides the basis for sketching out the standards for the adoption of the blockchain for the Nigerian financial market.

Finally, chapter six provides for recommendations to the issues discussed in the work. It also summarises the limitations of study and indicates areas for further research.

1.9. Contribution to knowledge

This research work contributes to the body of knowledge in three ways. It:

i. Re-examines the state and quality of the Nigerian financial market regulatory framework in the light of emerging technologies like blockchain technology.
ii. Develops the requisite regulatory standards needed for the Nigerian market to adopt blockchain technology into its financial market.
iii. Contributes to the evolving discussion of blockchain technology in emerging financial markets in Africa and develops recommendations that will assist regulators and policy makers in the Nigerian financial market in retooling its legal and regulatory architecture to enable it adopt the technology.

1.10 Technological developments over time

The Nigerian financial market has undergone some notable technological development and transformation from its inception till date. Since the principal discussion of this works rests on investigating the regulatory standards needed to adopt blockchain technology, it is apropos that this work tracks some of the notable technological developments that has been introduced into its market to make its operations more efficient.

Some of the notable technological strides documented in the literatures in Patricia (2015)[45] and SEC (2005) are summarized as follows:

[45] Patricia, B.A (2015) Capital Market and Economic Growth of Nigeria, *Research Journal of Finance and Accounting* Vol.6 (9) pp 82 -93

i. **Automated Trading System (ATS)**: The Automated Trading System (ATS), introduced in the Nigerian capital market on April 27, 1999, marked a significant shift from the traditional call-over method of conducting trades. ATS, a network-based system for securities trading, is regarded as one of the most impactful innovations in Nigeria's securities market. Prior to the implementation of ATS, the settlement cycle for transactions took up to 21 days. ATS has streamlined the trading process and improved efficiency in the Nigerian capital market.

ii. **Central Securities Clearing System (CSCS):** The Central Securities Clearing System (CSCS) commenced operations in 1999 with the primary objective of achieving a T-3 settlement cycle. Working in conjunction with the Automated Trading System (ATS), the CSCS functions as an interface that automatically receives and processes trade-related data to facilitate efficient settlement. This integration has significantly improved the speed and accuracy of trade settlements in the market.

iii. **On-line Trading:** To enhance accessibility and connectivity, the Nigerian Exchange has successfully connected several of its high-transaction branches to the central server located at the Customs House in Lagos, Abuja, Kano, Yola, and Port Harcourt. This integration allows stockbrokers in these regions to access the main trading platform directly, eliminating the need for them to be physically present on the Lagos trading floor to conduct their trades. This has greatly improved efficiency and convenience for market participants.

iv. **Remote Trading:** In 2004, the exchange implemented remote trading as a reform initiative to enhance accessibility for market transactions and improve operational efficiency. Remote trading empowers brokers to conduct trades directly from their offices, effectively removing the need for physical trading on the exchange floor. This convenience is made possible by securely connecting the stockbrokers' computers to the exchange's main trading platform, ensuring seamless and efficient transactions.

v. **The Trade Alert:** This system was introduced in 2005 as part of the package of reforms to strengthen investors protection by ensuring transparency in the capital market. Under this method, investors get instant notification of trade transactions on their phone device from the CSCS. It is called the X-alert. This helps to track transactions conducted on the investors account at the CSCS and prevent any unauthorised trade before it occurs.

vi. **The e-Bonus/Dividend:** This innovation is geared towards increasing transparency and streamlining the payment process of dividends and bonuses to investors. Under this method, dividends and bonuses are

paid instantly and directly to the investors account at the CSCS. It eliminates the process where paper certificates were distributed to investors, which would then have to claimed manually at the bank. This electronic payment method also helps to address the issue of unclaimed dividends in the Nigeria capital market.

E-IPO: The central purpose of the E-IPO was to ensure that companies listed on the floor of the exchange can be electronically captured on the accounts of the CSCS. The way this works is that once an offer and allotment of shares is done by an issuer, the list of successful subscribers are forwarded to the CSCS for retention in its depository. This method removes that arduous task that the registrar goes through by printing and distributing share certificates.

vii. **Digitization mandate for market operators**: The Securities Exchange Commission move to ensure that the market is efficient and that market operators facilitate smooth operational relationship between their customers and regulators prompted it to develop guidelines that will enable market operators who carry out their transactions on internet-based devices. This move was achieved through its guidelines titled 'Minimum Operating Standard for Information Technology for Capital Market Operators'. The guideline is aimed at establishing a minimum threshold that will guarantee the efficiency in the Nigerian capital market in terms of in driving business operations and ensuring the security, confidentiality, integrity and reliability of Information systems[46]

The guidelines encompass all pertinent market operators across every aspect of capital market operations, including security trading, fund management, share registration, and custodial services. These rules necessitate that all capital market operators maintain a reliable and functional website along with an operational electronic mailing system, which can be hosted privately or through a cloud service provider. The domain names for these systems must be owned and registered by the capital market operator. Upon application of these rules, capital market operators (CMOs) have the discretion to select their email providers. However, the use of private email services like Yahoo Mail, Gmail, and Hotmail, among others, will be prohibited for official transactions.[47] This measure aims to bolster security, foster confidence among market users, and mitigate potential instances of fraud.

[46] Securities and Exchange Commission (2022) *Exposure Of Proposed Guidelines On Minimum Operating Standards For Information Technology For Capital Market Operators (CMOS)* Available at: https://sec.gov.ng/wp-content/uploads/2022/04/Exposure-of-Proposed-Guideline-for-MOS-for-IT-final-1.pdf (Accessed 4th August 2022)
[47] Ibid 8

1.11. Conclusion

This chapter has been able to set the perspective of this research work which seeks to interrogate the readiness of the Nigerian capital market to adopt blockchain technology. As a foundational chapter, it sets out the scope of the work by giving a background to the research work, laying out the research question, objectives and framing the methodology to be used for the research. The chapter situates the research within existing works and the theoretical framework supporting the research. This chapter also utilized the opportunity to carry out the technological reforms that the market has gone through to date. This chapter sets the foundation for the succeeding part of this work and opens the floor for discussing a vital component of the work in the next chapter, which explores the concept of blockchain and its application in the capital market.

CHAPTER TWO

BLOCKCHAIN TECHNOLOGY IN FINANCE : CHALLENGES AND OPPORTUNITIES

Blockchain Technology [Distributed ledgers] have the potential to be radically disruptive. Their processing capability is real time, near tamper-proof and increasingly low-cost. They can be applied to a wide range of industries and services, such as financial services, real estate, healthcare and identity management.

- UK Government of the Office of Science[48]

2.1. Introduction

This research aims to investigate the regulatory standards required for the successful adoption of blockchain technology in the Nigerian capital market. Central to this discussion is the need to gain a comprehensive understanding of blockchain technology's core concepts and its significance within the financial industry.

Blockchain technology as a distributed database architecture is a malleable technology. This elastic feature allows it to be applied in different sectors and industries with the overarching objective of driving efficiency. One area where its application has gained momentum over the years is the financial sector. This chapter explores the concept of the technology by examining its key tenets and its broad application in the financial sector. An appraisal of the tenets of the technology is relevant to the overall scope of this work. This is because this research work principally seeks to interrogate the prospects of adopting blockchain technology in the Nigeria capital market by exploring its legal and regulatory framework.

As a starting point, this section conducts an historical evolution of blockchain technology and its connection with bitcoin. It also examines the distinctive features of the technology and various consensus models. As an addendum to the overall scope of the chapter, the work uses the opportunity to briefly appraise a proximate topic which is weaved into the wider discussion of this work. This is the perception of blockchain technology being used as an underlying technology to democratise financial operations after the imbroglio of the 2008 financial crisis. The discussion evocates a lingering issue of trust in the financial system and how

[48] UK Government for Science, (2016) *Distributed Ledger Technology Beyond Blockchain,* Available at <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/492972/gs-16-1-distributed-ledger-technology.pdf> (Accessed 23 May, 2022)

blockchain technology can be used a panacea to revive that key element into financial operations between financial service providers and their consumers.

This work also conducts an exposition on the types of blockchain and argues that permissioned blockchain technology is more suitable than permissionless blockchain for financial environments that are enclosed such as the capital markets. This is because of its strict rules of operation and the ability of the governing authority/operators to prevent authorised access to the network.

Part of the argument in this chapter also is that while blockchain technology presents its self as a technology that can revolutionise financial operations and drive efficiency, it is not infallible. Just like any other technology, it has its own limitations. Part of the catalogue of submissions in this chapter, and which runs across this work is that intending users must weigh the pros and cons of adoption before venturing to replace or interoperate with their legacy technology. The discussion of the limitations, allowed the work to highlight and clarify some myths that have shrouded the technology by its enthusiast. This chapter concludes by exploring the diverse regulatory approaches to blockchain technology. This discussion is integral to this work because it showcases how different regulators across the globe perceive innovative technologies and its application in the financial sector.

2.2. Historical Background and Evolution of Blockchain Technology

It is customary at the commencement of any research, that to fully appreciate a concept, it is considered good practice to venture into appraisal by laying its historical or evolutionary background. This is so, particularly when the concept or subject matter has evolved overtime and created new frontiers for discussion. This proposition draws inspiration from the research methodology known as historical research.[49] This approach to research involves the "systematic collection and objective evaluation of data related to past occurrences in order to test hypotheses concerning causes, effects, or trends of those events which may help to explain present events and anticipate future events."[50] This research adopts this practice with an evolutionary assertion that the concept of blockchain technology emanates from a broader subset called Distributed Ledger Technology (DLT).[51]

[49] See: Gay, L. R. (1981). *Educational Research: Competencies for Analysis and Application*. 2nd ed. Columbus, OH: Charles E. Merrill

[50] Ibid, p. 432. See also: Powell. R, (2004) *Basic Research Methods for Librarian,* Greenwich: Ablex Publishing Corporation at p. 48.

[51] See: The European Central Bank, (2021) *The Use of DLT in Post-trade Processes.* Advisory Groups on Market Infrastructure for Securities and Collateral and for Payments (Discussing the potential impact of the use of DLT in a post-trade environment); Maull. R, Godsiff. P, Mulligan. C, Brown. and Kewell (2017) Distributed Ledger Technology: Applications and Implications *Briefings in Entrepreneurial Finance* 26 (5) pp 481- 489 (Discussing the disruptive force of DLT and how it can contribute in solving problems in the future); Bank for International Settlements (2017)

Distributed ledger technology just like blockchain technology have become a popular word in the catalogue of business and finance literatures[52]. However, as common as these concepts are, it is plagued with a multitude of definitions, which sometimes is used interchangeably albeit, erroneously. This error stems from the lack of a rigorously acceptable defined set of terminologies or taxonomy.[53] The resulting effect has complicated the landscape leading to overhype and misconceptions of its use, applications, and prospects of what the technology can achieve.[54]

While the foregoing observation may not be far from the truth, the misconception as to its true classification or definition continues to plague the literatures. As observed in the literatures, there appears to be a broad and narrow approach to the definition of DLT. As an example, a 2017 World Bank report on DLT and blockchain technology categorized DLT systems as a particular implementation within the broader class of shared ledgers. The report provided a straightforward definition for shared ledgers as a collective data record maintained and accessible by multiple parties.[55] The European Central Bank aligns with this perspective, offering a similar definition for distributed ledger technology (DLT). According to the ECB, DLT enables users to store and retrieve information about assets and holders in a shared database of transactions or account balances. This information is distributed among users, allowing them to settle transfers, such as securities or cash, without relying on a trusted central validation system.[56]

Conversely, other literatures have approached the definition of DLT by itemizing the key characteristics that can be identified from the functionalities of the technology rather than constricting it to a definition which may either be too narrow or broadTasca and Tescoe observed that a DLT system can be described as a community consensus-driven distributed ledger where data storage is not block-based. Instead, the

---

Distributed ledger technology in payment, clearing and settlement An analytical framework. Available at, https://www.bis.org/cpmi/publ/d157.pdf (Accessed 10 July 2022)

[52] Martino, P (2021) *Blockchain and Banking: How Technological Innovations are Shaping the banking Industry* Palgrave: Switzerland (Discussing the technological changes in the banking sector and the impact of blockchain technology); Gensler, G., Casey, M., Johnson, S., Narula, N., Crane, J. (2018). The Impact of Blockchain Technology on Finance: A Catalyst for Change. Switzerland: Centre for Economic Policy Research.

[53] Rauchs. M, Glidden. A, Gordon. B, Pieters. G, Recanatini. M, Rostand. F, Vagneur.K and Zhang.B (2018) , Distributed Ledger Technology Systems: A Conceptual Framework, Cambridge Centre for Alternative Finance

[54] Carson. B, Romanelli. G, Walsh. P and Askhat Zhumaev (2018*) Blockchain beyond the hype: What is the strategic business value*. Digital Mckinsey, Available at https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/blockchain-beyond-the-hype-what-is-the-strategic-business-value#/ (accessed 10 July, 2022)

[55] World Bank Group (2017) Distributed Ledger Technology (DLT) and Blockchain. FinTech Note No. 1. Available at http://documents.worldbank.org/curated/en/177911513714062215/pdf/122140-WPPUBLIC-Distributed-Ledger-Technology-and-Blockchain-Fintech-Notes.pdf [Accessed: 10 August 2021].

[56] Pinna, A. & Ruttenberg, W. (2016) Distributed Ledger Technologies in Securities Post-Trading Revolution or Evolution? *ECB Occasional Paper No. 172*. Available at: https://www.ecb.europa.eu/pub/pdf/scpops/ecbop172.en.pdf[accessed 10 August 2021]

system's foundation rests on three core principles: (a) decentralized consensus, ensuring collective agreement without a central authority, (b) transparency, promoting visibility and openness in decision-making and data access, and (c) security and immutability, prioritizing the protection and irreversible nature of stored information.[57] It is worthy of note that the definition offered by Tasca & Tescoe quickly dispenses the notion of DLT being in chain of blocks as that is a concept that blockchain utilizes. This point is critical and worthy of note when appreciating the distinction between these two concepts.

The base point is that DLT and blockchain technology are mutually distinct but interrelated concepts. Some authors have neglected the line of divide in appreciating these concepts by interchangeably using them without any form of differentiation. However, in theoretical terms, the concept of DLT is used as an umbrella term to designate multiparty systems that operates in an environment with no central operator or authority. On a specific note, blockchain technology is said to be a subset of the DLT universe that uses a particular data structure consisting of a chain of hash linked blocks of data.[58]

The highlight of this technology is that it operates on an architectural design that encourages a trust less, distributed, and decentralised network of operators to facilitate the system. A pivotal part of this technology is that it operates on a global public ledger which contains a manifest of sequence of blocks. Each block contains a record of the transactions, as well as the *hash* or digital signature of the previous block created, thus forming the sequence called a *blockchain* for the ledger, since each block in the sequence is chained to the previous one[59]. The appraisal of the mechanism of blockchain operation therefore dispels the confusion as to the whether blockchain technology is one and the same as DLT.

[57] Tasca, P. & Tessone, C. (2018) *Taxonomy of Blockchain Technologies. Principles of Identification and Classification*. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2977811 (accessed 10 August 2021); The Bank of England adopted similar approach by highlighting 3 key features of DLT which differentiates it from traditional data base, namely: (i) Decentralisation (ii) Reliability in a Trustless environments (iii) Cryptographic encryption. See: Bank of England (2017) *The economics of distributed ledger technology for securities settlement.* Staff Working Paper n.670. Available at: https://www.bankofengland.co.uk/-/media/boe/files/working-paper/2017/the-economics-of-distributed-ledger-technology-for-securities-settlement.pdf?la=en&hash=17895E1C1FEC86D37E12E4BE63BA9D9741577FE5 (accessed 10 August 2021).

[58] Benciˇ c, F.M and Zarko, I.P (2018) *Distributed Ledger Technology: Blockchain Compared to Directed Acyclic Graph* available at https://arxiv.org/pdf/1804.10013.pdf (accessed 25 September 2021).

[59] Atzori, M. (2017). Blockchain Technology and Decentralized Governance: is the State Still Necessary? *Journal of Governance and Regulation*, 6(1) p.45-62.

It is worthy of mention that there are other subsets of data structures that fall under DLT such as, the Directed Acrylic Graphs (DAG)[60] Hashgraph, Tempo and Holochain[61]

2.2.1 The Paxos Protocol and the Consensus Theory

Literatures on the genealogy of blockchain are quick to associate the emergence of blockchain technology to the launch of the Bitcoin network[62]. While this position is probably due to the popularity that bitcoin has gained overtime and how it arguably constituted a breakthrough in fault-tolerant distributed computing, after decades of research in this field[63], it is apropos to state that the emergence of blockchain technology/ draws historical inspirations from the writings of Leslie Lamport[64] who developed the Paxos Protocol in his notorious article titled "The Part-time Parliament."[65] His paper which suffered significant delay before the Association for Computing Machinery (ACM) before gaining approval for publication, describes a consensus model for reaching agreement on a result in a network of computers where the computers or network itself may be unreliable. In his paper which was published in 1998, Dr Leslie Lamport adopts a fictional and metaphorical methodology of the ancient civilisation of Paxos to exemplify his algorithm.

Lamport uses the ancient parliament as a metaphor for consensus and decision-making among random technical units within a system. In this metaphor, part-time legislators are not always present in the chambers when decrees need to be passed. Lamport details an algorithm for achieving consensus, making decisions, and recording transactions between entities, emphasizing the need for trust among the involved entities and consistency in maintaining records. In the algorithm, each legislator keeps a ledger to document the sequentially numbered decrees, ensuring a well-recorded decision-making process.[66]

---

[60] DAG in contradistinction to blocks as described under the blockchain concept stores transactions in nodes, where each node holds a single transaction. For further discussion on the concept of DAG and its difference from blockchain technology see: Antal, C., Cioara,T, Anghel, I.; Antal, M. and Salomie, I. (2021) Distributed Ledger Technology Review and Decentralized Applications Development Guidelines. *Future Internet 13*(62). Available at https://www.mdpi.com/1999-5903/13/3/62 (accessed 25 September, 2021;

[61] Green, T (2019*) Different type of DLT and how they work*. Available at https://medium.com/@support_61820/different-types-of-dlts-and-how-they-work-cfd4eb218431 (Accessed 25 September, 2021)

[62] See: Raj. K *Foundations of Blockchain: The Pathway to Cryptocurrencies and Decentralized Blockchain Applications.* Packt Publishing, Birmingham. See p.7: Magnunson W (2020) *Blockchain Democracy: Technology, Law and the Rule of the Crowd*, Cambridge University Press: Cambridge See pages 1- 40(Discussing the origins of blockchain technology)

[63] International Finance Corporation, World Bank Group (2019*) Blockchain Opportunities for Private Enterprises in Emerging Markets,* available at https://documents1.worldbank.org/curated/en/260121548673898731/pdf/134063-WP-121278-2nd-edition-IFC-EMCompass-Blockchain-Report-PUBLIC.pdf (accessed 20 July 2021); Atzori, M. (2017). Blockchain Technology and Decentralized Governance: is the State Still Necessary? *Journal of Governance and Regulation, 6(1), 45-62.*

[64] Yaga.D, Mell.P, Roby.N and Scarfone, K (2018) *Overview of Blockchain Technology,* National Institute of Standards and Technology Internal Report 8202

[65] Leslie. L, (1998) "The Part-Time Parliament" *ACM Transactions on Computer System*, vol.16 (2) pp.133-169.

[66] Ibid, 2

A crucial requirement for each technical entity (legislator) using the ledger is that every decree must be recorded in indelible ink, ensuring the permanence and immutability of the recorded information. The primary goal of this protocol is to maintain consistency across all distributed ledgers, ensuring no contradictory information exists between them. The comprehensive protocol encompasses rules for initiating decision-making procedures, conducting ballots, establishing quorums, and attaining consensus on decrees. It also includes guidelines for recording passed decrees in the respective ledgers.
Legislators are mandated to carry their ledgers at all times, providing them with a comprehensive record of the ballots they participated in, as well as the time and sequence of passed decrees and participating legislators. Messengers play a vital role in distributing messages among legislators during ballots, facilitating the decision-making process.[67]

The "Paxos protocol" possesses the necessary attributes for a fault-tolerant and distributed system operating under a shared protocol. In this system, consensus-based decisions on transactions can be made and securely recorded in distributed ledgers. Collectively, these ledgers provide an up-to-date and comprehensive view of all decisions made, accessible to each component at any given time.[68]

From the forgoing exposition, it is quite clear that the core features of blockchain and by extension, the principles that DLT coincides with the theory painted by Dr Lamport in 1998.[69] This position draws strength from recent literatures that have sought to evaluate the value that the paxos algorithm presents in reaching a consensus in the context of blockchain and how the paxos protocol reflect the qualities of the blockchain.[70] In a lucid metaphor, Heck compares blockchain technology to the Paxos parliament by drawing similarities between the two. The chamber represents the network, messengers symbolize network connections, messages equate to network packages, and the sturdy ledger signifies the database. Indelible ink corresponds to the immutability of the database data, while the hourglass relates to computer time or time-stamps. Notes on the back of the ledger signify stable storage, and notes on pieces of paper

[67] *Ibid* 2.
[68] Ibid.
[69] Schneider, F. Implementing Fault-Tolerant Services Using the State Machine Approach: A Tutorial [J]. ACM Computing Surveys, 1990, 22(4): 299-319
[70] Herk, F (2018) *Paxos Blockchain: A Private Blockchain Stimulation based on the Paxos protocol*, Available at https://www.hogeschoolrotterdam.nl/globalassets/documenten/onderzoek/projecten/kc-dhs/verslag-technische-haalbaarheid.pdf (Accessed 26 September, 2021) See also Charapko, A, Ailijiang. and M. Demirbas,. M (2018)Bridging Paxos and Blockchain Consensus, *IEEE International Conference on Internet of Things (iThings) and IEEE Green Computing and Communications (GreenCom) and IEEE Cyber, Physical and Social Computing (CPSCom) and IEEE Smart Data (SmartData)*, pp. 1545-1552, (Seeks to draw parallels between blockchain technology consensus and a classical consensus protocol, Paxos)

represent temporary, unstable storage. An absent priest equates to an offline node, and an absent messenger signifies package loss within the network.[71]

2.3 The features of Blockchain Technology

There are a number of key features that can be extracted from the array of definitions offered by the literatures on blockchain technology. They are its immutability, decentralization, enhanced security, distributed ledger, consensus, transparency and faster settlements.[72] These features will be examined in detail below. Before venturing into the analysis of the features, it is important to state the highlighted features are what distinguishes it from centralised ledger.

i. Immutability

The immutability of the records on the blockchain ranks as one of the core features of the technology. This speaks indirectly to the credibility and trustworthiness of the technology.[73] The implication of such features is that transactions recorded on the blockchain ledger cannot be easily altered.[74] The immutability feature is secured through cryptographic means. The immutability feature enable transactions to be easily tracked on the chain thus creating an audit trail.[75] The immutability feature is strengthened because blocks of transactions are chained together. Therefore, the older the transactions, the more difficult it is to fraudulently tamper with it. To fraudulently modify a block in the chain, the malicious actor would have to replace that block with a new block to recreate all of the previous blocks in the chain.

When one considers the operations of a centralised data, there is the argument that because the ledger is controlled by a single entity, such entity can carry out malicious acts by altering the records of transaction without the concerned parties having knowledge of such. This would be difficult in distributed data ledger where alteration of the transactions stored on the blockchain is difficult without the knowledge of the nodes in the blockchain.

As laudable as this feature is, there are arguments that the feature of immutability is only applicable and achievable under a public blockchain where consensus mechanism is used to verify transactions. Immutability under a permissioned blockchain is a myth. This is because the centralised authority who

[71] Ibid. 9

[72] Mohamed. A.A et'al (2022) Characteristics of Blockchain and Smart Services, for Smart Governments: A systematic review of the literature, *International Journal of Information Systems and Project Management,* 10(3) p. 30 - 55

[73] Ibid. 36

[74] Bank for International Settlements (2023) *The Crypto ecosystem: Key elements and risks,* Available at: *https://www.bis.org/publ/othp72.pdf* (accessed 2 September, 2023) see p. 13

[75] The World Bank Group (2017) Distributed Ledger Technology (DLT) and Blockchain, Fintech Note 1. See page 15.

governs and gives access to nodes to the network can alter or modify a block. The governing authority can act maliciously and tamper with the records to its advantage.

II. Distributed Nature

Another core attribute of the blockchain technology is its distributed data base or ledger. The ledger is maintained by all the nodes in the network as opposed to a centralised leger which is maintained by an intermediary. There is no central authority that is charge of holding or updating the ledger. The distributed nature of the ledger obviates the circumstance of being subject to single point of entry attack because all the participants have record of the transactions.[76] This therefore reduces the risk of corrupting the ledger. Because, for attackers to hamper the ledger, they would need to gain substantial control of the servers of the network. This can be time consuming and resource intensive. Furthermore, the elimination of a central party enables actions to be processed faster, increases speed, and enhances efficiencies. It eliminates any reconciliatory processes that exist on traditional centralised ledgers. [77]

III. Consensus agreement

The consensus mechanism is a key component of the technology. Under the blockchain, it is difficult for any block to be added without requiring the approval of the nodes in the network. This is because of the distributed nature of the ledger The rules that require the agreement of nodes to validate transaction on the network is known as consensus mechanism. The consensus mechanism can take different forms, depending on the blockchain and its purpose i.e., proof of work, proof of stake, proof of identity etc. The consensus mechanism is crucial because it ensures that all the nodes agree to the same version of the ledger before it can be validated. It is a mechanism that ensures that transactions conducted on the chain are legitimate. The mechanism is also used to resolves issues of competing entries on the chain.[78]

IV. Transparency

This a core attribute of technology. In public blockchain, transactions are open to everyone to see, although in certain use cases like cryptocurrencies, the identity of the nodes are not known but the records are made public and transparent so that anyone can see the transactions. [79] Part of the transparency elements of this blockchain technology is auditability. To ensure this, all transactions that occur on the ledger is validated

[76] Ibid p.5
[77] Ibid p.5
[78] Ibid p. 6
[79] Ibid. 15

by a digital timestamp. This makes it easy to track the history of transactions and difficult to manipulate records.

2.4 Types of Blockchain Technology

Blockchain can be categorised into two forms. These are permissioned and permissionless blockchain. The classification is primarily based on their accessibility, governance, and control features. The differences in the types of blockchain identified hinges on a broad range of factors such as who can alter the chain, add nodes to the network or publish new blocks.[80] It should be noted that the literatures have classified permissioned blockchain to represent private blockchain while permissionless blockchain to represent to public blockchain. These terms although interchangeably used are one and the same and may represented as such in parts of this work.[81] It should further be noted that some literatures have referred to another type of blockchain. This is known as consortium blockchain. It is said to be a hybrid of the public and private blockchain.

2.4.1. Permissionless (Public) Blockchain.

This type of blockchain is popular for the issuance of cryptocurrencies such as Bitcoin and other digital currencies like Ethereum. [82] Their ledger are open source and permit anyone to publish block without requiring the permission of any authority. Since anyone has the latitude to publish blocks in the network, this by implication mean that anyone can read and the transactions on the blockchain. While this may be construed as an advantage, the lack of or minimal participation criteria or can be disadvantageous because it gives room for malicious user to participate and possibly subvert the system when they have sufficient resources. Such issue can manifest in consensus models such as proof of work and proof of stake. Although, it should be noted that one of the ways to limit this occurrence is rewarding non-malicious users with of blocks that conform with the required protocols worth in its native cryptocurrency.[83] It is touted to work seamlessly because its network relies on trustless nodes and the immutability of the nature of its records.[84]

2.4.2. Permissioned (Private) Blockchain.

In this type of blockchain, access is controlled, and governance is usually placed in some authority (This could either be centralised or decentralised). Users must be granted permission and authority to publish

[80] OECD, *Blockchain Primer*, Available at https://www.oecd.org/finance/OECD-Blockchain-Primer.pdf Accessed 2nd October 2021
[81] Joannou. D, Kalawsky. R, Martínez-Garcia. M and Fowler. C (2020) *Realizing the Role of Permissioned Blockchains In a systems Engineering Lifecycle. MPDI Systems Concepts Paper*
[82] *Ibid,* p.15
[83] Ibid p.15
[84] *Ibid,* p.15

blocks before they can do so. The controlling authority can give permission or restrict access to nodes to read the blockchain. It is imperative to note that a Permissioned blockchain network can be operated and maintained using open source or closed source software.

Because of the controlled nature of this network, the consensus model requires the identity of its nodes to participate. This element is used to establish trust with each other. Therefore, the consensus mechanism used in this network may differ. It may not require the possession of large number of resources as a criterion to publish block, rather, in some cases, it relies on the authenticity of the node's identity. Therefore, the argument is that it is less computational expensive. It should also be noted participants in the permissioned blockchain network are more likely to behave and respect the rules of operation. Misbehaviours can easily be addressed because participants are known. The disclosure of the node's identity can help to promote transparency. The regimented rules of operations strict requirement for access to the network makes it a good fit for a closed and sensitive environment like the capital market.

2.5. Bitcoin and blockchain technology

Cryptocurrencies are of the most developed applications of blockchain technology.[85] From this premise, the argument can be developed that bitcoin was one of the payment technologies that popularised the tenets of blockchain technology. Its historical evolution can be traced to the pysodium, Satoshi Nakomoto in his in white paper published in November 2008. In that paper, Satoshi described Bitcoin as a peer-to-peer electronic payment network that operates in a decentralized manner without the need for a centralised trusted party to give consent to transactions. The underpinning philosophy behind its creation was to establish a financial system that was outside the oversight of a third party or central administrator: an idea that is antithetical to the orthodox operations of financial system.[86] Although the release had a slow adoption during its initial stages of its creation, it has so far gained some recognizable traction. This has gradually moved from its initial retail adoption to wholesale adoption by companies.[87] The birth of the technology witnessed the creation of other form of cryptocurrencies popularly classed as alternate coins or Altcoins which were arguably developed to improve on the limitations of the bitcoin. [88]

---

[85] The World Bank (2018) Cryptocurrencies and Blockchain, *Europe and Central Asia Economic Update, Office of the Chief Economist* available at https://documents1.worldbank.org/curated/en/293821525702130886/pdf/Cryptocurrencies-and-blockchain.pdf (accessed 2 September 2023)

[86] Satoshi Naakamot, Bitcoin*: A Peer-to-Peer Electronic Cash System*, Bitcoin.Org (Nov. 1, 2008), https://bitcoin.org/bitcoin.pdf [Accessed 14 January, 2020

[87] Nasdaq (2022) *PayPal and Microsoft Adopt Cryptocurrencies: What This Means for the Future*, Available at: https://www.nasdaq.com/articles/paypal-and-microsoft-adopt-cryptocurrencies%3A-what-this-means-for-the-future (accessed 2 September 2023)

[88] The World Bank (2018), p. 37

There is the argument that the technology represents a significant breakthrough in a fault tolerant decentralised and distributed computing. This comes after decades of research in the field. Although the definition has been given in the preceding section of this work, it is important to highlight that there appears to be some confusion on the difference between blockchain technology and bitcoin. The interchange of use by some literatures has helped to further create this confusion[89]. It should therefore be noted that blockchain and bitcoin are not one and the same. They are distinct concepts. At the risk of repetition, this work seeks to present another concise definition. In simple terms, blockchain is a distributed, tamper-resistant digital ledger containing all transactions within a peer-to-peer network. This permanent database is maintained collectively by all nodes in the system. Bitcoin, a virtual currency, enables peer-to-peer transactions, with blockchain serving as the underlying technology facilitating these transactions.

While the growth in value of bitcoin and some other cryptocurrencies has been tremendous, Bitcoin place in the realm of other assets remains purely a speculative asset. The level of volatility that has engulfed the cryptocurrency over the years lends credence to this assertion. The market has witnessed its prices oscillate from circa $8,000 to 25,000 and back within a short period of time. Such type of fluctuation is common. The submission here is that it remains a speculative asset with no intrinsic value. Its value is simply driven by the demand for it. There is no correlation to an asset backing it up. This thus makes it a very risky.

One key argument surrounding the nature of bitcoin is the confusion that engulfs the ability to determine its identity. This confusion extends to other types of cryptocurrencies and what it constitutes in the realm of other existing financial or competing products. The confusion is further compounded by its heterogenous capabilities and its multifaceted functionalities. This oscillates around its classification as money, securities, and commodities.[90] It is important to state this confusion remains alive and the appropriate classification is still unsettled in the literatures and in the financial industry. As Gikay notes, 'the lack of clear legal category for cryptocurrencies could lead to differential treatment of different financial institutions and their respective customers as well as other business entities'[91] The succeeding section of the work seeks to present the different positions on the classification of bitcoin.

---

[89] Williams Magnuson in his book: 'Blockchain Democracy Technology, Law and the Rule of the Crowd' (2020) constantly used the concepts interchangeable thereby giving the reader the impression that they are one and the same.

[90] *See* Bierer. T,(2016) Hashing It Out: The Problems and Solutions Concerning Cryptocurrency used *as Article 9* Collatera*l*, 7 *Journal of Law, Technology and the Internet*. 7 p. 79-94; Hafner. C (2019) Alternative Assets and Cryptocurrencies, *Journal of Risk and Financial Management* 13(1):7.

[91] Gikay A. (2018), Regulating Decentralized Cryptocurrencies under Payment Services Law: Lessons from European Union Law, *Journal of Law, Technology and the Internet* Vol.9 p. 1-35 at page 12.

i. Money

The heterogenous capabilities of bitcoin makes it easy to pigeonhole its functionalities as money. This is a tempting analogy that economist and crypto enthusiast mirror. However, from a regulator's perspective, they are quick to shelve such analogy away. The imminent argument is that only sovereign entities can issue legal tender, thereby reasserting this supreme and centralized powers as monetary policy makers within a defined territory.[92] This is further reflected in the definitions offered by central banks of the money.

The recent categorization of bitcoin as money by some countries like El Salvador and Central African Republic have rendered otiose the argument that bitcoin does not constitutes legal tender. Although this defiant move has witnessed serious criticism from international bodies[93], the classification as money presents an alternative perception and reception of bitcoin by legitimising its use from a sovereign perspective.

The forgoing positions notwithstanding, the contest for bitcoin legitimacy as a legal tender still broadly rests on it satisfying the three (3) qualities of money which are: as a medium of exchange; unit of account and store of value.[94] When it comes to bitcoin satisfying the first criteria of it being a medium of exchange, the argument is that bitcoin has partly satisfied this test. Bitcoin as means of exchange has mainly been used as an alternative medium for payments. Although in its early stages it gained notoriety for settling nefarious transactions in markets like the silk road, it has, in recent times, gained legitimacy. Payment companies like Paypal have included cryptocurrencies as part of their payment methods.[95] However, its limited use and lack of centralised status still makes it a challenge for global adoption as a medium of exchange. Furthermore, there is the argument that because Bitcoin is not supported by a sovereign body, its success and adoption will depend on its acceptability by private agents. A supporting argument towards its acceptability is that given that Bitcoin confirmation times is less and its transaction fees is low, bitcoin will become more attractive, and its adoption may increase.

Another criterion is whether it can be used as a store of value. This apparently is one of the use cases of bitcoin. Many of the users hold the bitcoin with the expectation that it would increase in value before trading it. The danger here is that because bitcoin is not attached or pegged to any assets, it is very volatile

---

[92] European Central Bank (2015) Virtual Currency Schemes- A Further Analysis, available at https://www.ecb.europa.eu/pub/pdf/other/virtualcurrencyschemesen.pdf (accessed 15 September 2023). See precisely pages 23 -25

[93] Financial Times, (2021) *IMF warns against using crypto as national currency ahead of El Salvador* https://www.ft.com/content/c36c45d2-1100-4756-a752-07a217b2bde0 launch (accessed 16th September, 2023)

[94] Ibid,p.23

[95] Nasdaq (2022)

and an unattractive medium for storing wealth when compared to gold or even fiat currencies that has the backing of government. It has thus been severally classified as a speculative asset class in that regard.[96]

The last criterion is using bitcoin as a store of value. The is a challenge for bitcoin because the adoptability has not gained widespread recognition. Merchants who use bitcoin still post their prices in standard fiat currencies. This may be attributed to the volatility of bitcoin.[97]

ii. Securities

A popular juxtaposition of bitcoin and other types of cryptocurrencies is its comparison with securities. The guiding light for determining this is reference to the supreme court decision is SEC v. W.j Howey as far back as 1946 who provided some guidance in resolving this question. In that case, the court noted that a transaction would classify as security where the scheme involves an investment of money in a common enterprise with profits to come solely from the effort of others". Three elements can be distilled from this: (i) an investment of money (ii) in a common enterprise (iii) with the expectation of profit to be derived solely from the efforts of others.

The first criterion implies that the investment must involve a financial risk for the participants. Second, there must be a common enterprise, indicating that the financial success of the investors is interconnected. This can be demonstrated through evidence of pooled resources or reliance on a third party to manage investments. Lastly, there must be an expectation of profit derived from the efforts of others, suggesting that investors rely on a third party to generate returns on their investment.

In line with this test, the US Securities Commission has ruled out bitcoin and some other cryptocurrencies from being a security.[98] However, while this approach is applicable in the US, the argument is that this criteria is not of general application. The classification of virtual currencies as securities is based on how the regulators in each jurisdiction perceive them. The common approach appears to be that where the virtual assets behaves like a security then securities regulators would be inclined to subject it to regulation under its securities laws. The cognizable reason behind such approach would be to protect investors and the safety of the financial system. This is an approach that the Nigerian securities regulator have taken

[96] Apolonia. J and Abreu. M (2022) Is Bitcoin a Good Investment Asset? *European Review of Business Economics* 1(2) p. 129- 163

[97] For further insight on the evaluation of Bitcoin as money, See Ciaian, P., Kancs, d.,and Rajcaniova, M., The digital agenda of virtual currencies – Can Bitcoin become a global currency? available at: https://data.europa.eu/doi/10.2791/96234 (accessed 13 September 2023)

[98]Rivers, M (2023) Bitcoin is not crypt, The SEC confirms, available at: https://www.forbes.com/sites/martinrivers/2023/07/31/bitcoin-is-not-crypto-the-sec-confirms/

where virtual assets are classified as securities unless proven otherwise. This is the presumption that exist. The onus is therefore on the virtual asset provider to prove that the asset is not a security. This would done by making an initial assessment filing.[99]

iii. Commodities

Another juxtaposition of bitcoin/ cryptocurrency is its comparison with commodities. This analogy was notoriously raised by the US Commodity Futures Trading Commission (CFTC) with the intent of bringing it within the prism of regulation and its jurisdictional reach. Firstly, what is a commodity within the context of CFTC and does the definition offered accommodate the features of bitcoin (cryptocurrency)? The Commodity Exchange Act gives a broad a definition of commodity to include:

> 'wheat, cotton, rice, corn, oats, barley, rye, flaxseed, grain, sorghums, mill feeds, butter, eggs ,Solanum tuberosum (Irish potatoes), wool, wool tops, fats and oil (including land, lard, tallow, cottonseed oil, peanut oil, soybean oil, and all other fats and oil) cottonseeds, peanuts, soyabeans, soybean meal, livestock products and frozen concentrated orange juice, and all other goods and articles, except onions… and motion picture box office receipts ..and all services , rights and interest … in which contracts for future delivery are presently or in the future dealt in' [100]

From the definition offered, can bitcoin intelligibly be compared with items like wool, wheat, cottonseeds which are commodities? or can it be classed with items like onions and motion box which the provision expressly excludes? In what context are they relatable? What features makes them identical? These are the endless list of questions that crop up when the analogy is raised.

However, the resounding answer from CFTC position is yes. One of its earliest enforcement actions construing this definition was In the Matter of *Coinflip, Inc., d/b/a Derivabit,* and Francisco Riordan[101]**.** In its settlement order, the CFTC asserted that individuals who had established a platform for buying and selling Bitcoin options were effectively operating a facility for the trading or processing of swaps without being registered as a swap execution facility or designated contract market. By applying the broad definition of a

[99]Securities and Exchange Commission (2020) *Statement On Digital Assets And Their Classification And Treatment*, available at: https://sec.gov.ng/statement-on-digital-assets-and-their-classification-and-treatment/ (accessed 13 September 2023)
[100] Section 1 (a) (9) U.S.C (accessed 13 September 2023)
[101] CFTC Docket No. 15-29.3

commodity as outlined in the Commodity Exchange Act (CEA), the CFTC determined that the scope of this definition included Bitcoin, thus bringing it under the regulatory purview of the CFTC.[102]

The courts have favoured this perspective of classification. Recent cases such as that of the *Commodity Futures Trading Commission v. McDonnell*[103] have held that the CFTC has the power to prosecute the creators of virtual currency for violating the Commodity Exchange Act. Lucking and Arvind (2019) noted that, the enforcement actions initiated by the CFTC have addressed a broad spectrum of activities, including the failure of entities selling cryptocurrency-related products to register appropriately, as well as fraudulent schemes involving individuals posing as federal employees to engage in Bitcoin theft.[104]

It is clear that the analogy offered in the US has gone beyond speculation. There is a host of established cases alluding to its analogy. However, what is certain is that this approach to bitcoin and other concurrencies by the CFTC has a limited scope and is only binding within the US. More so, this definition offered under the Commodities Exchange Act does not reflect attitude of other jurisdictions as some countries have not contemplated classifying bitcoin under the realm of commodities.

On a broader context, there remains an unsettled position as to the true nature or asset class of bitcoin in the literatures.[105] This is partly because of its malleable nature and the attitude of regulators towards it. One author titled his work 'Is it a currency? A commodity: Bitcoin an identity crisis'[106]. This is an apt and realistic reflection of the confusion that bitcoin and many other cryptocurrencies poses. It was posited in that article that given the heterogenous nature of bitcoin, regulators may have the attitude to treat it differently depending on their specific characteristics. Another class of literature give an interesting but

[102] Ibid

[103] 321 F Supp. 3d 366 (EDNY July 16, 2018). See also the following line of cases where the CFTC have successfully defined bitcoin/cryptocurrency as commodities *CFTC v. Dillon Michael Dean and The Entrepreneurs Headquarters Limited*, *Corp. d/b/a Coin Drop Markets*, and *CFTC v. My Big Coin Pay, Inc*.

[104] Luckin. D and Aravind V (2019) *The CFTC's Regulatory Framework,* GLI Fintech (1st Edition) Allen & Overy LLP Available at https://www.allenovery.com/global/-/media/allenovery/2_documents/news_and_insights/publications/2019/8/cryptocurrency_as_a_commodity_the_cftcs_regulator_framework.pdf?la=en-gb&hash=8FB9966803A518C6CDC922AE1C6880AA
(Accessed at 1st March , 2022)

[105] Hafner. C (2020) Alternative Assets and Cryptocurrency, Journal of Risk and Financial Management 13(7) p1 -3.

[106] Wilson. T (2020) https://www.reuters.com/article/us-crypto-currencies-idUSKBN20Q0LK (Accessed 1st March 2022)

reoccurring analogy that bitcoin shares similarities with asset classes like gold and other precious metals.[107] Dyhrberg (2016) suggest that Bitcoin has several similarities with both gold and the dollar[108].

2.6 2008 Financial Crisis, Blockchain Technology and Democratising Financial Operation.

The 2008 global financial crisis continues to remain a landmark reference point in the extensive discussions on the emergence and popularity of distributed ledger technology and blockchain technology in finance. This point is arguably so because the aftermath of the crisis led to the reconstruction of a new financial regulatory architecture that was developed to revisit the social contract that exists between regulators, actors through large scale financial reforms.[109] The after effect of the crisis arguably created a window that ushered in a wave of technological revolutionary innovations that challenged the operations of traditional financial institution. The technologies in finance that emanated after the crisis created products, services and an atmosphere that lowered the barrier of entry for small and medium market participants who hitherto were either excluded because of their nimble capacity to compete or had not gain the credibility yet to swindle the trust of consumers in their favour. This emergence arguably created financial inclusion initiatives that allowed disenfranchised persons across the globe into the financial net.

This point coincides with the thoughts of Arner who posited that the 2008 global financial crisis constituted a catalyst for the growth of FinTech.[110] The crisis unveiled considerable vulnerabilities in the banking system and its prudential framework, resulting in excessive lending and risk-taking that was not backed by sufficient capital and liquidity buffers. This lack of adequate safeguards contributed to the severity of the financial instability experienced during the crisis.[111] This also exposed the inefficiencies in the operation of the capital market.

It is from that era that the word Fintech was arguably coined - the joinder of two words, namely finance and technology. It should be stated that the influence of technology in finance predates this era.

---

[107] Baur, D., Hong, K., Lee, A. (2017) Bitcoin: Medium of Exchange or Speculative Assets?. Available at SSRN: https://ssrn.com/abstract=2561183 or http://dx.doi.org/10.2139/ssrn.2561183 (Accessed 1st March, 2022); Bouri, E., Azzi, G., Dyhrberg A.H. (2017). On the return-volatility relationship in the Bitcoin market around the price crash of 2013. Economics: The Open-Access, OpenAssessment E-Journal 11, 116.

[108] Dyhrberg, A.H., 2016. Bitcoin, gold and the dollar – A GARCH volatility analysis. Finance Research Letters 16, 85-92.

[109] King. M (2022) We Need a New Approach to Bank Regulation, Financial Times, available at https://www.ft.com/content/43b926a6-b1ba-47a6-91f7-9ad5f776f8f8 (accessed September, 2023)

[110] Arner. D, Barberis J and Buckle. R (2015) The Evolution of Fintech: A New Post-Crisis Paradigm, *University of Hongkong Faculty of Law* Research *Paper* No. 2015/047

[111] Bank of International Settlements (2018) *Structural Changes in Banking After the Crisis,* CGFS Papers No 60 https://www.bis.org/publ/cgfs60.pdf (accessed 21 April 2021)

One interesting submission remains that even as the crisis showed the interconnectedness of the global financial system through the shocks that were propagated and the multiple pathways which it permeated through to create what was termed systemic risks,[112] the subsequent explosion of fintech innovations created products and services that were accessible on a cross border basis which, before now, were predominantly only accessible in the jurisdiction where the financial product or service was situated.[113] In this respect, there are lingering arguments that FinTechs which are usually characterized as small, disaggregated, atomic, decentralized and dispersed could pose systemic risk as legacy financial players did during the 2008 crisis. Therefore, the caution is that regulators should be perspicacious enough not to ignore their relevance and fragility from the modality of their operations.[114]

The this period marked a shift in the provision of financial services from the exclusive domain of regulated financial institutions to a more diverse landscape. Tech start-ups, mobile network operators, and other non-bank payment providers emerged, fostering consumer confidence and delivering financial services. [115] A 2015 survey revealed that American trust in technology firms handling their finances not only increased but also surpassed their confidence in traditional banks. For instance, while trust in Citibank was at 37%, trust in Amazon and Google was significantly higher at 71% and 64%, respectively. [116] Alongside the growing mistrust in banks, younger generations began to exhibit distinct consumer patterns compared to older generations. Having grown up with access to personalized, tailored solutions, their preferences diverged from the traditional "mass" approach employed by banks and other financial institutions. [117]

The 2008 global financial crisis further catalysed industrial and technological advancements, creating new avenues for entrants such as FinTechs and regulated institutions outside the traditional financial sector. [118]

---

[112] Magnuson. W (2018) Regulating Fintech *Vanderbilt Law Review* 71(4) pp. 1167-1226 (discussing the regulatory methodology for fintechs in the wake of financial technological innovations viz-a viz the class of regulations that emanated after the 2008 financial crisis). For a demystification of the misconceptions from the literatures as to what constitutes systemic risks. See, precisely p 1187 -1193.

[113] *Ibid*, 1199.

[114] Ibid.

[115] FCA (2022) *The potential competition impacts of Big Tech entry and expansion in retail financial service,* Discussion Paper, Available at: https://www.fca.org.uk/publication/discussion/dp22-5.pdf (accessed 2 September, 2023); FSB (2019) *BigTech in Finance: Market developments and potential financial stability* implications available at: https://www.fsb.org/wp-content/uploads/P091219-1.pdf (accessed 2nd September 2023)

[116]Let's talk Payment (2015), Survey shows Americans trust technology firms more than banks and retailers, available at <http://letstalkpayments.com/survey-shows-americans-trust-technology-firms-more-than-banks-and-retailers/.> (accessed 21 April 2021)

[117] Anyfantaki. S (2016) The Evolution of Financial Technology (FINTECH) Economic Analysis and Research Department, 47 -62 Economic Bulletin No 44 Bank of Greece

[118] Schmukler. S and Cortina. J (2018) The FinTech Revolution: A threat to Global Banking, Research and Policy Brief *World Bank Group* http://documents1.worldbank.org/curated/en/516561523035869085/pdf/125038-REVISED-A-Threat-to-Global-Banking-6-April-2018.pdf (accessed 21 April 2021)

This development was particularly noticeable in payments, investments, and lending. [119] The dynamic interplay between the private sector aiming to expand through financial services and the public sector pursuing market reform for economic growth has further fueled this shift, reshaping the financial services landscape. [120] This notwithstanding, there are studies that establish that the introduction and application of technology in finance over-complicated the institutional structure of global finance and negatively impacted on the stability of financial system.[121]

It is argued that the most significant effects of these new opportunities are witnessed in African emerging market economies, particularly those with a swiftly expanding middle-income populace. Specifically, there is a surge in demand for financial services among individuals who previously lacked access to the banking sector. Mobile device-based technology facilitates access to financial solutions without relying on physical banking infrastructure, addressing this growing demand..[122] This assertion is supported by evidence from markets such as Kenya, [123] Nigeria, and Ghana, where mobile payment technologies and platforms have been instrumental in advancing financial inclusion. By leveraging these innovations, these countries have successfully reduced barriers to financial services and fostered greater economic participation among their citizens.

The incursion of technology In finance after the 2008 GFC can be typified into sectors. From the summary of literatures on the subject, it can be deduced that the influence of technology has significantly impacted the following areas. These are: payments, investment, lending, data security, monetization operations, risk management, customer interface and regulation.[124]

The event showcased the inefficiencies inherent in a centralized financial system and magnified the level of distrust in the operations of traditional financial institutions. The system's downfall can be largely

[119] Palmié, M., Wincent, J., Parida, V., & Caglar, U., (2020). The evolution of the financial technology ecosystem: an introduction and agenda for future research on disruptive innovations in ecosystems. Technological forecasting and social change 151. https://doi.org/ 10.1016/ j.techfore.2019.119779.

[120] Anyfantaki. S (n, 47)

[121] Azarenkova. G, Shkodina. I, Samorodov. B, Babenko. M and Onishchenko. I (2018) The influence of financial technologies on the global financial system stability *Investment Management and Financial Innovations* (15) 2 pp. 229-38

[122] *Ibid,* 48; Andersson-Manjang. S and Naghavi. N (2021) *State of the Industry Report on Mobile Money,* GSMA; International Organization for Migration - ACP Observatory on Migration (2014) *Mobile Money Services: "A Bank in Your Pocket"- Overview and Opportunities*.

[123] i.e., the creation of M-Pesa See Malala , J (2018) Law and Regulation of Mobile Payments Systems: Issues arising 'post 'financial inclusion in Kenya In *C. G. R. N. Publications, African Centre for Technology* Studies pp. 8-23. See broadly the appraisal by Joy Malala of the legal regulatory issues that emanated from the usage of mobile payments technologies in Kenya's post-financial inclusion era.

[124] Arner (2015) classifies the current influence of technology into five area: finance and investment; financial operations and risk management; payments and infrastructure; Data Security and monetization; and customer interface.

attributed to the opacity surrounding the extent of risk that significant banks were amassing. The absence of transparency obfuscated the true magnitude of these risks, ultimately contributing to the systemic failure A prime example was that of the Lehman Brothers[125]. As at the time they filed for bankruptcy, it had incurred a monumental debt of 613bn USD, bond debt of 155bn USD and assets of 639bn USD[126]. A 2009 report by the International Monetary Fund (IMF) estimated that U.S and European banks incurred toxic debt and assets to the tune of about $1 trillion from January 2007 to September 2009.[127]

The underlying argument is that the negative revelations of the global financial crisis influenced the move of consumers towards technologies like blockchain which inherently dispenses with the need of a central intermediary to validate transactions.[128]

2. 7. Limitations to blockchain technology

> *"Blockchain therefore offers the opportunity to simplify the structure, reduce the number of parties and quantity of documentation and automate many of the processes, saving complexity, time and cost**. It is not a panacea though. Issues remain and there are limitations on its privacy, scalability and performance. In addition, it is easy to introduce significant (and potentially irreversible and highly detrimental) vulnerabilities in smart contracts that attempt to implement too much complexity and execution logic. This was seen in the decentralised autonomous organisation (DAO) attack in 2016, that resulted in US$60m of Ether being stolen at the time; and the case of the freezing contract incident in 2017 where US$150m of Ether was stuck in a multi-signature smart contract due to a bug**"[emphasis mine][129]*

The forgoing excerpt clearly encapsulates the fragilities of the technology. Suffice to say that despite the remarkable features of blockchain technology as discussed above, it is important to note that the technology is not infallible. There are innumerable challenges that threatens its viability. The issue is that many of the conversation on the technology have focused on highlighting its positives while downplaying

---

[125] Dill, A. (2019). Bank regulation, risk management, and compliance: Theory, practice, and key problem areas. Informa Law.

[126] BBC. (2009) *BBC World Service, Aftershock Timeline*. available at: http://www. bbc.co.uk/worldservice/business/2009/09/090902 aftershocktimelineoflash.shtml (accessed 13th June 2023)

[127] IMF (2009) *International Monetary Fund Annual Report: Fighting the Crisis*

[128] Gudgeon L et'al , The Decentralised Financial Crisis, *Department of Computing Imperial; College London,* available at https://www.doc.ic.ac.uk/~livshits/papers/pdf/cvs20.pdf (accessed 20th June 2023)

[129] Cohen. R, Smith. P, Aruchandran. V and Sehra. A (2018) Automation and Blochian in securities issuances, *Butterworths Journal of International Banking and Financial Law* p.144-150

its challenges. This is coupled with the undue hype that the technology has received by its enthusiasts. As reckoned by Mulligan et'al, because of the novelty of the technology, businesses and corporations may attempt to the adopt the technology into their business model even without proper grasping the details of the technology or even where it is unnecessary. This race to adopt the technology is further compounded by the fear of missing out. [130] This section highlights some of the limitations and misconceptions of blockchain technology.

2.7.1 Immutability

Many of the literatures on blockchain technology have described blockchain ledgers as being immutable. However, this position is not absolute. One of the reasons why the technology is trusted to settle financial transactions are because it is tamperproof and tamper resistant. This notwithstanding, the technology has its fallibilities and there are situations that the blockchain can be modified. There are certain ways that the immutability feature of the blockchain ledger can be impeached.

Firstly, it should be noted that there are a number of blockchain networks that employ the strategy where the longest chain is used as the mechanism to determine the truth when faced with multiple competing chains[131]. The longest chain is a concept that evidences the amount of work that is put into it. So, in practical terms, when faced with two chains, each with their competing sequence of tail blocks, the one with longest chain is adopted. However, this does not mean that the chain which was not selected and which contains the records of transactions, is lost. What happens is that the chain could either be added to a different block or may be reversed to a pool of pending transactions. The option to choose means that the chain which is not long enough indicates the degree of weak immutability. This possibly explains why most blockchain networks prefer to wait for many blocks to be created before determining when a transaction is valid.

The forgoing explanation is important when analysing the types of blockchain networks. For permissionless network, the reason for requesting longer chains is to ensure that the network is secure against attack. Some authors have further attributed this requirement to the 51 % attack threat. This arises where the attackers possess more than 51 % of the resources more than the rest of the miners or nodes in the blockchain to outpace them in the block creation where a proof of work consensus model is used to verify

[130] Mulligan. C, Scott. J, Warren. S and Rangaswami. JP (2018) *Blockchain Beyond the Hype: A Practical Framework for Business Leaders*, World Economic Forum White Paper; Carson. B, Romanelli. G, Walsh. P and Askhat Zhumaev (2018*) Blockchain beyond the hype: What is the strategic business value*. Digital Mckinsey

[131]Yaga et'al (2018) *Overview of Blockchain Technology.* p.34

transactions[132]. Although, this can be a very costly for the attacker to carry out because of the number of resources needed, the possibility cannot be eliminated. This further speaks to the vulnerability of the technology. With such resources, the attackers can modify the blockchain and tamper with recorded transactions.

This issue is likely to manifest in a permissioned blockchain where access to the network resides with a defined consortium of owner(s). However, in a permissioned network there is less likelihood for competing chains since the owner or governing authority can compel publishing nodes to collaborate fairly with the rules of operation. To ensure this, the governing authority can create legal contract to govern how the nodes participate on the chain. This can come in form of clauses against any circumstances that can trigger a legal action. While the possibility of the 51% is minimal, the blocks in the chain can be modified by the governing authority maliciously. Therefore, an unaccountable or unscrupulous owner can threaten the credibility and ultimately, the immutability of the network. [133]

2.7.2 Cybersecurity

The idea that has been foisted in a number of literatures cited in this chapter is that blockchain network is tamper proof and resilient. While this statement has some elements of truth, blockchain network is not immune from cybersecurity risks. The worry is that because blockchain technology is controllable whether by a consortium or phishing nodes, software developer etc., it creates the possibility for humans to attack the technology. Management of the blockchain network, just like every other technology requires a robust cyber security framework to protect the network from attacks and the participating organization from cybersecurity threat. This is important as hackers are beginning to gain more knowledge of the blockchain network and their vulnerabilities.[134] The conclusion been made here is that blockchain does not eliminate inherent cybersecurity risk. Such risk would need to be addressed thoughtfully and through a proactive risk management strategy.

2.7.3 Blockchain Governance

A common misconception is that blockchain systems are without control or ownership. This position is not entirely true. Blockchain operates based on rules, practices and processes which are directed and controlled by a governing consortium who oversee its integrity and grant access to nodes to participate in

[132] Ibid 34; See also Aponte-Novoa, F et'al (2021) The 51% attack on blockchain: A mining behaviour study, available at https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9567686 (accessed 20th June 2023) (The article makes a number of propositions on how to mitigate the 51% attack on blockchain)
[133] Ibid 34
[134] Ibid 35

the network. It should however be stated the level of governance depends on the type of blockchain (permissioned or permissionless)[135]

For permissioned blockchain, governance and control resides with the owners or consortium. It is the consortium that grants access to users to join the network and determine who can be removed. For permissionless blockchain, while the developers have some degree of control and influence over the network, the users have significant level of control. The users can for instance, refuse the developer's request to update the software. They can do this because they create and publish new blocks.

The point being established here is that blockchain is governed and controlled one way or the other. This might be the software developers, the publishing nodes and or the users.[136]

2.7.4 Cyber and Network-based Attacks

As previously mentioned, blockchain has been constantly touted as tamper proof in that once transaction are recorded, it is difficult to alter them. However, this position only applies to transactions that have been included in the published blockchain. Transactions that are yet to be published within the blockchain are susceptible to several types of attacks. For instance, where a blockchain network has a transaction timestamp reflective in it, there is the possibility of spoofing the time or altering the clock of an order service therefore making time and the communication a window for attack. [137]

In another stance, blockchain network are not immune from malicious actors who are participants in the network. They could use their access to scan the network and exploit its vulnerabilities and possibly launch what is called a zero-day attack. [138]

2.7.5 Malicious Users

Blockchain networks are not immune from malicious users. The issue is that while the network may enforce transaction rules on the users, it is difficult to enforce the users code of conduct. This issue becomes more difficult for permissionless network where users are anonymised and difficult to map the transactions to the user. Such network tries to ensure participants act fairly and are motivated to do so through a rewards system of issuing cryptocurrency. However, the user may elect to act maliciously where such act would provide more reward. The key focus of the malicious user is to gain enough power to control the network.

[135] Ibid
[136] Ibid 35
[137] Ibid 37
[138] A zero day attack or vulnerability is a vulnerability in a system that has been identified but is yet to patched

Once they can acquire that, they could conduct malicious mining action such as ignoring transactions from users, nodes or countries, secretly establishing an altered alternative chain and then submitting that alternative chain when it is longer than the real chain. They may even reuse to transmit block to other nodes which could therefore affect the smooth distribution of information.[139]

While the issue of malicious user is more tenable in a permissionless blockchain network, one cannot write off its possibility in permissioned network. For instance, with the enormous control that administrators of such network have there is the possibility of them to act maliciously for their own self-interest. They may take over block production, exclude certain users from performing transactions, re-route or block network connections.

Attacks by malicious users can dampen the trust of users of the network. Although, control of the network can be gained back through a process known as hard fork, malicious users may have done damage that may be irreparable before such is recovered.

2.7.6 No Trust

One of the common misconceptions of blockchain technology is that because it is a distributed data base, there is no trusted third party or that it is a trust less environment. While there is no central third-party confirming transaction in permissionless network, trust is still an essential ingredient for the effective operation of the network. For permissioned network, trust should be expressed by the administrator (granting users admission and permissions).

On a general level, there is an implied trust that the cryptographic component of the technology being used would be safe and properly configured. There is also the implied trust that the software developers would produce a bug free software. Trust is also implied to the fact that users would not collude in secret to subvert the integrity of the network. Also, there is the trust that nodes are accepting and processing transactions in a fair manner.[140]

2.8. Blockchain Consensus Model

There are a number of consensus model used to verify transactions on the blockchain. Some of the popular models are:

[139] Ibid p.37
[140] Ibid p. 38

2.8.1. Proof of Work Consensus Model

The Proof of Work (PoW) consensus model serves as the foundation for the Bitcoin blockchain network. This model requires users to solve a complex mathematical puzzle to publish the subsequent block, and the provided solution acts as evidence or 'proof' that the node has completed the necessary work. The puzzle's design ensures its difficulty while maintaining ease in verifying the correctness of the solution. As an example, the Bitcoin network regularly adjusts the difficulty level of the puzzle, aiming to maintain a consistent production rate of bitcoins, with a target of at least one block produced every ten minutes..[141]

2.8.2. Proof of Stake Consensus Model

This method of validation is based on the amount of token the holder has in their cryptoassets community. This is the basis upon which they are selected by algorithm to create blocks. The idea behind this model is that the more you own and invested in the system, the more likely such node would want the system to succeed. Hence, block creation is given to validators with significant ownership.[142] One can compare the consensus model to a lottery as holder of the largest tokens have better chances of being selected.

This model improves on the deficiencies of the proof of work model by requiring less energy consumption while maintaining the integrity and security of the network. The requirement of less energy means that there is the less need to issue new coins to incentivise nodes to participate in the network. This model also minimises the risk of 51% attack where nodes may acquire a large percentage of the resources to control the network.

One of the arguments against this model is that it gives the control to only rich participants. This is because, since participation is directly correlated to the amount of stake one has in the system, there is a high probability that only rich entities are likely to be selected to validate transactions.[143] This creates inequality and non-inclusiveness in the consensus model as those with lesser stake have lower chances of being selected. This can lead to participants with less or smaller stake exiting the network if they are not able to get rewards

It is important to note that the proof of work and proof of stake consensus mechanism are commonly used in a public blockchain.

---

[141] Bains, P (2022) Blockchain consensus mechanisms; A primer for supervisors Note/ 2022/003
[142] Yaga et'al (2018) *Overview of Blockchain Technology.* p.22
[143] Ibid p. 23

2.8.3. Round Robin Consensus Model

This consensus model is commonly used in permissioned private blockchain. Under this model, nodes in the network take their turn in creating blocks. Usually, this is done within a time frame. The idea of placing a time limit to validation is so that the absence of one node does not halt the validation process. Where the time elapses, the available nodes in the network can validate the transactions. This is regarded as a more straightforward mechanism that promotes equality. Such model requires less power and does not requires solving difficult mathematical puzzles. [144]

2.8.4. Proof of Authority/Proof of Identity Consensus Model

This model relies on the identity of the nodes as the basis for creating blocks. The level of trust in this model to verify transaction is higher because participation depends on a verifiable link of the node's identity to the real word. Nodes in this model are not anonymised because their identity are known. Their identity must be proven and verified within the blockchain network. The identity and reputation of the nodes is at stake, and they must take caution not to do anything to taint it. Where a node's reputation is low, this can affect its ability to publish a block. Therefore, the nodes would have to ensure that it maintains a good reputation at all times. It is important to state this consensus model is only applicable to permissioned blockchain network where the level of trust required is high.[145]

2.8.5. Proof of Elapsed Time Consensus Model

In this consensus model, each publishing node within the network requests a wait time from a secure time source within their computer system. Upon receiving the request, the hardware generates the wait time and sends it back to the publishing node. The node then enters an idle state for a predetermined duration specified by the generated wait time. Once the idle period ends, the publishing node can create and publish the block to the network. The other nodes are notified of the new block's creation. If any publishing nodes are still idle at this point, they discontinue waiting, and the entire process is restarted. This consensus mechanism ensures coordinated block creation and propagation throughout the network.[146]

2.9. Regulatory Approaches to Blockchain Technology in Financial Markets

The discussion on the application of blockchain technology/ DLT solutions in the financial markets would be inchoate without presenting the diverse positions on regulatory approach to blockchain technology.

[144] Ibid, p.23
[145] Ibid, p. 23
[146] Ibid, p.24

This is imperative because it is the underlying technology that has propelled disruptive innovations in the alternative financial markets.

Blockchain technology traces its origin and application to the private sector.[147] Its application by Satoshi Nakomoto, who notably popularized this concept in its white paper, nursed an original intention to utilize the technology to develop virtual currencies that operated on a peer-to-peer basis.[148] This was to be conducted outside the traditional financial system. As Sataoshi explicitly puts the concept of bitcoin in its introductory statement of its white paper, he noted that it was designed to operate as 'a purely peer-to-peer version of electronic cash [which] would allow online payments to be sent directly from one party to another without going through a financial institution'[149]

However, over the years, the technology has proved to be malleable. It has witnessed significant adoption in different areas, particularly in the public sector. As Magnusson argues, the most radical experiment in blockchain have occurred not in corporation but in government. While his position appears not be supported with a wide range of examples and use cases of the technology, his statement holds some elements of truth when one considers the increasing interest and experiments that has been undertaken by the public sector in the past few years.[150] On this point, it is imperative to note that the application of blockchain technology appears to be more appreciable in areas where recording and reconciliation of data is expensive and requires multi-party system of cooperation for validation.[151] i.e., electoral systems, insurance, financial markets etc.

Interestingly, at the incipience of its usage, many governments were wary and sceptical of its relevance. This is arguably because they had, a probably, shallow and narrow understanding of digital currencies and more importantly the underlying technology that drove this innovation. But recent understanding and application has shown that while bitcoin and other cryptocurrencies operates on the ideals of blockchain, the application of blockchain is beyond bitcoin. Its malleability has witnessed the technology being applied in different arears of the financial sector and beyond. Sectors such as are healthcare, finance, supply chain,

[147] Magnuson (2020) p. 85
[148] Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System,* available at https://bitcoin.org/bitcoin.pdf [Accessed 14 January, 2021)
[149] Ibid.
[150] Deloitte and FICCI (2018), *Blockchain in Public Sector: Transforming government services through exponential technologies*, available at https://www2.deloitte.com/content/dam/Deloitte/in/Documents/public-sector/in-ps-blockchain-noexp.pdf; accessed 27 April, 2023) World Economic Forum, (2020), Exploring Blockchain Technology for Government Transparency: Blockchain-based Public Procurement to Reduce Corruption, *insight Report.* available at https://www3.weforum.org/docs/WEF_Blockchain_Government_Transparency_Report.pdf; (accessed 27 April, 2023)
[151] Ibid. 84

energy, among others are exploring or have benefited from the revolutionary tendencies of this technology[152]

The conception of crypto assets, as is preferably referred to[153], and the stiff opposition that greeted it by many governments may be justified in two breaths. In one breath, there is the submission that some of the tenets of blockchain technology which are anonymity and decentralization permits cryptocurrencies to be used to serve malicious ends such as tax evasion, money laundering, terrorist financing, amongst other vices.[154]In another breath, it is posited that central banks in sovereign entities only want to regulate what they can exercise control over. The reasoning behind this attitude is that since virtual currencies like cryptocurrencies is antithetical to fiat currencies and issued by private entities operating in a distributed fashion, regulating same may prove problematic to central banks who operate in a centralized manner.[155]

A conflation of these submissions probably explains the mixed bag of regulatory response that have emanated so far. From observations of various governments and the iterations in the literatures, these responses can intelligibly be categorized into three forms. First is the 'default approach' as Magnusson puts it. This is alternatively referred to as the do-nothing approach or a wait and see approach. Second is the permissive approach which much attention would place on in this work. Lastly is the restrictive approach. There are other works that try to extend this categorization into four approaches, such as the World Bank - such as (a) wait and see approach (b) test and learn approach (c) innovative facilitators (d) regulatory laws and reforms.[156] This work adopts the typology stated by Magnusson as there is no iron cast rule or body of work that contains a defined taxonomy of regulatory approaches. Also, it is imperative to highlight that the other categories developed by the World Bank can easily fit into these three major regulatory approaches.

[152] See IEEE Innovation, *5 sectors exploring new ways of doing business with advanced blockchain*, available at: https://innovationatwork.ieee.org/5-sectors-exploring-new-ways-of-doing-business-with-advanced-blockchain/ (accessed 27 April 2023)

[153] Crypto asset is regarded as a specific subset of the omnibus term digital asset. On the taxonomy of digital assets, see: Cambridge Centre for Alternative Finance (2020). Allen. J, Rauchs. M, Blandin. A and Bear. K (2020) Legal and Regulatory considerations for digital assets, available at https://www.jbs.cam.ac.uk/wp-content/uploads/2020/10/2020-ccaf-legal-regulatory-considerations-report.pdf (accessed 27 April, 2023)

[154] Angela S.M and Turner A. B (2018) Illicit bitcoin transactions: challenges in getting to the who, what and where, *Journal of Money laundering,* 21(3) p.297 -313; Martin. J (2013) Lost on the *Silk Road*: Online drug distribution and the cryptomarket, *Criminology and Criminal Justice* 14(3) p. 351-367

[155] Nabilou, H and Andre, P (2019), Central banks and regulation of cryptocurrencies, , *University of Luxembourg Law Working paper, No. 2019-014.*

[156] The World Bank (2020) *How Regulators Respond to Fintech: Evaluating the Different Approaches – Sandboxes and Beyond*. Finance Competitiveness & Innovation Global Practice, Fintech Note | No.5

2.9.1 A Do-Nothing Approach

A do-nothing approach is a common placed approach that many governments adopt for technological innovation in their financial markets. It allows government to wait and see as the technology evolves and matures before developing regulation around it. Interestingly, it has been argued that the wait and see approach is a font that masks an important truth in which government has decided not to act, thus the origination of the phrase a do-nothing approach. [157]

Doing nothing in this sense means for some, taking no recognizable action towards technological inventions. It can be likened to sitting on the fence on the subject. Under this approach, it could also mean that there is no clear regulatory stance from the government whether the technology should be restricted or permitted to operate. This method allows government to continue to use and apply its current regulatory structure without any form of alteration.[158]

One may be tempted to argue that this is a lax approach. Counter arguments exist from the World bank's paper that a do-nothing approach does not necessarily connote passive approach to regulation.[159] However, before taking sides with any of these polarized conclusions, it is imperative to note that there are some positives reflective in this regulatory approach that incentivize governments to adopt this method. The thinking backing this approach stems from the school of thought that believe that a do-nothing approach saves government the herculean and costly process involved in passing new laws and regulations to address emerging innovations.

Another positive, which is an offshoot of the foregoing is that the seeming reluctance by regulators or government to develop rules hurriedly is a window opportunity for them to sufficiently gain knowledge and build capacity around innovation. Therefore, as the technology gains more traction and begin to witness adoption by regulated entities, policymakers may then be motivated begin to make systematic and incremental changes to regulation over time.[160] Magnusson puts it eloquently well when appraising this regulatory approach for emerging technologies. In one of his submissions on the topic, he noted that:

> "a final reason for adopting a do-nothing approach when it comes to technological disruption is that it allows governments to gain more information before acting. Whether drafting laws or deciding on budget priorities or fashioning regulatory enforcement goals, it is essential for

[157] Magnuson (2020)
[158] Ibid.
[159] World bank (2020)
[160] Magnuson (2020)

decision makers to have an accurate and comprehensive information about the field concerned. Otherwise, they are deciding on policy without knowing the facts. As an industry matures and develops, it can be expected to grow more stable. Governments will come to know the relevant actors and the ways they interact with one another"

The primary rationale behind this approach appears to be the shared desire to thoroughly evaluate and comprehend the technology and its various applications. There is abundance of evidence that shows that jurisdictions have applied this approach. Amidst the hype surrounding the potentials of blockchain technology in capital markets, it is imperative to note that quite a number of counties have not passed specific laws permitting the use of DLT/ blockchain in their financial markets. Other countries have noted the transformational features of the technology and its supposed impact of the technology in policy and strategy documents, but that appears to be the limit of their recognition of the technology. An example is the Nigerian capital market which has recognized the potentials of the technology in its revised capital market master plan but has not initiated any plan to apply the technology in its financial market. This recognition has now gained traction through the country's development of a national blockchain policy which express the intent of the country to adopt the technology in every aspect of its national life.

For some other jurisdictions, they have permitted the use of technology by private institutions in raising funds through security tokens offering, therefore allowing those operations to be captured under its existing securities laws without creating additional legislation on the matter. While others like Nigeria have taken the additional step of creating specific rules to govern how issuance and custody of STO in their jurisdiction to ensure integrity of its financial system and protect investors participation.[161]

The corollary of the forgoing analysis suggests that while a do-nothing approach may be an opportunity for regulators to buy time, there is the argument that such approach has a limited life span, therefore it should be carefully used.[162] Concerns trailing this position stems from the argument that technology usually evolves at a fast pace, and where government does nothing or takes too much time in studying it, it will outpace the law. A spill off concern of this is that where the technology is not regulated on time, or where it is ignored for whatever reasons, its unregulated operation may pose risk to the financial market with the possibility of a causing financial instability. Given the potential impact on the financial market, it is advisable to adopt an active learning approach during the early stages of the technology's development. This strategy

[161] See chapter five for an analysis of Nigeria's position.
[162] Magnuson (2020)

would help ensure that any potential adverse effects on the financial market are minimized while capitalizing on the technology's potential benefits.[163]

In concluding the discussion of this point, the case is put forward that market operators and regulators are not oblivious the potentials of this technology. However, onboarding the technology is not a straitjacket approach. Speculatively speaking, this could be as a result of a number of reasons such as the potential implication of disrupting the chain of market transaction cycle and overhaul the legacy infrastructure thus rendering certain, if not all, market intermediaries redundant. Also, the cost associated with such transition could constitute a possible cause why regulators, particularly in emerging market in Africa have not taken active step in developing a framework or mapping out a strategy for its adoption. In Ghana for instance, its 9 years capital master plan (2020-2029) recognised the potentials of blockchain in streamlining market process to make transactions faster, easier and less costly.[164] It even further indicated the clearing and settlement ambit of the market cycle as an area that the technology would most effectively influence.[165]. While this is good in terms of recognition, no active step has been taken to utilize the technology neither is a time frame allocated to such intent. Beyond the cost of adoption, one may be tempted to make the case that the reason for such lacuna in that document is possibly because it intends to wait and observe, to see how the technology would develop in other markets.

In Kenya, parliament has made proposal to amend its securities law to empower the Kenya Capital market Authority to regulate digital currencies issuance and of license. The proposal also sought to recognizes digital assets as securities just like Nigeria had done under it laws. As laudable as this is, one might construe this as a first step in the process. However, there appears to be no concrete plan for the adoption of DLT/blockchain into its financial market other than the recognition of its potential.[166]

This foregoing represents the reality of most emerging markets in Africa. It is hoped that more markets develop their stance from mere recognition of the potential to taking concrete regulatory measures towards the application of blockchain.

---

[163] Ibid, (2020) Magnuson

[164] Ghana Securities and Exchange Commission () *Ghana Capital Master Plan* available at *https://sec.gov.gh/wp-content/uploads/Press-Release/SEC_CMMP.pdf* (accessed 27 April, 2023) see page 58.

[165] Ibid. 58

[166] See: Kenya Capital Market Authority (2017) *Stakeholder's consultative paper on policy framework for implementation of a regulatory sandbox to support financial technology (Fintech) innovation in the capital markets in Kenya.* available at https://cma.or.ke/index.php/cma-study-on-low-uptake-of-capital-markets-products?download=100:stakeholders-consultative-paper-on-policy-framework-for-implementation-of-regulatory-sandbox-to-support-financial-technology-fintech-innovation-in-the-capital-markets-in-kenya (accessed 27 April, 2023)

2.9.2. Restrictive Approach

> "[Of course] bans and restrictions are difficult to administer when the technology at issue is as decentralized as blockchain is. It is hard to have an effective ban on a technology when there is no single administrator or company that runs it."[167]
>
> Magnuson, 2020

Diametrically opposed to a permissive approach or a do-nothing approach is the restrictive approach. As the word suggest, the approach has a precautionary inclination. It is a regulatory approach that is employed by government when regulators do not have good knowledge of the potential harms that the technology poses. The natural and probably the easiest thing to do is to restrict its application until they are able to assess the harm.

Blockchain as a technology presents 'unconventional' features such as the decentralization and anonymity: a concept that is keenly debated to be antithetical to traditional practice of public administration from a centralized perspective. The restrictive approach therefore promotes the idea that government and regulatory bodies should be tightening its regulation rather than loosening its rules to regulate it. The reasoning behind such stance is that blockchain technology raises a number of issues which existing regulatory framework have not largely addressed.[168] This resonates with the stance of Magnuson who had noted that blockchain has an uneasy relationship with law because of its novelty and innovation.[169]One may be inclined to agree with that position when viewed from the perspective of governance and the role of the law. This is because many of our legacy systems and process are created with a centralized mechanism.

In order to minimize or even possibly eliminate these problems, regulators take an easier approach to adopt more restrictive rules for the blockchain industry. From a practical perspective that appeared to be the stance of many countries at the incipience of its notorious use case - cryptocurrencies. Example of such stance ranged from imposing stronger gatekeeper rules on virtual currency exchanges to banning all uses of the technology.[170] Therefore, when juxtaposed with the extreme regulatory approach to blockchain, the statement cannot be more accurate that 'permissive approach to blockchain technology represents an

---

[167] Magnuson, 2020 p. 187
[168] Magnuson (2020) p. 184
[169] Ibid, Magnuson (2020) p. 170
[170]Thomson Reuters (2022), *Cryptocurrency regulation by country*, Crypto on the rise (3) https://www.thomsonreuters.com/en-us/posts/wp-content/uploads/sites/20/2022/04/Cryptos-Report-Compendium-2022.pdf (accessed 17 April, 2023)

attempt to open the gates wide to blockchain technology, [while] the restrictive one represents an attempt to slam them shut'.[171]

The reality is that, in the face of the spate of emerging technologies that is springing up on a frequent basis and where the risk that such technologies posed are not clearly or fully understood, the most comfortable and probably less costly approach that regulators can take is to restrict the technology. Regulators easily take this approach particularly when the technology presents more harm to the citizens with little or no avenue to redress the harm. [172]

For the purposes of this work, blockchain is sought to be applied in the financial market. However, as malleable as this technology is in terms of wide application in major sectors, proponents of a restrictive approach anchor their stance from the initial application of this technology in the virtual currency space. For instance, governments were worried that the technology had become a tool for perpetuating scams that were difficult to trace and identify the perpetrators. This was the position in Nigeria where the apex financial regulatory body- Central Bank of Nigeria (CBN) -had embraced this technology particularly its application in cryptocurrency with cynicism and caution. The CBN consistently issued policy statements deprecating the use of virtual currencies in Nigeria.[173] It justified its position on the premise that such currencies are not regulated by any existing law, hence investors and dealers were not protected by the law should any risk occur when dealing with them. However, in a recent regulatory statement, the Central bank reversed its earlier stance banning cryptocurrencies and noted that there was a need to regulate it. This approach accords with the trend in many countries across the globe.

Before this regulatory statement by the CBN in December 2023, a similar warning was also issued by the Securities and Exchange Commission (SEC)-the apex regulator of the Nigerian capital market. However, this statement was greeted with oppositions from some quarters of the public who believe that the regulator should look beyond the negatives that virtual currencies portend and extend its lens towards appreciating the technology behind the concept (blockchain) to see how it can be applied in its financial system. However, this opposition yielded positive reaction as the SEC came out with a suite of guidelines recognising and regulating virtual assets and virtual asset providers.

[171] Ibid, p.148
[172] Ibid, 185
[173] Central Bank of Nigeria (2017), *Circular to Banks and other Financial Institutions on Virtual Currency operations in Nigeria.*

So, even where the technology has mixed uses, with some beneficial one and some harmful, governments like Nigeria and other likeminded countries might still be justified in banning it if the government believes its permission to operate will undermine other more important policies. Magnuson lucidly presents this case with an example by stating that:

> "If blockchain technology provides a more secure and less expensive way for individuals to store and send value, government might still be justified in banning it in order to uphold say, currency controls of money laundering filters"[174]

Beyond banning through regulatory statements, countries now go as far as taking punitive measures to prevent the usage through the imposition of penal consequences. For instance, The Central Bank of Bangladesh announced in 2014 that transactions by anyone using bitcoin or any cryptocurrency is a punishable offence with an imprisonment of 12 years upon conviction.[175]

As draconian as these positions may be, one must understand that the usage of blockchain technology has developed beyond virtual currencies. As the focal point of this work is, it is being considered by many countries in their financial market because if its ability to make market operations and processes more effective. The question will be that would government be prepared to see beyond the risks that the technology presents and focus on developing a regulatory environment that is designed to understand the risk without necessarily undermining its positive impact in their financial market. This is a question that emerging markets, particularly in Africa, should strongly consider in the quest to transform their markets through this technology.

As at the time of this research, there is no record of any country that appears to be adverse to the idea of the usage of blockchain in their capital markets. While they be no regulatory position on that point by some regulators, there is certainly no clear statement prohibiting or restricting the use of blockchain in their capital markets. This may therefore be construed as a do-nothing approach.

[174] Magnuson at 185. See the UK law on EU disclosure of cryptocurrency transaction. See also the FATF report where it noted that The Financial Action Task Force (FATF) recent recommendations for national authorities on how to effectively regulate Virtual Assets (VA) and Virtual Assets Service Providers (VASP) noted in its findings how criminals are leveraging on the positives of this technology to launder the proceeds of their crime and finance terrorism.

[175] Higgins,S (2023) Bangladesh Central Bank: Cryptocurrency Use is a 'Punishable Offense, available at https://www.coindesk.com/markets/2014/09/16/bangladesh-central-bank-cryptocurrency-use-is-a-punishable-offense/ (accessed 12 December, 2023)

2.9.3. Permissive Approach

At the other end of the regulatory stance is the permissive approach. Permissive approach to regulation from the context of new and emerging technology connotes building rules and mechanisms to understand and regulate the technology. This approach to regulation is not a popular approach when it comes to the adoption of blockchain, particularly when it is viewed from the early use case of the technology. As previously argued in this work, this could probably be attributed to the novelty of the technology and the narrow appraisal of its features beyond its usage for promoting cryptocurrencies.

It is imperative to state that a permissive approach is an umbrella approach that accommodates other typologies created by the literatures on the classification of regulatory approaches to fintech's. For instance, the World Bank categorises this approach such as test and learn and innovative facilitators (this category contains subset like regulatory hub, regulatory sandboxes and regulatory accelerators)[176] Therefore, for lack of a consensus in the literatures on the appropriate classification, this work adopts the umbrella term of permissive approach to accommodate the various forms of approaches that permit the operation or adoption of blockchain technology.

Proponents of this regulatory approach believe in the revolutionary tendencies of this technology and therefore support its adoption. However, concerns trail this approach because of its novelty. Industry proponents argue that the current system of law does not provide the appropriate structure for the adoption of this technology. They argue that the current law was not made with such technology in mind and thus requires amendment if blockchain were to be properly regulated. The proposal following the identification of this issue is that governments should amend or adopt rules that are designed to accommodate such technology.

Interestingly, this approach of the technology has ranged from developing regulatory sandboxes to understand the risk, to amending existing securities laws to accommodate the functionality of DLT in their financial markets to a more extreme case of developing unique laws specially for its operation. Before venturing into appraising different jurisdiction’s approach to this technology and the format of permissiveness they have undertaken, it is important to state that as at the time of this writing, the application of the blockchain technology in the financial market has not been tested in the complete transaction cycle, rather it has been done in phases.

[176] The World Bank (2020) *How Regulators Respond to Fintech: Evaluating the Different Approaches – Sandboxes and Beyond*. Finance Competitiveness & Innovation Global Practice, Fintech Note | No.5

Regulatory sandboxes appear to be one of the popular reflections of a permissive regulatory approach. This approach was eloquently described by way of an analogy by Magnuson. He states:

> 'One version of a permissive approach that has been widely bandied about in blockchain circles is a so-called regulatory sandbox. The term, or course, conjures up images of toddlers at play in a sandbox under the watchful eye of their parents. Rambunctious as they may be, they are largely immune from causing serious injury, either to themselves or to others. The sand protects them from falls, and their parents can step in if things get really bad. Regulatory sandboxes are based on similar idea: if we establish a framework in which blockchain companies can play around with new ideas or products in a controlled environment and under the watchful gaze of regulators, we can encourage innovation while preventing harm.'[177]

The foregoing beautifully sums up the concept of regulatory sandboxes and reflects the approach that some regulators are taking to enable them to allow innovators to test their technologies under safe spaces with existing law but without harming the wider consumer. The idea behind this is to create a platform to understand the risk that the technology poses. It enables regulators to have proper insight of the application of the technology in order to enable them to develop proper regulation around the technology.

This contemporary approach to technology can be construed to be dialogical, interactive and participatory in nature when compared to the historical methods of regulation which was more a command approach and prescriptive in nature. Here, regulators tend to actively engage with the innovators. They do not stand aloof. In fact, they provide the resources and guidance for their operations.

It is interesting to note that regulatory sandboxes have become a common placed approach to innovative and novel technologies. It is believed that the UK was the early pioneers of this approach as far back as 2015 where it developed several cohorts to enable firms test their innovative products.[178] In 2018, the UK introduced the Regulatory Sandbox Cohort 4 programme, which included propositions from technology firms aiming to explore how DLT/blockchain-based platforms can enable companies to raise capital more

[177] Magnuson (2020) p.182

[178] There are a number of regulatory sandboxes on this point. See for example the UK 'Financial Conduct Authority (2018) *Regulatory Sandbox accepted firms*, Available at: https://www.fca.org.uk/news/press-releases/fca-reveals-fourth-round-successful-firms-its-regulatory-sandbox (accessed 9 April, 2023).

efficiently and streamline processes. This initiative allowed firms to test their innovative solutions within a controlled environment, fostering the development of new financial technologies.[179]

This regulatory sandbox, in 2019, witnessed the successful sale of tokenized equities[180]by 20|30 on the London Stock Exchange Group's Turquoise trading platform with trades being settled via blockchain technology. The sale represented an epochal moment in the UK capital market and a demonstration of the Stock Exchange Group's determination to be on the front foot when it comes to decentralised share sales. There was also the issuance of tokenized Ethereum denominated bonds by Nivaura, which was cleared and settled on a public blockchain under the UK FCA supervisory regulatory sandbox under that cohort.

In acknowledgment of the potential impact of blockchain technology/DLT on the UK's financial market infrastructure, the UK government expressed its intention to legislate the establishment of a Financial Market Infrastructure (FMI) 'Sandbox.' This sandbox will enable firms to experiment and innovate in providing infrastructure services that support markets by facilitating the testing of Distributed Ledger Technology. The FMI Sandbox aims to create a controlled environment where companies can explore the potential of DLT while adhering to a modified legislative framework. [181]. Interestingly, The UK reflected this commitment under the recent the Financial Services and Markets Act 2023 (Digital Securities Sandbox) Regulations 2023. It is important to highlight that the regulation has a life span of five years with a scheduled date of termination on the 8th of January 2029 with a commencement date from the 8tth of January 2024.

The success that this regulatory approach has recorded has witnessed many jurisdictions adopting the same. In 2016 for instance, the monetary authority for Hong Kong launched its regulatory sandbox that permitted banks and tech companies to test their products and services without the need to comply with the barrage of laws on registrations and disclosure that would ordinarily accompany such process.[182] More

[179] Regulatory Sandbox accepted firms https://www.fca.org.uk/firms/innovation/regulatory-sandbox/accepted-firms Firms include: Capex - Platform that uses DLT to allow small companies to raise capital in a more efficient and streamlined way;

[180] European Business Magazine, (2019), 20|30 completes first ever Tokenized Equity Offering Issuance. Available at https://europeanbusinessmagazine.com/business/2030-completes-first-ever-tokenised-equity-offering-issuance/ (Accessed at 14th March 2022)

[181] HM Treasury, (2022) UK regulatory approach to cryptoassets, stablecoins, and distributed ledger technology in financial markets: Response to the consultation and call for evidence. Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1066166/O-S_Stablecoins_consultation_response.pdf (accessed 3rd April 2022)

[182] Hong Kong Monetary Authority, *Fintech Supervisory Sandbox (FSS)* available at: https://www.hkma.gov.hk/eng/key-functions/international-financial-centre/fintech/fintech-supervisory-sandbox-

exciting waivers in this regulatory approach sprung up in Singapore for instance where the Singapore Monetary Authority created an express sandbox that scaled down the requirements, with approval to be granted within a short time frame of 21 days.[183]

The stage is now littered with regulatory sandboxes with examples drawing from Bahrain[184], India,[185] Brazil,[186] Malaysia,[187] Kuwait[188], Russia,[189] Australia,[190] Canada among others. This approach has also attracted regional regulatory attention. The case of the EU Is a classic example. Here the EU developed a DLT regulatory pilot regime which became effective in March 2023. This regulatory sandbox functions as a controlled environment where eligible firms can apply to operate a DLT-based trading facility and/or settlement system for financial instruments within a flexible regulatory framework. The main goal of this sandbox is to support the creation of secondary market infrastructure for digital securities, encompassing both tokenized securities and digitally native securities, while maintaining regulatory oversight and fostering innovation. Additionally, the sandbox will help inform EU regulators about potential permanent changes to the regulatory framework that could prove advantageous.

The point should be stressed that that African market have also joined the train of adopters. The Central bank of Nigeria recently announced its regulatory sandbox to enable innovative firms test their product and services in a controlled environment with regulatory oversight. This is the same situation in Ghana, South Africa, Kenya, Rwanda, Mauritius, and Mozambique [191]who developed their regulatory sandbox.

---

fss/#:~:text=The%20Fintech%20Supervisory%20Sandbox%20(FSS,full%20compliance%20with%20the%20HKMA's (accessed 3rd April, 2022)

[183] Singapore Monetary Authority (2022) *Sandbox Express Guidelines,* available at https://www.mas.gov.sg/-/media/mas-media-library/development/regulatory-sandbox/sandbox-express/sandbox-express-guidelines-1-jan-2022.pdf (accessed 3rd April, 2022)

[184] Central Bank of Bahrain, Fintech and innovation: Regulatory Sandbox Framework, available at: https://www.cbb.gov.bh/fintech/ (accessed 2nd January, 2023)

[185] Reserve Bank of India, (2020) *Enabling Framework for Regulatory Sandbox,* available at https://rbi.org.in/scripts/PublicationReportDetails.aspx?ID=1161 (accessed 2nd January , 2023)

[186] Banco Central Do Brazil, *Regulatory Sandbox,* available at https://www.bcb.gov.br/en/financialstability/regulatorysandbox (accessed 4th January 2023)

[187] Central Bank of Malaysia (2016) *Regulatory Sandbox,* available at https://www.bnm.gov.my/sandbox (accessed 4th January 2023)

[188] Central Bank of Kuwait (2022) *CBK Regulatory Sandbox Adopts Sustainable FinTech Products and Services,* available at: https://www.cbk.gov.kw/en/cbk-news/announcements-and-press-releases/press-releases/2022/11/202211240800-cbk-regulatory-sandbox-adopts-sustainable-fintech-products-and-services (accessed 2nd January, 2023)

[189] Bank of Russia, *Regulatory Sandbox*, available at https://www.cbr.ru/eng/fintech/regulatory_sandbox/ (accessed 4th January, 2023)

[190] Australia Securities and Investment Commission, *Enhanced Regulatory Sandbox* available at: https://asic.gov.au/for-business/innovation-hub/enhanced-regulatory-sandbox-ers/#guidance (accessed 4th January 2023)

[191] Ngari, L (N.d) Regulatory sandboxes in Africa, Available at: (https://empowerafrica.com/regulatory-sandboxes-in-africa/ (accessed 15th March 2023)

While the idea of a regulatory sandbox is a laudable step in the process of understanding innovative technologies, it is argued such sandboxes can only thrive in markets where their regulatory regime is sound and robust. This may possibly explain why there appear to be no evidence or case of the application of the blockchain technology in those financial markets.

As an annexure to the forgoing position on regulatory sandboxes, it has been argued that the seeming rush towards this approach may see regulators abandoning their core priorities of protecting consumers against harm that emerges from novel technologies. The supporting argument is that some countries are racing to the bottom to entice industry and innovative firms to their country.[192] While the argument is meritorious to an extent, one can put up the argument as well that regulatory sandboxes are designed to operate in safe spaces and therefore inviting industry to participate does not necessarily harm investors, provided the requisite regulatory framework is in place. This corroborates the argument that regulatory sandboxes may only be able to thrive in countries that have strong and quality regulatory framework.

Several countries, such as France, Luxembourg, and Germany, have taken a different approach to regulatory sandboxes by amending or introducing legislation that acknowledges the application of blockchain technology/DLT in their financial markets. These legislative changes help address the legal uncertainty surrounding the technology. Notably, these countries have pioneered the adoption of specific laws that allow companies to issue securities directly on the blockchain, fostering innovation and growth in the financial sector.

As a final word on the regulatory approaches examined above, the concluding point is where markets decide to permit the application of DLT/ blockchain, its operations should be guided by the overarching principles of securities regulation. These are to protect investors, maintain integrity of the financial market and to guard against the occurrence of systemic risk.[193]

2.10. Conclusion

The body of knowledge on blockchain technology and its application in finance is an evolving and iterative discussion. Blockchain as a threshold technology poses as a disruptive force that can recalibrate the functioning of institutions and their processes. Over the last decade, this technology has presented a

[192] Magnuson (2020) p. 183
[193] OECD (2020) p. 4

platform for the emergence of new players to test certain technologies that seeks to promote financial inclusion by lowering the barriers of entry and participation, both for consumers and players.

Good understanding of its functioning can assist players, governments and institutions. The technology is still filled with myths that needs clarification before its adoption. In recognition of this, a careful and meticulous understanding of the technology will aid the successful application of the technology. The question of its relevance in every sector is gaining momentum by the day and its core features.

Analysis of the existing literature and empirical observations indicates a gradual shift in the adoption of blockchain technology. Initially implemented primarily by private industry, blockchain applications are now increasingly being embraced by governmental entities, particularly in the realm of financial services. This evolving trend highlights the growing recognition of blockchain's potential to enhance efficiency and security across various sectors, leading to its wider acceptance and integration within public institutions. Although this pace is not as rapid because of the disruptive features and a host of other issues that can imped its immediate adoption, careful observation of its application and a systematic adoption of the technology should be the approach. Who are the new players that will emerge? Which players will be rendered otiose by its adoption? and how has the UK approached the adoption of blockchain in its capital market? These are exciting questions that this research work will answer in the subsequent chapter

CHAPTER THREE

BLOCKCHAIN APPLICATION IN CAPITAL MARKETS

"The electronification of financial markets and the use of automation for the issuance and trading of financial instruments is not new; securities have existed in electronic-only format for a long time in what is described as "dematerialised" form. Tokenised securities could be seen as a form of cryptography-enabled dematerialised securities that are based and recorded on a decentralised ledgers powered by DLTs, instead of electronic book-entries in securities registries of central securities depositories."

OECD, 2020[194]

3.1. Introduction

Blockchain technology has been as adjudged as revolutionary technology that can simplify market process and enable value and risk to be exchanged in the financial market more efficiently. In recognition of the potentials of this technology, policy makers and regulators across the globe have begun to develop pilot scheme,[195] regulatory sandbox,[196] innovative hubs and even launch live projects[197] on its applicability in financial markets. With the surge in interest in this technology, there is the growing need to understand to what degree it can influence the financial market infrastructure, actors, and processes.

In contextualizing the discussion, part of the intriguing questions summarily posed by policy makers, market players and actors across the spectrum are: what area of the market would witness the efficiency gains of

---

[194] OECD (2020), *The tokenization of assets and potential implications for financial markets,* OECD Blockchain Policy Series, available at: www.oecd.org/finance/The-Tokenisation-of-Assets-and-PotentialImplications-for-Financial-Markets.htm. (accessed 9th April 2023)

[195] See Regulations (EU) 2022/858 of the European Parliament of the Council (2022) Pilot regime for market infrastructures based on DLT, *Official Journal of the European Union* L 151/1-33. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022R0858 (accessed 9 April, 2023). The regime can be described as a regulatory sandbox that enables eligible firms apply to operate a DLT-based trading facility and /or a settlement system for financial instrument. The regime will inform regulators within the EU to understand the how the technology would operate and what beneficial regulatory changes will be made.

[196] There are a number of regulatory sandboxes on this point. See for example the UK 'Financial Conduct Authority (2018) *Regulatory Sandbox accepted firms*, Available at: https://www.fca.org.uk/news/press-releases/fca-reveals-fourth-round-successful-firms-its-regulatory-sandbox (accessed 9 April, 2023). Cohort 4 of the sandbox witnessed a company, 20|30 a DLT-based platform that allows companies to raise capital in a more efficient and streamlined way. The test involved the admission and trading of tokenised equities issued by 20/30 on the London Stock Exchange (LSE) Turquoise platform. For analysis on the issuance of tokenised bonds under the FCA sandbox see: Cohen. R, Smith. P, Arulchandran. V and Dr Avtar Sehra (2018) Automation and blockchain in securities issuances, *Butterworths Journal of International Banking and Financial Law* 3 p. 144- 150

[197]

this technology?[198] would DLT completely encapsulate the full market cycle?[199] how would existing market infrastructure interoperate with this disruptive technology? how would DLT/ blockchain technology affect the way in which traditional asset classes are traded in the market?[200] which market infrastructure and intermediaries would be rendered redundant?[201] what risk would the technology present to the traditional financial market? what are the implications of the technology on investors protection? and more contentiously, should the technology even be considered for adoption?[202] These, among many, are the broad class of questions that lie at the heart of the conversation on the adoption of the blockchain technology. Appraisal of some of the afore-posed questions constitutes a fundamental part of the chain of this thesis.

Against this backdrop, this section commences by presenting some factors that could arguably be construed as the driving force behind the use of DLT/blockchain technology in the financial market. It also assesses the potentials and risks of the technology to the financial market. It uses the avenue to also appraise the technical components of the technology in relation to its applicability to the financial market. Consequently, it presents the myriad of visions on the extent to which DLT/blockchain can disintermediate the market and the consequences it would create

The concluding part of this chapter examines the adoption of blockchain technology in the UK capital market. The discussion examines its current regulatory approach to the technology and argues that quest to integrate the technology into its market is supported by its strong regulatory. This serves as a

[198] The literature is awash with the position that the technology would mostly transform the post trade ambit of the trading cycle. See: Bech. M. L, Hancock. J, Rice. T and Wadsworth. A (2020) *On the future of securities settlement, Bank* of International Settlement Quarterly Review pp 67-83; Priem, R. (2020) Distributed ledger technology for securities clearing and settlement: benefits, risks, and regulatory implications. Financial Innovation 6(11). Available at: https://doi.org/10.1186/s40854-019-0169-6 (accessed 15 January, 2022)

[199] See page 27 in World Economic Forum and Boston Consulting Group (2021) *Digital Assets, Distributed Ledger Technology and the Future of Capital Markets*, WEF Insight Report.

[200] *Ibid,* p. 32

[201] *Ibid,* p. 21

[202] This has become an issue in the face of notable exchanges like the Australian Securities Exchange (ASX) halting its quest to replace its legacy post trade settlement system known as Chess with blockchain technology. This move saw them losing the sum invested in the technology to the tune of about A£250 million. The Exchange had cited issues of complexity with the technology, governance and delivery that needed to be addressed. In that respect, it noted that its current settlement system was still secure, stable and performed well. See: Fidelis, N (2022) *Australian stock exchange apologises for dropping botched blockchain upgrade* Available at https://www.ft.com/content/029dd01f-eaf5-493c-b195-299408b62469 (Accessed 10 April, 2023); For further analysis on whether blockchain should be adopted in capital markets, see the OCED analysis on the tripartite conditions that regulators should consider before adopting the technology. These conditions are the: business rationale, technical feasibility and economic sense. OECD (2020), *The Tokenisation of Assets and Potential Implications for Financial Markets*, OECD Blockchain Policy Series, Available at: www.oecd.org/finance/The-Tokenisation-of-Assets-and-PotentialImplications-for-Financial-Markets.htm. (Accessed 10 April, 2023).

fundamental basis for proving the hypothesis in this research work that a strong financial market regulatory framework is a pre-condition for the adoption of blockchain technology in the Nigerian capital market.

3.2. Hypothesis of Motivation for DLT Solutions in Capital Markets

It can be argued that the increasing interest in applying DLT solutions in the capital market stems from a broad class of reasons. These reasons are possibly connected to a number of developments occurring in the market and policy space. This section appraises the hypothesis from three segments. These are the market development, policy development and technical development.

3.2.1 Market Development

I. The Increasing interest of retail and institutional investors in digital assets.

Digital asset as an asset class began to gain popularity through the emergence of bitcoin in 2009. Instrumental to the success of bitcoin (a peer-to-peer cryptocurrency) is its underlying technology: blockchain technology. This is a type of DLT which enables participants in the system to transact without the need for any central party.[203] Since then, the interest in this asset class has grown tremendously. One of the reasons is because it provides an alternative medium in facilitating transaction and creating value[204]. Enthusiast of a democratised financial system have since realised its usefulness in fuelling decentralised applications.[205] This gave rise to other cryptocurrencies such as Ethereum[206]. Ethereum is notably the first public blockchain with smart contract embedded in it. The blockchain is acknowledged to be responsible for enabling disruptive branch of financial products and services such as decentralised finance and fungible tokens.[207]

Although cryptocurrencies have witnessed their fair share of volatility in the past years, the digital asset has grown strongly in terms of adoption base. Coinbase reports that since its inception, the industry has grown to an estimated value of USD 1 trillion dollar, as of September 2023.[208] According to a PWC report, the United States experienced substantial growth in the combined market capitalization of digital assets from approximately $14 billion in November 2016 to about $3 trillion in November 2021. This remarkable increase represents a compound annual growth rate (CAGR) of 193%, showcasing the significant expansion

[203] Ankenbrand, T and Bieri, D (2018) Assessment of cryptocurrencies as an asset class by their characteristics. *Investment Management and Financial Innovations*, 15(3), 169-181.
[204] *Ibid,* p.169
[205] *Ibid*
[206] Other known types of cryptocurrencies are: XRP, Dogecoin, Solana, Cardano, BNB, Dash etc.,
[207] *Ibid*, p. *169*
[208] Coin Market Cap, *Global Cryptocurrency Charts - Total Cryptocurrency Market Cap*, available at: https://coinmarketcap.com/charts/ (accessed 11 September 2023)

of the digital asset market at the national level during this period.[209] It can be argued that chiefly instrumental to the growth, is its adoption by institutional investors who sought to add digital assets into their asset portfolio. This class of asset has seen gradual adoption despite the high level of volatility that befalls it and the stiff regulatory positions that have countenanced it usage.

It should be highlighted that that prior to institutional investors making inroad into the sector, the space was mainly manned by retail investors. That scene has changed with big data and large payments companies like PayPal among many others, who have included cryptocurrencies as means of conducting payments thus recognizing its potential in facilitating transactions.[210] To accentuate the position on institutional adoption, a crypto report released by Fidelity digital assets in 2022 indicated that an estimate of 6 out of 10 institutional investors had invested in digital assets globally.[211] That figure is eye-catching and arguably serves as an indication of the level that institutional investors have recognised the potentials of digital assets.

In relation to the foregoing development, some have argued that the scale of digitization in the delivery of financial services and the exodus of cashless and contactless payments methods, coupled with the quest of consumers and companies to engage in fast safer and less costlier methods of conducting payments internationally could be responsible for the decision to invest in cryptocurrencies as an alternative method of conducting payments.[212] This position is with merit given the constant rise in the usage of cryptocurrencies to facilitate transactions.

The momentum in the digital assets space grew to the extent that countries began to adopt it as a means of payment. First in the list was El Salvador who passed a law legitimizing bitcoin as a legal tender and a means of facilitating payment in 2021. Second was the Central African Republic. Although this move had

---

[209] PWC (2022) *Digital Assets- An Emerging Trend in Capital Markets,* Available at https://www.pwc.com/ng/en/assets/pdf/digital-assets.pdf, (accessed 10 April, 2023)

[210] Paypal, *How to use Crypto to checkout?,* available in https://www.paypal.com/us/cshelp/article/how-to-use-crypto-at-checkout-help571#:~:text=Checkout%20with%20Crypto%20will%20automatically,No. (accessed 16 April 2023)

[211] Fidelity digital assets (2022) *Institutional Investor Digital Assets Study: Key Findings*, available at https://www.fidelitydigitalassets.com/sites/default/files/documents/2022_Institutional_Investor_Digital_Assets_Study.pdf (accessed 16 April 2023)

[212] Auer. R and Tercero-Lucas, D (2021*) Distrust or Speculation? The Socioeconomic drivers of US Cryptocurrency investments*, Bank for International Settlements Working paper No.951(Although the authors sought to disprove the hypothesis that cryptocurrency investors are motivated by distrust in fiat currencies or regulated finance, the argument still remains that the events from the 2009 created lack of trust in the financial sector, (particularly traditional; financial institutions like banks) and triggered the creation and adoption of digital assets.

received strong criticisms against their respective convictions for its use, the move remains a *locus classicus* for other countries and an indication of the incursion of digital assets in mainstream finance.[213]

As digital assets gradually begin to integrate into the fabric of the financial market, the argument remains that the motivating factor for financial regulators and institutions in adopting the technology is the relative success that digital assets have principally gained due to the attributes of DLT ensuring a safe, efficient and streamlined ecosystem for conducting transactions.

II. Deployment of DLT solutions in alternative markets for finance and payments methods

The hypothesis being developed under this head is that the deployment of DLT solutions in adjacent markets in facilitating payments and other financial activities could be responsible for the growing interest in the traditional financial market. The last decade has witnessed how technologies such as DLT is used as a mechanism for redefining the concept of money in terms of how it can be created, exchanged, stored, and used to facilitate payments. A notable example that has emanated out of the experimental class of cryptocurrencies is known as stablecoins. These can be summarily described as cryptocurrencies with values tied to fiat currencies or other assets.[214]

The unattractive level of volatility that has engulfed cryptocurrencies in recent times led to the development of stablecoins to hedge against sudden movement in value. Stablecoins, just like cryptocurrencies, serve as a means for storing value and making payments by deploying DLT solutions. Its unique attribute, and possibly distinguishing factor is that it is pegged to an underlying asset like gold or fiat currency. This is used to guarantee its stability. This possible assurance of stability, being one of the cardinal catchpoints for regulators, served as a soft spot in securing the interest of regulators.

It is imperative to state the regulatory perimeter for regulators has been on fiat backed stablecoins. This is possibly because of the relative stability of fiat money. This area has witnessed an explosive growth, particularly for the US dollar. On this point, the US Federal Reserve recently noted that "In the past year, USD-pegged stablecoins circulating on public blockchains have seen explosive growth, with a combined circulating supply of nearly $130 billion as of September 2021 – a more than 500% increase from one year ago…[additionally,] payments companies could use an internal,

[213] The Independent (2021) *World Bank refuses to help El Salvador adopt bitcoin over environmental and transparency concerns*, available at https://www.independent.co.uk/tech/world-bank-bitcoin-el-salvador-b1867557.html (11 September 2023)

[214] Arner. D, Auer R and Forst. J (2020) *Stablecoins: risks, potential and regulation,* Bank for International Settlements working paper No. 905

permissioned DLT to settle payments efficiently, which would be conceptually equivalent to a stablecoin."[215]

The relative success that stablecoins have enjoyed has seen it challenging legacy frontiers as a means of payment that could facilitate cross border transaction.[216] Its recognition as an alternative stem from the costly, relatively slow, and limited visibility that is associated with the traditional method of facilitating cross border transactions. It is thus believed that the use of stablecoins, powered by DLT would introduce visibility into transactions, reduce transaction cost significantly,[217] enable real time settlement of transactions, eliminate fraud and counterparty default in transaction by deploying the power of DLT and smart contracts to automate transactions.

In another breadth, and more closely connected to the motive for the consideration of DLT in the financial market, is possibly the surge in Initial coin offerings (ICO) that usurped the market after the successful global issuance of Ethereum in 2014.[218] ICOs are similar to the traditional methods of raising finance: Initial public offering (IPO). Initial Coin Offerings (ICOs) bear resemblance to conventional fundraising methods such as Initial Public Offerings (IPOs). They rapidly gained popularity as an alternative financing route, particularly for technology companies, due to their operation outside the purview of regulatory authorities. By circumventing traditional fundraising methods, ICOs enabled firms to bypass the multitude of regulatory and compliance obstacles typically associated with conventional offerings.[219]

Its hallmark feature is that the 'coin' are tokens that represents an economic right in the firm offering it, with a promise of returns or enables the holder to have access to certain products or services. Such tokens are issued on the blockchain and then offered to investors in exchange for cryptocurrency or other forms of value, who would then have them stored in a digital wallet. This

---

[215] Gordon Y.L and Caramichael. J (2022). *Stablecoins: Growth Potential and Impact on Banking,* International Finance Discussion Papers 1334. Washington: Board of Governors of the Federal Reserve System, https://doi.org/10.17016/IFDP.2022.1334. See pp 1-5

[216] Hedera (2021) *Real-time intercontinental settlement using stablecoins*, https://hedera.com/stablecoin-settlement

[217] On a broader scale, an article by Goldman Sach notes that DLT/blockchain could significantly reduce transaction cost in the insurance underwriting by $ 2- 4 billion in just the US and the cost associated to securities and clearing could reduce by $11 - $12 billion. See: Goldman Sach (2016) *Blockchain: Putting theory in Practice In Equity Research https://github.com/bellaj/Blockchain/blob/master/Goldman-Sachs-report-Blockchain-Putting-Theory-into-Practice.pdf (accessed 18 April, 2023).*

[218] Deloitte (2020) *Security Token Offerings: The next phase of financial market evolution?* available in https://www2.deloitte.com/content/dam/Deloitte/cn/Documents/audit/deloitte-cn-audit-security-token-offering-en-201009.pdf (accessed 17 April, 2023)

[219] Cohney. S, Hoffman. D, Sklaroff. J and Wishnick. D (2019) Coin-Operated Capitalism, *Columbia Law Review* , Vol. 119, No. 3, pp. 591-676.

novel method of raising finance soon met its waterloo. This was because of its unregulated nature therefore making it an easy target for scammers. This made the concept unattractive for investors and thus witnessed a significant decline as a method of raising finance.[220]

The point being established here Is that this alternative method of raising finance outside the traditional route, soon began to attract regulatory scrutiny to first prevent the exploitative conduct that had engulfed the practice, but more importantly, to understand the underlying technology that influenced it.[221]

In a contemporary approach to regulation, one which seeks to avoid stifling innovation with regulation, regulators sought to create a balance by accommodating this method of raising finance, but in more in a regulated environment. This gave birth to the concept of security tokens offering (STO): a more regulatory compliant offering as opposed to the ICOs. Some jurisdictions regulate STOs under their extant securities laws. Other regulators took the step of developing *sui generis* rules to govern its issuance, the platform where it is exchanged and the medium through it which it is exchanged. This was done all in the bid to ensure that its operations accord within the triumvirate tenets of securities regulation. These are: investors protection, market integrity and financial stability.[222] A prime example is the Nigeria Securities and Exchange commission who released special rules on the issuance, offering platforms and custody of digital asset[223]

It posited that, it is the aggregate of these developments in the market that is sparking the increasing interest by regulators and policy makers to formally integrate the technology into the traditional financial market.

3.2.2. Policy Development

I. Regulator's recognition of the potential of blockchain technology

The growing comfort by regulators towards blockchain technology is probably attributable to its malleability and its usefulness across a variety of sectors. Magnuson remarks that some of the radical

---

[220] *Ibid*, p. 596

[221] *Ibid* p. 607

[222] Ibid p.9 Deloitte (2020): On the objectives of regulation see: IOSCO (2017*) Objectives and Principles of Securities Regulation*, https://www.iosco.org/library/pubdocs/pdf/IOSCOPD561.pdf (available 17 April 2023)

[223] SEC (2022) *New Rules on Issuance, Offering Platforms and Custody of Digital Assets*, https://sec.gov.ng/wp-content/uploads/2022/05/Rules-on-Issuance-Offering-and-Custody-of-Digital-Assets.pdf. Detailed analysis of these rules is carried out in chapter 5. However, the rules cover five critical areas: (i) Rules on digital assets as securities (ii) Rules on registration for Digital Assets Offering Platforms (iii) Rules on Registration Requirements for Digital Assets Custodians (iv) Rules on Virtual Assets Providers and (V) Rules on Digital Assets Exchange

experimentation of the blockchain technology has been within the government and not in corporations.[224] While his position is unsupported with empirical evidence, his position is arguably not distant from the truth. This is so when a cursory observation is done on the areas blockchain technology is being experimented within government operations. I.e., electioneering, shipping, land among others.[225]

An inferable stance is that the level of adoption possibly explains the spate of policy development that is occurring across the globe to ensure its smooth application, particularly in mainstream finance. This practice underpins the theoretical approaches of regulation which under this hypothesis, shifts from a do-nothing or restrictive approach to a permissive approach.[226]

The recognition of the potentials of the technology is seeing regulators relax the initial guard they had against its underpinning products that first was used: cryptocurrencies. Regulators are now beginning to adopt a permissive approach: an approach which encourages innovative firms to test their innovation under regulatory and policy regimes such as sandboxes, tech hubs, among others. Take the UK as an example. The UK has a supportive regulatory landscape which is adjudged as its cornerstone of its FinTech success and initiatives. This has largely been pioneered by the Financial Conduct Authority (FCA) and its approach has been emulated by other regulators across the globe. For instance, the FCA has championed the path by developing and implementing world-leading initiatives such as the digital sandbox[227] and regulatory sandbox,[228], TechSprints, horizon scanning, and thought leadership pieces on topics such as cryptoassets and machine learning.[229] More importantly, It is planning develop rules that would support tokenisation and DLT in financial market infrastructures.[230]

---

[224] Magnuson (2020) p 89; See also Ølnes, S., Ubacht, J., & Janssen, M. (2017). Blockchain in government: Benefits and implications of distributed ledger technology for information sharing. Government Information Quarterly, *an international journal of information technology management, policies, and practices*, 34(3), 355-364.

[225] Alvi, S.T, Uddin, M.N., Islam, L and Ahamed S (2022) DVT Chain: A blockchain-based decentralized mechanism to ensure the security of digital voting system voting system Journal of King Saud University - Computer and Information Sciences 34 (9) P 6855-6871

[226] See section 4.8 of this chapter for an analysis on the various regulatory approaches to blockchain technology.

[227] FCA (2023) *Digital Sandbox*, https://www.fca.org.uk/firms/innovation/digital-sandbox (accessed April 17, 2023)

[228] FCA Regulatory Sandbox Guide. Available at: https://www.fca.org.uk/publication/fca/fca-regulatory-sandbox-guide.pdf (accessed 21 October 2022)

[229]See: FCA (2019) *Machine Learning in UK Financial Services* Available at https://www.fca.org.uk/publications/research/research-note-machine-learning-uk-financial-services (accessed 21 October 2020; FCA (2017) Discussion paper on Distributed Ledger Technology Available at: https://www.fca.org.uk/publication/discussion/dp17-03.pdf (accessed 21 October 2022) and The City UK (2020) *Enhancing the UK's Approach to Innovation in financial Services* Available at: https://www.thecityuk.com/media/t42jvkyk/enhancing-the-uks-approach-to-innovation-in-financial-services.pdf (accessed 21 October 2022); FCA, (2022) *Building a digital regulator: how the FCA is riding the innovation wave, https://www.fca.org.uk/news/speeches/building-digital-regulator-how-fca-riding-innovation-wave/printable/print* (accessed 23 October 2022)

[230] HM Treasury (2022) UK regulatory approach to cryptoassets, stablecoins and distributed ledger technology in financial markets: Response to the consultation and call for evidence, Available at

It is important to state that these policy developments are occurring rapidly within the EU in countries like France, Luxembourg, Germany among other. This has been through the instrumentality of the law by amending existing legalisations or creating new policies to recognize DLT in their respective financial markets. On a regional level, the EU has developed a DLT regulatory pilot regime which became effective in March 2023. The regulatory sandbox regime allows eligible firms to apply for operating a Distributed Ledger Technology (DLT)-based trading facility and/or settlement system for financial instruments within a flexible regulatory environment. This sandbox's primary goal is to support the creation of secondary market infrastructure for digital securities, encompassing both tokenized securities and digitally native securities. Simultaneously, the sandbox aims to gather valuable insights for EU regulators, helping them determine whether permanent adjustments to the regulatory framework would be advantageous.

It is important to note that these developments are occurring at different stages as regulators understudy the risks and potentials to their respective financial systems and the global implication.

II. Exploration of CBDC and the application in a DLT based financial market

The last couple of years has seen the quest by central banks across the globe to develop their digital currencies. Central bank digital currency (CBDC) as is popularly called, arguably has it creation linked to the rising adoption of digital currencies issued by private actors and the risks that they pose to the consumers and the financial system.[231] Although, the reasons and purpose of the creation of CBDCs differs across various jurisdictions, its usage in the financial market has, since its adoption, been subject to different experiments on how it can be used to facilitate an efficient payment system and promote financial inclusion.[232]

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1088774/O-S_Stablecoins_consultation_response.pdf (accessed at May 10 2022)

[231] Kosse, A and Mattei (2023) Making headway-Results of the 2022 BIS survey on central bank digital currencies and crypto, Bank for International Settlements Papers No 136. The empirical paper finds that nearly 60% of its respondents (made up of central banks) who participated in the survey indicated that Nearly 60% of respondent the advent of cryptoassets and stablecoins had accelerated their work on CBDCs.

[232] See Bank for International Settlements, BIS Innovation Hub work on central bank digital currency (CBDC), available at https://www.bis.org/about/bisih/topics/cbdc.htm#:~:text=A%202021%20BIS%20survey%20of,would%20be%20a%20digital%20banknote (accessed 13 September 2023). This source details out notable projects and experiments being conducted by central banks across the globe on the experimental cases of CBDC. Some notable projects are: Project Sela (BIS, Central Banks of Hong Kong SAR and Israel); Project Polaris (BIS Innovation Hub Nordic centre); Project Marina (BIS Innovation hub, Bank of France, The Monetary Authority of Singapore and the Swiss National Bank) among others.

Before delving into its use case in the financial market, it is important to make clear that CBDCs are not solely issued on the blockchain or by DLT mechanism. Other technologies can be used to facilitate its issuance and management[233]. However, this section only focuses on the relevance of CBDCs and its application in the financial markets operated by the DLT.

The use case of CBDCs in facilitating market transactions is beginning to catch the attention of regulators. Some of the countries who already have implemented CBDCs arguably have the technological incentives to drive the adoption of DLT solution in their financial market. The argument backing CBDCs as a technological incentive is that the application of DLT/ blockchain technology requires the digitization of securities to effectively operate on the technology (a process known as tokenization). To achieve instantaneous settlement and guarantee certainty in securities transactions, it is essential for the securities and corresponding payments to change ownership simultaneously. This necessitates the availability and utilization of a tokenized form of currency on the blockchain, enabling the exchange of payments without lengthy processing times or costly intermediary fees off-chain.[234]

A recent collaborative experiment called Project Helvetia, conducted by the BIS Innovation Hub Swiss Centre, SIX Group AG, and the Swiss National Bank, explored the integration of tokenized assets and central bank money on the SDX platform. The project examined two proofs of concept (PoCs) for settling tokenized assets: (i) issuing a new wholesale central bank digital currency (w-CBDC) and (ii) establishing a connection between SDX's novel securities settlement platform and the current central bank payment system. The experiments demonstrated the practical feasibility of both PoCs, as they were tested in live or near-live system environments and proved to be legally sound. [235]

One key takeaway from Project Helvetia is that central banks can continue providing central bank money settlement options, such as through a central bank digital currency (CBDC) or by enhancing the interoperability of existing systems. This highlights the potential for integrating tokenized assets and central bank money in securities settlement processes.[236] With more countries creating their CBDCs, the prediction is that countries would begin to see the role of digital currencies as an added incentive to use DLT solutions in their financial markets.

---

[233] BIS Committee on Payments and Market Infrastructure (2018) *Central Bank Digital Currencies*, available at https://www.bis.org/cpmi/publ/d174.pdf (accessed 13 September 2023)
[234] OECD, (2020) p. 35
[235] Bank for International Settlements, SIX Group AG and Swiss National Bank (2020) *Project Helvita Settling Tokenized assets in Central Bank Money.* https://www.bis.org/publ/othp35.pdf (Accessed 7 April 2023)
[236] Ibid.

3.2.3. Technical Development

The increasing comfort in deploying DLT solutions in financial markets can arguably be attributed to the number of technical update and buffers that has it has undergone in the past years to make it more resilient, reliable, secured, and immune from attacks. This development rides on the concerns of business and government preferring DLT solutions only if it will make their businesses and processes more secured and efficient.[237]

To this extent, blockchain like Ethereum has undergone several technical developments to make it unimpeachable and effective. For instance, it upgraded its consensus mechanism from proof-of-work to proof-of stake. This allows pioneers of the Ethereum to stake their ETH in a deposit contract. The ETH that is staked is used to protect the network.

The novel consensus mechanism plays a crucial role in preserving the system's security and the decentralization model it employs. For instance, the model of decentralization prevents individuals or small groups of validators from gaining excessive influence. Innovative staking technologies can contribute to maintaining Ethereum's validators as decentralized as possible, while also safeguarding them against various failures related to hardware, software, and networks. A prime example of such technology is distributed validator technology (DVT), which enables the distribution of validator responsibilities across multiple nodes.[238]

Ethereum further acknowledges the possibility of sophisticated attackers identifying and spamming upcoming validators to hinder block proposals, a type of denial of service (DoS) attack. To counteract this threat, the implementation of secret leader election (SLE) will conceal block proposers' identities, offering protection against such targeted attacks.[239]

The continuous quest by developers of DLT/blockchain to make the technology trustworthy, resilient and safe for use could continue to attract an increase in the use of the technology, particularly in the financial market.

---

[237] PWC (2020), *Time for trust: The trillion-dollar reasons to rethink blockchain,* *https://image.uk.info.pwc.com/lib/fe3111707564047570 1c74/m/2/434c46d2-a889-4fed-a030-c52964c71a64.pdf* (accessed 16 November 2022)

[238] Ethereum, *A more secure Ethereum* available at: https://ethereum.org/en/roadmap/security/ (accessed 13 April 2023)

[239] Ibid

Another significant factor contributing to the shifting landscape can be attributed to heightened competition stemming from various sources. These include the emergence of digital disruptors challenging traditional intermediaries and service providers, the accelerated adoption of digital solutions spurred by the COVID-19 pandemic, and persistent cost pressures throughout the value chain. Collectively, these influences are reshaping the industry and prompting a re-evaluation of established practices.[240]

3.3. An Outlook of a Traditional Financial Market Operation: Process and Problems

To appreciate the transformative changes that blockchain technology presents to the current market structure and process, a cursory overview of the traditional market is important. Today, traditional financial markets across the globe operate a highly centralized system that is populated with several intermediaries - With each playing one role or the other in the trade cycle.

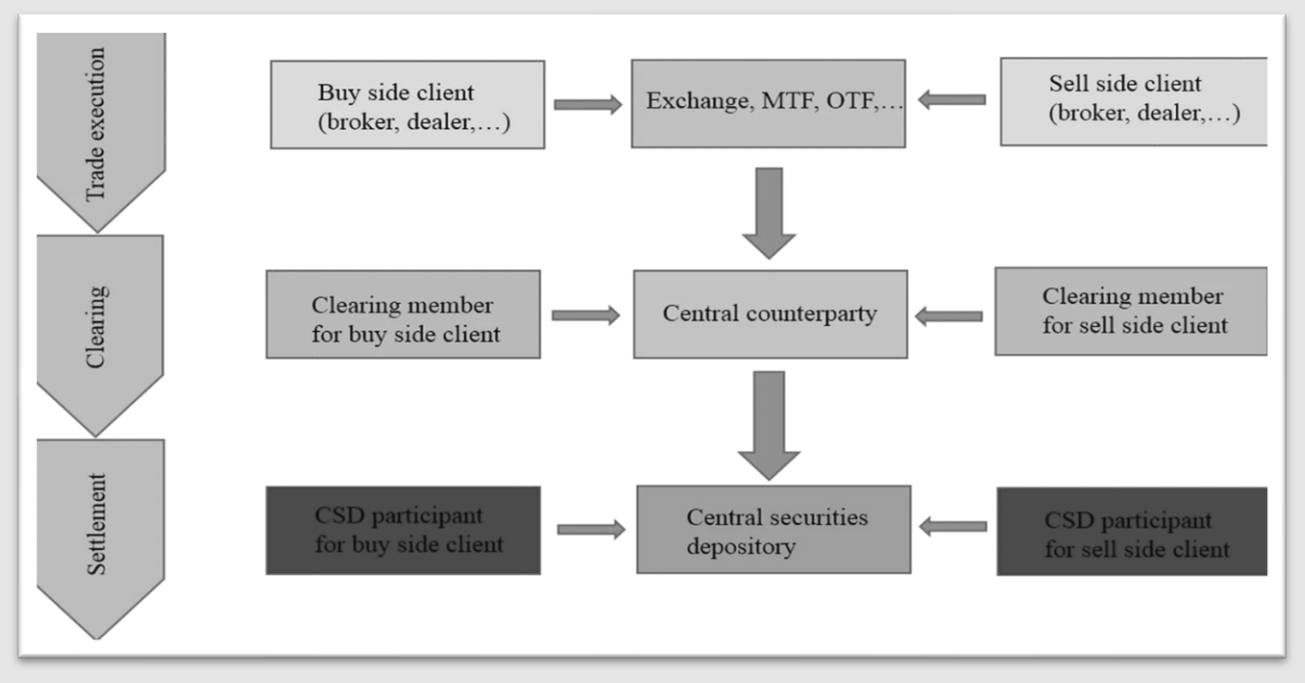
Priem, presents a clear process on how traditional financial markets operates without a DLT/ blockchain. It is apropos to replicate his apt documentation of the process below:

> "In the trade execution phase, a buy side and a sell side client/investor, acting through their respective brokers, seek to buy and sell financial instruments to each other on a trading venue which serves as a meeting point for all buyers and sellers. Alternatively, the trade can take place over-the-counter. When the trade is executed and the clearing phase starts, the sell instruction and buy instruction are forwarded to the central counterparty (CCP). A novation takes place, whereby the CCP acts as a buyer to the seller and a seller to the buyer. The clearing members, being the direct clients of the CCP acting on behalf of the buy side and sell side clients, post collateral to the CCP to mitigate the latter's credit and counterparty risk. They will need to post (or collect) collateral in function of the financial instruments' value changes until the instruments finally mature.
>
> After the novation, the CCP will forward the settlement instruction to the CSD. The CSD will operate the securities settlement system by crediting and debiting the securities accounts of its participants, acting on behalf of the buy side and sell side clients, respectively.....[The] current financial industry structure is dominated by centralizing institutions. The trade life cycle and

[240] World Economic Forum & Boston Consulting Group (2021) *Digital Assets, Distributed Ledger Technology and the Future of Capital markets* available at: https://www3.weforum.org/docs/WEF_Digital_Assets_Distributed_Ledger_Technology_2021.pdf (13 September 2023)

custody chains can be long, with numerous intermediaries having their own proprietary databases with overlapping information on transactions leading to a lot of duplication. Participants in the post-trade value chain often need to manually update their digital records to reconcile them with any change that occurred in the records of counterparties at a different level in the holding chain, leading to a considerable operational risk"[241]

Figure 1: A representation of a trade cycle in the current traditional financial market.



See: *Priem (2020) p. 9*

It is imperative to state that some markets are comfortable with this process. This may probably be due to the effectiveness of their existing technology used in facilitating transactions and the maturity of their capital markets. This position coincides with the submission of the OECD, where it questioned unrealistic expectations of some industry participants who are pushing the need to transit to a DLT-based market.[242] It is argued that the use of DLT would be meaningful only where there is a proven rationale for such transition. A critical aspect of the evaluation process is the technical feasibility assessment, which is required to demonstrate that implementing DLT would yield substantial benefits

[241] Priem (2020) p. 9

[242]See the case of the AEX who backed out of their quest to use DLT facilitate market transaction. Fidelis, N (2022) *Australian stock exchange apologises for dropping botched blockchain upgrade* Available at https://www.ft.com/content/029dd01f-eaf5-493c-b195-299408b62469 (Accessed 10 April, 2023);

compared to the technology currently employed in the market. This assessment is essential to ensure that the transition to DLT is both viable and advantageous for the market.[243]

While the position of the OECD appears to be forthright on that point, the reality is that the current representation of the market process is highly fragmented. The number of intermediaries in each ambit of the transaction cycle are required to maintain their own independent record of transactions, securities and other relevant data: all of which would need to be reconciled to ensure their veracity. This process, when viewed from the lens of the potentials of DLT in streamlining the market process, one can argue that the current process is highly complex. This complexity increases the risk of error and increases the timeframe for settling transactions. The limited ability or inability of firms to swiftly transfer securities and cash has significant consequences for their capacity to manage funding requirements and take advantage of liquidity opportunities. This restriction could impede their financial flexibility and overall performance in the market.

Furthermore, the number of intermediaries in the process creates cost implication which would be borne by the investor. A culmination of the issues inherent in the complex and multi-layered process in the financial market provides a good cause for the adoption of the technology.

3.4. What is the Impact of DLT/ Blockchain technology in capital market?

The application of DLT/ blockchain technology has numerous impacts on the capital market. The test cases that have been conducted so far suggest that DLT can enable the tokenization of asset which makes it easier for value to be exchanged in the financial markets in a frictionless and more secured manner.[244] Such tokenization also opens the floor for the fractionalization of asset which enable investors to hold assets of a variety of classes in different sizes.[245] Furthermore, the use of smart contract could also potentially reduce the cost of transaction in administering securities that otherwise would have to be borne by the investor. It does this by automating transaction process when certain predetermined criteria have been met. The spill off effect is that it helps to condense the trading to settlement cycle which then makes transactions faster to settle.[246] It is imperative to note that these are some of the few impacts that the technology has in the financial markets. To properly appreciate the impact, it is imperative to examine the potentials of the technology in the next subsection.

[243] Priem (2020) p. 21
[244] OECD (2020), *The Tokenisation of Assets and Potential Implications for Financial Markets*, OECD Blockchain Policy Series, Available at: www.oecd.org/finance/The-Tokenisation-of-Assets-and-PotentialImplications-for-Financial-Markets.htm. (Accessed 15 March, 2021);.
[245] Ibid, (2020) p.7
[246] Ibid

3.4.1 Highlight of the Potentials of DLT/Blockchain Technology in Capital Markets

The rush and hype towards blockchain technology simply revolves around the potentials it presents to the capital market. The potential of the technology seems more attractive and convincing to adopt when one examines the current arrangement of the capital market. The sum and substance on the subject from the literatures indicate that the adoption technology can lead to the following: [247]

I. Enable greater operational efficiency

Blockchain or distributed ledger technology has the capability to enhance and automate current market processes, resulting in accelerated settlement times, more effective reconciliation processes, and expedited handling of corporate actions such as coupon or dividend payments. Consequently, these advancements will lead to shorter settlement cycles, enabling same-day settlement of transactions and decreasing the occurrence of settlement failures. The DLT/blockchain will constitute the single ledger and ultimate version of version of truth. This would reduce the fragmentation that is ladened in the current market structure. These value propositions, if realised , would have dual significant savings for both the financial market infrastructure and end-users.

ii. Reduce risk: Blockchain technology could enable faster and immediate settlement of transactions with complete certainty. This is because of the tamper proof and secured nature of the ledger which makes it difficult for transactions recorded to be altered without the knowledge of other participants in the network. This arrangement enables transactions to be secured and transparent. Furthermore, the use of smart contact to automate processes when certain predetermined conditions are fulfilled could reduce the counterparty risk where one party fails to fulfil its own part of the transaction. Utilizing smart contracts has the potential to minimize the amount of capital required to maintain against various exposures, ultimately leading to more efficient capital allocation and reduced risk.

iii. Improve transparency and traceability of transactions: DLT systems can significantly improve information sharing and synchronization among participants, potentially enhancing the transparency of financial market activities for both market participants and regulators by providing real-time access to market data. By reducing the fragmentation of data across various intermediaries, DLT financial market

[247] Ibid OECD (2020); Bank for International Settlements (2017), Distributed ledger technology in payment, clearing and settlement: An analytical framework, Committee on Payments and Market Infrastructures, available at: https://www.bis.org/cpmi/publ/d157.pdf (accessed 15 March 2021); Cohen, R., P. Smith, V. Arulchandran and A. Sehra (2018), Automation and blockchain in securities issuances, *Butterworths Journal of International Banking and Financial Law.*

infrastructures could create a more cohesive and synchronized database, ensuring immediate access to up-to-date information. Furthermore, DLT has the potential to foster more direct connections between market participants, allowing issuers to establish closer relationships with their investors. This could lead to easier identification of end investors and facilitate more efficient know-your-customer (KYC) and anti-money laundering (AML) checks, ultimately contributing to a more secure and transparent financial ecosystem.

iv. Increase resilience in capital market infrastructure services: Implementing blockchain or DLT-based networks could enhance the resilience of capital market infrastructure services. Due to their decentralized nature, these networks are less susceptible to disruptions, as there is no single point of failure. Consequently, a blockchain or DLT system could remain operational even in the event of outages affecting individual participants, providing a more robust and dependable infrastructure for capital markets.

3.5. Core Technical Properties of DLT and Implication for the Capital Market

Distributed ledger technology/ blockchain possesses a number of technical properties that distinguishes it from other methods of storing data and information. Notably are its immutability, decentralization, among others. However, there are other technical properties or features that the technology harbours which makes it an attractive candidate for the capital market. Some of them are discussed below as follows:

3.5.1. Tokenization

One of the fascinating and transformative features of blockchain technology is that it gives opportunity for the tokenization of securities. Before venturing into what the phrase is in the context of securities, it is imperative to understand what tokenization as a concept is. Hileman and Rauchs aptly describes it as the 'process of digitally representing a real assets-on a distributed ledger'.[248] A more elaborate appraisal of the concept was provided by the OECD in its examination of the potential implication it has in the financial markets. It stated that:

> "Asset tokenisation involves the representation of pre-existing real assets on the ledger by linking or embedding by convention the economic value and rights derived from these assets into digital tokens created on the blockchain"[249]

[248]Hileman, G and Rauchs, M (2017), *Global Blockchain Benchmarking Study*, Available at: http://dx.doi.org/10.2139/ssrn.3040224 (Accessed 15 January, 2022)

[249] OECD (2020), *The Tokenisation of Assets and Potential Implications for Financial Markets*, OECD Blockchain Policy Series, Available at: www.oecd.org/finance/The-Tokenisation-of-Assets-and-PotentialImplications-for-Financial-Markets.htm. (Accessed 15 March , 2021) See similar definition offered by The Financial stability Board "the representation of traditional assets – e.g. financial instruments, a basket of collateral or real assets – on DLT" in

By implication, the definitions offered presupposes that there is a real-life asset in place. Asset tokenization simply engages in the transformation of existing assets into digital form. The point must be made that while this concept had gain traction in non-traditional financial markets, this model of asset conversion and possession is novel in the traditional financial market, and it constitutes a watershed innovation in the method of recording the right of ownership over securities.

In furtherance of this analysis, it is imperative to note that there is distinction a between the tokenization of real-life assets that exists off the chain and tokens that are native to the blockchain which exist purely within the distributed ledger. Examples of such tokens are digital currencies like bitcoins and other types of cryptocurrencies. A unique characteristic of native blockchain tokens is that their value is intrinsically linked to their existence on the blockchain. These tokens derive their worth from their inherent attributes and their integration within the blockchain ecosystem. Also, tokens native to the blockchain may not backed by any real-life assets. This should not be confused for concepts like stablecoins which has its value pegged to another cryptocurrency, commodity, fiat currency or other real-life assets.[250] An additional illustration that can be categorized as tokenization of blockchain-native assets involves the digital representation of equity in a non-listed company through the issuance of tokens. In this scenario, the company's free float is represented by tokens and offered to investors on the blockchain. This type of transaction would effectively function as a digital, on-chain private placement of securities, exemplifying the tokenization of traditionally illiquid assets.[251]

Market participants view the tokenization of securities, including both equity and debt, as the sector with the most promising and immediate growth potential within the realm of financial assets. In teasing out the concept of tokenization and operation in a DLT, the argument must be posited that traditional financial market have always existed and conducted transactions in electronic format. Its process has equally been heavily influenced by automation.[252] The electronification also extends to the recording of property rights over securities that exist in a demetallized form. The distillable questions therefore are that since the concept of tokenization of securities envisages transforming what already exist is into digital form, then

---

Financial Stability Board (FSB) (2019), Decentralised financial technologies: Report on financial stability, regulatory and governance implications, Available at: https://www.fsb.org/2019/06/decentralised-financialtechnologies-report-on-financial-stability-regulatory-and-governance-implications/ (accessed 16 March, 2021)

[250] Stablecoins are a form of cryptoassets which tries to maintain the stability of their value relative to other assets. On further appraisal of stablecoins, see: Arner. D, Auer.R & Frost. J (2020) *Stablecoins: Risks, potential, and regulation*, Bank for International Settlements (BIS) Working Paper Monetary and Economic Department;

[251] OECD, (2020) 14

[252] OECD (2020)

what is new about the model of recording financial assets? and what significant feature does it introduce to the financial market? The OECD lucidly summarises the concept and its influence in the following words:

> *"Tokenised securities could be seen as a form of* ***cryptography-enabled dematerialised securities*** *that are based and recorded on a decentralised ledgers powered by DLTs, instead of electronic book-entries in securities registries of central securities depositories. The decentralisation of tokenised securities, coupled with the ability to* ***automatically transact and settle without trusted intermediaries****, may be where most of the disruptive potential of tokenisation lies. Tokenised securities* ***eliminate the need for the use of intermediaries or proxies in the distribution of dividends or votes****, giving investors full control of the equity they own." [Emphasis mine]*[253]

In the conversation on the tokenized securities, (equities and bonds) the distinction must be made that tokenized securities can be issued either directly on the blockchain or issued as traditional securities which are then later tokenised and issued on the blockchain. The issuance directly on the blockchain is adjudged to be simple and straightforward. This is particularly for bonds. This is because, depending on the jurisdiction, bonds are construed as bearer assets in which ordinarily no information of the ownership is recorded on them and whose possession accords ownership.[254] For equities, the issuance on the DLT may not be an easy process. This would require amendment in the jurisdiction's corporate or investment law to accommodate equity tokens issued on the blockchain to be construed specifically as such, and not as a digital representation of an existing share certificate. The state of Delaware in the US took a lead approach in this regard by incorporating two salient changes. Firstly, is the adoption of blockchain technology in recording data:

> *Any records administered by or on behalf of the corporation in the regular course of its business, including its stock ledger . . . may be kept on, or by means of, or be in the form of, any information storage device, method, or one or more electronic networks or databases (****including one or more distributed electronic networks or databases)*** *....*[255]

Secondly is that it enables companies to issue their equities in tokenised form and for tokenised equities to be recognized as evidence of ownership. [256]

---

[253] OECD (2020)

[254] This would depend on the jurisdiction

[255] S. 224 of the General Corporation Law (as amended); For a comprehensive appraisal of tis amendment see also Laster, T and Rosner, M.T (2018) Distributed Stock Ledger and Delaware *The Business Lawyer* (73) p.319-336

[256] See: Delaware State Senate (2017), Senate Bill No. 69, Act to amend title 8 of the Delaware code relating to the General Corporation Law, Available at:

While most of the issuances of the tokenised equities involve digital representation of the rights to a share, there are also issuances of tokenized equities issued directly on the blockchain. Prime example are the cases in the UK involved the admission and trading of tokenised equities issued by 20/30 on the London Stock Exchange (LSE) Turquoise platform.[257] There is also the issuance of tokenized Ethereum denominated bonds by Nivaura, which was cleared and settled on a public blockchain under the UK FCA supervisory regulatory sandbox.[258] Examples of conventional securities that were issued traditionally and then transferred on the blockchain to be tokenized is bonds issued by Daimler in conventional form and then transferred on the blockchain.[259] In the context of traditional equities, a notable example is Mt Pelerin's shares in Switzerland, which were issued in adherence to the country's regulatory framework. This case demonstrates the successful application of issuing traditional equities within the established regulatory environment of Switzerland.[260]

3.5.2. Fractionalization of Securities

One of the fascinating features of the tokenization of securities on the blockchain is that allows for fractionalization of assets. This is a feature that is not possible in traditional markets where ownership of securities is indivisible. Fractionalization as a concept, in this context, means that tokenised forms of securities can be sliced and divided into bits. This would enable investors to lay fractional claims and ownership over the securities (i.e., bonds and equities)[261]

This is an exciting feature that would benefit investors in the financial market. The argument is that it would be more advantageous for retail investors who, hitherto, are limited to a certain class of assets that they can invest in based on their capacity and risk appetite.[262] Fractionalization allows investors to access

---

https://legis.delaware.gov/json/BillDetail/GenerateHtmlDocument?legislationId=25730&legislationTypeId=1&docTypeId=2&legislationName=SB69

[257] European Business Magazine, (2019), 20|30 completes first ever Tokenized Equity Offering Issuance. Available at https://europeanbusinessmagazine.com/business/2030-completes-first-ever-tokenised-equity-offering-issuance/ (Accessed 14th March 2022)

[258] the UK 'Financial Conduct Authority (2018) *Regulatory Sandbox accepted firms*, Available at: https://www.fca.org.uk/news/press-releases/fca-reveals-fourth-round-successful-firms-its-regulatory-sandbox (accessed 9 April, 2023).

[259] Nina T (2017) *Daimler uses blockchain to issue bonds,* The wall Street Journal*,* available at https://www.wsj.com/articles/daimler-uses-blockchain-to-issue-bonds-1499895714 (accessed 14th March 2022)

[260] Mt Pelerin (2018) *The world first tokenized shares*, available at https://www.mtpelerin.com/blog/world-first-tokenized-shares (accessed 14 March 2022)

[261] UK Finance and Oliver Wyman (2023) *Unlocking the power of securities tokenization: How the UK can lead digital transformation and consolidate its role as a global financial centre,* available at https://www.ukfinance.org.uk/system/files/202307/Unlocking%20the%20power%20of%20securities%20tokenisation.pdf (accessed 20 September 2023) See Page 14

[262] for example, private equity funds.

various asset classes with lower entry requirements and reduced minimum portfolio sizes. Additionally, this approach enables investors to diversify their investment portfolios more easily within certain asset classes, whether they hold traditional or digital assets. The extent of diversification will depend on the specific method of decentralization implemented in the market.

The overarching idea is that fractionalised ownership of securities would help to promote a more inclusive financial market. Under such arrangement, small and retail investors may be motivated to participate through their ability to access a global pool of capital, which are in a way, restricted to large and sophisticated investors.[263] It is imperative to note that as access to such asset class is permitted, so also are they likely to be exposed to the risk that are attached to them. This would of course demand a higher level of protection for such class of investors. It is suggested that one of the ways to enable investors protection would probably be to limit the level of participation that retail investors can engage in, or, set a threshold where they cannot go beyond. This is reasonable in a way, because, while it offers investors access to wide pool to assets, it also extends a hand of protection by limiting their risk exposure through the creation of threshold limit.

The idea of inclusivity which fractionalisation presents can also be beneficial for firms seeking capital. The proliferation of tokenised securities would enable any class of investors, particularly retail investors to fund project of SMEs, who may, hitherto, have limited to capital pools. The broader picture here is that there would be better flow of capital from a variety of investors to corporates to finance their needs. This exchange of liquidity and risk would facilitate an efficient allocation of resources which would be beneficial for the economy.

4.5.3. Smart Contract

The concept of smart contract has been referenced in the preceding part of this work. However, its relevance in the financial market has not been analysed. It is imperative to state that at the heart of the discussion of blockchain technology is the automation of the trading process, which by implication, seeks to eliminate market intermediaries and replace their role with smart contract. This has been argued to reduce the associated cost in administering securities and drive efficiency by streamlining the market process which can lead to the reduction of settlement times.[264]

[263] Private placements of equity or debt of small and medium-sized companies (SMEs) are examples of security transactions that are traditionally restricted to large institutional investors and funds.
[264] OECD (2020) p.16

Smart contracts are embedded on the blockchain and enable certain action to be taken based predetermined factors. They are in the simpler terms, programmable codes that are activated when certain conditions are met.[265] For the financial market, the benefits are enormous. For example, it can facilitate regulatory compliance by limiting the sale of securities to residents of a certain jurisdictions when certain information collected are not in tandem with the criteria written in the contract. Also, smart contracts can be created in such a way that it can limit the number of investors that are allowed to participate in an offering. It may also limit the class of assets that investors can participate in. Such limit would have to be built into the smart contract [266]

Smart contract can also be beneficial for facilitating certain corporate actions such as the payments of dividends and coupons. It can also be used to facilitate, and the exchange of ownership interest once tokenised cash is received thus eliminating the reconciliatory process involved in traditional market cycle. As a result, the roles of registrars and transfer agents might become unnecessary, as corporate and shareholder registries could be effectively managed and represented through the blockchain. This approach streamlines the process and reduces the need for traditional intermediaries, making the system more efficient and cost-effective.[267]

On the part of the regulator, it has been posited that smart contract can be used to facilitate transparent compliance process. For instance, in enforcing restrictions and interactions with corporates automatically. Also, regulators may have the opportunity of have quasi-time information of activities on the chain which may of interest to them.

Amidst the advantages that it presents, smart contacts as a functionality of the blockchain is still evolving and its place remains to be fully captured under the relevant securities legislations in many jurisdictions. This is because the regulatory landscape of the application of blockchain is still evolving.[268] Furthermore,

---

[265] Eliza, M (2017) Smart contracts: Terminology, technical limitations, and real-world complexity. *Law, Innovation and Technology*. 9(2), 269-300.

[266] OECD (2020) p. 16

[267]Ibid. p.16; WIPRO, *Blockchain in capital market*. Available at https://www.wipro.com/content/dam/nexus/en/industries/securities-and-capital-markets/latest-thinking/blockchain-in-capital-markets.pdf (accessed 20 September 2023)

[268]In the UK however, the UK Jurisdiction Taskforce (UKJT) in a legal statement has noted that smart contract can be captured under English law. The criteria being if it fulfilled the basic tenet of a binding and enforceable legal contract between parties. See: UK Jurisdiction Taskforce, Legal statement on cryptoassets and smart contracts (2019) ("UKJT Legal Statement"), available at: https://35z8e83m1ih83drye280o9d1-wpengine.netdna-ssl.com/wpcontent/uploads/2019/11/6.6056_JO_Cryptocurrencies_Statement_FINAL_WEB_111119-1.pdf; (27 September, 2023) See also the position of the Law Commission (2021) Smart legal contract advice to government

there are lingering questions as to what extent they would take over the function of intermediaries in the market? what programme can be embedded in the contract? how would the programme be amended once they have been deployed in the case of a sudden change of event in the market?. These suite of questions requires imminent answers. The argument is that as the market evolves, and as more test cases come to light, the role and influence of smart contact would be gradually defined.[269]

From the corollary of the foregoing analysis, one position worth restating, and which is the submission here is that smart contracts may not eliminate the role of intermediaries, at least in the interim. While they would still be relevant in an automated environment, they would likely operate side by side with key legacy intermediaries. This is because these legacy intermediaries would be needed to manage certain risk which human intervention is critical for, particularly in complex areas of securities.

3.6 Spectrum of adoption of DLT in the future: From minimal change to maximum disruption

> "And for another, there are powerful forces at work against decentralization. There will always be groups that seek to concentrate power back into their own hands. They may be driven by ostensible, or even truly, altruistic motivations. They might think that they are better at running things, or that individuals would prefer some measure of central authority and organization. But they may also be driven to undermine decentralization for more self-interested reasons"[270]
>
> **William M*agnuson, 2020***

One of the most discussed points on the adoption of blockchain technology in the capital market is the extent to which the technology would disintermediate the market process.[271] Implicit in that discussion is the feasibility of blockchain capturing the entire market transaction cycle from trading to settlement. This

Available at: https://s3-eu-west-2.amazonaws.com/lawcom-prod-storage-11jsxou24uy7q/uploads/2021/11/Smart-legal-contracts-accessible.pdf (accessed 27 September, 2023). On a regional scale, the EU Data Act recognise the place of Smart contract.

[269] See: Maugeri, M (2022) Smart contracts, consumer protection, and competing European narratives of private law, *German Law Journal New Private Law Theory: Problems and Perspectives* 23(6) p 900 – 909. The author notes that smart contract can reduce litigation because they help in self-execution.

[270] Magnuson, 2020 p. 212

[271] Cheng-Te, T and Shang, S (2021) Exploring the Sustainability of the Intermediary Role in Blockchain, *Sustainability* 13, no. 4: 1936. Available at https://doi.org/10.3390/su13041936 (accessed 24 September 2023); Eva, M and Luke, V (2016) Holding, clearing and settling securities through blockchain/distributed ledger technology: creating an efficient system by empowering investors. *Journal of International Banking & Financial Law*, 31 (11) p.1742-6812

discussion is one of the focal points of this research, as it constitutes one of the standpoints to be appraised in sketching the requisite legal and regulatory standards for the Nigerian market, if it decides to adopt the technology in its market.

Interestingly, there is no single view on the extent of its application. The extent to which the technology will disintermediate the market has received a litany of polarized perspectives from several literatures, academics, regulators, industry players and policy makers. This section seeks to present the views and possibly add to the collection of opinions on the matter based on the uniqueness of emerging markets in Africa.

In contextualizing the discussion, it is important to point out that there are two extreme views. On the one hand, one of the views envisages minimal changes in the market infrastructure wherein market intermediaries would be retained, and the technology be allowed to interoperate with existing market infrastructure, thus creating a 'quasi-decentralized system'. The other extreme vision, which at the time of this work is yet to be tested, is that blockchain would completely envelope the market cycle thus creating a situation whereby the issuers and investors would operate completely independent on the blockchain with all market intermediaries rendered redundant. This would be considered the 'utopia state'. Somewhere in the middle of these visons on the applicability of the blockchain is the argument on which market intermediary should remain depending on their relevance, what role they would play and how they would interoperate with the technology.

A disruptive feature and probably the most unsettling for legacy market intermediaries is the decentralized mechanism of the blockchain and its grand proposition to operate completely without any central intermediary. This has trumped up a lot of concerns given how embedded legacy market infrastructures are in the market cycle and the way the technology would apply. The chief question of concern is whether the technology would be adopted in a gradual and systematic manner or will it be overhaul and immediately replace the legacy system of operation. This question is out there to evaluate.

Following this train of thought, a comprehensive vision of the possibilities of the application DLT/blockchain technology was painted by the World Economic Forum (WEF) which helps to guide the discussion under this section. It portrayed five possible case scenarios ranging from minimal changes to a complete replacement of the legacy system.[272]

[272] WEF (2021) p. 27

The first scenario envisioned that the current centralized market intermediaries will continue to operate, however, the technology and its embedded feature - smart contracts - will help to drive innovation. This scenario appears to be one of the popular positions canvassed by the industry. As previously posited, this model could be argued to be plausible because of the novelty of the technology and how embedded legacy intermediaries are in the market. A systematic and gradual application of the technology would be a convenient approach. This would be a case where the technology would have to operate side by side with existing market infrastructures in the interim. This would be a more comfortable starting point, particularly for emerging markets in Africa who may not have all the technological and regulatory apparatus to fully onboard the technology. They would need to interoperate and grow into it until such a time when the markets are mature and comfortable enough to allow the technology take complete control.

The forgoing position appears to be forthright because any proposition of a complete overhaul at the initial stage would face stiff resistance. Furthermore, this aligns with the submission of Priem who noted that markets may not be willing to phase off their investment in legacy technologies at such an immediate pace.[273] This position was echoed by the International Securities Services Association (ISSA) who noted that DLT and legacy infrastructure may coexist for a foreseeable future.[274] The German Banking Industry Committee puts an estimate to it be noting that they may operate together for the next 20 to 30 years.[275]

In connection to this argument, it has been suggested that the attention of the technology should be applied in areas of the market that is the most inefficient. This would be typically the post-trade segment which encapsulate the clearing and settlement. This is an area that has several reconciliatory process and long custody chain. The innovation of DLT/blockchain technology and smart contract can help to streamline the market process and drive efficiency.

Another potential scenario involves buyers and sellers executing trades through stockbrokers at the initial stage. Following the trade, a transaction would be created to transfer the corresponding amount of the asset. This transaction would then be transmitted to the network for verification and validation, ensuring the secure and accurate exchange of assets between parties. This may be a comfortable approach for

[273] Priem (2020) p.3

[274] ISSA (2019) Crypto assets: moving from theory to practice. Available at https://issanet.org/content/uploads/2019/11/2019-11_ISSA_Report_Crypto Assets_Moving_from_Theory_to_Practice.pdf (accessed 17 September, 2023)

[275] German Banking Industry Committee (2016) Response to the consultation on the distributed ledger technology applied to securities markets. http://www.esma.europa.eu/file/19543/download?token=g3KSQ0B2

markets where the investors are unsophisticated and may need time to understand the workings of the technology before been completely left alone to interact fully on the blockchain. [276]

It is argued that while the forgoing vision is plausible, it runs contrary to the overarching objective of DLT/blockchain technology which seeks to bring transparency and remove control from central intermediaries. The questions that such arrangement raises is that If centralized intermediaries are to co-exist with the technology, what influence would that have over the technology? and who drive the operation of such technology?. While these questions require clarity in the future, it can be posited that this arrangement or vision may be a convenient approach for advanced markets because of the market intermediaries have better compliance to the rule of law in terms of custody of assets and governance. For emerging markets in Africa, the same cannot be easily said because there is the tendency that if governance and control is given to them there is possibility to manipulate the system.

Before wrapping up this point, it should be established that the regulators' role in this vision would be enhanced. For instance, they should be able put in place mechanisms to ensure that the quality of data imputed in the blockchain is robust. This is because the blockchain does not resolve issues of quality of data. Inputting data of poor quality can lead to a transparent, unchangeable, and time-stamped repository of unreliable or inaccurate outputs. In other words, even though the data may be stored securely and transparently using technologies like blockchain, the end results will still be flawed if the initial data is not of high quality. [277]

The second vision which the WEF noted is that markets in the issuance of digital native securities, which are alternatively called security tokens may develop in parallel with existing securities market, however, this would be led by central infrastructures and other institutions.

This vision can also be argued to be a plausible one. This is premised on the fact that as its stands, some markets in developed and emerging economies have countenanced the issuance of tokens native to the blockchain to qualify as securities provided that are done in compliance with existing securities law. From an international outlook, the trend has become for regulators to regulate exchanges and custodians of virtual assets from the perspective of protecting investors against misconduct. The intendment is to

[276] Peters GW, Panayi E (2015) *Understanding modern banking ledgers through blockchain technologies: future of transaction processing and smart contracts on the internet of money.* Available at SSRN: http://dx.doi.org/10.2139/ssrn.2692487 (accessed 24 September, 2023). See the vision painted by the authors in pages 27 -28. In summary, the authors envision the possibility of a consortium blockchain that would influence every stage of the trading cycle from trade to settlement.
[277] OECD (2020) p.

possibly to increase the level of confidence that investors in them and maintain the integrity of the financial system.[278]

There are examples of this. For instance, in the UK, a token will be classified as a specified investment and be subject to existing laws where the tokens share similarities with a traditional securities like shares or debentures.[279] To further amplify this, the UK notes that token issuances and custodians are regulated under its money laundering regime. [280]

In the US, bit licences are granted by the New York State's Department of Financial Services to persons who intend to engage in virtual currency business Activity. [281] In Cyprus, its Securities and Exchange Commission sought to adopt the approach of the European Securities and Markets Authority where it noted that ICOs should comply with the regulatory perimeter that govern securities where the tokens qualify under the definition of financial instruments.

Also, in Singapore, the Monetary Authority of Singapore (MAS) grants digital payment token services licenses under the Payment Services Act (PSA). This license covers activities such as providing services that enable the buying and selling of any digital payment token in exchange for money or other digital payment tokens.[282] Similarly, in Hong Kong, the Securities and Futures Commission (SFC) grants licenses to virtual assets service providers (VASPs). This regulatory framework oversees the activities of centralized online trading platform operators that facilitate security token trading[283]

The foregoing examples point to the fact that as more jurisdictions recognize the issuance of tokens by private institutions, there is the possibility that in the long run, to ensure better coordination, regulators

[278] For instance, under paragraph 4.1 (I) (J) of the Nigerian SEC rules for Virtual Asset Providers, person seeking to register as a virtual asset provider are required to be submit to SEC the rules of the entity is seeks to operate which would contain satisfactory provisions for the protection of investors and the interest of the public.

[279] See the HM Treasury (2023) The Future financial services regulatory regime for cryptoassets: consultation and call for evidence.

[280] FCA (2023) Cryptoassets: AML/ CFT regime available at: https://www.fca.org.uk/firms/financial-crime/cryptoassets-aml-ctf-regime (accessed 7 October 2023). In that regulatory statement, the FCA noted empathically that cryptoassets business, under which security tokens loosely falls under, would need to be registered with the FCA under Money Laundering, Terrorist Financing and Transfer of Funds (Information on the Payer) Regulations 2017.

[281] 23 NYCRR 200.2 (q) and New York State Department of Financial Services 23 NYCRR Part 102, *Virtual Currency Licensee Assessment*

[282] Monetary Authority of Singapore, *how are digital payment token services regulated in Singapore,* available at: https://www.mas.gov.sg/-/media/MAS-Media-Library/who-we-are/mas-gallery/MAS-Gallery/Digital-Payment-Tokens.pdf (accessed 7 October 2023)

[283] Securities and Futures Commission (2023) *Guidelines for Virtual Asset Trading Platform Operators* available at: https://apps.sfc.hk/edistributionWeb/api/consultation/conclusion?lang=EN&refNo=23CP1#page=31 (accessed 24 December 2023) See precisely page 31.

may transfer their control to centralized intermediaries. The argument is that this would eliminate the situation where you have proliferated exchanges. The legitimacy that centralized infrastructures have in the traditional market would help to guarantee the integrity of such issuance. It can avoid the situation where the exchange enters a liquidity crunch as was the case of the FTX exchange.[284]

However, the question that needs to be answered is that what is the essence of having centralized intermediary exercise control of these private issuance if the overall intent of blockchain technology is to reduce or eliminate the input of these intermediaries? Apparently, there are more questions than answers here.

The third vison painted in that document is that centralized infrastructures providers may begin to re-platform for DLT solutions across the market. According to it, participants would increasingly begin to transform their operations in order to realize the benefits. This is a scenario that has been pictured by some authors. Priem suggests that trading venues could potentially develop their own Distributed Ledger Technology (DLT) solutions for clearing and settling transactions, effectively bypassing the need for Central Counterparty Clearing Houses (CCPs) and Central Securities Depositories (CSDs). By integrating DLT into their existing infrastructure, trading venues could streamline operations, increase efficiency, and reduce costs associated with traditional clearing and settlement methods. [285] The International Securities Services Association (ISSA) shares a similar view. It anticipates the possibility of market forces driving the creation of multiple ledgers or DLT systems. Some of these systems might integrate issuance, trading, and settlement functions, while others could specialize in settlement alone. This diversification of DLT-based solutions could cater to the specific needs of various market participants, fostering innovation and competition within the financial industry.[286]

Interestingly, the foregoing position coincides with the current framework laid out by the EU under its latest DLT pilot regime for financial market. Under that regulation, the EU stated three methods through which DLT will apply in its financial market. The first is that authorized investment and market operators can apply to operate a DLT multilateral trading facility. The second scenario involves authorized central securities depositories applying to operate a Distributed Ledger Technology (DLT) securities settlement system. This approach would integrate DLT into the existing securities settlement infrastructure, potentially enhancing

[284] The Guardian (2022) *What happened to FTX and could the crisis spill over to the rest of crypto?* available at: https://www.theguardian.com/technology/2022/nov/10/what-happened-to-ftx-and-could-crisis-spill-over-to-rest-of-crypto (accessed 24 December 2023)
[285] Priem (2020) 2
[286] ISSA (2021). The Future of Securities Services in a DLT Environment. International Securities Services Association.

efficiency and security in the settlement process. The third scenario combines elements of the first two, with both groups applying to operate a combined DLT trading and settlement system (DLT SSS). This comprehensive system would utilize DLT for both trading and settlement activities, offering the potential for further streamlining and integration of key market functions.[287]

While the foregoing vision appears to be a more realistic approach, the operational efficacy can be questioned. This is because if any authorized firm can apply to operate a DLT MTF this would lead to a proliferation of DLT ledgers in the market. The implication is that it would increase the regulatory burden of the regulators as opposed to having a recognised operator of a CCD trading venue. In the current market regime, market regulators know the market infrastructures and set rules to govern their respective activities. However, in such scenario as envisioned under the EU pilot regime, the regulator would have to ensure that guiding principles of operations are compiled by investment firms. The second approach where central securities depositories would operate the DLT also means that existing market infrastructure would have an input in the running of the ledger. This would be antithetical to the utopian ledger where the no central intermediary is needed to have control of market transactions. The issues highlighted in the foregoing can also be visible in the third vision approach where both groups could apply operate a DLT trading and settlement. For authorized firms, the issue may be more complex because the implication of such regime is that it gives them oversight of settlement process: a role that they may not be traditionally conversant with. [288]

In practical terms, what the third vision envisages is that governance and control still resides with the intermediaries. To effectively carry out their role, intermediaries will have to ensure that they can be trusted and can comply with securities rules. This approach may be problematic for emerging markets in Africa where the level of accountability of market intermediaries are still questionable.

The fourth perspective envisions Distributed Ledger Technology (DLT) as a catalyst for substantial disintermediation of existing infrastructure providers, ultimately leading to a predominantly decentralized market.[289] This vision also tilts towards the extreme vison. However, such vision may envisage a situation where the transaction phase and the post trading phase become largely intertwined. The implication of such is that market infrastructures would be significantly reduced.[290] Another case scenario would be where

[287] Regulations (EU) 2022/858 of the European Parliament of the Council (2022) Pilot Regime for Market Infrastructures Based on DLT, *Official Journal of the European Union* L 151/1-33
[288] Ibid.
[289] WEF 2020) Supra p.
[290] Peters GW and Panayi E (2016) Understanding modern banking ledgers through blockchain technologies: future of transaction processing and smart contracts on the internet of money. Springer, Banking beyond Banks and Money

trading venues develop their method of clearing and settlement using DLT, thereby rendering the role of CCP and CSDs irrelevant. This would create a situation where the market is largely and significantly disintermediated. However, this method is contentious, as there is the wide proposition that the adoption of the technology would be implemented on a gradual basis rather than a complete overhaul through such mechanism.

The last vision is as previously referred to, a utopian one. Here, there is complete disintermediation of the market transaction cycle. This envisions a radical shift of market transaction to the blockchain. It offers the opportunity for investors and issuers to relate directly on the blockchain without any intermediary.[291] As at the time of writing this, there is no known case of this application. But as have been argued in this work, it may take a long time to attain this stage. One issue that may come up in such environment is investors protection. This is more of a concern for retail investors who may not be sophisticated with trading without guidance on the chain. This concern is further highlighted in emerging markets in Africa that is characterised with weak investors protection regime. Retail investors may need the guidance of market intermediaries who may act as a shield against market risks that they may be exposed to.[292]

As a concluding statement, whilst these visons are being tested or yet be tested, the market is waiting to see how DLT/ blockchain technology would develop. Countries are learning from the experiences of others while being mindful of the maturity of their financial market in adopting the technology.

3.6.1 Blockchain in derivatives market: Spectrum of application

The derivatives market is an integral component of the capital market and the financial system. They are interconnected because changes in the capital market can impact the value of derivatives, and derivative instruments can be used to manage risks arising from capital market investments. Derivates market involves trading financial instruments, such as futures, options, and swaps, which derive their value from an underlying asset like stocks, bonds, commodities, currencies, or interest rates. These instruments enable participants to manage various financial risks, including interest rate risk, currency risk, and commodity price risk. Besides risk management, the derivates markets enables price discovery and offer investors exposure to additional assets or strategies that may not be directly available in the capital market.

According to the Bank for International Settlements (BIS), the gross market value of outstanding over-the-counter (OTC) derivatives, which includes both positive and negative market values, increased by 13% in

[291] ISSA (2019) p. 10
[292] Priem, R. (2020)

the second half of 2022, reaching $20.7 trillion at the end of the year. This growth was primarily driven by interest rate derivatives amid higher inflation and rising rates.[293] The market value of commodities derivatives, however, experienced a decline of 45% during the same period, which can be attributed to a drop in energy and food prices. The overall increase in the gross market value of outstanding derivatives can be seen in the context of globally higher inflation and policy rate increases during the second half of 2022. This measure of market value has not reached such levels in the preceding six years. While Equity- and credit-linked derivatives evidenced lower number in volume, they are still reckoned as essential for many investors.[294] The foregoing statistics shows the growing pace of the derivates markets and key component of the capital market.

Before discussing how blockchain can influence the market, it is important to highlight that the derivates markets possess key distinguishing characteristics. Derivatives can be traded either on exchanges or over-the-counter (OTC). Exchange-traded derivatives are centrally cleared, whereas OTC derivatives can be settled bilaterally or through central clearing counterparties. Exchange-traded and centrally cleared OTC derivatives often use standardized contract terms, while uncleared OTC derivatives tend to be more customized. While electronic trading has been common in exchanges, OTC derivatives trading has increasingly shifted towards electronic platforms.

Having established the forgoing, it should be pointed out that the current state of derivatives trading and settlement presents several challenges that can result in operational inefficiencies, increased costs, and errors. These pain points have semblance with what is obtainable in the equities and fixed income markets. For instance data repositories for derivatives contracts are maintained separately by different financial institutions thus necessitating ongoing reconciliation efforts that can lead to substantial errors.

Furthermore, transactions are still manually processed. This means that manual intervention is often required for continuous valuation, maintenance, and reporting of ownership records. This can result in discrepancies and increased operational workload. Additionally, there is the issue of margin management. This is of concern because manual processing associated with managing margin obligations across multiple

[293] Bank for International Settlements (BIS). (2023). 'Global OTC derivatives market sees sustained activity in the second half of 2022', BIS Quarterly Review, March 2023. [Online]. Available from: https://www.bis.org/publ/qtrpdf/r_qt2303.htm [Accessed: 26 April 2023]; Bank for International Settlements (BIS). (2022). 'OTC derivatives statistics at end-June 2022', BIS Quarterly Review, December 2022. [Online]. Available from: https://www.bis.org/publ/qtrpdf/r_qt2212.htm [Accessed: 26 April 2023].

[294] Ibid. According to the Bank for International Settlements (BIS) as of the end of June 2022, the notional amount of outstanding equity-linked derivatives contracts was approximately $6.2 trillion. This represents about 5% of the total notional amount of all outstanding derivatives contracts. For credit-linked derivatives, as of the same date, the notional amount outstanding was about $2.6 trillion, which equates to roughly 2% of the total notional amount of all outstanding derivatives contracts. [Please note that these figures represent the notional amounts, which can be significantly different from the actual market value of these derivatives due to factors like leverage and netting.]

systems or depositories can be complex and time-consuming. Lastly, there is the possibility of trade failures in OTC derivatives. Research has shown that OTC derivatives have a 2% failure rate globally, leading to significant costs for the industry.[295]

However, distributed ledger technology (DLT), such as blockchain, presents promising solutions to address these challenges in a number of ways. For example, DLT can constitute a single source of truth. In such instance, DLT can create a shared, immutable ledger of derivatives contracts, enabling better position management and automation throughout the contract lifecycle.

Derivatives transactions can benefit from the automative power of smart contracts. Smart contracts can automate manual processes, such as valuations, reporting, and verification, reducing the likelihood of errors and discrepancies while streamlining operations. By leveraging DLT and smart contracts, the derivatives market can potentially achieve greater efficiency, reduced operational costs, and enhanced transparency. These improvements would benefit all participants, including financial institutions, investors, and regulators.[296]

3.6.1.1 How would DLT influence the derivates market?

There a number of ways that DLT can influence the derivates market. They include:

I. **DLT would constitute the platform for OTC derivatives post-trade**

Several market participants are actively engaged in developing distributed ledger technology (DLT) tools to enhance the servicing of securitized products and underlying loans. These initiatives aim to create a targeted ecosystem that can foster faster development and deliver efficiencies throughout the value chain. The degree of change brought about by these DLT solutions can be characterized as a narrow focus, primarily targeting OTC post-trade, re-platforming, collateral management, and trade lifecycle aspects within the broader value chain.

For instance, companies like Symbiont, Digital Asset Holdings, and R3 have been working on DLT-based platforms to improve the efficiency of derivatives trading. In one example, Symbiont's Assembly platform uses smart contracts and a shared ledger to streamline the entire trade lifecycle, from trade execution to settlement.

[295] WEF (2021) p 65

[296] Chishti, S., & Barberis, J. (2016). 'The distributed ledger technology and blockchain: A framework for impact assessment', Journal of Payments Strategy & Systems, 10(3), 245-257. [Online]. Available from: https://doi.org/10.1108/JPPS-06-2016-0027 [Accessed: 26 April 2023].

In comparison to the current state of operations, DLT implementation brings forth major changes, such as: The transition from traditional, fragmented data sources to a centralized platform for booking trades using standardized contract terms. This new approach allows parties to verify trade details digitally, fostering a single source of truth for derivatives positions. For instance, Digital Asset's platform enables participants to view and verify the same data simultaneously, reducing the need for manual reconciliation. Streamlining daily valuation calculations and event processing through the automation of shared position data and reference data, leading to minimized discrepancies and reduced reliance on manual reconciliation. An example of this can be seen in R3's Corda platform, which leverages DLT to automate post-trade processes and manage the lifecycle of financial agreements.

While the potential benefits are substantial, the adoption of DLT-enabled solutions may also present certain challenges that need to be addressed. These include the reliance on manual reconciliation for error identification in the current system may require significant change management efforts to transition to DLT-based solutions. For instance, transitioning from legacy systems to DLT platforms may involve extensive system upgrades and staff training. Another concerning challenge is that parties involved in the process must establish and adopt new, robust mechanisms for verifying contract terms as trades are booked and smart contracts are created. An example of this challenge can be seen in ensuring that the legal enforceability of smart contracts is equivalent to traditional contracts.

Successful implementation of DLT solutions for servicing securitized products and underlying loans can yield several advantages, including reduced likelihood of errors and trade failures, simplified operations, and greater transparency of derivatives positions and calculation logic for all involved parties. Examples of such benefits can be found in the aforementioned initiatives, where DLT platforms have demonstrated the potential for streamlined post-trade processing and enhanced data accuracy in the derivatives market.

ii. **Re-platforming existing infrastructure on DLT**[297]

Re-platforming existing infrastructure using Distributed Ledger Technology (DLT) primarily focuses on transforming specific components of the derivatives infrastructure, such as DTCC's Trade Information Warehouse for credit default swaps. This targeted approach concentrates on four key aspects: OTC post-trade, re-platforming, collateral management, and trade lifecycle.

[297] WEF (2020) p. 64

By re-platforming, a shared distributed ledger is established for derivatives contracts, ensuring that all participants have continuous access to an identical copy of relevant data. This new system employs smart contracts to automate and share workflows across institutions for life-cycle/credit events, ongoing clearing/netting, and payment calculations.

Re-platforming on DLT offers several potential advantages. It increases transparency for all participants, potentially improving risk management across the board. Additionally, it reduces operational burdens by eliminating the need for reconciliation activity or minimizing operational complexity, lowering operational expenses and potentially reducing transaction costs for all parties involved.

However, re-platforming on DLT presents challenges. Transitioning an entire market to a new infrastructure can be complex and limited by specific institutions. Integrating the new DLT-based system with other critical infrastructure and data systems can also pose difficulties.[298]

In summary, transitioning the derivatives infrastructure to DLT-based systems, as seen with DTCC, can result in increased efficiency and cost savings in the long term. While this process may face obstacles, the potential benefits make re-platforming an appealing prospect for infrastructure providers and market participants alike.

III. **DLT would constitute platform for managing collateral for cleared derivatives**

Distributed Ledger Technology (DLT) presents a promising solution for managing collateral in the derivatives market, specifically addressing the challenges related to margin requirements and the collateral workflow across central counterparties. Traditionally, brokers and custodians have relied on manual coordination across various systems to facilitate margin payments, which is often time-consuming and costly. However, DLT-based systems can offer faster, synchronized processing across institutions, streamlining these processes and bringing numerous benefits.[299]

Several institutions are currently developing DLT-based solutions for collateral management in cleared derivatives. For instance, Baton Systems has partnered with JPMorgan, Citi, SGX, and other stakeholders to develop a platform that focuses on automating margin and collateral workflows with derivatives clearing houses. This platform integrates seamlessly with existing treasury systems, enhancing efficiency and

[298] Ibid

[299] Baton Systems. (2022). Baton Systems – Transforming the post-trade environment with distributed ledger technology. Available at https://batonsystems.com/ (accessed 17 August 2023)

streamlining post-trade processes.[300] Another example is the collaboration between Bolsa de Valores de Colombia and Contrato Marco, aiming to automate margin and collateral workflows for OTC derivatives.

The implementation of DLT in collateral management entails a narrow focus on the challenges of margining in derivatives clearing within the broader context of OTC post-trade, re-platforming, and trade life cycle management. This approach introduces some major changes to the current system, including centralized visibility of an institution's collateral and margin obligations, automation of margining and collateral workflows using smart contracts, and direct integration of collateral and payment instructions into optimization systems.

These proposed changes bring potential benefits, such as significant operational efficiencies through end-to-end automation, better optimization of collateral and cash balances, and reduced risks and costs associated with manual processing. However, these platforms' success largely depends on integrating as many central counterparties as possible and addressing speed limitations imposed by existing payment rails.[301]

Overall, DLT-based platforms for collateral management in cleared derivatives hold the potential to revolutionize operations and reduce costs for institutions involved in the derivatives market. As these platforms continue to develop and integrate with other systems, they could contribute to a shared digital record of all aspects of a derivative transaction post-trade.[302]

IV. **DLT Platform for Exchange-Traded Derivatives Lifecycle**

Distributed Ledger Technology (DLT) holds the promise of transforming the management of exchange-traded derivatives (ETDs) by providing real-time visibility of margin requirements and streamlining collateral workflows across central counterparties. A notable example of this cutting-edge technology is the STACS Mercury Platform, developed by BNP Paribas Securities Services and Eastspring.[303]

The Mercury Platform enables Asset Managers, Middle Offices, and Brokers to overcome critical challenges in the ETD trade lifecycle management through its real-time trading fee calculation platform. The

[300] Ibid

[301] Bolsa de Valores de Colombia. (2022). BVC Trading Platform for OTC Derivatives. Available at https://www.bvc.com.co/ (accessed 17 August 2023)

[302] Ibid

[303] Ishan, B. (2021). BNP Paribas Securities Services and Eastspring, via STACS' Mercury Platform, achieve 84% reduction in trade breaks for exchange traded derivatives (ETD) transactions in Singapore. Securities Services. Available at from https://securities.bnpparibas.com/news/news-b941d2db39a4e4219d4f6e742e47c169.html (accessed 13 July 2023)

complexities of ETD contracts often result in multiple trade breaks and hours of reconciliation work due to the necessity for various inputs to calculate broker fees. The platform's innovative use of blockchain technology provides centralized and transparent real-time ETD data to tackle these inefficiencies[304]
Launched in June 2020, the first phase of the Mercury Platform roll-out yielded an impressive 84% reduction in trade breaks and a significant four-hour per day decrease in non-value-added reconciliation work for Eastspring and BNP Paribas Securities Services. The platform's shared ledger approach to trade capture minimizes the need for trade matching across disparate systems, ensuring an increased level of transparency for all parties involved in the trades[305] (STACS, 2021).

By focusing on a narrow aspect of derivatives infrastructure and targeting specific components within the value chain, the Mercury Platform successfully demonstrates how DLT-based solutions can transform the management of exchange-traded derivatives. The platform's innovative features provide substantial benefits to its users, including the reduction of trade breaks, enhanced transparency, and accelerated trade matching and enrichment. However, to fully leverage its potential, effective integration with both DLT-based and traditional post-trade systems remains crucial[306]

In conclusion, the successful collaboration between STACS, BNP Paribas Securities Services, and Eastspring showcases the transformative potential of DLT-based solutions in addressing the challenges within the complex world of ETDs. This pioneering effort is a testament to the significant efficiency gains and cost reductions that DLT-based platforms can bring to institutions operating in the derivatives market.

3.7. Should DLT be adopted in financial markets? Key considerations for market operators

A central question on the application of blockchain technology in financial markets is whether the technology should be adopted. This question is usually guided by some considerations by the market operators and regulators. They are required to weigh the benefits and risks of adopting such technology in comparison with the legacy system. This is very important to avoid the situation which played out in Australia where its bourse had to halt its audacious quest to replace its legacy post trade settlement system with blockchain technology. Such move resulted into a colossal loss of about A£250 million after the replacement attempt failed due factors such as the complexity of the technology, among others. The failed attempt saw the bourse admitting that its legacy settlement system was still secure, stable and

[304] STACS. (2021). Eastspring Investments & BNP Paribas Securities Services achieve 84% reduction in trade breaks using STACS' Mercury Platform. [Press release]. Available at https://stacs.io/blog/eastspring-investments-bnp-paribas-securities-services-achieve-84-reduction-in-trade-breaks-using-stacs-mercury-platform (accessed 13 July 2023)
[305] Ibid.
[306] Ishan, B. (2021)

performed well. This by implication meant that there was no need in the first instance to have replaced its legacy technology.[307]

From a broader perspective, financial market infrastructure entities, such as exchanges, consistently seek to enhance key aspects like trade concentration, liquidity levels, and transparency in both pre-trade and post-trade phases. The ultimate goal is to drive efficiency and minimize transaction costs. This constant pursuit of improvement serves as a motivating factor for the adoption of cutting-edge technologies within the financial sector.[308]

Given the extensive attention and excitement surrounding blockchain technology across various industries, there is a risk of overestimating its potential benefits and applications. This could incentivize market infrastructure operators to adopt DLT-based solutions without a clear and proven rationale. To ensure meaningful application of DLT-enabled use cases in financial markets and other sectors, it is crucial to establish a solid business case for its implementation. Key questions must be addressed, including whether the adoption of blockchain technology effectively solves an existing business problem, whether there are gaps in trust or safety that DLT can address, and if there is significant potential for disintermediation. Additionally, potential efficiency gains and a comparison of DLT-based use cases to traditional solutions should be carefully considered. By answering these questions, stakeholders can make informed decisions about the value and feasibility of integrating blockchain technology into their operations.

In the context of adopting blockchain technology in financial markets, asset tokenization is a necessary step for enabling functionality on the blockchain. However, a strong business case must be established to justify the use of decentralization and blockchain.[309] This requires assessing whether the adoption of Distributed Ledger Technology (DLT) will result in tangible benefits such as cost reductions, increased efficiency, enhanced safety, improved resilience and trust, reduced complexity, and disintermediation. Tokenization of assets is likely to be most impactful in markets where there are significant opportunities for efficiency gains in terms of cost, speed, process simplicity, and reduced intermediation, or in markets characterized by a lack of trust. Careful analysis of these factors is essential for determining the viability and potential benefits of transitioning to DLT-based solutions within financial markets.

---

[307] See: Fidelis, N (2022) *Australian stock exchange apologises for dropping botched blockchain upgrade* Available at https://www.ft.com/content/029dd01f-eaf5-493c-b195-299408b62469 (Accessed 10 April, 2023).

[308] see: Moloney, N., Ferran, E., and Payne, J. (eds.) (2015) *The Oxford handbook of financial regulation*. Oxford University Press p. 569 -581. This section gives detailed analysis on the main concerns necessitating the regulation of exchanges and post-trade market infrastructures

[309] OECD (2020) *The Tokenization of Assets and Potential Implications for Financial Markets* OECD Blockchain Policy Series at page 22

The widespread adoption of asset tokenization may be more easily achieved in markets with limited liquidity and significant intermediation, such as private placements of non-listed securities, participation in private limited liability companies, small-scale bond issuances, or the tokenization of private equity and venture capital funds. In these markets, the potential efficiency gains from adopting asset tokenization are more apparent. Conversely, the adoption of asset tokenization for public equities in developed economies necessitates a careful consideration of the costs and benefits, especially given that these markets already possess high levels of trust among participants and are supported by fast, safe, and efficient processes. As such, the incremental efficiency gains from transitioning to tokenization may be relatively small. Nonetheless, the advanced technological infrastructure of these markets could potentially accelerate the adoption of tokenization.

A second factor to consider is the need for a technical feasibility assessment to demonstrate that Distributed Ledger Technology (DLT) offers substantial advantages over existing technologies.[310] Premature adoption without such an evaluation can be detrimental, potentially leading to significant financial losses due to the high costs associated with transitioning from legacy systems to blockchain technology. [311]

A third consideration is the economic rationale for transitioning to DLT. [312] Stakeholders must establish a proven and quantifiable economic justification for adopting the technology. For instance, market operators and regulators must determine whether implementing blockchain technology will result in reduced transaction costs, ensuring that the benefits outweigh the expenses associated with the transition.

Thorough assessments and quantification of both technical feasibility and operational cost efficiencies resulting from disintermediation in post-trade processes are yet to be fully realized through real-world applications. Potential obstacles to achieving the theoretical cost efficiencies of DLT-based clearing and settlement may include incomplete DLT integration throughout the post-trade process and the continued need for back-office reconciliation. Additionally, if related activities like securities lending or derivatives do not utilize the same technology, the full scale of efficiencies may not be achieved.[313]

[310] Ibid p. 22
[311] Ibid p. 22; Iansiti, M., & Lakhani, K. R. (2017). The truth about blockchain. *Harvard Business Review*, 95(1), 119–127.
[312] OECD (2020) p. 22
[313] Ibid.

Notably, the technical feasibility of asset tokenization is currently being tested in various major jurisdictions within controlled environments such as regulatory sandboxes and FinTech Hubs facilitated by central banks and other regulatory institutions. These trials enable participants to engage with regulators, comprehend the requirements for each use case, and evaluate the operational viability and readiness of their products. Moreover, sandbox participation allows innovative companies to gain regulatory clarity during their business lifecycle, ensuring better understanding and interpretation of regulatory requirements, as well as preparing for supervision and reporting during their operation.[314]

3.8. Adoption of Blockchain Technology in the UK Capital Markets: An appraisal of its Regulatory Approach[315]

The United Kingdom capital market is one of the oldest, leading, enviable, and most developed market across the globe.[316] These remarkable features rests on its strong and robust regulatory framework. A 2021 global regulatory outlook indicates that the UK has the most preferred regulatory regime for financial services amongst its contemporaries in the world.[317] Interestingly the report ranks the UK (31%) above countries like the US (25%), Singapore (25%), Hong Kong, Germany France and Japan.[318] The foregoing statistics is unsurprising when one considers the fact that English law has since time immemorial been a strong preference for governing international financial transactions and the resolution commercial disputes.[319] The strong preference is attributed to a number of reasons such as the stability of its financial

[314] Ibid

[315] Note that the appraisal is not limited to this section. More comparative analysis is done in subsequent sections of the work and in Chapter 6 which provides for recommendations.

[316] The Global City & HM Treasury (2022) *State of the Sector: Annual Review of the UK Financial Services 2022* Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1092788/State_of_the_sector_annual_review_of_UK_financial_services_2022.pdf (21 October, 2022) (Discussing the state of the UK financial sector) Some remarkable features noted in the paper of the UK financial sector are as follows: it has 117 companies listed on the Floor of the London stock exchange; Over £37bn was secured by Private equity and venture capital funds only in 2021; it actively monitors aa wide range of market activities i.e., initial public offerings (IPO): Equity markets; Over-the-counter (OTC) derivatives; Private equity (PE) and venture capital (VC) investment and Domiciled funds. The UK is adjudged the world's largest centre for OTC. The UK insurance sector is comparatively more important than major European economies i.e France and Germany.

[317] Ibid at p.29 The report ranks the UK (31%) above countries like the US (25%), Singapore (25%), Hong Kong (7%) Germany (2%) France (1%) and Japan (0%). For further information on this see: Kroll (2021) *Global Regulatory Outlook* 2021 Available at: https://www.kroll.com/en/insights/publications/financial-compliance-regulation/global-regulatory-outlook-2021 Accessed (21 October 2022)

[318] The methodology used to arrive at this was based on a survey that was conducted across leading financial centers in the UK, US, EU China and India. The survey extracted inputs from 250 senior executives working a cross different sectors of financial services I.e., s banking, asset management, hedge funds, private equity, broker-dealers amongst others.

[319] Wood, P (2009) *Law and Practice of International Finance*, Thomson Reuters, London

system, its experience in settling high level financial transactions, the predictability of its governing law, independence of its judiciary, speed in resolution of commercial disputes, among others.[320]

The work uses the UK as a reference point to prove the hypothesis that a strong and robust regulatory framework is a precondition for the adoption of blockchain technology in the Nigerian capital market. It draws inspiration from the UK and posits that it has a supportive regulatory environment for the application of blockchain technology in its capital market. This arises from a number of reasons. Firstly, the UK financial market has been typified by its progressive regulatory posture towards embracing new and emerging technologies to ensure that it functions effectively across every aspect of its market ecosystem. Complementing these efforts is the UK's supportive regulatory environment, widely recognized as the bedrock of its FinTech accomplishments and initiatives. Spearheaded by the Financial Conduct Authority (FCA), this approach has not only fostered innovation within the domestic financial sector but has also served as a model for regulatory bodies around the world seeking to adapt and evolve alongside emerging technologies. For instance, the FCA has championed the path by developing and implementing world-leading initiatives such as the regulatory sandbox[321], digital sandbox, Tech Sprints and thought leadership pieces on topics such as crypto assets and machine learning. This is complemented by its cross border collaboration. For instance, the UK FCA championed the creation of The Global Financial Innovative Network. It is an initiative that was developed out of the need to create a global regulatory sandbox that will enable firms to interact with regulators and help them understand the requirements of different jurisdictions as they scale their ideas. As noted by the FCA, the initiative will give firms that "ability to conduct a cross-border test – a solution for firms wishing to test innovative products, services or business models across more than one jurisdiction"[322]

The second reason is that it is one of developed markets that is pushing aggressively for the deployment of DLT solutions in its capital market and the tokenization of securities.[323] At the back of its intent are

[320] Ibid.

[321] For instance, the UK FCA championed the creation of The Global Financial Innovative Network. It is an initiative that was developed out of the need to create a global regulatory sandbox that will enable firms to interact with regulators and help them understand the requirements of different jurisdictions as they scale their ideas. As noted by the FCA, the initiative will give firms that "ability to conduct a cross-border test – a solution for firms wishing to test innovative products, services or business models across more than one jurisdiction". See: FCA (2023) *Global Financial Innovation Network (GFIN)* available at https://www.fca.org.uk/firms/innovation/global-financial-innovation-network (accessed 20 May 2023); GFIN, *Cross-Border Testing*, available at https://www.thegfin.com/crossborder-testing (accessed 20 May 2023).

[322] Ibid.

[323] HM Treasury (2022) UK regulatory approach to cryptoassets, stablecoins and distributed ledger technology in financial markets: Response to the consultation and call for evidence, Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1088774/O-S_Stablecoins_consultation_response.pdf (accessed at May 10 2022)

successful test cases piloted under the Financial Conduct Authority (FCA) regulatory sandbox mechanism.[324] For instance, In 2018, the Financial Conduct Authority (FCA) launched a regulatory sandbox, Cohort 4, which, among other initiatives, invited proposals from technology firms looking to investigate the potential of Distributed Ledger Technology (DLT) and blockchain-based platforms. These platforms aimed to enable businesses to raise capital more efficiently and effectively, providing an opportunity for innovation within the financial sector and encouraging the exploration of emerging technologies in the fundraising landscape.[325]

This regulatory sandbox, in 2019, witnessed the successful sale of tokenized equities[326] by 20|30 on the London Stock Exchange Group's Turquoise trading platform with trades being settled via blockchain technology. The sale represented an epochal moment in the UK capital market and a demonstration of the Stock Exchange Group's determination to be on the fore front when it comes to decentralised share sales. Before this, there was the issuance of tokenized Ethereum denominated bonds by Nivaura, which was cleared and settled on a public blockchain under the UK FCA supervisory regulatory sandbox.[327]

Recognizing the transformative potential of blockchain technology and Distributed Ledger Technology (DLT) in the UK financial market, the government announced its intention to introduce legislation that will create a financial market infrastructure (FMI) 'Sandbox.' This innovative regulatory environment will enable firms to explore and innovate in delivering infrastructure services that support markets, allowing DLT to be tested under controlled conditions. This initiative aligns with the government's goal of fostering a forward-looking and responsive financial sector, while also establishing a regulatory framework to oversee the adoption of DLT in the industry.[328]

[324] FCA Regulatory Sandbox Guide. Available at: https://www.fca.org.uk/publication/fca/fca-regulatory-sandbox-guide.pdf (accessed 21 October 2022)

[325] Regulatory Sandbox accepted firms https://www.fca.org.uk/firms/innovation/regulatory-sandbox/accepted-firms Firms include: Capex - Platform that uses DLT to allow small companies to raise capital in a more efficient and streamlined way;

[326] European Business Magazine, (2019), 20|30 completes first ever Tokenized Equity Offering Issuance. Available at https://europeanbusinessmagazine.com/business/2030-completes-first-ever-tokenised-equity-offering-issuance/ (Accessed at 14th March 2022)

[327]

[328] HM Treasury, (2022) UK regulatory approach to cryptoassets, stablecoins, and distributed ledger technology in financial markets: Response to the consultation and call for evidence. Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1088774/O-S_Stablecoins_consultation_response.pdf (accessed 3rd April 2022)

The UK, acting under its intent to usher in DLT into its financial markets pursuant to the provisions of Section 13 of the FSMA[329] developed a Digital Securities Sandbox (DSS). The sandbox mechanism is an important regulatory approach that enables the regulator understand the risk and benefits that innovative technological solutions like DLT can present to the capital market in a controlled environment. The DSS allows firms to test and develop DLT-based solutions for the issuance, trading, and settlement of digital securities in a controlled environment. By providing a flexible regulatory framework for testing and assessing the potential of DLT and other emerging technologies in FMI activities, Section 13 of FSMA 2023 seeks to strike a balance between fostering innovation and maintaining the stability and integrity of the UK's financial markets. Therefore, understanding the regulatory landscape and standard required the participants in the sandbox serves as a useful guidepost for other markets.

It is important to note that as at the time of writing this, the details of the DSS were contained in a consultative paper and were yet to be implemented.[330] However the intent of the DSS is strategically designed to foster innovation and promote the exploration of various business models within the financial market ecosystem. This is premised on four governing features

Firstly, the DSS is designed to operate in a proportionate and flexible approach.[331] By embracing adaptability and maintaining balance, the DSS ensures that a wide array of business models can flourish within the sandbox environment. This strategic flexibility is essential in encouraging innovation and attracting a diverse range of participants keen to explore the immense potential of distributed ledger technology (DLT) in transforming financial market activities.

Secondly, it is designed with the intent to safeguard the stability of its financial system.[332] In achieving this, the DSS proposes subjecting activities typically undertaken by a central securities depository (CSD) to appropriate limitations. This strategic measure allows for innovation and experimentation to take place while simultaneously preserving the integrity and overall resilience of the broader financial landscape.

Thirdly, the DSS is designed with the intent of enabling a seamless transition to a permanent regulatory regime. As would be explored in the subsequent subsections of this work, the DSS incorporates a glidepath

[329] Section 13 of FSMA 2023 grants HM Treasury the power to create regulatory sandboxes for FMI activities using developing technologies, including DLT. This provision aims to promote innovation and growth in the financial sector while ensuring appropriate regulatory oversight.
[330] Bank of England and Financial Conduct Authority (2024) *Digital Securities Sandbox joint Bank of England and FCA consultation paper.*
[331] Ibid, p.16
[332] Ibid.

for sandbox entrants to migrate from operating within the DSS to operating under a potential new permanent regime. This pragmatic approach is intended to mitigate the risk of a 'regulatory cliff edge', thereby fostering a supportive environment conducive to the growth and maturation of DLT-based financial market activities.

Lastly, the DSS is designed to enable effortless interaction between sandbox entrants, digital securities, and existing financial market infrastructure (FMI), while still adhering to prevailing requirements where activities fall outside the DSS scope. This design objective is important and reinforces the argument on the scope of the application of the technology that existing market players would play a key role in facilitating the application of the technology in the capital market.

In appraising the intended design attributes, it can be collectively deduced that the DSS acts as a potent catalyst for the transformation of financial market activities and the realization of DLT's potential. This is to be achieved with the guiding objectives of promoting flexibility, safeguarding financial stability, and facilitating integration.

Furthermore, it should be noted that the DSS is designed to operate under the joint oversight of the Bank of England and the Financial Conduct Authority (FCA).[333] The understanding is that it intends to leverage on the expertise of both regulatory bodies to ensure comprehensive supervision. This collaborative approach adopted by the regulators is expected to be tailored to suit the specific combination of activities undertaken by firms within the DSS.

Closely similar to the model under the EU DLT regime, the DSS is expected to allow three number of business models. These are Digital Securities Depository (DSD), an operating venue and an hybrid entity. DSDs are classified as firms that can engage in the activities of a Central Securities Depository (CSD) by focusing on the secure custody and management of digital securities. An operating trading venue is classed as firms that operate a digital trading platform, providing a marketplace for the buying and selling of digital securities and lastly is the hybrid entity. This model allows firms to combine the roles of a DSD and a trading venue, creating a hybrid entity that streamlines the trading and custody of digital securities within a single financial market infrastructure (FMI).[334] It is the expectation that this multi-faceted approach would pave the way for a more efficient, secure, and integrated trading ecosystem by maximizing the potential benefits of DLT for all market participants.

[333] Ibid. P. 17
[334] Ibid p. 17 & 18

3.8.1. Stages of the Digital Securities Sandbox and Supervisory Approach

The DSS operates in five tiered stages which are closely monitored and supervised by the Bank and the Financial Conduct Authority (FCA).[335] This structured approach ensures a smooth transition for participating firms while maintaining the integrity and stability of financial markets. A summary of the each stage is as follows:

Stage 1 - Initial Application: At this stage firms initially submit their application to enter the DSS, which is evaluated based on the 'Gate 1' criteria[336]. Those meeting these criteria are approved as 'sandbox entrants' and proceed to Stage 2.

Stage 2 - Testing: In this stage, sandbox entrants engage with the Bank's supervisors to test their systems and prepare for the 'Gate 2' requirements.[337] As firms demonstrate their readiness to comply with these requirements, they transition into becoming Digital Securities Depositories (DSDs) and progress to Stage 3. For those intending to operate a trading venue as part of a hybrid entity, appropriate permissions from the FCA must be obtained or existing permissions adjusted as necessary.

Stage 3 - Go Live: With the necessary approvals and permissions in place, DSDs will begin live operations by adhering to predefined limits imposed by the regulators. DSDs may choose the financial instruments they wish to trade or undertake notary, maintenance, or settlement activities. In the case of key sterling asset classes, each DSD is allocated a portion of the overall DSD capacity, known as the 'Go Live Limit.' These limits are uniformly applied across DSS to promote fairness and are proportionate to the 'Gate 2' requirements

As the DSS matures and approach their Go Live Limits, it is the expectation that the Bank will initiate 'review points.' Therefore, DSDs seeking to increase their limits must demonstrate compliance with the more stringent 'Gate 3' requirements[338], which reflect the risks associated with their growing scale and financial stability impact. Successful DSDs would be able progress to Stage 4. After the second review point, the DSS will be closed to new entrants, ensuring that overall limits are prudently allocated among participating firms.

[335] See Appendix A Bank of England (2024) *Draft guidance on the Operations of the Digital Securities Sandbox* p. 9 -22
[336] Ibid
[337] Ibid p. 11-15
[338] Ibid. p 15 -18

Stage 4 - Scaling Stage: As firms progress to this stage, they gain access to higher limits, allowing Digital Securities Depositories (DSDs) to scale their operations within these expanded parameters. This stage provides DSDs with the opportunity to consider their strategies for adhering to endpoint requirements once they transition beyond the Distributed Ledger Technology Sandbox (DSD).

Stage 5 - Operating Outside the DSS Under a New Regime: Building upon the insights and lessons learned from the DSS, the regulators and HM Treasury plan to establish a new permanent regime for settlement, provided it is deemed appropriate. In anticipation of this potential development, the BoE's DSS rules instrument includes the expected end-state rules of such a regime. This guidance serves to support firms in comprehending and preparing for the likely regulatory requirements under the new framework.

The five stage design of the DSS seeks to facilitate the seamless integration of distributed ledger technology within the UK financial market infrastructure. By providing a structured pathway for firms to enter, test, and scale their operations, the DSS seeks to foster innovation and growth while mitigating risks and maintaining the stability of the broader financial system.

Notably, the innovative and untested nature of the Digital Securities Sandbox (DSS) may present potential financial stability risks, particularly when implemented at scale within conventional financial markets. Such risks involve possible large-scale failures in securities recording, trading, and settlement, which could have wider implications on the overall market stability. Additionally, the DSD's modified regulatory standards for sandbox entrants and the emergence of new business models could create unforeseen financial stability risks, such as those stemming from instant settlement.[339]

To address these potential risks, the Bank of England (BoE) intends to impose stringent restrictions on the activities of Digital Securities Depositories (DSDs) within the Digital Securities Sandbox (DSS). Simultaneously, the Financial Conduct Authority (FCA) aims to uphold market integrity by holding operators of trading venues within the DSS to the same standards as those outside the sandbox. This strategy will help ensure the efficient functioning of the UK's financial markets while safeguarding against financial crime and market abuse. Notably, the existing investor protection rules will continue to apply to all FCA-regulated activities within the DSS, thereby preserving investor confidence and security.[340]

[339] Supra n.311 at p. 35.
[340] Ibid.

From the examination of the stages in the DSS, it is clear that the UK's approach to adopting innovative solutions in its financial markets is firmly rooted in the tripartite objectives of securities regulation: protecting investors, ensuring fair, efficient, and transparent markets, and reducing systemic risk. These objectives are crucial considerations for markets to embrace new technologies. It is argued that such objectives can be effectively fostered in environments with robust regulatory frameworks. As demonstrated by the DSS, participants still operate within the parameters of existing traditional rules thus, highlighting the importance of a strong regulatory framework like that found in the UK.

Therefore, the ability of DSS participants to maintain regulatory standards is dependent on this strong framework, which balances the need for innovation with the necessity of managing risks and promoting transparency, fairness, and efficiency in the financial markets.

3.9 Conclusion

The revolutionary and transformative tendencies of blockchain technology and how it can be leveraged on to drive an efficient in the capital market is beginning to gain traction in many markets.

As markets experiments on areas where its use will be most efficient and the appropriate method of adoption, part of the preliminary concerns should be whether such market has a strong and robust regulatory framework to adopt the technology. Alongside this consideration, markets should realistically assess the state of their legacy system to determine whether it is necessary to adopt the technology in the first instance.

As the research has shown, the literature on the application of blockchain in capital markets and the test cases conducted so far have been mainly in developed markets. Although some emerging markets in Africa have recognized the potentials of the technology, there has not been any concrete step towards adopting the technology.

Furthermore, from the exposition of the application of blockchain in capital markets, the submission can be made the that the technology stands as both an opportunity and threat to legacy institutions in the capital market.

In concluding, the points discussed under this chapter forms a backbone for the subsequent chapter and is germane to the overall thesis. It seeks to evaluate whether the Nigerian capital market has the requisite regulatory standards to adopt blockchain technology by examining key issues such as investors protection, safety of custody of assets, data privacy and cybersecurity, level of enforcement amongst others.

CHAPTER FOUR

AN OUTLOOK OF THE NIGERIAN CAPITAL MARKET REGULATORY FRAMEWORK

"Sound and effective regulation and, in turn, the confidence it brings, is important for the integrity, growth and development of securities market."

International Securities of Securities Commission (IOSCO)[440]

4.1. Introduction

One of the core arguments of this research work is the proposition that a sound and robust regulatory framework constitutes the foundation upon which any technological change in the capital market can thrive. This proposition coincides with the submission that the prospect of the Nigerian capital market adopting new and innovative technologies like blockchain will need to be carefully considered alongside the regulatory standards of its capital market.

In testing the soundness and quality of its regulatory framework, this chapter examines the array of laws, market infrastructure and intermediaries of the Nigerian capital market. This part is crucial to discussing the gaps that exists in its regulatory framework and the challenges that may constitute a drawback towards the successful adoption of blockchain technology.

For easy comprehension, this work will appraise the Nigerian regulatory framework from three perspectives: key market infrastructures, market intermediaries and the key legislations governing its market operations.

4.2 Statutory Regulations of the Nigerian Capital Market

The Nigerian capital is regulated by an array of laws and regulations. The governing laws and regulations are one of the mediums through which the market regulator conveys its regulatory expectations[441] and standards of operations. Chief among the laws are the Investment and Securities Act and the Companies and Allied matters Act. This work would however focus on the Investment and Securities Act. However, in the course of the exposition in this chapter, some of the relevant rules and regulations made pursuant to the ISA would be referenced.

---

[440] International Organisation of Securities Commission (2003) *Objectives and Principles of Securities Regulation*, available at: https://www.iosco.org/library/pubdocs/pdf/IOSCOPD154.pdf (accessed 11 March 2022). This document details out core objectives securities regulation for an effective system of securities regulation.

[441] Dill, A. (2019). *Bank regulation, risk management, and compliance: Theory, practice, and key problem areas*. Informa Law: London

4.2.1 A capsule exposition of the Investment and Securities Act 2007.

The Investment and Securities Act is the principal legislation enacted to govern the Nigerian capital market. The preamble of the Act resonates with objectives of the IOSCO objectives for market regulation which are to ensure the protection of investors, maintain fair, efficient and transparent market and reduction of systemic risk.

The Investment and securities Act traces its existence as far back as 1999 where it was enacted. The Act repealed and replaced preceding securities legalisations like the Securities and Exchange Commission Act of 1998 and the Lagos Stock Exchange Act of 1960.

The Act covers critical areas of market operation such as: the establishment and management of the Securities and Exchange Commission (SEC)[442], its functions and powers staff and financial provision[443]; registration and regulation of securities exchange, capital trade points and regulatory organizations;[444]registration and regulation of capital market operators; inspection and investigation of capital of capital market operators;[445] registration of securities, corporate responsibility of public companies; public offer and sale of securities and invitation to the public; conduct of securities business; trading in securities; mergers, takeovers and acquisition; collective investment scheme;[446] investors protection fund;[447] borrowing by federal, state and local government and other agencies;[448] establishment, jurisdiction, authority and procedure of the Investment Securities Tribunal,[449] among other matters.

As already established, the Act created the Securities and Exchange Commission as the apex regulatory body of the Nigerian securities market. In exercise of its supervisory mandate under the Act, the Securities and Exchange Commission is conferred with rule making powers to cater for sundry development within the sector. The powers also enable it to address specific part to clarify the provisions of the ISA and set expectations for participants in the market. The Securities and Exchange Commission lucidly expresses this rationale for its rule making powers in the following words:

[442] s.1 of ISA
[443] s.13 of ISA
[444] Part V of ISA
[445] Part VI of ISA
[446] Part XIII of ISA
[447] Part XIV of ISA
[448] Part XV of ISA
[449] Part XVI of ISA

"In order to effectively and efficiently carry out the objectives of securities regulation as embedded in the Investments and Securities Act (The Act), the Securities and Exchange Commission (The Commission), has prescribed these Rules and Regulations. These Rules and Regulations provide participants (regulated persons) in the capital market with more precise notice of what is expected of them, what conduct will be sanctioned and also promotes fairness and equality of treatment among similarly situated persons.

The Commission recognizes that adoption of formal rule-making process is more efficient than case- by-case adjudication, because it can resolve a multiplicity of issues in a single proceeding. A clear general rule can produce rapid and uniform compliance among the affected firms or individuals and provides individuals with more protection.

The Act has granted the Commission general and specific rule-making authority. However, the Commission in exercising this authority has adopted a consultative procedure whereby inputs and comments are obtained from persons subject to its jurisdiction. "

It further noted that:

"It should be noted that rule-making is a continuous process. In addition to these legislative or substantive rules, which may be amended from time to time, the Commission will also be issuing interpretative rules and general statements of policy all of which guide participants in the market." [450]

The source of this SEC rule making power can be traced to the joint provisions of Section 13 (dd) and Section 313 of the Act. These sections reads as follows:

"13. *The commission shall be the apex regulatory organization for the Nigerian Capital market and shall carry out the functions and exercise all powers prescribed in the Act, in particular shall:*

(dd) *perform such functions and exercise such other power not inconsistent with this Act as are necessary or expedient for giving full effect to the provisions of the Act."*

[450] See the introductory page (1) of the SEC *Consolidated Rules and Regulations*, 2013

313. *The commission, may from time to time make rules and regulations for the purpose of giving effect to the provisions of the Act and may in particular and without prejudice to the generally of the foregoing provisions makes rules and regulations"*[451]

Some of the rules made by the SEC includes the following: Securities and Exchange Commission (Capital Market Operators Anti-Money Laundering and Combating The Financing Of Terrorism) Regulations; Rules Relating to the Complaints Management Framework of the Nigerian Capital Market
Rules Relating to the Complaints Management Framework of the Nigerian Capital Market; Rules on Regulation of Derivatives Trading; Rules on Central Counter Party (CCP); New Rule on Registration of Fixed Income Existing Securities Major Amendments; Amendment to Rules on Collective Investment Schemes; Rules on Direct Cash Settlement; Rules on Electronic Offerings; Rules on Transmission of Shares Rules on Issuance Offering and Custody of Digital Assets

The Act covers a broad range of market operations and gives SEC the power to create several intermediaries/ marketer operators to like stockbrokers, registers, issuing houses exchanges, among others for conducting market transactions. In line with overall direction of this work, this means that any adoption of disruptive technologies like blockchain / DLT which seek eliminate or reduce number of these intermediaries would require an overhauling of the Act to reflect the changes.

4.3. The Nigerian Capital Market Master Plan (NCMP) - (2015-2025)

The NCMP is a policy strategy document that details the milestone developments to be achieved within the defined period. Analysis of this document is essential to the conversation in this work as it stipulate some of the issues that confronts the Nigerian capital market and the possible solutions to the issues. The document also sets estimated time frame within which the market is expected to achieve its desired goals for an efficient capital market.

The 10-year policy strategy document, spanning from 2015, serves as a guiding framework for policymakers, operators, and key stakeholders within the ecosystem. Primarily driven by the Securities and Exchange Commission (SEC), this initiative aims to transform the Nigerian capital market by building investor confidence through robust regulation and enforcement, fortifying market institutions, championing corporate governance, fostering innovation, and prioritizing both domestic and international cooperation. The ultimate goal of this policy is to elevate the Nigerian capital market to world-class status, ensuring its competitiveness and relevance in the global financial landscape.

[451] See 2. 313 (a) to (p) on specific areas that the SEC has rule making powers over.

Its formative background can be traced to the 25-man committee chaired by Mr Adeotun Suemna (MFR) was charged under with responsibility of developing the master plan under the defined terms of reference. These terms are replicated here for as such, to:

i. "Review the implementation progress of Nigeria's Capital Market: Making World Class Potential a Reality and outline milestones yet unachieved.

ii. Conduct a holistic review of peer emerging markets with a view to articulating the requisite element, size and structure of a capital market that will enhance the global competitiveness of the Nigerian capital market and catalyse Nigeria's potential to become the largest economy in Africa within the focus period.

iii. Examine successful growth strategies in other jurisdictions and articulate a development strategy for the Nigerian Capital market covering key area such as investors protection and education, professionalism, product innovation and expansion of the role of the capital market in economic development.

iv. Consider relevant factors that impact market growth and develop a strategy for robust governance for improved efficiency, transparency and enhancement of market stability.

v. Make necessary recommendations with clear and actionable quarterly and annual milestone that will lead to a world class capital market which supports an inclusive economy and improves the living standard of Nigerians."[452]

Overall, the policy document contains laudable objectives which will take a religious implementation to drive it into reality. It did highlight some key issue bedevilling the market which the master plan seeks to address within the 10 years period. Some of the most relevant and possibly dominant issues relatable and of concern to this work are the low level of technological usage; inertia in the level of enforcement of markets rues by regulators; sub-optimal capital market process, transparency, disclosure, and compliance laxity displayed by market operators; sub-optimal operating models. In detailed summary, the plan noted that there is low technological footprint in the Nigeria capital market particularly in the area of information technology. The plan drew the dichotomy on which segment had more technological influence. It stated that larger operators are relatively equipped with IT infrastructure to transform their operating models

[452] Securities and Exchange Commission (2015, *The Nigerian Capital Market Master Plan 2015 -2025*

more than smaller operators who might struggle in terms of capacity to scale up to be able to invest in technology.[453]

On the complexity of capital market processes, the plan noted that the market process is predominantly manual, cumbersome, lengthy, technical, and burdensome. This complexity stretches even to the issuance of new securities and lengthy trade settlement process. To put this issue in context, an excerpt of the master plan stipulated that 'new debt issues take an average of 6 months from appointment to closure of transaction and while the time lag is sometimes due to poor organization on the part of the issuer, there is some level of regulatory bureaucracy as well'[454]

An extension of the complexity of the capital market process is its sub-optimal models. It was noted that the operating model of its process is such that market operators are largely unsophisticated and manually driven. While some of the processes have been digitized to some extent, i.e., purchase of securities, payment of dividends, some parts are still manually driven.

With regards to the issues of regulation and regulatory oversight, there is the finding that the Nigerian capital market oversight and regulatory framework aligns with international benchmark standards in line with IOSCO principles. However, an issue lies in respect to its level of compliance and enforcement when compared to its peer markets like South Africa and Malaysia[455]

From the totality of the issues highlighted by the master plan as far back as 2015, one fundamental question is whether the issues highlighted in the document are still prevalent? In retrospect, while it can be argued that some of the issues that the plan highlighted have been partly addressed, some issues are still lingering which could preclude it from being an efficient and world class capital market. An issue of concern here is its weak regulatory framework in the face of the adoption emerging technologies that could transform the market process viz-a-viz the risk that it portends.

Overall, the master plan details out the scale of issues that confronts it. At the face of it lies the relevance of technology and the necessity of a strong regulatory framework. On this, it is imperative to replicate the some wordings of the master plan towards achieving this. It noted that:

[453] Securities and Exchange Commission (2015, *The Nigerian Capital Market Master Plan 2015 -2025*
[454] *Ibid*, 35
[455] *Ibid.* Peer markets here is connotes broadly the term emerging markets.

"To fulfil these considerations and take advantage of new opportunities going forward, it is envisaged that Nigeria will develop a modern and efficient capital market that is intentionally competitive, bearing the hallmarks of a high levels of relevance, productivity and innovation. It must be flexible and easily adaptive to an ever-changing environment while providing market participants with a wide range of products and services comparable with leading financial centres in the world. At the same time, it should be relevant in all core areas necessary to develop the Nigerian economy.

For [the] capital market to be increasingly relevant and achieve the foregoing, it must actively pursue deliberate growth, scale, robustness, flexibility, and improved practices. Regulators must have the right competencies and skills to move the market forward and leverage technology in doing so. Regulators must have the right competencies and skills to move the market forward and leverage technology in doing so. Robust systems must be established and maintained for risk management, surveillance as well as transactions. Operators must conduct their activities fairly and ethically and must be supported in their activities to develop the market. Accountability and good governance must be entrenched and continually reinforced."[456]

4.4. Institutional Framework and Market Infrastructures of the Nigerian Capital Market

It is trite that one of the expressions of a regulatory framework in the capital market is not just the array of laws that govern market practices and relationships but also the institutions created by law to execute them. The institutions or infrastructures are the vehicle established under the law to achieve the statutory or regulatory mandate. Without them, the letters of the law or regulations will be lifeless. By virtue of the design of the market, its complexity, they are regarded as a necessity to drive market interaction.

The International Monetary Fund in a working paper on the development of local capital markets while emphasizing on the relevance of a strong financial market infrastructure lucidly stated:

"Sound macroeconomic policies and a strong legal framework and institutional setup alone are not sufficient for capital markets to flourish. ***They need to be complemented with a well-developed financial infrastructure to facilitate trading and the exchange of information****. A financial infrastructure refers to the physical underpinnings for a financial market exchange, including trading platform and trading system, as well as the regulatory*

[456] *Ibid,* 40

apparatus and industry to process, evaluate, and validate the information being produced and used by the market. The trading platform could be physical or electronic. The regulatory apparatus will consist of a securities market regulator, together with any self-regulation imposed by the market itself. The regulator's job is to issue and enforce public regulations and promote the private disclosure of information and private enforcement of rules. The rating process will be generated and supported by rating agencies and credit guarantors."[457]

For easy comprehension, this section will organize the institution into regulators, self-regulators, and market intermediaries.

4.4.1. Securities and Exchange Commission.[458]

SEC is the apex regulatory body saddled with the responsibility of maintaining and protecting the integrity of the capital market. It is established under the investment and Securities Act and is bestowed with wide functions and powers under section 13 of the ISA to ensure the smooth and efficient functioning of the Nigerian capital market. It exercises regulatory oversight over market operators and self-regulatory agencies established under the Act.[459]

The SEC is conferred with powers under its establishing Act to facilitate the establishment of the nation's system of dealing with securities[460]. The implication of this power when construed in line with the scope of this work is that innovations that alter the method for securities trading, clearing and settlement such as of blockchain technology, would need the approval of the SEC before it can be applied.

As the supervisory authority of the capital market, the SEC is also conferred with a wide range monitoring mechanism and enforcement powers to prevent abuses and combat fraudulent practices in the capital market.[461] Its powers are further complemented by SEC rules and regulations, 2013 and more precisely a code of conduct for capital market operators which seeks to instil discipline and professionalism on market operators.

[457] Laeven, L (2014) p. 15

[458] Section 4.4.1, 4.4.2, 4.4.2.1 and 4.4.2.2 is extracted from my course work submitted to the University of East London. It is cited as Osemwengie, C (2019*) Enforcement standards of the Nigerian capital markets regulators*, University of East London, Unpublished.

[459] s.13 (b) (v) (g) and (o) of the ISA.

[460] s. 13 (f)

[461] Securities and Exchange Commission v. Oni Alasibekan (2008) LPELR at 4937. See precisely on the powers of enforcement, s. 13 (n) (r) (v) (w) (x) (z) (aa) of the Investment and Securities Act, 2007

For instance, under Section 13 (r) of the ISA, SEC has the power to call for information and inspect the books of market operators. Its powers also extend to conducting audit on securities operators. The ISA confers as a duty on SEC to periodically conduct special inspection and investigation of market operators. [462] It makes provision for the creation of an office specifically for that purpose. This is known as the Monitoring and investigation department of the SEC. [463] In special circumstances, SEC is empowered to order a special examination or investigation of the books of operators where it is satisfied that it is the interest of the public to do so or where the market operator do not have sufficient assets to meet up its liabilities to the clients, beneficiaries and creditors.[464] Where the circumstance demands, the capital market operator is by law required to furnish SEC for examination all books, accounts, documents and such other information that it may require.[465]

The ISA gives SEC a wide range of enforcement powers in the quest to ensure the sanctity of the market and also for the protection of investors. For instance, as a way of ensuring only person legally registered and permitted to carry out investment business are in operation, it has the power to enter and seal up the premises of persons illegally carrying on capital market operations. Its powers also extend to disqualify persons considered unfit from being employed in any arm of the securities industry. [466]

The decision of the IST in *Esiaba Iheanyi Alozie v. Ikenna Igboamaeze, SEC & 570 Ors* affirming the sanctions and fines of the SEC-APC on appeal shows the extent to which SEC can go to utilize its powers to maintain the integrity of the market. In this case, SEC received several allegations against the Appellants (Respondents at the Committee) for violation of the ISA and the Code of Conduct for Capital market Operators and Employees, *inter alia*: making invitation to the public to deposit monies in violation of the provisions of the ISA; failure/refusal to return deposited monies to depositors with the intention to defraud its investors; and failure to exercise due care and skill in the exercise of its duties as directors. The APC-SEC upon its hearing cancelled the 1st Respondent's registration with the commission, banned the alter ego of the 1st Respondent from engaging in capital market activities and from holding directorship position in any public company for life for his unprofessional conduct in the management and control of the 1st Respondent and imposed huge monetary sanctions

[462] *Ibid,* s. 45 (1)
[463] *Ibid,* s. 45 (2)
[464] *Ibid,* s. 47 (1)
[465] *Ibid,* s. 45 (8)
[466] *Ibid,* s. 48(2) (d).

As part of its enforcement powers, section 13 (v) of the ISA provides that SEC has the power to intervene in the management and control of market operators where it considers that it is failing. It could achieve this by removing the directors and appointing persons to manage its affairs in the interim, or the commission can itself gain temporary control of the affairs pending when it has satisfactorily determined that it is no longer necessary to remain in control of the business[467]. This accords with the underlying principle for securities regulation to ensure that the market maintains its integrity and that investors are protected.

The Court of appeal in a recent decision had the opportunity to give judicial cognizance to this power in the case of *Securities and Exchange Commission v. Big Treat Plc & Ors*.[468] Here, upon submission of the defendant's audited accounts to the SEC as part of its regulatory filing, SEC discovered from its analysis that its financial affairs were in a deplorable state, and in order to avoid the assets from further depleting and also protect the interest of its stakeholders, it sought an injunction restraining the company from obstructing it from appointing an interim management to manage the day to day affairs of the company. Although the defendant argued that it was not a capital market operator under the ISA of 2007, the court discountenanced that argument and held that "SEC duly exercised its statutory powers to stem the tide of decay in the internal management of the Company.''

4.4.2. Investment and Securities Tribunal

Intertwined in the framework of enforcement of market rules on market operators is the determination of the appropriate forum for enforcement. Under the capital market regulatory framework, provisions for resolution of market disputes beyond the enclave of the regulator's administrative panel is important. This is to give a balanced and fair resolution to market disputes. Dissatisfied market intermediaries should have the right to contest the decisions of the regulator.[469] So is it for retail or institutional investors who are not satisfied with the decisions of the market regulator or who intend to personally seek remedy on their own.

[467] s. 49 & 50 (1) (a) & (b) of the ISA,2007

[468] 2019 LPELR-46520

[469] In *Resort Savings & Loans Plc & 3 Ors v SEC* IST/APP/4/14 (Unreported) [Delivered on the 5th December 2018.] The IST while reviewing the decision of the APC-SEC although it held that the Appellants committed grievous market infractions which were capable of affecting of the integrity of the market, it reviewed the sanction banning the 2nd – 4th Appellants from engaging in capital market activities and holding directorship position in public companies from 15 years to 4 years and also reducing the fines imposed on the 13th Respondent (1st Appellant) from N1,000,000.00 to N500,000.00

Conversely, this also becomes important for regulators too because they should be able to depend on the efficacy, expertise and independence of the judicial system as an avenue to review, clarify, reaffirm and expand its enforcement powers.[470]

Therefore, the need to have a well-defined avenue and process for resolution of market disputes is necessary. This enforcement requirement is envisaged by the IOSCO committee on Enforcement and Exchange of Information.[471] The inclusion of this in the enforcement framework enhances confidence of investors and market operators.[472]

As is the case in most jurisdiction like the South Africa [473] and other emerging peer markets, Nigeria's capital market enforcement framework has a specialised adjudicatory body for entertaining securities disputes. This body is known as the Investment and Securities Tribunal (IST). It is established pursuant to *section 274 of the ISA.* The Tribunal has as its mandate to expeditiously determine cases brought before it within a period of three (3) months from the date of commencement of the hearing of the substantive suit. This short time frame in the resolution of disputes is done with the supposed intent to build and maintain investors 'confidence given the specialised nature of the capital market.

4.4.2.1 Jurisdiction

The jurisdictional competence of the Tribunal is preserved under *section 284 of the ISA*. The Tribunal is conferred with the jurisdiction to entertain disputes arising out of the ISA between a number of parties. These are between capital market operators; between an investor and a securities exchange or capital trade point or clearing and settlement agency; between capital market operators and self-regulatory organization; the Commission and self-regulatory organization; a capital market operator and the Commission; an investor and the Commission; an issuer of securities and the Commission; and disputes arising from the administration, management and operation of collective investment schemes.[474]

---

[470] Osemwengie, C (2019) Enforcement standards of the Nigerian capital markets regulators, University of East London, Unpublished.

[471] IOSCO Committee on enforcement and the Exchange of Information, *Credible Deterrence in the Enforcement of Securities Regulation*, 2015

[472] *Ibid,* 7

[473] South Africa has a Financial Services Tribunal (FST) established under Section 219 of the Financial Sector Regulation Act 9 of 2017. One notable distinction from the IST is that it has a wide jurisdiction to entertain disputes beyond securities matters.

[474] *Eze Okorocha v UBA PLC & ORS* (2011) 1NWLR PT. 1228 P. 348 at P. 374-375, *Nospetco Oil & Gas Ltd v Olorunnimbe* (2012) 10 NWLR (Pt. 1307) 115.

The Tribunal is also designed to entertain appeals from SEC Administrative decisions under Section 287 of the ISA and Rules 18 of the Procedure of the SEC APC while appeals from the decision of the Tribunal goes to the Court of appeal.[475] The IST has severally expressed its appellate powers. For instance In *Resort Savings & Loans Plc & 3 Ors v SEC*[476] the IST while reviewing the decision of the APC-SEC although held that the Appellants committed grievous market infractions which were capable of affecting of the integrity of the market, it reviewed the sanction banning the 2nd – 4th Appellants from engaging in capital market activities and holding directorship position in public companies from 15 years to 4 years and also reducing the fines imposed on the 13th Respondent (1st Appellant) from N1,000,000.00 to N500,000.00.

It is imperative to state that according to the provisions of *section 293 (3 of the ISA*, the Tribunal appears to have equivalent status to the Federal High Court. In fact, it expressly provides that 'an award or judgment of the Tribunal shall be enforced as if it were a judgment of the Federal High Court upon registration of such award or judgment with the Chief registrar of the Federal High court by the Tribunal. To bolster this point, under *section 290 (3) of the ISA* proceedings of the Tribunal are deemed to be a judicial proceedings and the Tribunal shall be deemed to be a civil court for all purposes.[477] If the argument on the equivalence of the Tribunal is to be stretched, *section 280 of the ISA* would be a good reference point as it provides that the renumeration package of the chairman, members and Chief registrar of the Tribunal 'shall be equivalent to that of the chief judge, judges a chief registrar of the Federal High Court respectively'. While this provision is clear and unambiguous in its wordings, there is still the lingering issue as to the right and appropriate forum equipped with the jurisdiction to entertain the capital market disputes. This uncertainty and the tussle for jurisdiction lies between the Investment and Securities Tribunal and the Federal High Court of Nigeria.

The implication of this persistent uncertainty has negatively impacted the market. It has resulted to judicial forum shopping by litigants who in the absence of clear regulatory guidance approach different adjudicatory windows such as Administrative Proceedings Committee, Investment and Securities Tribunal or Federal High Court to ventilate their grievances and resolve their disputes. This act continues to weaken enforcement arm of the market. In *FIS Securities Ltd v Securities and Exchange Commission*, the High Court held that the Tribunal has jurisdiction to deal with matters specified in the Companies and Allied Matters Act, 1990[478], in so far as it deals with quoted companies' securities and transactions in those securities. On

[475] Section 295. As is the hierarchy of entertaining disputes in Nigeria, section 297 provides that appeals against the decision of the court of appeal from either a party or the SEC shall lie to the Supreme court. See section 297.
[476] IST/APP/4/14 (Unreported) [Delivered on the 5th December 2018.]
[477] To further reinforce its equivalence, Section 281
[478] As is then was, The CAMA has been amended to CAMA,2020

appeal, the Appellate court reversed the decision of the lower court and held that such powers had been removed from the IST. The Court saw the Tribunal as a jurisdictional interloper.

Furthermore, uncertainty in the Investment and Securities Act 2007 regarding the judicial structure of the Investment and Securities Tribunal entraps the IST under the Executive arm rather than Judiciary. This issue is further compounded by legislative inertia of the National Assembly to produce clear and unambiguous laws that reposes jurisdiction on the appropriate court. The forgoing issues have weakened the integrity of market and the confidence of investors.

4.4.2.2 Issue with Independence

The International Organization for Securities Commission (IOSCO) recommends that such institutions have an aura of independence to enable them resolve market disputes freely, fairly, and timeously. This is applicable also for regular courts. However, findings from its assessment suggest that *the independence and stability of the IST is not certain*. This is not unconnected to the fact that it is an appendage of the executive arm of government and therefore subject to its whims and caprices. A prime display of its instability was the dissolution of the IST in 2015 by the executive arm which was adjudged to be contrary to the provisions of section 277 and 279 of ISA. The unlawful dissolution of the Tribunal left a significant number of capital market cases unresolved for more than two years. This gap impacted on the hearings of the cases that were filed before the dissolution and those which were yet to be filed, thereby causing a delay in resolving the disputes of parties.

The stability of the entire capital market enforcement decision making body should be guaranteed. Thus, Nigeria should therefore be looking at emulating the models of advanced markets like the UK who have theirs controlled under the ministry of justice to give it the protection, stability and independence it needs to fairly and timeously resolve market disputes without undue interference.[479]

4.4.2.3 Composition, Quorum and Procedural Rules

The ISA provides that the Tribunal shall have 10 person who are appointed by the Minister of Finance.[480] Members of the Tribunal draw experience from different background such as law and finance. The chairman is required to be a legal practitioner with at least 15 years of 'cognate experience' in capital market matters while four of the members shall also be legal practitioner but have a minimum of 10 years' experience in

[479] The Upper Tribunal (Tax and Chancery chambers). A superior court of record administered by the Ministry of Justice
[480] S. 275 (1) ISA

capital market matters.[481] The other five members are by law require to operate on a part time basis.[482] While there is no minimum number of years of experience required for them, they are expected to have ability and expertise in corporate and capital market matters.[483]

With this number spread, the Tribunal, according to the provisions of *section 276 (1*) of the ISA, is deemed to be duly constituted for the purpose of exercising its jurisdiction when it has a minimum of 3 members in its panel.[484] In exercising its jurisdictional powers under the Act and to ensure the smooth exercise of it, the law of the confers on it the powers to makes rules and regulation to govern its procedures in hearing market disputes.[485]

4.4.2.4 IST ADR Centre

The Tribunal provides an additional conflict resolution mechanism known as the Investments and Securities Tribunal Alternative Dispute Resolution (ISTADR) Centre. This platform promotes amicable conflict resolution through mediation and conciliation, fostering mutual understanding, confidentiality, and cooperation among disputants. Agreements reached at the Centre are recognized as judgments of the Tribunal, ensuring their enforceability and legal validity. The ISTADR Centre serves as an effective alternative to traditional litigation, encouraging parties to engage in collaborative problem-solving and facilitating the swift resolution of disputes within the securities industry.

4.5. Capital Market Operators, Intermediaries and infrastructure

The Nigerian capital market has an interesting blend of market operators/intermediaries, experts and self-regulatory agencies all operating in different but correlated fashion for the smooth and efficient working of the system. Some of them are listed as follows: banks, corporate investment advisers, registrars, fund managers, issuing houses, rating agencies, reporting accountants, solicitors, corporate sub-brokers, trustees, portfolio managers, underwriters, commodities exchange, securities exchange, depository, settlement and clearing institutions.[486] As at the last count in 2021 from the official portal of Nigerian Securities and Exchange Commission, the total number of registered market operators within the capital market ecosystem was estimated to be over 900.

---

[481] S. 275 (1) (b) ISA

[482] The chairman of the Tribunal and the four other members shall act on a full-time basis. All of which shall be legal practitioners.

[483] S.275 (1) (c) ISA

[484] See. S.276 (1) ISA

[485] S. 290 (1) & (2) ISA

[486] For a useful guide of a comprehensive list of capital market operators in Nigeria see: Securities and Exchange Commission, *List of Capital Market Operators (CMO)*: Available at < *https://sec.gov.ng/list-of-capital-market-operators-cmos/* >(Accessed 9th December, 2021): See also Rule 45 & 178 of the SEC consolidated rules, 2013

These market operators trace their existence, powers, and functions from various legal instruments, such as the Companies and Allied Matters Act, Central Bank Act, Banks and other Financial Institutions Act Investment and Securities Act etc. Chief among them is the Investment and Securities Act, 2007. Under that law, section *38 (a) and (b)* expressly prohibit any person(s) from operating within the capital market as experts or professionals or even carry out investment and securities business unless they are duly registered in accordance with the provisions of that law.[487] To this extent, *section 315 of the ISA*, defines capital market operators to mean "any person (individuals or corporate) duly registered by the Commission to perform specific functions in the capital market". This is a standard provision in securities law across the world. The deducible intent of that provision is to protect the integrity of the market from unscrupulous and dubious entities who do not that have the legal backing to conduct capital market activities.

It should be stated that it is the core responsibility of the SEC to create an enabling and conducive environment for these market operators to operate in order to for them to effectively carry out their various mandates under the law. *Section 13* of the ISA sufficiently details out what the SEC should do through the exercise of its powers as the apex supervisory and regulatory body in that respect. This includes among many others, facilitating the establishment of a nationwide system for securities trading in the Nigerian capital market,[488] facilitate the linking of all markets in securities with information and communication technology facilities with an omnibus power under the paragraph (dd) of that provision which to perform all other functions and powers that are consistent with the Act and which are considered necessary or expedient to giving full effect to the provisions of this Act.

Having perfunctorily established this, it is expedient that this work considers the various market operators within the sphere. It is noted that is given here that not all the operators listed is considered in much detail.

4.5.1 Stockbroker

Stockbrokers are a critical component of the Nigerian capital market. By design, they are an essential intermediary between the market and the investing public. Their enabling law positions them in such in a way that they constitute an indispensable conduit that investors must go through in order to access the various investments that the market has to offer. *Rule 25 of the SEC consolidated rules and regulations, 2013* voices this position by requiring that before a broker can trade securities over the counter it must be a registered member of the association of securities. *Rule 56 (1) (a) of the SEC consolidated rules* further

[487] See generally Part VI ISA,2007. See also section 315 (definition provision) defines capital market operator
[488] Section 13(i) ISA, 2007

establishes this point by stating that only registered brokers shall have the power to sell and purchase securities on behalf of clients on a recognized exchange. The implication of these provisions rules out the possibility of investors directly accessing the capital market without going a registered stockbroker.

Stockbrokers have a wide variety of functions unique to their role. *The Securities and Exchange Commission Rules and Regulations* under *Rule 175 of the Sundry Amendment to the Rules and Regulations* state the duties of a stockbroker to include "(a) purchasing securities on behalf of his clients and himself (b) disposing of securities on behalf of his clients and himself (c) trading on registered securities exchanges and over-counter markets (d) disclose to the commission any single deal in a company's securities of 500, 000 units and above within a day."[489]

Idigbe gives a detailed analysis of the process that the stockbroker engages in facilitating a trade. His documentation of the process is worthy of replication below because it shows the level in which stockbrokers are embedded in almost every part of the capital market transaction. Idigbe notes that:

> *"The application of their functions, particularly in securities trading may vary depending on whether the securities being offer for sale is in the primary or secondary market.*
>
> *In a public issue, once a mandate has been won and the Issuing House and the Issuer have determined the turning of the offer, the broker must be appointed. They act as the principal intermediary between the company, its advisers, and the Stock Exchange. They participate in facilitating the listing of securities after the application and registration requirement of the SEC have been complied with.*
>
> *The issuing house and the stockbroker meet with the issuer to ensure compliance with the requirement of the Companies and Allied Matters Act 1990 as amended. At the mandate giving stage, the stockbroker files an application to the Stock Exchange intimating her of the offer. They have the further responsibility of vetting all documents for presentation to the regulatory authorities and authenticating all claims made therein.*
>
> *At the approval stage, the stockbroker sponsors the application to the Stock Exchange along with the accompanying documents and information. They answer any queries and, or*

[489] *Dr. Okam Kalu Ugwu v. SEC & 4 Ors* SUIT NO: IST/EN/OA/2014

question that may be asked by the Quotation department of the Nigerian Exchange Limited (Formerly known as the Nigerian Stock Exchange).

Furthermore, the stockbroker delivers to the Exchange proof print of the prospectus, the application form, posters and newspaper adverts after approval has been given by the Quotations Committee as well as collect the Certificate of Exemption issued in accordance with section 553 of Companies and Allied Matters Act and this authorizes the Issuer to produce the abridged prospectus prior to the Completion Board Meeting.

Also, the stockbroker with the other parties to the issue signs the verification questionnaire and offer documents at the Completion Board Meeting and files a complete set of the signed documents with the Stock Exchange immediately after the meeting and they act as a receiving agent for the application and ensures wide distribution of the shares.

Apart from the primary market activities of the stockbroker, he also plays a major role in secondary market transactions. They take to the floor of the Exchange the shares of an investor who wants to sell or buys or the floor the shares of investors offered for sale by other stockbrokers. This role places a delicate responsibility on the stockbroker. They must act in the interest of the investors and be fair efficient and transparent. In addition, the Stockbroker places huge responsibility on them because of the sensitive role they occupy to is expected to exercise due diligence at the floor of the Stock Exchange by not engaging in sharp practices."[490]

The foregoing involvement in market transactions notwithstanding, the fidelity of stockbrokers in handling transactions on behalf of their clients have been a recurring issue and have thus put them in the spot light. For instance, case law is replete with circumstances where stockbrokers have been held wanting for breach of this duty by engaging in sharp practices. A prominent case illustrating this issue is Central Securities Clearing System & Anor v. Bonkolans Investment Ltd & 5 Ors. . In this case, the Securities and Exchange Commission (SEC) discovered an alleged scam involving the sale of securities such as Nestle Foods Plc and Unilever Plc on the Nigerian Stock Exchange. Allegedly perpetrated by a syndicate using several stockbroking houses, this scam led to an investigation by the SEC's Administrative Proceeding Committee (APC).

[490] Anthony. I, *The role of stock brokers, registrars and investors in deepening the securities and commodities market-the emerging markets challenges*, available at https://punuka.com/wp-content/uploads/2019/01/Capital_market_role_of_stock_brokers.doc (accessed 15th March 2109) See page 2

The APC found some stockbrokers and other capital market operators liable for the scam, penalizing them for breaching the SEC Code for Capital Market Operations. Upon appeal, the Investment and Securities Tribunal upheld the APC's decision, reinforcing the importance of adhering to the established code of conduct and maintaining integrity within the capital market.

Aside the broad overview of the functions and their relevance in the capital market structure, it is worthy of note that section *315 of the ISA* gives a contextual and narrow appreciation of the term 'stockbroker'. It defines it to mean "a member of the Chartered Institute of Stockbrokers recognized by an Act, or any other enactment, registered by the Commission as a market operator or a dealing member of securities exchange or capital trade point, or any other recognized mode of securities transaction and engaged in the business of effecting transactions in securities"

From the given definition, three key criteria can be identified for an individual or corporate entity to qualify as a stockbroker. The foremost requirement is membership in the Chartered Institute of Stockbrokers, a professional body established under Act 105 of 1992 and recognized by law. As the sole professional organization in Nigeria authorized to administer qualifying exams and issue professional certifications for stockbrokers and other capital market professionals, such as securities dealers, financial and investment analysts, and portfolio and fund managers, this institute plays a pivotal role in maintaining professional standards in the industry.

Secondly, the person must be registered by the SEC either as a market operator or a dealing member of a securities exchange or capital trade point[491] or any other recognized mode of securities transactions. Securities exchange under the Act means an approved trading facility such as a commodity exchange, metal exchange, petroleum exchange, options, futures exchanges, over the counter market and derivatives exchanges. Ready examples of such exchanges contemplated under the Act exist within the Nigeria capital market. For instance, there is the Nigerian Commodities Exchange (Commodities exchange), NASD Plc (Securities exchange) FMDQ OTC Plc (Securities exchange), Nigerian Exchange Limited (Securities exchange) amongst others.

Lastly, the person must be engaged in the business of effecting securities transactions. *Schedule 2, Part II (1) of the ISA*, provides a useful guide on the activities that constitutes effecting or dealing in securities to

[491] A capital trade point performs similar functions like a standard securities exchange. However, it is regarded as mini exchange registered by the SEC which maintains and provides an avenue or facilities for bringing together buyers and sellers of securities.

include buying, selling, subscribing for or underwriting investments or offering or agreeing either as principal or as agent.

Without prevaricating from the core criteria as to what qualifies one as a stockbroker under the ISA, one interesting issue arises as to what can kind of securities a registered stockbroker can transact in contemplation of the combined provision of section 315 and *Schedule 2, Part II (1) of the ISA*. This issue calls for consideration in the light of emerging Fintech entities who trade securities enlisted in markets outside the shores of Nigeria to Nigerian investors. The fundamental question of concern here is whether those foreign securities fall within the definition of 'securities' contemplated under section *315 of the ISA*.

Under that section, the definition of securities is restricted to debentures, bonds, stocks or the right or option thereof issued by the government or a body corporate; commodities future contract options derivatives which is deposited, kept stored with any licensed depository or custodian company as provided under the ISA. Also are the cumulative provisions of sections *67-70 of the Investments and Securities Act (ISA), 2007 and Rules 414 & 415 of the SEC Rules and Regulations* which provides that only foreign securities listed on any Exchange registered in Nigeria may be issued, sold or offered for sale or subscription to the Nigerian public. Therefore, unless the securities and sale thereof pass the test in those provisions, such activity is deemed to be an infraction of the extant securities law. This explains the SEC's vocality expressed vide its circular dated 8th April 2021 admonishing CMO's operating online platforms to desist from such acts and also cautioning the proliferation of unregistered stock trading platform offering such securities to the public.[492]

That said, it is the intent of the definition of a stockbroker that the criteria operate conjunctively. Therefore, anyone who brandishes itself as a stockbroker must fulfil all the requirements enlisted in that section or will fall short of the qualification of a stockbroker.

The cherished position that stockbrokers maintain within market system, especially with the investing public, places them in a delicate realm where they are expected to exercise due care, skill and caution when

[492] Securities and Exchange Commission (2021) *Proliferation of Unregistered Online Investment and Trading Platforms Facilitating Access to Trading in Securities Listed in Foreign Markets:* Available at https://sec.gov.ng/proliferation-of-unregistered-online-investment-and-trading-platforms facilitating-access-to-trading-in-securities-listed-in-foreign-markets/ (Accessed 13th December, 2021) See also: Securities and Exchange Commission (2021) *The Investments And Securities Tribunal (IST) Restrains Unregistered Fintech Company From Stock Trading:* Available at *https://sec.gov.ng/the-investments-and-securities-tribunal-ist-restrains-unregistered-fintech-company-from-stock-trading/ (*Accessed 13th December, 2021)

discharging their duties. For example, by virtue of their role, they maintain custody of client's fund[493] and utilize the mandate they derive from their customers to carry capital market transaction. This principle also extends to carrying out verification checks when exercising a client's mandate. The foundation of this position can be traced to the aged long principle of the tort of negligence established in the one the earliest leading authority on duty of care: *Donoghue v Stevenson.*[494]

The Nigerian courts have been opportune to pronounce on the principle of duty and care between stockbrokers and their clients. A recent decision of the Investment and Securities Tribunal in *Dr. Okam Kalu Ugwu v. SEC & 4 Ors*[495] exemplifies this position. In this case, the chief issue before the tribunal was whether the 2nd defendant was in breach of its professional and statutory duties under the Investments and Securities Act (ISA), 2007 and other extant rules and regulations governing the capital market. The position of the Claimant against the 3rd Defendant was that there was an unlawful verification, transfer, and sale of its 2, 083 units of Guinness Nig. Plc and 43, 813 units of Union Bank of Nig. Plc shares through Union Registrars. Also was the claim that the 3rd Defendant alleged to have taken instructions from an impostor, who disguised himself as true owner, to verify and sell the Claimant's shares.

The Tribunal speaking through Hon. Nosa Osemwengie rejected the contention of the 3rd Defendant on the issue on whether it had exercised reasonable care in dealing with the Claimant shares. In reaching the decision, the Hon. Judge noted that the 3rd defendant had acted negligently and without proper verification, failed to comply with the cannons of KYC prescribed in *Rule 11.1 (a) of Securities and Exchange Commission Consolidated Rules and Regulations (2015)* when it sold the shares of the Clamant based on the instructions of an imposter posing to be the claimant.

It is worthy of mention here that the rule stipulates that a "dealing Member shall not accept or operate a share trading account or otherwise deal on behalf of any other person unless it has taken all reasonable steps to establish the true identity of the person, including his address, occupation, date of birth, mother's maiden name, driver's license or international passport, current passport photograph and utility bills or any other information that can sufficiently identify him; if a body corporate, certificate of incorporation, Board resolution and relevant Corporate Affairs Commission's form showing return on allotment."[496]

[493] S.40 (Maintenance of sperate accounts and payments into trust account) & s. 41 (Penalty for withdrawing money from trust account without authority)
[494] [1932] AC 562
[495] SUIT NO: IST/EN/OA/2014
[496] Ibid

This decision speaks volume of the pitfalls in the current market regime, especially on the role of stockbrokers. The facts of this case, which gives a wholistic appreciation of the various market participant in the trade cycle will be further analysed in subsequent part of this work. As a precursor, the facts present shocking revelations of some unscrupulous acts that intermediaries play in the trade cycle and presents good ground in this work for questioning whether the value propositions of blockchain technology to eliminate or reduce the participation of intermediaries in the trade cycle within Nigerian capital market should not be considered.

4.5.2 Registrars

Another significant operator in the capital market are registrars. Although the ISA does not specifically define a registrar under the Act, it introduces the position when discussing the need to have a register or record of securities transactions. For instance, *section 227 (1) of the ISA* mandates that a 'body', which can be interpreted as a separate institution, shall keep a register of securities transactions. Such register shall comply with the content of the information demanded under the Act.

Rule 99 of the SEC consolidated rules copiously set out in details the functions that registrars should carry out. These are: "(a) maintaining the register of members of a company and unit holders of collective investment schemes, and effecting appropriate changes in the register; (b) issuing share/debenture/bond certificates; (c) returning surplus monies and monies for rejected applications; (d) preparing and dispatching dividend/interest warrants; (e) distributing rights circulars and public offer documents; (f) dispatching annual reports, accounts and notices of meetings; (g) printing and dispatching securities certificates to new investors in respect of the transfers of existing securities; (h) verifying the genuineness of share certificate and authenticating signature on transfer instruments in respect of existing securities; (i) collecting interests on debenture and loan stocks from the issuer for onward dispatch to debenture or stockholders where applicable; (j) any other function ancillary to all the above."

Other important roles they play are that in quoted companies, which by nature have large number of members, they are contracted to maintain the register of members.[497] Under such arrangement, It is the expectation of the law that the register bears certain content in compliance with the provisions of section 109 (1) of CAMA, 2020 which includes the names and addresses of the members; where the company has share capital, a statement and class of the shares held by each member distinguishing each share by its

[497] Ojoro, O (2008) *Company Law and Practice in Nigeria* LexisNexis 5th Ed

number and the amount paid on the shares by each member. Also is the date any person ceases to be a member. [498]

From the forgoing responsibilities, it can be argued that registrars are the nerve centre of the capital market, particularly for publicly quoted companies. They play a sensitive role in the market by ensuring that they regularly maintain an accurate and updated register of investors. This is task can be herculean, and for it to be discharged effectively, this would usually requires a technological driven process, especially for companies with large number as shareholders. This is because ownership of securities in the capital market is fluid and involves the constant movement of shareholdings from one person to another. This movement needs to be actively and constantly tracked. This is a very critical aspect of their functions because, according to CAMA, only members whose names are in the register of a company are entitled to exercise the various rights of shareholders captured under the Companies and Allied Matters Act. These would include rights like claiming dividend, bonus, right to vote and attend meetings etc.[499]

The law further mandates that registrars maintain electronic register of member of client with adequate back-up.[500] The back-up is expected to be located in a safe place outside the premises of the registrar. The deducible intent of the law here would be to safeguard the data and information of members in the event there is technical challenge which could result to a loss.

Beyond the requirements of the law, the operational methodology of registrars in the Nigerian capital market has been largely criticised for being largely manually driven thus making the process slow, inefficient, and subject to error. Market operators push the responsibility to the investors to reconcile their information. This is because the current state of operation is one where the registrars and stockbrokers maintain separate and fragmented data sets. Rosemary (2015) adequately summarizes the frustration many investors encounter from registrars and draws a strong relationship with the sloppy attitude of registrars and its effect in increasing cost of transaction on investors. It was observed that:

> *"Major challenges identified include overbearing procedures for share certificate verification and dematerialization; untimely delivery/receipt of dividend warrants; undue delay in re-validation of dividend warrants, inability to access unclaimed dividends; general sloppiness in handling clients' enquiries by registrars; time wasting and unnecessarily making investors obtain bankers'*

[498] Section 109 (1) (c) CAMA, 2020
[499] See among other relevant provisions on this sections 107, 426 (2) and 432 (1) & (2) of The Companies and Allied Matters Act , 2020 (as amended)
[500] Section 375 (3) CAMA, 2020

confirmation which some believe is a way of making money for the banks to which they are affiliated, which in turn increases the cost of transaction to the investor"[501]

Whilst some of the issues identified by Rosemary have now been addressed such as share certificate dematerialization, some issues highlighted above are still prevalent. It is thus argued here that the manual process employed by registrars is still cumbersome, daunting, unnecessary, and repetitive in the light of new and emerging technologies. The scale of inefficiencies and redundancy identified solidifies the argument in this work for the adoption blockchain technology for data management and security, albeit subject to having a sound regulatory framework for the technology to operate. [502]

The duties of registrars in the capital market have been have given judicial cognizance in several decisions. In *UBN Plc (Registrars' Dept.) v. SEC*[503] the Investment and Securities Tribunal appraised the duties of a registrar when dealing with securities trading. In such transaction, the Tribunal stated the "registrar deals with the stock broking firms acting on behalf of investors/shareholders; they verify /authenticate investors' claims (i.e., certificates and transfer forms) as presented through the stock broking firm; Send/verify certificate(s) and signed transfer form(s) with two(2) copies of certificate deposit form(2) to the CSCS within 48 hours; receive recycled dematerialized share certificates from the CSCS and alert the CSCS of any abnormality promptly; receive transactions updates from CSCS and apply same by effecting the necessary debits and credits in their books. They also raise claims where necessary."[504]

The sensitive role that registrars play in the trading cycle commands of them a high sense of responsibility, diligence and duty of care. These features have been espoused by the courts in a number of decisions. In *Dr. Okam Kalu Ugwu v. SEC & 4 Ors*, part of the contentions of the claimant was that the 2nd defendant who was the registrar was complicit in the trade process where its shares was unlawfully verified, dematerialized, and transferred to 3rd parties through it without the claimant's authority, consent, and knowledge. Evidence before the Tribunal showed that the claimant issued caution letters instructing the registrar to place a caveat on its shares, the evidence of which was disputed by the registrar on the basis that it did not receive such caution letters. The Tribunal in resolving the issue of negligence and collusion asked itself "whether is it not the custom and practice in financial industry for due care to be exercised when dealing with instruments from strangers?" The tribunal resolved this question in the affirmative and held that from the

[501] Ibid, 39
[502] Nneka Rosemary, I (2015) Challenges Faced by Individual Investors in the Nigerian Capital Market**,** *European Journal of Business and Management* 7(23) pp 36-41
[503] *(2004) 1 NISLR 115 at 150*
[504] Ibid 150

facts presented before it and the way the registrar conducted itself in the process, it acted negligently and unprofessionally for failing to exercise due care in dealing with the share certificates of the Claimant.

The reasoning of the Tribunal here is on good standing, as the registrar cannot extricate themselves from the process of the trade cycle just because they do not directly engage in securities transaction. From the analysis above, registrars constitute an integral part of the securities trading cycle and a conduit pipe through which shares are being bought and sold. So, technically, they ought to act professionally and exercise duty of care in conducting their activities i.e., in verifying the identity of shareholders. Also, the decision of the Tribunal is didactic in this respect, in the sense that it speaks to the argument canvassed here, which is that the threshold of care required in such process cannot be simply whittled down even when they rely on the instructions of stockbrokers to carry out the mandates of shareholders.

To further buttress the standard of care exemplified here, the decision of the Tribunal in *Thomas Kingsley Securities Ltd & Anor v. Meristem Registrar Ltd*[505] provided a helpful stance when it affirmed the acts of the registrar for placing a lien on the claimants' stocks in order to prevent fraudulent trading. In this case, the Defendant noticed a shortfall in the claimant stocks which arose as a result of double lodgement and the sale of 12,519 units of Berger Paints Plc. It therefore placed a lien on the Claimants stock with the tacit approval of the SEC, the apex regulatory body in the industry. The Tribunal applauded the action of the Defendant and noted that it acted on the principle of commercial necessity and natural equity in order to give security and confidence to investors.[506]

Registrars are positioned as an interface between the investors and the issuers. They have a fiduciary obligation to build public and corporate trust in discharging their responsibilities as guardians of shareholders information of a company.

4.5.3 Issuing houses

issuing houses is an integral part of the capital market. They are key market operators that provide financial advisory services and coordinate the mobilization of capital for quoted and unquoted companies, government agencies and institutions to fund their required projects.

Rule 84 of the SEC consolidated rules spells out the functions that they are mandated under the law to perform. These include: (a) the provision of financial advisory services for schemes and issuance of securities

[505] SUIT NO: IST/LA/OA/02/16 (Unreported)
[506] See also: *Hon. Tribunal in Prof. Anthony Asiwaju vs. SEC & Anor (unreported) Suit No. IST/LA/OA/05/16*

under the relevant provisions of the Companies and Allied Matters Act and any other relevant provisions of the law; (b) act as agent for the issuer for the purpose of issuance of securities (c) coordinate activities of other professionals and parties to an issue or scheme; (d) prepare the registration statement, the prospectus , the scheme document or another transaction document recognized by law; (d) perform any other ancillary role related to the functions specified above.

As is the practice with most market intermediaries, the code of conduct enjoins issuing hose to maintain separate account when conducting issues.[507] It should be further noted that the issuing houses can perform the twin function of both its primary functions under rules 84 of the code of conduct and as a receiving banker[508], provide the conditions indicted under *rule 85 (2)* are met. These are: (a) The applicant as a receiving bank has good financial position; (b) There are adverse report tainting the financial position of the applicant; (c) The applicant has no pending investigations or enforcement actions before SEC; (d) The applicant discloses the details of the relationship between the directors, major shareholders and principal officers of the issuing house, the receiving banker and the issuer; and other factor that may be considered by SEC.

4.6 Financial Market Infrastructures

Financial market infrastructures (FMIs) serve as vital components of the financial system, facilitating trading, clearing, settlement, and reporting services for securities and derivative transactions. FMIs comprise various institutions, including exchanges, central counter parties (CCPs), central securities depositories (CSDs), and trade repositories (TRs). These entities play a crucial role in connecting counterparties, mitigating systemic risk, and promoting transparency, among other functions.

Given the importance of FMIs, effective regulation is essential to ensure their stability and proper functioning. While national laws primarily govern these institutions, the cross-border nature of securities and derivatives transactions has led to the implementation of international regulatory oversight. This framework aims to address the challenges posed by the interconnectedness of global financial markets and to maintain the integrity of the financial system as a whole.[509]

[507] Rule 85, SEC code of conduct consolidate rule, 2013

[508] A receiving bank is usually appointed on an issue of shares to the public to receive and process the application forms for the shares, process and clear cheques, allocate the shares and send out share certificates. The bank enters in to a special form of agreement known as the 'receiving bank agreement'. The agreement instructs the receiving bank the role that it would perform on behalf of the company or investment bank. See Thomson Reuters Practical Law, *Receiving bank,* available at: https://uk.practicallaw.thomsonreuters.com/3-200-1402?transitionType=Default&contextData=(sc.Default)&firstPage=true (accessed 12 March 2022)

[509] Moloney, N., Ferran, E., and Payne, J. (eds.) (2015) *The Oxford handbook of financial regulation*. Oxford University Press,

To give context to their roles in trade cycle, Priem (2020) lucidly gives a graphical representation of how depositories, clearing and settlement houses are involved in the process within a typical capital market in the following words:

> *"In the trade execution phase, a buy side, and a sell side client/investor, acting through their respective broker, seek to buy and sell financial instruments to each other on a trading venue, which serves as a meeting point for all buyers and sellers. Alternatively, the trade can take place over-the -counter. When the trade is executed and clearing phase starts, the sell instruction and but instructions are forwarded to the Central counterparty (CCP). A novation takes place, whereby the CCP acts as a buyer to the seller and a seller to the buyer. The clearing members, being the direct clients of the CCP acting on behalf of the buy side and sell side, post collateral to the CCP to mitigate the latter's credit and counterparty risk. They will need to post (or collect) collateral in function of the financial instruments' value changes until the instruments finally mature. After the novation, the CCP will forward the settlement instruction to the CSD. The CSD will operate the securities settlement system by crediting and debiting the securities accounts of its participants, acting on behalf of the buy and sell side clients respectively"*[510]

Without the existence of these institutions in the capital market, trade cycle will be inchoate. Some markets have these institutions playing the role together as a Central Securities Depositories (CSD). The CSD in the market is comparable to a "bank vault" responsible for safe keeping of securities and ensures those securities are transferred to the rightful owners. The characteristics highlighted here aligns with the IMF definition of CSD.[511]

In Nigeria, the existence of these institutions can be traced from *Section 13 (m)* which gives power to The SEC to register and regulate companies engaged in securities depositories and clearing companies. The Nigerian capital market has only two registered Central depository systems. These are the Central Securities clearing System (CSCS) and the FMDQ Depository Limited. These depositories also act as institutions who clear and settle securities or commodities. This work would focus on the CSCS.

4.6.1 Central Securities Clearing System

The existence of the CSCS can be traced as far back as July 29,1992 when it was incorporated. The creation of this financial market infrastructure was part of the effort to make the Nigerian capital market more

[510] Ibid (n.1) 9

[511] Braeckevelt, F Clearing, Settlement and Depository Issues, Bank for International Settlement p.284 – 332 https://www.bis.org/publ/bppdf/bispap30z.pdf (accessed 3rd January 2022)

efficient and investor- friendly. However, it was only until April, 1997 that it was commissioned and officially commenced operations precisely on the April, 14 1997. It is important to highlight that the CSCS witnessed a corporate restructuring on May 16, 2012 when it made a Public Limited Liability company (PLC) by virtue of a special resolution.

The Securities and Exchange Commission (SEC) licensed the CSCS Nigeria PLC as a FMI to carry out key backend operations of the market. These are depository, clearing and settlement of market transactions that are executed on recognised exchanges in the Nigerian Capital market. The CSCS constitute the last leg in the trade cycle and facilitates the transfer of ownership of securities from the seller to the buyer and also ensure that settlement to those securities bought. This delicate position comes with high sense of responsibility and diligence.

It is argued that the CSCS has over the year made strident technological changes in the bid to ensure that it efficiently carry out its depository, clearing and settlement services in the Nigerian market. An example was when it condensed the transaction cycle from T+5 to T+3. This, to an extent ensured that market transactions were settled faster to meet the demand of its customers. Another notable example was the dematerialization of share certificates. This process obviated the need for relevant FMIs and investors to maintain paper record of share certificate whenever there was a transaction.

Just like other market operators, the CSCS maintains an exalted albeit delicate position in the Nigerian capital market. In that respect, and as previously noted, they are expected to exercise duty of care and diligence in discharging their duties. Recent activities have established that they have maintained this standard, but there are cases where the courts have berated their conduct for their failure to exercise due care. This has, to an extent, tainted the integrity of the market and affected the confidence of investors in their services as critical FMIs.

One of the leading and notorious cases that establishes this is the *CSCS & Anor v. Bonkolans Investment Ltd & 5 Ors.*[512] The facts of that case is instructive and worthy of reiteration here. The case showed the need for the CSCS to exercise due diligence in the performance of its duties in share transfer and verification. It particularly highlighted the need for it to conduct proper checks when accepting documents from stockbrokers.

[512] IST/OA/03/2003

In that case, it was discovered that some stockbroking firms fraudulently introduced some share certificates into the CSCS depository which were cleared and sold. Further discovery evidenced that such sale was successful as a result of the connivance and collusion of one of the staff of the CSCS who fraudulently introduced those shares into CSCS system by entering them into the depository. The APC SCE held that the principal officers neglected/failed to effectively exercise due care and supervision over the activities and staff of the company which facilitated the introduction of the forge certificates into the CSCS system.

Interestingly, when the matter was appealed before the Investment and Securities Tribunal, the CSCS attempted to lead evidence to evade culpability which was rather shocking and unconvincing. In an excerpt from the pleadings, the CSCS noted that " The CSCS [1st Applicant] is only a clearing and settlement agent of the capital market. Its operations are designed to complement the role of other key operators in the market…..CSCS does not initiate any transaction in the market rather its operations relies heavily on the declarations by stockbroker/firms that they have mandate of the shareholders to deal in the shares…"[513]

While part of the forgoing statement is the correct position, which is only to the extent that they play a complementary role, they are an essential FMI and so the seeming argument of the CSCS to evade liability in that case and exempt itself from exercising due care diligence is not welcomed in the instance. This position is predicated on the reasoning that the CSCS is an important arm of the capital market. Arguably, no securities transaction traded on recognised exchanges can be concluded without their involvement. This thus makes them an indispensable channel in the settlement of securities. In that regard, in so far as they hold custody of shares, they owe a duty to go beyond rubber stamping the documents tendered by the stockbroker to fact checking whether they are indeed genuine and a true representation of the customer's instructions and details.

The foregoing argument can be further stretched to showcase the relevance of their presence in the chain of securities market transaction by examining *Section 34 of the SEC consolidated rules*. The rules refer to them as "custodian who holds securities on behalf of known investors [but] whose name appears on the issuers register as a fiduciary nominee for the benefit of the investor.." The definition when carefully examined harbours two key operative words that lends credence to their relevance. These are *custodian* and *fiduciary nominee*.

In the construing words in law, statute and case laws confers a high threshold of responsibility on any person who keeps or holds anything of ownership in trust and for the benefit of others. An early and frequently

[513] Ibid

cited English case of *Bristol & West Building Society v. Mothew*[514] offers a reliable definition of what constitutes fiduciary relationship which is applicable here. Millet J. describes the term has elected to act for another 'in circumstances which give rise to a relationship of trust and confidence'. In his illuminating judgment, the learned judge emphasized that the key characteristic distinguishing a fiduciary from other relationships is the paramount duty of loyalty. This duty requires the fiduciary to act in the best interests of the beneficiary and to refrain from actions that would harm or betray the trust placed in them. [515] It should be stated that the concept would have to be appreciated on a case by case basis based on the uniqueness of the relationship. However, an indication of fraud and dishonesty by a market participant of such nature in would certainly constitute a breach of that duty.[516]

As already established, issues of such nature are common. In the case of *Dr. Okam Kalu Ugwu v. SEC & 4 Ors.* for instance, although the CSCS was not a party to the matter before the Tribunal, the Tribunal made comments which indicated that the fraudulent sale of shares without the claimant consent went through the CSCS. This was allowed to be caried on irrespective of the caution letters which the registrar sent and which arguably, the CSCS turned a blind eye towards . It claimed it was not privy to the information leading to the sales even though all the relevant documents went through the CSCS before the shares was sold. The unpleasant perception of the CSCS from such cases is that it merely participates as a bye stander in the process by relying heavily on the information tendered by other market operators without properly conducting its verification checks before settlement is done. It should be noted that the CSCS ought to play a critical role in the trade process. Once shares are bought and sold, there is a transfer of ownership. In that case they must actively participate in the process to prevent fraud and collusion.

Another decisions of the tribunal worth considering is that of *Helmsworth Investment Ltd & Anor v. BGL Securities Limited.*[517] This matter appears to be worrisome because there were so many unanswered questions which the Tribunal did not consider. This could have been because those issues were not joined by parties to the suit or because the claimant did not raise those issues before the Tribunal. In the case under consideration, the claimant provided legal services to the defendant during the year 2006. The second claimant, Etomi, specifically offered legal advisory services to the third defendant by representing their interests in National Sports Lottery Plc (NSL). Instead of compensating Etomi with a traditional monetary payment, the third defendant proposed an alternative arrangement: transferring five million

[514] [1988] Ch 1.
[515] Ibid (n.2) [18]
[516] See: Beaton, G () Can mere incompetence constitute a breach of fiduciary duty, *Dundee Student Review* 5(1+2); Sealey, L (1962) Fiduciary Relationships, *The Cambridge Law Journal* 20(1) p.69-81
[517] IST/LA/OA/01/2014

units of their personal shares in NSL to Etomi as full and final settlement of the legal fees owed. This unique form of remuneration necessitated a thorough examination of relevant securities regulations and legal principles to ensure compliance with the established frameworks governing securities transactions.

Things took a different turn when the Law firm was contacted to collect proceeds of the sale of shares that were hitherto transferred to the claimant and was told it had been sold. The claimant refuted the sum. Although the court affirmed the claims of the claimant, some issues are worth nothing. i.e., were the shares not in the CSCS custody in the name of the claimant? Who authorised the sale of shares that was in the name of another person without lawful authority. These issues are of primary importance considering the fact that the CSCS plays a pivotal role in the custody of securities on behalf of the owners.

The cumulative provisions of the law and the few decisions that have identified above establishes two points. In one part, it gives insight into the cherished and sensitive roles that depositories play in the market cycle. In another part, as the decisions of the court has shown, it exposes the loopholes within the system that can be negatively explored if not properly addressed - the consequences of which can affect the integrity of the market and confidence of investors through the conduct of fraudulent activities.

4.6.2 The Nigerian Exchange (NGX)

The Nigerian Exchange Limited is a critical financial market infrastructure of the Nigerian Capital market. Formerly known as the Nigerian Stock Exchange (NSE), the NSE went through demutualization in 2021 - a process where a mutually owned company changes into a public company. The corporate restructuring led to the creation of the NGX group plc which comprises of three subsidiaries namely: The Nigerian Exchange Limited (the operating exchange), the NGX Regulation limited (independent securities regulator) and the NGX Real Estate Limited (the real estate company)[518]

The Nigerian Exchange (NGX), previously known as the Nigerian Stock Exchange (NSE), utilizes an automated trading system. In partnership with the Central Securities Clearing System Plc (CSCS), the NGX offers a range of services, including electronic clearing, settlement, delivery, and custodial solutions. The NGX's headquarters are located in Lagos, Nigeria's financial center, and the organization has 13 other branches across the nation, allowing for concurrent trading activities.

[518] Nigerian Exchange Group, *NSE Demutualization Update*, available at; https://ngxgroup.com/demutualisation-update/ (accessed 14 March 2022)

An important aspect of the NGX is that all trading and listing activities are carried out through dealing members, which are stockbroking firms specifically licensed by the NGX. Investors are obligated to open securities accounts with the CSCS. In order to protect investors from possible market losses arising from issues such as insolvency, bankruptcy, negligence, or defalcation by a dealing member firm, the Investments and Securities Act (ISA) stipulates that the NGX must maintain an Investors Protection Fund. Investors may file claims against a dealing member, with the maximum compensation amount currently set at 400,000 naira for an individual investor's claim.

As a self-regulatory organization within the Nigerian capital market, the NGX has established a variety of market rules governing the interactions among issuers, market intermediaries, and the exchange itself. These rules encompass a range of topics, including audited financial statement submission and listing regulations. Notable among these are the NGX Rulebook, which outlines the requirements for securities trading and admission, and the Rules and Regulations Governing Trading License Holders, which provide a structured framework for organized exchange trading. NGX Regulation Limited (NGX REGCO), an independent securities regulator, ensures compliance with these rules and regulations among market participants.

4.7. Conclusion

This section has explored the regulatory framework of the Nigeria capital market. Findings from the analysis showed that the Nigerian capital market has an array of laws, relevant market infrastructures and key intermediaries that are typical of any developed or emerging capital market. However, the analysis of its regulatory framework revealed that the market is still currently plagued with an array of issues which necessitates the adoption of the blockchain technology to foster market transparency and efficiency.

However, it is argued that the regulatory standards of the Nigerian capital market appears to be low and therefore questions its level of preparedness to adopt blockchain technology into its market operations. The supporting argument made in this thesis is that its regulatory standards needs to be improved upon before one can conveniently spring up the discussion on the adoption of blockchain technology. This is premised on the two strands of argument. The first is that technology in itself is not a panacea to regulatory deficiency. Secondly, that the technology is more likely to thrive in markets with high regulatory standards. Regulatory standards in this context relates the quality of its regulatory framework. Therefore, issues such as the level of respect for rules by market infrastructures and intermediaries, the level of transparency by market operators, the level of enforcement of market rules by regulators, the level of protection accorded to market participants, among others needs to be critically weighed alongside the quest of its market to

adopt the technology. This is the core argument that is canvassed throughout this work. It is important to highlight that the subsequent chapters of this work would seek to gauge the regulatory standards required for the adoption of the technology. This would done from a comparative lens by examining the regulatory standards of the United Kingdom as a useful guide.

Having established the relevance of this chapter to the narrative in this work, the next chapter ventures into a substantive part of the work by appraising the standards and quality of the Nigerian capital market in line with blockchain technology.

CHAPTER FIVE

IN DEFENCE OF A SOUND AND QUALITATIVE REGULATORY FRAMEWORK FOR BLOCKCHAIN ADOPTION IN THE NIGERIAN CAPITAL MARKET

> "*Undertaking an assessment of the legal and regulatory framework is a crucial first step in that it helps to clarify if jurisdictions can apply existing regulatory frameworks to new innovations and their business models".*
>
> The World Bank, 2020[519]

5.1. Introduction

The basis of this research work rests on proving the hypothesis that a sound and qualitative regulatory framework is a prerequisite for the adoption of blockchain technology in the Nigerian capital market.

This section seeks to prove this hypothesis from two fundamental standpoints. These are the evaluation of: (I) the issues innate to blockchain technology that makes it vulnerable for the Nigerian capital market and (ii) the argument surrounding the extent to which blockchain will influence the capital market. It is imperative to state that these standpoints have an implication on the market because it raises issues of custody, governance, accountability, access, investors protection, data privacy, cybersecurity, interoperability, among others.

Complement to the forgoing standpoints is the usage of the United Kingdom as a comparative case study to prove the hypothesis in this work based on the quality of its regulatory framework of its financial market. The appraisal of these positions creates the basis for developing the requisite regulatory standards that will assist policy makers in retooling its legal and regulatory architecture to enable it to adopt blockchain technology in its financial market.

[519] See page 34 In: World Bank Group, (2020) *How regulators respond to fintech: Evaluating the different approaches-Sandboxes and Beyond,* Finance, Competitiveness & Global practice, Fintech Note, Available at: No.5 https://documents1.worldbank.org/curated/en/579101587660589857/pdf/How-Regulators-Respond-To-FinTech-Evaluating-the-Different-Approaches-Sandboxes-and-Beyond.pdf (accessed 20 April, 2023)

5.2. State of Play: Blockchain Technology in the Nigerian Capital Market

The position has been repeatedly stated throughout this work that blockchain technology and the tokenization of securities has the potential to transform the operations of the capital market. The malleability of the technology was reflected in the recent Nigerian blockchain policy where the government spelt out in its intent for the adoption of blockchain in several sectors of the operations[520]

For capital markets, the argument is that emerging markets like the Nigerian capital market stands to benefit immensely from the positives of this technology given efficacy gains that it presents. This argument is premised on two grounds. The first is that the technology is suitable to address the scale of inefficiencies that is ladened in its market operation such as an illiquid market, lack of transparency and accountability by market operators, lengthy clearing and settlement process, weak investors protection among others. Secondly, the technology would help to drive economic growth by enabling greater liquidity and investors diversity through tokenization and fractionalization of assets.

Interestingly, the Nigerian Securities and Exchange Commission in its revised capital market plan (2021-2025) recognises the potentials of the technology by identifying four (4) key beneficiaries that would benefit from the technology. These are the regulators, the issuers, fund managers and investors. For the regulator, the SEC noted that the technology can help it to automate its functions such as auditing and compliance which would improve the quality of its data and enhance disclosures. For self-regulators like the exchanges, the adoption would help to improve business operations across board such as trading, securities management, clearing and settlement, enhance customer verification and enable better compliance with Anti-money laundering regulations. For issuers, the technology would enhance better access to capital. For fund managers, it would help to facilitate peer-to-peer trading of assets on a secure and verifiable ledger[521]. Lastly, the technology would enable investors have access or wide base of bespoke investment products that is tailored to their needs and risk appetite. [522]

While the SEC recognition of the potentials of this technology is commendable, it is imperative to observe that the document does not lay out a concrete plan for the adoption of the technology in its capital market. The clear insinuation from such omission is that the Nigerian regulator has not contemplated, at least in the interim, developing a regulatory framework to adopt the technology. Similarly, there are no policy statements or record in the public domain that financial market infrastructures like the Nigerian Exchange

[520] National Information Technology Development Agency (2023) *National Blockchain Policy for Nigeria,* available at https://nitda.gov.ng/wp-content/uploads/2023/05/National-Blockchain-Policy.pdf (accessed 14, June, 2023)
[521] NCMP (2020) p. 33
[522] NCMP (2020) p. 14

have formulated a concrete plan towards the usage of blockchain in facilitating capital market transactions. This gap provides a good ground for this research work to appraise the state of its regulatory framework to determine whether it is sound and robust enough to accommodate the disruptive changes and risk that the technology presents. The findings in this work would contribute towards developing the legal and regulatory standards needed to adopt the technology in its capital markets.

It is imperative to note that while the Nigerian capital market has not developed a framework for the adoption of the technology in its market, it has implicitly recognised the role of blockchain technology in the issuance of security tokens by decentralised private exchanges/ virtual assets providers. This was made apparent under its 2022 rules on issuance, offering platforms and custody of digital assets. The rules cover five critical areas: (i) ***Rules on digital assets as securities (ii) Rules on registration for Digital Assets Offering Platforms (iii) Rules on Registration Requirements for Digital Assets Custodians (iv) Rules on Virtual Assets Providers and (V) Rules on Digital Assets Exchange.***

While this work is not devoted to x-raying details of the rules, it is important to point out that in a tacit recognition of this technology, the definition section of the **R*ules on the issuance of digital assets as securities*** defines Initial coin offering as 'ICOs and other Distributed Ledger Technology offers of digital assets. In addition, that section construes digital assets to mean digital tokens that represents assets such as debt or equity claim on the issuer.[523]

By virtue of this, the Nigeria capital market forms part of the leading jurisdictions that have sought to classify tokens issued by virtual assets providers/platforms to be classed as securities, subject to an initial assessment review, under existing securities laws[524]

While there is no available data of businesses or promoters that have applied to be registered under this rule, it is submitted that the creation of the rules is a good step in the right direction. This is because of the scale of abuse that Initial coin offering have been subject to due to lack of effective regulation. Also, it provides a good ground for the regulator to test the efficacy of the rules on digital assets. It is submitted that lessons from such observation would help it in developing a regulatory framework and standards for the adoption of blockchain technology and tokenization of securities in its financial markets. This is because the method of operation are similar in the sense that they are of a decentralised nature.[525]

[523] Paragraph 2

[524] See paragraphs 4.0 and 5.0 of the rules on issuance of Digital Assets on Securities. Note that the rules stipulate that securities structured and offered exclusively on crowdfunding portals are exempted from registration.

[525] This is dependent on the model of adoption by market regulators. However, the adoption would take some centralized form.

5.3. Regulatory standards for blockchain adoption in capital markets

The position is beyond argument that the myriad of issues that blockchain technology poses demands that any jurisdiction that intends to apply same in its capital market must possess the requisite regulatory standards to cater for the risk that it presents and nurture the potentials that it harbours.

The fundamental question therefore is what parameters can be used to gauge whether a jurisdiction has the requisite regulatory standards needed to onboard blockchain technology into financial markets? It is argued that the guiding light for determining such is to test whether the regulatory framework aligns with the core objectives of securities regulation as echoed by the IOSCO. These are 'the protection of investors, ensuring market are fair, efficient and transparent and; the reduction of systemic risk'.[526] Caution must be given here that alignment should not be limited to documentation of the broad objectives on piece of legislations and policy documents but is given light through effective implementation and actualization through the establishment of strong and independent and accountable regulatory infrastructures

The foregoing requirement is critical because, as it has been established in the chain of argument in this work, the application of new and innovative technology can only thrive in markets with strong regulatory framework. This is evident from the exposition of the UK intent to deploy DLT/ solutions to its capital markets.

To establish the readiness of a jurisdiction to adopt blockchain technology in a financial market certain question must be asked based on the broad objectives of securities regulation highlighted above. These are: how well does the system guarantee and protect the rights of investors? what mechanisms are in place to ensure that its market processes are fair, transparent and efficient? What are the mechanisms for detection and prevention of systemic risk. Are they robust enough?

From a practical perspective, answering the questions depend on a variety of considerations based on the unique properties of the technology. The questions would range from how strong is the cybersecurity framework in Nigeria? are there digital infrastructures in place and how efficient is it? how accountable and transparent are market operators? Do market operators respect the rule of law? how well does the market regulators enforce market standards? is the market arbiter independent and impartial? how

[526] IOSCO *Objectives and Principles of Securities Regulation and the IOSCO Assessment Methodology,*Available at: https://www.iosco.org/about/?subsection=display_committee&cmtid=19&subSection1=principles (accessed 15 June 2023)

effective is the digital identity and data privacy framework? what mechanism exist for the protection of investors? are they easily accessible by the investors? what are the channels for communicating risk and are these channels clear and accessible?.

The foregoing questions are threshold questions that goes to the root of any regulatory framework and is a key determinant of its quality. They can arguably be classed as the metrics used in determining the strength of the regulatory framework for the adoption of blockchain technology. They rest on the broader theoretical principles of strong institutions as established by Douglas s North. Findings arrived at based on the analysis of the Nigerian capital market regulatory framework in chapter four shows it does not satisfactorily answer the questions raised. There are certain areas of its regulatory framework that are deficient. This thus creates doubt on the quality of its regulatory framework and questions its readiness to adopt the technology in its market irrespective of its ambition.

Part of the method is ascertaining the requisite regulatory standards needed to onboard this technology is to observe the regulatory standards of jurisdictions that have adopted or in the process of adopting the technology in their financial markets. As established in the methodology of this research work, this work utilises a comparative approach by using the UK capital market regulatory framework as a blueprint for the Nigerian market.

The rationale behind selecting the UK as a comparative jurisdiction is because it has partly embraced blockchain technology in facilitating securities transactions introduced a sandbox to better understand the technology with the quest to adopt in its market[527]. In achieving this, the initial findings of this work is that such adoption is likely thrive due to a combination of certain factors which relates to its sound regulatory framework. These are factors such as its strong and effective regulator, leading exchange, sound body of laws, effective court system for adjudication of securities disputes, technology driven market, respect for the rule of law by market players etc.

5.4. In defence of a sound regulatory framework as a prerequisite for blockchain adoption in the Nigerian capital market.

The preceding part of this chapter has examined the roadmap of the UK to develop regulatory parameters to fully understand and adopt the technology. It has also established that the success in the test cases for

[527] section 13 of FSMA 2023

both the issuance of tokenized equites and bonds under the FCA regulatory sandbox regime can be effectively attributed to its sound and resilient regulatory framework.

Next, this work turns to address the issues that are associated to blockchain technology based on the changes that it seeks to introduce to the capital market. Its application raises the fundamental question whether it would constitute a challenge for the Nigerian capital market based on the quality of its regulatory framework. The reservations related to Distributed Ledger Technology (DLT) and blockchain arise from a myriad of complexities associated with these cutting-edge technologies. These challenges encompass various facets, such as cybersecurity risks, regulatory compliance concerns, combating financial crime, maintaining business continuity, protecting data privacy, integrating asset onboarding, managing digital identities, establishing governance structures, and ensuring secure custody solutions. Addressing these concerns necessitates the development of a robust and comprehensive regulatory framework to ensure that the implementation and adoption of DLT and blockchain technologies are both secure and compliant with existing laws and regulations. Some of the key issues are addressed and specifically tailored to the Nigerian capital market as follows:

5.4.1. Custody Issue

One of the fascinating features of the blockchain technology that makes it an attractive candidate is its theoretical proposition to operate in a decentralized manner without the need of a central authority. However, given the nature of the capital market and its unique configuration, a completely decentralized operation might not be feasible, particularly for the issuance of tokenized securities on the blockchain. The argument on the implementation model of blockchain in the capital market indicates that intermediaries cannot be eliminated completely from the transaction process. In this context, it would require a central and trusted third party authority that can be in custody and guarantee the tokens issued by the real assets.

The implication of such arrangements would imply a need for the creation of a trusted third party such as a custodian who would be conferred with the responsibility of establishing the link between the off-chain world and the distributed ledger ecosystem. This requirement is of necessity because when the blockchain interacts with the real world, particularly under a permissioned system, there would be a need for a central third party. The custodian in this case would perform functions like maintaining the data regarding the ownership of the assets to be tokenised and would be in charge of verifying the information around the assets to ascertain its ownership before it is placed on the blockchain.[528] Furthermore, based on the role of

[528] While blockchain can act as custodian for safekeeping of investors asset through the wallet based model, there is the case for an integrated custody model which would involve qualified custodians like the CSDs. This would therefore require a third party in the transaction cycle. For more on this argument see pages 78 – 82 in BCG, Clifford Chance

the custodian in this arrangement, it may be conferred with the responsibility of ensuring that the tokenized securities on the blockchain tallies and does not exist in multiple token in different platforms.

It is imperative to state that this sensitive role places the safeguarding of the assets similar to the role of custodians in the traditional market. In line with this, it has been argued that existing Clearing and Settlement Depositories may likely be in charge of performing this role under this new arrangement.
A high-level paper released by the Boston Consulting group in conjunction with Clifford chance and others restates this position and further classified the role of CSD based on the nature of method the tokens are related.

> 'Impact on the CSD role and the Custody chain could depend on the type of DLT-based security. For Security Tokens, the CSD could evolve towards a governance role in enforcing standards and resolving disputes, while custodians and other intermediaries play a larger role in proposing and validating transactions, and safekeeping private keys on behalf of clients. In the case of Tokenized Securities, the CSD role and the Custody chain would remain similar to the status quo for the traditional asset portion.' [Emphasis mine][529]

If this proposition holds, then it would imply that CSDs would, as of course, need to maintain a high level of accountability, transparency and trust in superintending over the custody of investor's assets. These standards are critical to ensure that investors are not exposed to humanly created risk such as transaction manipulation, fraud and other forms of misconduct that may be perpetuated by market intermediaries.

Flowing from this line of thought, it would mean that in the Nigerian capital market, this role of ensuring safe custody of the tokenized securities on the chain may be conferred with the Nigerian Central Securities

---

et'al (2023) *Impact of Distributed Ledger Technology in Global Capital Markets* , available at https://www.afme.eu/Portals/0/DispatchFeaturedImages/20230512%20GFMAImpactofDLT%20FullReport%20FINAL%20FULL.pdf (accessed 15 November, 2023)

[529] Ibid, p. 74. To further reinforce this position, the experiment conducted by the Bank of France where French government bond was settled using Central Bank Digital Currency with the blockchain is testament to the evolving role of CSD in performing custodial functions on the blockchain environment. In its experimentation report, it was noted that "During the experiment, the role of 'wallet manager' was extended to allow custodians to open securities wallets for their own clients and manage their related keys. While the custodians keep full control of the relationship with their clients, the wallet of their clients is on the blockchain platform. This means that securities transactions between clients of a custodian can be directly managed on the blockchain platform like any securities transaction between two direct participants of the CSD and privacy is preserved." See the Banque De France et'al (2021) *Experimenting settlement of French government bonds in Central Bank Digital Currency with blockchain technology*, Available at: settlement-french-government bonds-in-cbdc-with-blockchain.pdf (euroclear.com) (accessed 15 January, 2024)

and Clearing System[530]. It is important to state that this model of operation would depend on whether the law would grant such power to centralized third party. This model of operation however springs up the issues of trust and accountability on the part CSCS given its antecedent in flouting market rules on the safe custody of traditional asset in an off-chain world.

This is an issue because respect of market rules by custodians like the CSCS - a functional arm of the capital market - is an important tenet of a sound regulatory framework. Under Section 34 of the SEC consolidated rules, the CSCS is categorised as a "custodian who holds securities on behalf of known investors [but] whose name appears on the issuers register as a fiduciary nominee for the behalf of the investor'. This sensitive role establishes a fiduciary relationship between the investor and CSCS. In this context, the full weight of the law on the fiduciary duties applies. The relationship enunciates the principles of trust and confidence. [531]

To confer the custodial responsibility on a CSD to be in charge of assets transacted on the blockchain, the CSD must have displayed a high level of accountability in the traditional market ecosystem. The question that arises is that can the CSCS be entrusted with such task? The antecedent of the CSCS compels one to answer the question in the negative.

This stance is supported by decisions of the court that have showed how negligent and complicit the CSCS have been in the trade cycle, thus posing a dangerous picture that may erode the confidence of investors. The CSCS has over time had its fair share of exhibiting negligence and ineffective practice. One of the leading and notorious cases that establishes this is *CSCS & Anor v. Bonkolans Investment Ltd & 5 Ors*[532] The facts of the case is instructive and worthy of reiteration here because it showed not only how the CSCS lacked due diligence in the exercise of its duties in the share transfer and verification of investors securities but also its connivance with other market intermediaries to shroud a fraudulent transaction in secrecy.

[530] This is dependent on whether it fulfils the requirement under the law for performing such function under the blockchain operated market. This is so because, as can be gleaned under the UK DSS regulatory sandbox, multiple firms are welcomed to test innovative technologies for trading and settlement of traditional securities in the DSS. This would imply that there may be multiple trading and settlement entities if these firms successfully go through the DSS. However, it remains to be seen whether there will be a streamlined system with one entity for settlement and custody of traditional securities. This thesis has used the CSCS as a test case to tease out the requirements of trust and accountability which should be visible in a centralized market infrastructure.

[531] See the definition of 'Fiduciary' offered by Milet J in Bristol & West Buildings Society v. Mothew [1998] Ch 1. His Lordship noted that 'a fiduciary Is someone who has undertaken to act for or on behalf of another in a particular matter. In circumstances which give rise to a relationship of trust and confidence. The distinguishing obligation of a fiduciary is loyalty.; See Atkins. S (2016) *Equity and Trust* 2nd Ed, Routlegde, London.

[532] (2007) 2 NISLR 93.

In that case, it was discovered that some stockbroking firms fraudulently introduced some share certificates into the CSCS depository which were cleared and sold. Further discovery evidenced that such sale was successful as a result of the connivance and collusion of one of the staff of the CSCS who fraudulently introduced those shares into CSCS system by entering them into the depository. The APC SCE held that chief executive principal officers neglected/failed to effectively exercise due care and supervision over the activities and staff of the company which facilitated the introduction of the forge certificates into the CSCS system.

Interestingly, when the matter was appealed before the Investment and Securities Tribunal, the CSCS attempted to lead evidence to evade culpability which was rather shocking and non-convincing. In an excerpt from the pleadings, the CSCS noted that "The CSCS [1st Applicant] is only a clearing and settlement agent of the capital market. its operations are designed to complement the role of other key operators in the market…..CSCS does not initiate any transaction in the market rather for its operations it relies heavily on the declarations by stockbroker/firms that they have mandate of the shareholders to deal in the shares."

While part of the statement is the correct position, which is only to the extent that the CSCS plays a complementary role, it should be stressed that they are an essential body and so, its attempt to evade lability in the case here and exempt itself from the duty of exercising due care and diligence is not a palatable argument. This position is predicated on the reasoning that the CSCS is an important arm of the capital market operation. No securities transaction can be concluded without its involvement. It is an indispensable market infrastructure for clearing and settlement of investors assets. In that regard, in so far as it holds custody of shares, it owes a duty to go beyond rubber stamping the documents tendered by the stockbroker to fact checking whether they are genuine and a true representation of the customers instruction and details.

Beyond the approbation and reprobation in that case, a key concern that arises from that case is that if one cannot guarantee the fidelity of the CSCS in an off chain market how can one guarantee it to be a competent infrastructure to superintend over the custody of investors assets on the blockchain. This is a worrisome concern that cast doubts on the readiness to adopt the technology based on the operational standards and antecedents of its intermediaries.

5.4.2. Governance Issues

> "*Successful implementation of a distributed ledger will require a combination of governance to protect the participants and stakeholders and regulation to ensure the system is resilient*

to systemic risk or criminal activity. The challenge is to strike the balance between safeguarding the interests of participants in the system and the broader interests of society whilst avoiding the stifling of innovation by excessively rigid structures."[533]

UK Government Office for Science

"*In relation to decentralized systems, a key question for regulators is who should be held accountable for breaches of law and regulation. This is similar to the problem of determining accountability on the internet before the emergence of blockchain. Accountability of the various parties carrying out relevant activities on the Internet has been a vexing problem since its inception*"[534]

John Salmon and Gordon Myers

The adoption of blockchain technology and the tokenization of securities springs up governance issues. This is an issue that the Nigerian capital market would have to confront in its quest towards the adoption of this revolutionary technology. As established in the preceding section of this work, one of the questions that the capital market would have to contend with is what model of distributed leger would be most suitable. The model of the distributed ledger selected would give an inclination of the governance structure and control of the technology. This is turned between permissioned or permissionless blockchain.

From the totality of the findings on blockchain technology, this work believes that given the operational structure of the technology and coupled with the unique nature of the capital market, a permissioned distributed ledger would be more feasible. This is as opposed to a permissionless ledger which is notoriously used for piloting virtual assets like cryptocurrency. The implication of using such model is that it would, just like the traditional securities market model, confer control and governance rights to a centralized third party to ensure the sanctity of the system. This authority would be in charge of giving access to only authorized participants to the network. The central authority would have to read write and validate transactions.

If it is assumed that a centralized authority would perform this sensitive function, the fundamental question that then arises is that who would be the central authority controlling the ledger if the ledger would be the main framework for the trading and issuance? It has been posited that the controlling authority would

[533] See page 11 in UK Government Office for Science, *Distributed Ledger Technology Beyond Blockchain.* Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/492972/gs-16-1-distributed-ledger-technology.pdf (accessed 11 April, 2023)

[534] Salmon. J and Myers. G (2019) *Blockchain and Associated Legal Issues for Emerging Markets*, EM Compass Note 63, IFC, available at https://documents1.worldbank.org/curated/en/260121548673898731/pdf/134063-WP-121278-2nd-edition-IFC-EMCompass-Blockchain-Report-PUBLIC.pdf (accessed 11 July 2023)

likely be an existing market operator from traditional capital market. In the specific, this would likely be trading platforms like stock exchanges or possibly, central securities depositories (CSD).[535] They would oversee and govern access to the network by updating data and giving permission to authorized nodes. This is the case under the issuance of tokenized securities by 20|30. There, the issuance of the tokenized equities was done on the London Stock Exchange Group's Turquoise trading platform with trades being settled via blockchain technology.

In the Nigerian context, would the Central Securities Clearing System who is suggested to have custody rights also oversee governance or would the Nigerian Exchange (NGX) perform this function? The answer to this question would be pronounced as the intent matures. This would also be dependent on the model of operation selected by policy makers. However, the point been teased out here is that whosoever is charge of governance is practically in charge of the key operations and so has a delicate, and in fact a fiduciary duty to ensure that eligible nodes are not negligently or wilfully excluded from the system. Similarly, they have to ensure they have enough security buffers to prevent unauthorized persons from gaining control into the system.

This model carries greater responsivity because a third party is inundated with the task of ensuring the safety and resilience of the network. As puts by the OECD:

> Permissioned DLTs allow for easier AML/KYC checks and implementation of privacy requirements as well as a higher security for the network given the control over access and transaction validation, although these come at the cost of potentially lower resilience given the dependence on a central authority[536] [Emphasis mine]

Since security and resilience of the network would be entrusted with a central intermediary, the strength of its operational environment is a key determinant to its success. For the Nigerian market, this raises a concern given the weak digital environment and proneness to cyber-attacks. This concern was highlighted by the SEC in its Fintech Roadmap of 2019 where it noted that cybersecurity is a major threat and if not properly checked could pose risk to information technology and even create financial instability.[537] This admission of the SEC is true.

---

[535] See the model proposed by the EU pilot scheme previously discussed in the preceding chapters of this work

[536] OECD 2020.

[537] SEC (2019) *The Future of Fintech in Nigeria,* Fintech Roadmap Committee of the Nigerian Capital Market, available at: file:///C:/Users/cosemwengie/Downloads/Report-of-the-FinTech-Roadmap-Committee-of-the-Nigerian-Capital-Market_-October-14-2019.pdf (accessed 13th November, 2023)

Although the issue of cybersecurity will be addressed in a separate section of this work, it is imperative to note that despite the Nigeria's policy on data protection and cybersecurity, it has not frontally addressed the issues when compared to the UK. The UK has had a strong and robust framework on cybersecurity through its phased rollout of its Active Cyber Defence (ACD) programme. Last year, for instance, the defence mechanism took down 2.3 million malicious campaigns.[538] This number is testament to its active framework in ensuring safe and secure digital space for operation of financial services. On the other hand, the lax approach by regulators in Nigeria reinforces the doubts that it lacks the standards needed to maintain a resilient network for the operation of the technology by intermediaries, private institutions and government. Notably, it took the SEC over four decades since the establishment of the Nigerian capital market to develop comprehensive guidelines designed to bolster the efficiency of business operations within the market. These guidelines, introduced in 2022, aim to enhance security, maintain confidentiality, uphold data integrity, and improve the overall reliability of information systems. Despite the long delay, these measures represent an important step towards strengthening the market's infrastructure and ensuring the protection of critical data and systems.[539] The situation hitherto was that market operators interacted 'loosely' with consumers and the regulator on an open and unsecured network, thereby exposing consumer transaction details and personal data to breach. It should be noted that this guideline alone does not itself guarantee the resilience of the digital space because it would take time to implement given the cost of erecting digital security infrastructures and acquiring the expertise.

Beyond the issue of cyber security, it is important to state that governance and accountability are concepts that coexist but appears to be deficient in the Nigerian capital market. From the standpoint of antecedent, this work raises the concern that if the CSCS is given governance right of the blockchain, the possibility of fraud and market manipulation cannot be eliminated. A no too distant case that portrays this concern *is CSCS & Anor v. Bonkolans Investment Ltd & 5 Ors*. The case shows the flagrant breach of conduct rules by a financial market infrastructure who ought to exhibit integrity and professionalism in the discharge of its statutory duties. It also questions the accountability of the institution. The question that arises is that what assurance does one have to guarantee that the CSCS would perform this function honestly. This is a serious

[538] HM Government (2022) *National Cyber Strategy : Pioneering a cyber future with the whole of the UK* (Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1053023/national-cyber-strategy-amend.pdf accessed 4 November 2022.

[539] SEC (2022) *Exposure of Proposed Guidelines On Minimum Operating Standards for Information Technology for Capital Market Operators (CMOs),* available at https://proshareco.bluebooktech.com:44312/uploads/Others/News/89408980-0ac6-47f8-885d-a6e78971c1dc.pdf (13th November, 2023)

issue because accountability is a critical metric that would be used to ascertain the strength of a regulatory framework in the era of emerging technologies.

In closing this section, it is worthy of mention that the totality of the submissions made here accords with the position of the UK finance and Oliver Wyman in their latest appraisal of the tokenisation in securities in the UK financial market.[540] They noted that trust of financial market infrastructures is an essential element in conversation of the tokenization of securities and the adoption blockchain in the UK financial market. The reason being that the financial market infrastructures would be active players in the journey towards the development of tokenised securities markets. To function, they would need to be 'adapted specifically to support issuance, trading, and post-trade activities of a tokenised security'.[541] These are sensitive areas of the financial market process and so, market participant must be able to trust that the FMIs can exercise safe custody of digital assets, establish security standards that can withstand cyberattacks on the DLT platform and ensure that there are robust mechanism to support verification process i.e. KYC and compliance with anti-money laundering requirements. The paper lucidly presents these areas of concern in the following words:

> 'Some adaptation of market infrastructure will be required for securities tokenisation activity to take place. The adapted infrastructure will need to accommodate the storage of digital assets (custody); the use of a form of digital cash to settle transactions involving tokenised securities; convergence on industry standards, including technical standards that determine how the security interacts with the underlying blockchain/DLT platform; and guardrails to ensure the transactions are performed in a safe and trusted manner, such as through verifiable credentials that support Know Your Customer and anti-money laundering requirements (KYC/AML).'[542]

5.4.3. Enforcement framework and Supervisory mechanism

One of the indices of measuring a strong regulatory framework is how effective and efficient its enforcement framework and supervisory mechanism is. This ingredient is important given the peculiarity of the technology in question.

---

[540] UK Finance and Oliver Wyman (2023) *Unlocking the power of securities tokenization: How the UK can lead digital transformation and consolidate the role as a global financial centre.* Available at https://www.ukfinance.org.uk/system/files/2023-07/Unlocking%20the%20power%20of%20securities%20tokenisation.pdf (accessed 8 July, 2023)

[541] Ibid p.8

[542] Ibid p.8

As the preceding chapters of this work has established, one of the realistic visions of the application of blockchain technology is that centralized market infrastructures would interoperate with the technology, at least in the interim, to surprinted over access and governance while some part would be left for automation. The implication of such arrangement is that the designated intermediary(ies) would, implicitly, be entrusted with task of maintaining the integrity of the technology. This is quite worrisome because as cases on blockchain management has shown, intermediaries can manipulate the system and investors can lose their assets or records of transactions.

The foregoing arrangement therefore requires a strong enforcement framework and an effective regulator with the requisite powers to maintain the sanctity of the technology and protect the interest of investors. For the Nigerian market, effective implementation and timeous enforcement of market rules remains an existential issue, particularly for the apex regulator- SEC. This is worrisome when one considers the fact one of the propositions of blockchain is that transactions would be settled in real time and the markets will be allowed to operate on a 24/7 basis, subject to liquidity arrangement. Such arrangement would need an effective supervisor to constantly monitor the operations of the market and timeously address issues that may arise. Unfortunately, the SEC does not have an impressive antecedent in timeously responding to complaints and effectively exercising its statutory powers.

[543] Legal precedent has demonstrated the regulatory body's laxity in enforcing market rules. A prime example of this can be observed in the recent case of Prof Anthony Asiwaju v. SEC & Anor. In this case, the Securities and Exchange Commission (SEC) received multiple complaints against a market operator concerning unlawful share dealings. Pursuant to its investigatory powers, the SEC placed a lien on the shares of the claimant, a director of the company in question. The claimant subsequently filed a complaint with the SEC to have the lien lifted.

Interestingly, the SEC took no further enforcement action or reached a decision on the matter while the lien remained in effect for approximately four years. In its defense, the SEC claimed that the lien was merely a provisional step and temporary measure related to its investigation process. This was intended to prevent market participants from hastily liquidating their investments, leaving nothing for investors to rely on. While the Tribunal ultimately upheld the SEC's investigatory powers, it admonished the SEC for the inordinate length of time the lien had been imposed on the director's shares. As stated by the Tribunal:

[543] This part is extracted from my course work submitted to the University of East London. It is cited as Osemwengie, C (2019*) Enforcement standards of the Nigerian capital markets regulators*, University of East London, Unpublished

"The evidence adduced before this Honourable Tribunal showed that the 1st Defendant placed a lien on the stock account of Claimant with CSCS sometime in 2014 or thereabout, now a period of about four years. There is nothing before this Tribunal to show that the 1st Defendant has issued a foreclosure notice on the said stock account. As stated earlier, Section 13(x) of ISA, 2007 provides that:

x) in furtherance of its role of protecting the integrity of the securities market seek judicial order to freeze the assets (including bank accounts) of any person whose assets were derived from the violation of this Act, or any securities law or regulation in Nigeria or other jurisdictions;

The operative word is that SEC should "seek judicial order to freeze assets (including bank accounts)." There is nothing before this court to show that this provision has been complied with in this case. The argument of the 1st Defendant is that the caution or lien was placed on stock account of the Claimant as interim measure to get him to cooperate. But the lien or caution, which makes it impossible for the Claimant to operate his account, has existed for over four years now. There is also nothing before us to show that the 1st Defendant has gone a step further to validate its action through judicial process. In the absence of any judicial backing after four years, the action of the 1st Defendant, to us, is tantamount to self-help". [Emphasis mine]

This ruling indicates that the SEC may occasionally exhibit a lag in its enforcement actions, despite possessing the requisite tools for timely intervention. This tendency towards delayed action is also observable in other relevant enforcement agencies, such as the police, who are tasked with addressing market complaints involving criminal elements under Section 304 of the ISA. As a result, this culture of delay can hinder the effectiveness of regulatory oversight and the efficient resolution of pressing market concerns.

This is an issue that speaks of the standards of the regulatory framework and raises doubt on the readiness of the market to adopt the technology. The concern here is that such laxity expressed in responding to market issues would be of grave consequences under a blockchain environment if permitted to continue. It should be cautioned that the adoption blockchain does not necessarily relax the supervisory function of the regulator, rather it heightens it because of the automated nature of the technology. Therefore, in the broad conversation to adopt the technology, there is the need to reevaluate the supervisory mechanisms of the regulator and self-regulators to cope with the nuances of this technology and for investors to gain the confidence to migrate to such platform. In closing this point, this section turns to a comparative perspective in the UK. Here, one can cite the FCA and the Bank of England as examples of regulatory bodies who share oversight and enforcement powers over the financial market in the UK. These institutions have well

established supervisory and enforcement strategy to ensure proper surveillance of the market and enforcement of market breaches.[544] These institutions are well known to respond to market complaints timeously and deprecate acts that seek to diminish the market integrity. This is evident in some of its enforcement decisions that the FCA has recently handed down on firms operating in its capital market. For instance, the FCA imposed a huge sum of £215, 834, 156 only in 2022. The facts warranting such fines spans across various market infractions that seeks to diminish the integrity of the market and lower the confidence of investors.[545]

In a notable case, the Financial Conduct Authority (FCA) fined three stockbroking firms - BGC Brokers LP, GFI Brokers Limited, and GFI Securities Limited - a total of £4,775,200 for their failure to implement the Market Abuse Regulation (MAR) provisions. These provisions mandate firms to establish measures for monitoring and detecting abusive trading practices. The FCA's decision to penalize these firms underscores the enforcement approach of the regulatory body in ensuring that firms uphold high compliance standards with market rules and prioritize market integrity in their operations. Actions like this can send signals to the investors that the regulator not does not pay lip service to enforcing the law against market operators. This would boost confidence of investors which can be construed as evidence of its respect for timing in the market and sincerity in exercising its enforcement powers for the slightest breach of market rules.

The methodology of enforcement is reflective of the attitude of the financial market regulators in the UK towards maintaining the sanctity of its market and the confidence its investors. The approach is a proactive one. This is an approach that anticipates acts that can pose risk to the financial system and directing market players to put in place structures and mechanism to prevent it. Enforcement should not be only construed as taking measures to address risk when they have occurred or mature rather, it should encompass a proactive stance through an effective surveillance mechanism to detect market breach before they occur. This is an approach that regulators of the Nigerian capital market should would need to improve on.

While the Nigerian regulators have recorded some level of success in market surveillance and enforcement,[546] there is the issue of inconsistency in its standards of enforcement which needs to addressed critically. Furthermore, there is need for the SEC to develop a robust enforcement approach. This

[544] FCA, *Our Enforcement Guide and publicising enforcement investigations–a new approach*, available at: https://www.fca.org.uk/publication/consultation/cp24-2.pdf (accessed 16 March 2024); FCA, available at: *Our Approach to Supervision,* https://www.fca.org.uk/publication/corporate/our-approach-supervision.pdf (accessed 16 March 2024)

[545] FCA (2022) *2022 Fines* available at: *https://www.fca.org.uk/news/news-stories/2022-fines* (accessed 16 March 2023)

[546] Securities and Exchange Commission v Big Treat Plc & Ors. 2019 LPELR-46520

can be useful as markets begin to adopt new technologies. This can create confidence in the market and incentivize market participants to engage in the market with new technologies like blockchain technology.

5.5.4. Cybersecurity and Data protection

Cyberattack is an existential issue that stands to threaten the adoption of blockchain technology in the Nigerian capital market. Although, the argument has been that the security configuration of blockchain makes it resilient against breach. However, such position is contestable in the light of emerging threats that some have forecasted could impeach the credibility of the technology. A recent article by the World Economic Forum notes that cybercriminals are deploying sophisticated technology to compromise the technology. Therefore, users of the technology should be aware of some emerging threats such as consensus protocol threat breach of private and confidentiality, threat to private keys and smart contract defects among others.[547]

The notorious hack of Coinbase's Ethereum classic where attackers gained control of its computing power to rewrite its transaction history, and allegedly double spend the sum of $1.1 Million, is practical proof of the fallibility of the technology.[548] More worrisome is the 51% chance of blockchain being hacked when a proof of work consensus model is used as a basis for verification of transaction.[549]

This uncomfortable discovery raises the questions of how robust and effective the Nigerian cybersecurity framework is to cope with the fallibilities of the technology. This concern spills off to the Nigerian capital market regulatory framework on how effective its cybersecurity strategy is. This is an issue because for market actors and consumers to interact with blockchain technology for conducting market transaction, they must be assured that their data and asset are safe in the technology. Since cybersecurity is a generic issue that affects businesses and individuals, assessing the quality and robustness of the Nigerian capital market regulatory framework in line with this issue will require an appraisal of the cybersecurity regulatory regime in the financial sector and its effectiveness.

---

[547] World Economic Forum (2023) Is blockchain really secure? Here are four pressing cyber threats you must consider. Available at https://www.weforum.org/agenda/2023/02/blockchain-has-high-potential-but-beware-of-cyberthreats8642651f20/#:~:text=Four%20main%20cybersecurity%20threats%20to%20consider%201%201.,keys%20...%204%204.%20Smart%20contract%20defects%20 (accessed 30 May, 2023)

[548] Orcutt, M. (2019) Once hailed as unhackable, blockchains are now getting hacked, *MIT Technology Review*. Available at https://www.technologyreview.com/2019/02/19/239592/once-hailed-as-unhackable-blockchains-are-now-getting-hacked/ (accessed 30 May, 2023)

[549] Ibid

Before proceeding with this task, it should be noted that one of the limitations of this research is getting data of cybersecurity breaches on capital market firms and market intermediaries. Specific examples and information appear to be non-existent on the web. Attempts to extract this sensitive information from participants in this sector have proven unfruitful. That notwithstanding, the series of symposiums held by market operators on how cybersecurity threat is affecting capital market operations is broad evidence of the existence of this issue.[550] In recognition of this issue, this work draws examples from the cyber threats and attacks on other sectors of the financial system to establish, in general, the weak cybersecurity defence framework in the Nigeria's financial system, of which the capital market is an essential component of.

The regulation of cybersecurity was formalized through the enactment of the Cybercrime (Prohibition Prevention Etc) Act. This was done just 8 years ago after an intense call to have a national framework to frontally address the incessant cyberattacks that had threatened many aspects of individual and business operation. An appraisal of the Act reveals that a sizeable portion of the statute is devoted to prescribing acts and conducts that constitutes cybersecurity offences and their consequences. A limited part provided for the responsibilities for financial institutions to conduct KYC checks.

The Act establishes the cybercrime Advisory council as one of the administrative and enforcement mechanism of the Act.[551] Unfortunately, out of the over 29 government ministries, agencies and parastatals listed in the Act, the Nigerian Securities and Exchange Commission is not a member of the advisory body. The only capital market related body is the Nigerian Exchange Group (previously known and referred to in the Act as the Nigerian Stock Exchange) which is a just a self-regulatory organization and not the apex regulator. That body It is subject to the dictates of the SEC.[552] It is worrisome that its main decision-making body is not privileged to provide insight on how the cybersecurity issues would be tackled in the capital market. It is however unclear whether the NSE(now the NGX) in the circumstance reports to the SEC on the matters discussed by the advisory council.

Beyond the foregoing omission, the cybersecurity regulatory framework, particularly in the financial sector is supported by the Central bank of Nigeria risk-based cybersecurity framework. [553] which covers areas of

[550] Thisday, (2023) Associations to Discuss Cybersecurity Threat , available at: https://www.thisdaylive.com/index.php/2023/05/24/associations-to-discuss-cybersecurity-threat/ (accessed 13 May, 2023)
[551] s.41 Cybercrime Act, 2015
[552] s.13 (b) of the Investment and Securities Act, 2007
[553] Central Bank of Nigeria (2018) Risk-based Cybersecurity Framework and Guidelines for Deposit Banks and Payments Service Providers , available at https://www.cbn.gov.ng/Out/2018/BSD/RISK%20BASED%20CYBERSECURITY%20FRAMEWORK%20Exposure%20Draft%20June.pdf (accessed 23 May, 2023)

banking and payment services such as provision of ATM services, mobile banking, USSD services, among others. Also, in policy terms, cybersecurity is one of the key areas of focus of the Nigerian Digital Economic Policy and Strategy.[554]

Despite the extensive regulatory framework for cybersecurity, there has been a noticeable increase in large-scale cyberattacks targeting financial institutions, such as banks. The Nigeria Inter-Bank Settlement System (NIBSS) reported a high incidence of fraud cases, with over 35% of these fraudulent activities taking place through web-based transactions. Additionally, transactions conducted via mobile phones accounted for a substantial loss of N410 million, which represents 11.7 percent of the total loss value..[555]

The value of monies lost to cybercrimes is staggering, and it questions the efficacy of the cybersecurity regime for Nigeria in the financial sector. For the capital market, the impact of cyberattack can be very dangerous.[556] As the IOSCO noted:

> "cyber threats in capital markets may lead to manipulation of order management systems leading to incorrect feeds, false orders/ non-submissions, and corruption of trade surveillance systems thus enabling manipulative, illegal and abusive trade practices. All this can result in triggering automated rogue trading strategies, thereby increasing the chance of flash crashes. The cybersecurity landscape for asset and wealth management firms is also fraught with an array of threats aimed at stealing or compromising clients' investment or personal data."[557]

[554] Federal Ministry of Communications and Digital Economy, *National Digital Economy and Policy Strategy for a Digital Nigeria*, available at: file:///C:/Users/cosemwengie/Downloads/National%20Digital%20Economy%20Policy%20&%20Strategy_2019_FMoCDE_1661786066.pdf (accessed 23 May, 2023)

[555] Nigerian Financial Intelligence Unit (2023) *Money Laundering Typologies through Fraud in Nigeria,* available at: https://www.nfiu.gov.ng/Home/DownloadFile?filePath=C%3A%5CNFIU%5Cwwwroot%5Cdocuments%5CTMLtFiN_L0AJR2 (accessed 3rd January, 2024)

[556] For instance, In 2011, the Hong Kong stock exchange was forced to halt trading in the shares of some companies after a cyber-attack on its website deprived investors of important announcement from listed companies. The Warsaw Stock Exchange's website was also temporarily paralyzed by a cyber-attack in 2014, reportedly leading to login credentials for dozens of brokers being exposed. See: IOSCO, (2016), *Cyber Security in Securities Markets – An International Perspective Report on IOSCO's Cyber Risk Coordination efforts*. Available at: https://www.iosco.org/library/pubdocs/pdf/IOSCOPD528.pdf (accessed 23 May, 2023)

[557] Ibid

While cybersecurity can be specific to the sector, the issue is a general one. It should be noted that Nigeria lacks a coordinated and effective cybersecurity regime when compared to markets like the UK[558]. Financial market infrastructures are therefore left to develop their cybersecurity framework and standards for themselves which may not coincide with the national standards. This may create a staggered approach which may not be effective. If Nigeria intends to adopt blockchain in the public sector, particularly in the capital market, it would have to develop a comprehensive and coordinated strategy to effectively address the issue.

5.4.5. Investors Protection.

Investors protection is a cardinal objective of securities regulation. It is a culmination of several factors, and particularly related to the issues discussed above.

It is important to note that where the market seeks to embrace new and emerging technologies with the intent to achieve better efficiency, such technology must ensure that it does not harbour risk that would erode the protection that investors are entitled to under the law. For blockchain technology, this is a concern, because, as established in the proceeding chapters of this work, the technology possesses disruptive properties which presents certain risk that can threaten the position of investors. The hypothesis ladened in this point is that for markets to adopt such technology it must have a regulatory environment that possess the guardrails to protect the interest of the investors while also driving market efficiency. This position would however be dependent the quality and standards of its regulatory framework.

For emerging markets like Nigeria, the scale of issues that the technology present is worrisome when one considers the how 'fragile' and weak' the regulatory framework is to effectively address them. This is more pronounced in a tokenised environment where there is a proposition for investors to directly operate with the technology without any intermediary and where there is a tendency, depending on the model, for investors to have their tokenised securities kept in self-custody wallets.

In such an environment, one begins to question the state of the regulatory framework of Nigerian capital market to effectively protect investors where their tokens are stolen or where the security rails of the technology are breached. The concern of is more worrisome in the light of the models of operation of blockchain. From the visions of application that have been discussed so far, there is the likelihood that market infrastructures and intermediaries would superintend over the blockchain. This would enable

[558] HM Government, *Government Cyber Security Strategy Building a cyber resilient public sector 2022-2030,* available at https://assets.publishing.service.gov.uk/media/61f0169de90e070375c230a8/government-cyber-security-strategy.pdf (accessed 13 November, 2023)

investors to be better protected because the intermediaries would serve as a buffer against any risk that would naturally have ordinarily been passed to the investors. However, the position cannot be ruled out that if the Nigerian market wants to adopt the technology, it may want to opt for the extreme vision which envisage a complete removal of all intermediaries leaving the investors and the issuer firm to interact on the chain.

The issue there is that for emerging markets like Nigeria, the question of its weak investors protection regime will be raised. In such arrangement, the investors would be allowed to operate on the blockchain without the guidance of intermediaries. This would expose investors to the risk of the market. So for instance, in the event that investors lose their funds, how will they be protected? what is the method of recovery?. These are important questions that are currently asked in the market operated off chain. In the current system where the securities flows through the stockbrokers and the CSD, cases of appropriation of securities and theft still occurs with little window of protection for investors. This raises questions as to the level of protection that can be offered to investors if they are to operate on the blockchain given the fallibilities of the technology.

Furthermore, generic issues such bureaucratic access to dispute resolution mechanism by the regulator, slow turnaround time for resolving complaints, politically captured dispute resolution bodies adds to the collection of issues that portrays a weak investors regime. A combination of these issues leaves one with the conclusion that the Nigerian market is not ripe to the adopt the technology until these issues are effectively addressed.

5.6. Deficiencies in regulatory standards: Would Straight-Through-Transaction (STP) be an interim alternative?

> "The key to STP is that a single system is used for the entire processing. Global experience shows that a major disadvantage of using multiple systems is non-synchronization of data between different links in the processing chain"[559]
>
> **Natarajan M. et'al**

The argument that has been canvassed throughout this work is that for the Nigerian market to adopt blockchain technology into its capital market, it would need to have a sound and robust regulatory

[559] Natarajan. M, Khan. A and Nadkarni. G (2004) Straight Through Processing (STP): Prospects and Challenges, *Vikalpa* 29(1) pp. 93-99

framework. This is a threshold precondition. This submission stems from an evaluation of its regulatory framework which is adjudged to be inherently deficient to cope with nuances and vulnerabilities of blockchain technology.

This argument is further inadvertently corroborated by the omission of the Nigerian Securities and Exchange Commission in its 2025 capital master plan. In that document while the SEC recognised the impact of the technology in the capital market for various players such as the issuers, investors and regulators, it goes no further than that. It did not set a plan towards its adoption or make and intention towards its adoption in the future. One can argue that such omission by SEC is suggestive of the fact that it does it fully have regulatory apparatus needed to onboard the technology is not fully available.

Furthermore, on the part of the industry, there has been no concrete step, at least of public knowledge outlining the steps of the exchanges or CSDs adopting blockchain as a technological solution to drive efficiency in market operations.

The lack of concrete plan of adoption by the regulator or industry evidences the fact that the Nigerian market is not ready for the adoption of the technology, at least in the interim. This work argues that the lack of readiness is possibly connected to its weak regulatory framework. The forgoing argument notwithstanding, one must understand that blockchain technology is not the only technological solution that can drive efficiency across the value chain in the market cycle. There are other technologies that can perform that, although not as efficient as blockchain but may arguably require less regulatory requirements to adopt. A prime example is the Straight Through processing (STP).

Straight Through processing (STP) is a technological solution that can influence the transaction process by enabling end to end transaction of securities transactions with no manual intervention. Some of the key value propositions of the technology which has similarity to the blockchain technology is that it enables settlement times to be condensed from T+3 days to T+1 days. It further enables trail of transactions to be tracked easily.

Interestingly, I recently attended a virtual event organized by the NGX, titled ‘STP of Equity Transactions’ organized in collaboration with Central Securities Clearing System (CSCS) Plc and United Capital where the NGX shared insights of the benefits of the technology and its quest to adopt the technology to improve the

efficiency of its market.[560] From the event, my observations are that the market is enthusiastic about the technology in improving transaction such as condensing settlement time and ensuring fidelity of transactions process which would in turn would incentivise more persons (particularly the youths) into participating in the capital market. While the intent is good, one waits to see how that would be implemented and the various regulatory requirements that would be needed to onboard the technology.

In connection to the quest to adopt the technology, it should be highlighted that the SEC specifically identifies STP as a key technology that would drive market efficiency in its revised capital market master plan.[561] In precise words the plan indicates that "98% of trades in the market carried out through online straight-through processing by 2025"[562] This ambitious objective can arguably suggest that it places more premium on using STP in the capital market than blockchain in driving efficiency given state of its regulatory framework.

It should be noted that this work does not principally advocate for STP. It mere introduces it an interim as an alternative that can be adopted because of the perception that it may require minimal regulatory burden when compared to blockchain. It should also be stressed that the technology is not novel. Some advanced markets have incorporated the technology in their operations to enable efficient settlement However, some emerging markets are yet to use such technology. For Nigeria, technology still remains an elephant in the way toward markets efficiency of its markets. As the IOSCO notes over a decade ago, The automation in STP 'allows manual intervention to be eliminated from post-trade processing'.[563] Usage of such technology would be construed as a significant leap in the process towards attaining an efficient and inclusive capital market in Nigeria.

5.7. Conclusion

This chapter sought to prove the hypothesis that a sound and robust regulatory framework is a prerequisite for the adoption of blockchain technology in the Nigerian capital market. This was approached from a comparative lens by using the United Kingdom as a jurisdiction of guide. It argues that certain

[560] See the reportage in Business Day (2023) *NGX says working with stakeholders to reduce settlement cycle* available at: https://businessday.ng/markets/article/ngx-says-working-with-stakeholders-to-reduce-settlement-cycle/#:~:text=According%20to%20him%2C%20STP%20is,first%20deal%20to%20final%20settlement. (accessed 23 November 2023)

[561] SEC (2021) *Nigeria Capital Market Master Plan,* available at: file:///C:/Users/cosemwengie/Downloads/SEC_NIGERIA_Capital_market_masterplan_2021_2025-Final%20(2).pdf (accessed 24 March, 2023)

[562] Ibid. p.17

[563] See pages 141- 142 in IOSCO and BIS (2012) *Principles for financial market infrastructures,* available at: https://www.bis.org/cpmi/publ/d101a.pdf (accessed 17 November, 2023)

regulatory standards must be apparent in its market eco system before the technology can be adopted. This includes having a strong and effective supervisory and enforcement mechanism, effective cybersecurity framework, respect for market rules by intermediaries, strong investors protection regime among others.

The overarching submission therefore is that the Nigerian capital market should focus firstly on developing its regulatory framework to the extent that is sound, strong, resilient and have qualitative standards to confront the possible challenges that blockchain may present before contemplating adopting the technology. The thinking backing this proposition is that blockchain does not automatically eliminate foundational regulatory issues inherent the Nigeria capital market. Rather, it seeks to simplify the process of interaction between the market players and stakeholders in the ecosystem. For this mechanism to operate effectively, the Nigerian capital market would need to tackle the myriad of challenges confronting it. In the interim, an alternative technology that can be leveraged upon is STP, a technological solution which has similar value propositions but minimal regulatory requirements given the state of its regulatory framework.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

This research work examined the legal and regulatory standards for the adoption of blockchain technology in the Nigerian capital market. The basis for this research stemmed from the global discussions on the value propositions of the technology in driving an efficient capital market. More importantly, is the country's recognition of the technology in driving efficiency as indicated in its national blockchain policy.

A culmination of these position led to an interrogation of the regulatory framework of the Nigerian capital market to determine the readiness to adopt the technology. This enquiry was based on the vulnerabilities that the technology could pose to its financial market and the implication of the technology on its market operations. An examination of the regulatory framework showed that were gaps and issues that constitutes potential drawbacks towards the successful adoption of blockchain technology. This key finding supports the thesis of this work which states that ' a sound and robust regulatory framework is a precondition for the adoption of blockchain technology in the Nigerian capital market'. Hence, there is the need to develop the requisite regulatory standards needed to adopt the technology in the Nigeria capital market.

6.2. Recommendations

No research is of any societal or economic value if it expends effort highlighting and discussing the issues without proffering methods through which the issues can be addressed. In keeping with this statement, this research work sketches out several recommendations which is believed will assist policy makers in addressing the weak regulatory standards of the Nigeria capital market and position it to adopt blockchain technology. Before highlighting the recommendations, the point must be stressed that because of how endemic and deeply rooted the issues are, some of the recommendations may not materialise in the short run. However, it is the expected that a religious observation of the recommendations proffered here would guide the market towards the path of adoption in the long run.

Furthermore, since the research is a legal study with an interdisciplinary dimension of finance and technology, this work constrains itself to recommendations with a legal dimension while also factoring in the implications of the technology on the capital market.

6.2.1. Developing regulatory standards through experiential learning.

It is believed that the Nigerian capital market possesses the regulatory incentive to adopt blockchain technology in its capital market.

For the regulatory side, these are its basket of rules regulating the issuance, offering platform, and custody of digital assets (2022)[564]. The argument in this work is that the introduction of the rules can be construed as a tacit recognition by the regulator of the value propositions of the distributed Ledger technology (blockchain technology) in the capital market. It is also an implicit recognition of the power of decentralised private entities in the issuance of tokens which, under its rules, can be classified as securities.[565]

It is submitted that the regulators can learn from the experience of private issuers who use blockchain as an underlying technology to issue tokens. Through experiential learning, and collaboration with the private issuers, regulators can better understand where the risks is likely to manifest in the chain of transaction in the broader financial market. The argument in support of this recommendation is that the nature of risk that materialise in the decentralised market would likely be similar to that in the traditional capital market operated by a blockchain. i.e., issues of investors protection, cybersecurity etc. For instance, **paragraph 4 of the rules on Virtual Asset Service Providers** lends credence to this position by requiring that any entity seeking to operate in that space should make satisfactory provisions to cater for the protection of investors; ensure transparency in its operations; provide an avenue of appeal against decisions of the VASP; show evidence that the entity will manage risk that are associated with the business; show that the entity has enough security arrangement to cater for any technology risk that may arise[566].

Similarly, the combined provisions of **paragraph 24, 25, 26, 27 and 28 of the Rules on Digital Assets Exchange** makes copious provisions for the necessary requirements or arrangement that private decentralised exchanges should have or comply with in order to ensure safe custody of assets; integrity of trading operations; maintain market transparency; ensure safe and orderly custody and settlement of assets in their control and maintain proper record of transactions. While these requirements are applicable in a limited environment, the argument is that they are similar requirements that any market infrastructure designated to oversee the blockchain, if it is eventually adopted, would need to comply with. Therefore,

---

[564] (i) Rules on digital assets as securities (ii) Rules on registration for Digital Assets Offering Platforms (iii) Rules on Registration Requirements for Digital Assets Custodians (iv) Rules on Virtual Assets Providers and (V) Rules on Digital Assets Exchange.

[565] SEC (2020) *Statement on Digital Assets and Their Classification and Treatment*. Available at: https://sec.gov.ng/statement-on-digital-assets-and-their-classification-and-treatment/ (accessed 03/7/2023)

[566] Para 4 (j) (i-vii); (k) (j)) of the Rules on Virtual Assets Providers. See also Para 5 (i) on the need to put in place adequate policies and mechanism to mitigate money laundering, terrorism financing.

the lessons from such environment would enable the regulator to develop the requisite regulatory standards to adopt the technology in its financial market. This would position it to adequately cater for the risk that the technology may present to the broader financial market.

Such experiential learning can be achieved through regulatory mechanism like regulatory sandbox where the regulator and the private entities operate in safe space to test the issuance and custody of digital assets in a controlled environment. This has become a regulatory approach that regulators like the UK Financial Conduct Authority have adopted to enable them to understand the risks that a technology or innovation may present in the wider financial market. They tilt towards such approach because it affords them the opportunity to gain valuable insight into the details of an innovation in which they possess less technical knowledge of.

While this remains a recommendation, the viability in creating lessons for the Nigerian market is not without merit. This recommendation resonates with one of the visions of the by the World Economic Forum (WEF) who envisaged that markets for digital-native securities will develop in parallel to existing securities markets, which would be led primarily by central infrastructures and other institutions. If this vison is adopted by the Nigerian financial market, the experiential learning methodology provides a good basis for regulators to begin to develop the requisite standards that would promote such model of adoption in the Nigerian capital market.

6.2.2. Reappraisal of the enforcement methodology

The point has been severally stated that the enforcement mechanism by the regulators of the Nigerian capital market is weak. This weakness, if not addressed, would have major implication if its market transit to an on-chain. The proposal here for is that for investors to have the confidence to interact on the blockchain, its enforcement methodology must change. This point leans on the broader conversation on the regulatory standards for adoption of blockchain technology in the Nigerian financial market.

That said, one of the areas that must be reappraised is its response to market compliant and breaches. This is an appendage of risk management that the regulator should pay close attention to. The risk management strategy of the regulator should place more emphasis on preventing risk timeously through strong surveillance mechanism rather than expending effort in addressing the risk when it has occurred. The cases that have been cited in the preceding chapters of this work where the regulators were lethargic in either responding to market complaints or timeously exercising its powers cannot be condoled in a blockchain environment, which theoretically, the technology is proposed to operate on a 24/7 basis.

One can draw lessons from the UK approach to enforcement which places more emphasis on ensuring that firms put in place mechanism to prevent risk that may have adverse consequence on the integrity of the market before they occur. The attitude of the enforcement of the UK regulator was expressed in one of the enforcement decisions of the Financial Conduct Authority (FCA) where it imposed penalty of £215, 834, 156 on three stock broking firms known as BGC Brokers LP, GFI Brokers Limited and GFI Securities Limited for failing to implement the provisions of the Market Abuse Regulation which required them to put in place measures that would enable it monitor and detect abusive trading. Interestingly, the FCA construed this gap as factor that could pose risk to the market even before it occurred.

The foregoing methodology of enforcement is reflective of the attitude of the financial market regulators in the UK towards maintaining the sanctity of its market and the confidence of its investors. The approach is a proactive one: an approach that anticipates acts that can pose risk to the financial system and directing market players to put in place structures and mechanism to prevent it. This is an approach that the Nigerian market regulators should exemplify if it intends to adopt blockchain technology in its market.

This call is also applicable to self-regulatory institutions like the exchanges, securities settlement and depository bodies. This is important because the realistic propositions of the application of the technology is that one or more of the existing legacy financial market infrastructures, which are also self-regulatory organizations, may be in charge of the blockchain, provided they meet the regulatory requirements for performing such function. The recent rules by the EU on the application of DLT in financial market lends credence to this position. The rules envisage that infrastructure such as multilateral trading facilities, central securities depositories can apply to control the blockchain under its regulatory sandbox.[567] This position resonates with the UK response to its consultation on the application of DLT in financial market.[568] Thus, as critical market infrastructures, it is important that their enforcement mechanism embodies this approach if they would be the designated entities to operate the blockchain, if adopted.

6.2.3. Protection and independence of resolution body for securities dispute

The argument has been made throughout this work that blockchain technology does not cure inherent defects in a regulatory framework. It is merely a technological solution, which in the context of this work, would help drive efficiency of market operations. One of the insinuations from this position is that blockchain technology would not eliminate disputes between parties that arise on the chain. Resolution of

[567] See the proposition by the EU DLT regulatory sandbox rules (2023)
[568] FCA (2020)

disputes would still have to be entertained off chain by the statutory body designed to adjudicate over securities disputes. It is important that such body have an aura of independence to ensure that market disputes are resolved timeously and fairly. This is a point that is correlated to the required standards needed for the adoption of blockchain technology.

In Nigeria, the query Is that the designated institution that is empowered with the jurisdiction to entertain securities disputes, which is the Investment and Securities Tribunal (IST), does not have the constitutional independence and protection it requires to discharge its adjudicatory functions. This is as a result of its current arrangement which places it under the appendage of the executive, therefore making it subject to its whims and caprices. This has the tendency to create instability. This issue portrayed itself in 2015 when the IST was dissolved by an executive pronouncement contrary to the provisions of the **section 277 and 299 of the ISA**.[569] The implication of such act left many cases before the Tribunal unresolved for over 3 years. This has the effect of dampening the confidence of investors and goes to the issues of standards.

The proposal here is to remove the IST from the appendage of the executive arm and place it under the judiciary to be overseen by the National Judicial Council. This would give it the protection, stability and independence it needs to fairly and timeously resolve market disputes without undue interference. This is the same arrangement in the UK where the court that entertain securities dispute, the Upper Tribunal (Tax and chancery chambers), is administered by the ministry of justice.

Furthermore, it is recommended that since the IST has equivalent status with that of the Federal High Court, it should be captured under the Constitution of The Federal Republic of Nigeria to give it the desired protection it requires against the discretionary removal by the executive under the ISA. This proposition has statutory justification from several provisions of the ISA. For instance, the provisions of **section 290 (3) of the ISA** deems its proceedings as judicial proceedings and construes the Tribunal as a civil court for all purposes. Furthermore, the provisions of **section 293** notes that its decisions are to be enforced as if it were that of a Federal High Court. Also, appeals of its decision goes to the Court of Appeal by the provisions of **section 295** and further appeals to the Supreme Court by the provisions of **section 297.** Against the weight of these provisions, it is proposed that the Tribunal be included under the constitution just like other

[569] Section 277 of the ISA makes provision for the tenure of office of members of the Tribunal to be 5 years for the chairman and 4 years for other members. Section 278 on the other hand prescribes the grounds in which a member would cease to be a hold office. The grounds are if the persons become of unsound mind, bankrupt, commits felony or offence of dishonesty, commits serious misconduct and is professional disqualified. The argument is that none of the reasons in both provisions were applicable at that time, and so, the basis of dissolution was questionable and unjustifiable.

superior courts of record in the 1999 constitution[570]. This would obviate the circumstance where the executive, at their discretion, can tinker with the stability of the Tribunal, given its importance to the economy and the securities regulatory framework.

6.2.4 Religious compliance with conduct of business rules by market intermediaries and infrastructures

The inference from the application of blockchain technology in the capital market is that existing legacy market infrastructure and intermediaries may govern its operations where they fulfil the regulatory criteria for performing such function. This means that accountability and trust is expected from these intermediaries and infrastructures when exercising control over the blockchain. When this model of application is situated in the Nigerian financial market, it means that existing legacy market infrastructures like the trading venues (NGX) or the CSD (CSCS) would exercise governance and custody over assets.

The worry is that the level of trust and transparency required from these institutions have not been fully developed as the findings from the decision of the cases examined in this work has shown. The proposition here is that market infrastructure needs to start building trust, transparency and accountability by religiously complying with rules governing the conduct of their business. This is a required regulatory standard that would enable the smooth application of blockchain technology in the Nigerian capital market. Also, it would boost investors' confidence to interact on the blockchain.

As a way of ensuring transparency, there should be accessible channels to report obscene market practices such as fraud and conversion of client assets with clear and actionable timeline for addressing such complaints. Furthermore, market infrastructures and intermediaries should have robust surveillance mechanism that can prevent and detect market abuse. The infrastructures should also have mechanisms that promote disclosure practise. The SEC on its own part would need to ensure these mechanisms are put in place and are constantly monitored to assess its effectiveness.

6.2.5 Enhanced framework for data protection and coordinated cybersecurity framework.

The transition towards on chain market through the adoption of blockchain as a technological solution would require that the Nigerian capital market to develop a strong data protection and cybersecurity framework. The proposition is that regulators of the Nigerian capital should capitalize on the recent data protection Act to ensure that customers information are protected.

[570] See chapter 7 of the constitution.

Furthermore, there should be an overarching and coordinated cybersecurity framework for public sectors like the capital market. This would guarantee standards of operation across the all parastatals and relevant bodies that engages with relevant market operators.

Also, the Nigerian capital market should develop and effectively implement a bespoke cybersecurity strategy that would enable resilience across the value chain of the market cycle. This would be similar to the risk based cybersecurity framework and guidelines which the Central bank of Nigeria developed for deposit money banks and payment service banks.[571]

6.2.6 Enhance capacity building

The quest to adopt blockchain technology should be supplemented with capacity building. Equipping and training personnels is an important step towards understanding the benefits and risks that blockchain technology brings to the capital market. Capacity building should be comprehensive and should done across every sector of the value chain. This would imply training and equipping all the necessary capital market operators and market infrastructures.

One way that capacity building can be achieved is through regulatory exchange exercise. This could be situations where advanced markets share their practice and experience of the usage of blockchain technology with CMOs of the Nigerian capital market.

6.3 Limitation to study

This study had some limitations which impacted on the depth of analysis in specific areas of this work. One of such is the unavailability of data or reported cases of cyberattacks experienced by capital market intermediaries. Information of this nature are not made public by CMOs. The availability of this data would have helped reinforce the argument that the issue is an existential threat in the Nigerian capital market and so, needs to be imminently addressed if it intends to adopt blockchain technology.

Secondly, there is limited research in this area of law in emerging markets in Africa. Therefore, this work relied mostly on literatures developed by authors from developed markets. This formed part of the rationale for adopting a comparative approach in order to mirror what obtains in those markets. While this

[571] Central Bank of Nigeria (2024) Letter to all Deposit Money Banks and Payment Service Banks : Exposure Draft of the Risk Based Cybersecurity Framework and Guidelines for Deposit Money Banks and Payment Services Banks, available at: https://www.cbn.gov.ng/Out/2024/BSD/EXPOSURE%20DRAFT%20OF%20THE%20RISK-BASED%20CYBERSECURITY%20FRAMEWORK%20AND%20GUIDELINES%20FOR%20DEPOSIT%20MONEY%20BANKS%20AND%20PAYMENT%20SERVICE%20BANKS.pdf (accessed 20 March, 2024)

may be a limitation, it however presents itself as an opportunity because this work constitutes a body of work for reference. This void in literature in this area of law further substantiates the originality and necessity of this work as it provides a useful ground for other authors to develop.

BIBLOGRAPHY

Acemoglu, D., Johnson, S., & Robinson, J. A. (2005). Institutions as a fundamental cause of long-run growth. In P. Aghion & S. N. Durlauf (Eds.), Handbook of economic growth (Vol. 1, pp. 385–472). Elsevier.

ACM Computing Surveys, 1990, 22(4): 299-319 Available at: https://s3-eu-west-2.amazonaws.com/lawcom-prod-storage-11jsxou24uy7q/uploads/2021/11/Smart-legal-contracts-accessible.pdf (accessed 27 September, 2023).

Alexander. K, Rahul. D and John. E, (2005) Global Governance of Financial Systems: The International Regulation of Systemic Risk *New York, Oxford online* p. 134-154Alfonso Delgado et al. Towards a Sustainable ICO Process: Community Guidelines on Regulation and Best Practices (2016), pp. 9

Allen. J, Rauchs. M, Blandin. A and Bear. K (2020) Legal and Regulatory considerations for digital assets, available at https://www.jbs.cam.ac.uk/wp-content/uploads/2020/10/2020-ccaf-legal-regulatory-considerations-report.pdf (accessed 27 April, 2023)

Alvi, S.T, Uddin, M.N., Islam, L and Ahamed S (2022) DVT Chain: A blockchain-based decentralized mechanism to ensure the security of digital voting system voting system Journal of King Saud University - Computer and Information Sciences 34 (9) P 6855-6871

Andersson-Manjang. S and Naghavi. N (2021) *State of the Industry Report on Mobile Money,* GSMA

Angela S.M and Turner A. B (2018) Illicit bitcoin transactions: challenges in getting to the who, what and where, *Journal of Money laundering,* 21(3) p.297 -313

Ankenbrand, T and Bieri, D (2018) Assessment of cryptocurrencies as an asset class by their characteristics. *Investment Management and Financial Innovations*, 15(3), 169-181.

Antal, C., Cioara,T, Anghel, I.; Antal, M. and Salomie, I. (2021) Distributed Ledger Technology Review and Decentralized Applications Development Guidelines. *Future Internet 13*(62). Available at https://www.mdpi.com/1999-5903/13/3/62 (accessed 25 September, 2021)

Anthony. I, *The role of stock brokers, registrars and investors in deepening the securities and commodities market- the emerging markets challenges*, available at https://punuka.com/wp-content/uploads/2019/01/Capital_market_role_of_stock_brokers.doc (accessed 15th March 2109)

Anyfantaki. S (2016) The Evolution of Financial Technology (FINTECH) Economic Analysis and Research Department, 47 -62 Economic Bulletin No 44 Bank of Greece

Apolonia. J and Abreu. M (2022) Is Bitcoin a Good Investment Asset? *European Review of Business Economics* 1(2) p. 129- 163

Aponte-Novoa, F et'al (2021) The 51% attack on blockchain: A mining behaviour study, available at https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9567686 (accessed 20th June 2023)

Arner. D, Auer R and Forst. J (2020) *Stablecoins: risks, potential and regulation,* Bank for International Settlements working paper No. 905

Arner. D, Barberis J and Buckle. R (2015) The Evolution of Fintech: A New Post-Crisis Paradigm, *University of Hongkong Faculty of Law* Research *Paper* No. 2015/047

Atkins. S (2016) *Equity and Trust* 2nd Ed, Routlegde, London.

Atzori, M. (2017). Blockchain Technology and Decentralized Governance: is the State Still Necessary? *Journal of Governance and Regulation*, 6(1) p.45-62.

Auer. R and Tercero-Lucas, D (2021*) Distrust or Speculation? The Socioeconomic drivers of US Cryptocurrency investments*, Bank for International Settlements Working paper No.951

Australia Securities and Investment Commission, *Enhanced Regulatory Sandbox* available at: https://asic.gov.au/for-business/innovation-hub/enhanced-regulatory-sandbox-ers/#guidance (accessed 4th January 2023)

Azarenkova. G, Shkodina. I, Samorodov. B, Babenko. M and Onishchenko. I (2018) The influence of financial technologies on the global financial system stability *Investment Management and Financial Innovations* (15) 2 pp. 229-38

Bains, P (2022) Blockchain consensus mechanisms; A primer for supervisors Note/ 2022/003

Banco Central Do Brazil, *Regulatory Sandbox,* available at https://www.bcb.gov.br/en/financialstability/regulatorysandbox (accessed 4th January 2023)

Bank for International Settlements (2017) *Distributed ledger technology in payment, clearing and settlement An analytical framework.* Available at, https://www.bis.org/cpmi/publ/d157.pdf (Accessed 10 July 2022)

Bank for International Settlements (2023) *The Crypto ecosystem: Key elements and risks,* Available at: *https://www.bis.org/publ/othp72.pdf* (accessed 2 September, 2023)

Bank for International Settlements, BIS Innovation Hub work on central bank digital currency (CBDC), available at https://www.bis.org/about/bisih/topics/cbdc.htm#:~:text=A%202021%20BIS%20survey%20of,would%20be%20a%20digital%20banknote (accessed 13 September 2023).

Bank for International Settlements, SIX Group AG and Swiss National Bank (2020) *Project Helvita Settling Tokenized assets in Central Bank Money.* https://www.bis.org/publ/othp35.pdf (Accessed 7 April 2023)

Bank of England (2017) *The economics of distributed ledger technology for securities settlement.* Staff Working Paper n.670. Available at: https://www.bankofengland.co.uk/-/media/boe/files/working-paper/2017/the-economics-of-distributed-ledger-technology-for-securities-settlement.pdf?la=en&hash=17895E1C1FEC86D37E12E4BE63BA9D9741577FE5 (accessed 10 August 2021).

Bank of International Settlements (2018) *Structural Changes in Banking After the Crisis,* CGFS Papers No 60 https://www.bis.org/publ/cgfs60.pdf (accessed 21 April 2021)

Bank of Russia, *Regulatory Sandbox*, available at https://www.cbr.ru/eng/fintech/regulatory_sandbox/ (accessed 4th January, 2023)

Banque De France (2020) *Central Bank Digital Currency Experiments with Banque De France,* available at: https://www.banque-france.fr/sites/default/files/media/2020/03/27/200327-call-for-applications.pdf (accessed 21 April 2021)

Banque De France et'al (2021) *Experimenting settlement of French government bonds in Central Bank Digital Currency with blockchain technology*, Available at: settlement-french-government bonds-in-cbdc-with-blockchain.pdf (euroclear.com) (accessed 15 January, 2024)

Baton Systems. (2022). Baton Systems – Transforming the post-trade environment with distributed ledger technology. Available at https://batonsystems.com/ (accessed 17 August 2023)

Baur, D., Hong, K., Lee, A. (2017) Bitcoin: Medium of Exchange or Speculative Assets?. Available at SSRN: https://ssrn.com/abstract=2561183 or http://dx.doi.org/10.2139/ssrn.2561183 (Accessed 1st March, 2022)

BBC. (2009) *BBC World Service, Aftershock Timeline*. available at: http://www. bbc.co.uk/worldservice/business/2009/09/090902 aftershocktimelineoflash.shtml (accessed 13th June 2023)

BCG, Clifford Chance et'al (2023) *Impact of Distributed Ledger Technology in Global Capital Markets* , available at https://www.afme.eu/Portals/0/DispatchFeaturedImages/20230512%20GFMAImpactofDLT%20FullReport%20FINAL%20FULL.pdf (accessed 15 November, 2023)

Beaton, G () Can mere incompetence constitute a breach of fiduciary duty, *Dundee Student Review* 5(1+2); Sealey, L (1962) Fiduciary Relationships, *The Cambridge Law Journal* 20(1) p.69-81

Bech. M. L, Hancock. J, Rice. T and Wadsworth. A (2020) *On the future of securities settlement, Bank* of International Settlement Quarterly Review pp 67-83

Beck, T., & Levine, R. (2005). Legal institutions and financial development. In Handbook of new institutional economics (pp. 251-278). Springer, Berlin, Heidelberg; World Bank. (2001). Finance for growth: Policy choices in a volatile world. World Bank Publications

Benciˇ c, F.M and Zarko, I.P (2018) *Distributed Ledger Technology: Blockchain Compared to Directed Acyclic Graph* available at https://arxiv.org/pdf/1804.10013.pdf (accessed 25 September 2021)

Bhattacharya, U., & Daouk, H. (2002). The world price of insider trading. Journal of finance, 57(1), 75-108.

Bierer. T,(2016) Hashing It Out: The Problems and Solutions Concerning Cryptocurrency used *as Article 9* Collateral, 7 *Journal of Law, Technology and the Internet*. 7 p. 79-94

BIS Committee on Payments and Market Infrastructure (2018) *Central Bank Digital Currencies*, available at https://www.bis.org/cpmi/publ/d174.pdf (accessed 13 September 2023)

BIS Committee on Payments and Markets Infrastructure (2016) *Glossary,* available at https://www.bis.org/cpmi/publ/d00b.htm?&selection=26&scope=CPMI&c=a&base=term (accessed 21 March, 2022)

Bolsa de Valores de Colombia. (2022). BVC Trading Platform for OTC Derivatives. Available at https://www.bvc.com.co/ (accessed 17 August 2023)

Boston Consulting Group et'al (2023) *Press Release, Banks call for regulators to take a more innovative approach to DLT*/, available at: https://www.gfma.org/banks-call-for-regulators-to-take-more-innovative-approach-to-dlt/ (accessed 7h July, 2023)

Bouri, E., Azzi, G., Dyhrberg A.H. (2017). On the return-volatility relationship in the Bitcoin market around the price crash of 2013. Economics: The Open-Access, OpenAssessment E-Journal 11, 116.

Braeckevelt, F Clearing, Settlement and Depository Issues, Bank for International Settlement p.284 – 332 https://www.bis.org/publ/bppdf/bispap30z.pdf (accessed 3rd January 2022)

Brown. J, Murray. D, Furlong. K, Coco, E and Dablanco (2021) A breeding pool of ideas: *Analyzing interdisciplinary collaborations at the Complex Systems Summer School.* available at: doi: 10.1371/journal.pone.0246260 (accessed 13 March 2022)

Bushman, R. M., & Smith, A. J. (2001). Financial accounting information and corporate governance. Journal of accounting and economics, 32(1-3), 237-333;

Business Day (2023) *NGX says working with stakeholders to reduce settlement cycle* available at: https://businessday.ng/markets/article/ngx-says-working-with-stakeholders-to-reduce-settlement-cycle/#:~:text=According%20to%20him%2C%20STP%20is,first%20deal%20to%20final%20settlement. (accessed 23 November 2023)

Cai. C.W (2018) Disruption of financial intermediation by FinTech: a review on crowdfunding and blockchain, *Accounting & Finance 58 965–992.*

Cambridge Centre of Alternative Finance (2020) *The Global Alternative Finance Market Benchmarking Report Trends, Opportunities and Challenges for Lending, Equity, and Non-Investment Alternative Finance Models, available at: https://www.jbs.cam.ac.uk/wp-content/uploads/2020/08/2020-04-22-ccaf-global-alternative-finance-market-benchmarking-report.pdf* (accessed 11 March 2021)

Carson. B, Romanelli. G, Walsh. P and Askhat Zhumaev (2018*) Blockchain beyond the hype: What is the strategic business value*. Digital Mckinsey, Available at https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/blockchain-beyond-the-hype-what-is-the-strategic-business-value#/ (accessed 10 July, 2022)

Carson. B, Romanelli. G, Walsh. P and Askhat Zhumaev (2018*) Blockchain beyond the hype: What is the strategic business value*. Digital Mckinsey

Central Bank of Bahrain, Fintech and innovation: Regulatory Sandbox Framework, available at: https://www.cbb.gov.bh/fintech/ (accessed 2nd January, 2023)

Central Bank of Kuwait (2022) *CBK Regulatory Sandbox Adopts Sustainable FinTech Products and Services,* available at: https://www.cbk.gov.kw/en/cbk-news/announcements-and-press-releases/press-releases/2022/11/202211240800-cbk-regulatory-sandbox-adopts-sustainable-fintech-products-and-services (accessed 2nd January, 2023)

Central Bank of Malaysia (2016) *Regulatory Sandbox,* available at https://www.bnm.gov.my/sandbox (accessed 4th January 2023)

Central Bank of Nigeria (2017), *Circular to Banks and other Financial Institutions on Virtual Currency operations in Nigeria.*

Central Bank of Nigeria (2018) Risk-based Cybersecurity Framework and Guidelines for Deposit Banks and Payments Service Providers , available at https://www.cbn.gov.ng/Out/2018/BSD/RISK%20BASED%20CYBERSECURITY%20FRAMEWORK%20Exposure%20Draft%20June.pdf (accessed 23 May, 2023)

Central Bank of Nigeria (2021), *Response to Regulatory Directive on Cryptocurrencies,* available at: *https://www.cbn.gov.ng/out/2021/ccd/cbn%20press%20release%20crypto%2007022021.pdf (accessed 11 March 2021)*

Central Bank of Nigeria (2024) Letter to all Deposit Money Banks and Payment Service Banks : Exposure Draft of the Risk Based Cybersecurity Framework and Guidelines for Deposit Money Banks and Payment Services Banks, available at: https://www.cbn.gov.ng/Out/2024/BSD/EXPOSURE%20DRAFT%20OF%20THE%20RISK-BASED%20CYBERSECURITY%20FRAMEWORK%20AND%20GUIDELINES%20FOR%20DEPOSIT%20MONEY%20BANKS%20AND%20PAYMENT%20SERVICE%20BANKS.pdf (accessed 20 March, 2024)

Charapko, A, Ailijiang. and M. Demirbas,. M (2018)Bridging Paxos and Blockchain Consensus, *IEEE International Conference on Internet of Things (iThings) and IEEE Green Computing and Communications (GreenCom) and IEEE Cyber, Physical and Social Computing (CPSCom) and IEEE Smart Data (SmartData)*, pp. 1545-1552,

Cheng-Te, T and Shang, S (2021) Exploring the Sustainability of the Intermediary Role in Blockchain, *Sustainability* 13, no. 4: 1936. Available at https://doi.org/10.3390/su13041936 (accessed 24 September 2023)

Ciaian, P., Kancs, d.,and Rajcaniova, M., The digital agenda of virtual currencies – Can Bitcoin become a global currency? available at: https://data.europa.eu/doi/10.2791/96234 (accessed 13 September 2023)

Claessens, S., & Yurtoglu, B. B. (2013). Corporate governance in emerging markets: A survey. Emerging Markets Review, 15, 1-33.

Cohen, R., P. Smith, V. Arulchandran and A. Sehra (2018), Automation and blockchain in securities issuances, *Butterworths Journal of International Banking and Financial Law.*

Cohney. S, Hoffman. D, Sklaroff. J and Wishnick. D (2019) Coin-Operated Capitalism, *Columbia Law Review* , Vol. 119, No. 3, pp. 591-676.

Coin Market Cap, *Global Cryptocurrency Charts - Total Cryptocurrency Market Cap*, available at: https://coinmarketcap.com/charts/ (11 September 2023)

D.,Nikos and Georgitseas (2020) *An Introduction to Cryptocurrencies: The Crypto Market Ecosystem*. Routledge: Oxon

Delaware State Senate (2017), Senate Bill No. 69, Act to amend title 8 of the Delaware code relating to the General Corporation Law, Available at: https://legis.delaware.gov/json/BillDetail/GenerateHtmlDocument?legislationId=25730&legislationTyp eId=1&docTypeId=2&legislationName=SB69

Deloitte (2020) *Security Token Offerings: The next phase of financial market evolution?* available in https://www2.deloitte.com/content/dam/Deloitte/cn/Documents/audit/deloitte-cn-audit-security-token-offering-en-201009.pdf (accessed 17 April, 2023)

Deloitte (2020): On the objectives of regulation see: IOSCO (2017*) Objectives and Principles of Securities Regulation*, https://www.iosco.org/library/pubdocs/pdf/IOSCOPD561.pdf (available 17 April 2023)

Deloitte and FICCI (2018), *Blockchain in Public Sector: Transforming government services through exponential technologies*, available at https://www2.deloitte.com/content/dam/Deloitte/in/Documents/public-sector/in-ps-blockchain-noexp.pdf; accessed 27 April, 2023)

Deloitte, *Security token offerings: The next phase of financial market revolution,* available at: https://www2.deloitte.com/content/dam/Deloitte/cn/Documents/audit/deloitte-cn-audit-security-token-offering-en-201009.pdf (accessed 14 March, 2022)

Deutsche Borse Group, *Central securities depositories Providing efficient and reliable recording and safekeeping of cash and securities* (accessed 3rd January 2022)

Dill, A. (2019). *Bank regulation, risk management, and compliance: Theory, practice, and key problem areas*. Informa Law: London

Drescher, D. (2017). Blockchain Basics: A Non-Technical Introduction in 25 Steps. CreateSpace Independent Publishing Platform.

Durueke., (2020) Cryptocurrencies Trade 101: Trade Cryptocurrencies with Ease, lulu press

Dyhrberg, A.H., (2016) Bitcoin, gold and the dollar – A GARCH volatility analysis. Finance Research Letters 16, 85-92.

Eliza, M (2017) Smart contracts: Terminology, technical limitations, and real-world complexity. *Law, Innovation and Technology*. 9(2), 269-300.

Ethereum, *A more secure Ethereum* available at: https://ethereum.org/en/roadmap/security/ (accessed 13 April 2023)

European Business Magazine, (2019), 20|30 completes first ever Tokenized Equity Offering Issuance. Available at https://europeanbusinessmagazine.com/business/2030-completes-first-ever-tokenised-equity-offering-issuance/ (Accessed at 14th March 2022)

European Central Bank (2015) Virtual Currency Schemes- A Further Analysis, available at https://www.ecb.europa.eu/pub/pdf/other/virtualcurrencyschemesen.pdf (accessed 15 September 2023). See precisely pages 23 -25

European Crowdfunding Network (2019) *Exploring DLT and Blockchain for Alternative Finance: A Collection of Case Studies,* available at: https://eurocrowd.org/wp-content/uploads/2021/05/ECN_Exploring-DLT-and-Blockchain-for-alternative-finance_Nov2019.pdf (accessed 11March 2021)

Eva, M and Luke, V (2016) Holding, clearing and settling securities through blockchain/distributed ledger technology: creating an efficient system by empowering investors. *Journal of International Banking & Financial Law*, 31 (11) p.1742-6812

Faundez, J. (2014). Douglass North's Theory of Institutions: Lessons for Law and Development. Hague Journal on the Rule of Law, 6(1), 49-73.

FCA (2017) Discussion paper on Distributed Ledger Technology Available at: https://www.fca.org.uk/publication/discussion/dp17-03.pdf (accessed 21 October 2022) and TheCityUK (2020) *Enhancing the UK's Approach to Innovation in financial Services* Available at: https://www.thecityuk.com/media/t42jvkyk/enhancing-the-uks-approach-to-innovation-in-financial-services.pdf (accessed 21 October 2022)

FCA (2019) *Machine Learning in UK Financial Services* Available at https://www.fca.org.uk/publications/research/research-note-machine-learning-uk-financial-services (accessed 21 October 2020)

FCA (2022) *2022 Fines* available at: *https://www.fca.org.uk/news/news-stories/2022-fines* (accessed 16 March 2023)

FCA (2022) *The potential competition impacts of Big Tech entry and expansion in retail financial service,* Discussion Paper, Available at: https://www.fca.org.uk/publication/discussion/dp22-5.pdf (accessed 2 September, 2023)

FCA (2023) Cryptoassets: AML/ CFT regime available at: https://www.fca.org.uk/firms/financial-crime/cryptoassets-aml-ctf-regime (accessed 7 October 2023).

FCA (2023) *Digital Sandbox*, https://www.fca.org.uk/firms/innovation/digital-sandbox (accessed April 17, 2023)

FCA (2023) *Global Financial Innovation Network (GFIN)* available at https://www.fca.org.uk/firms/innovation/global-financial-innovation-network (accessed 20 May 2023)

FCA Regulatory Sandbox Guide. Available at: https://www.fca.org.uk/publication/fca/fca-regulatory-sandbox-guide.pdf (accessed 21 October 2022)

FCA, (2022) *Building a digital regulator: how the FCA is riding the innovation wave, https://www.fca.org.uk/news/speeches/building-digital-regulator-how-fca-riding-innovation-wave/printable/print (*accessed 23 October 2022)

FCA, *Our Enforcement Guide and publicising enforcement investigations–a new approach*, available at: https://www.fca.org.uk/publication/consultation/cp24-2.pdf (accessed 16 March 2024); FCA, available at: *Our Approach to Supervision,* https://www.fca.org.uk/publication/corporate/our-approach-supervision.pdf (accessed 16 March 2024)

Federal Ministry of Communications and Digital Economy, *National Digital Economy and Policy Strategy for a Digital Nigeria*, available at: file:///C:/Users/cosemwengie/Downloads/National%20Digital%20Economy%20Policy%20&%20Strategy_2019_FMoCDE_1661786066.pdf (accessed 23 May, 2023)

Fidelis, N (2022) *Australian stock exchange apologises for dropping botched blockchain upgrade* Available at https://www.ft.com/content/029dd01f-eaf5-493c-b195-299408b62469 (Accessed 10 April, 2023).

Fidelity digital assets (2022) *Institutional Investor Digital Assets Study: Key Findings*, available at https://www.fidelitydigitalassets.com/sites/default/files/documents/2022_Institutional_Investor_Digital_Assets_Study.pdf (accessed 16 April 2023)

Financial Conduct Authority (2018) *Regulatory Sandbox accepted firms*, Available at: https://www.fca.org.uk/news/press-releases/fca-reveals-fourth-round-successful-firms-its-regulatory-sandbox (accessed 9 April, 2023).

Financial Stability Board (FSB) (2019), Decentralised financial technologies: Report on financial stability, regulatory and governance implications, Available at: https://www.fsb.org/2019/06/decentralised-financialtechnologies-report-on-financial-stability-regulatory-and-governance-implications/ (accessed 16 March, 2021)

Financial Times, (2021) *IMF warns against using crypto as national currency ahead of El Salvador* launch https://www.ft.com/content/c36c45d2-1100-4756-a752-07a217b2bde0 (accessed 16th September, 2023)

Frederiks. A.J, Costa. S, Hulst. B & Groen. A.J (2022), The early bird catches the worm: The role of regulatory uncertainty in early adoption of blockchain's cryptocurrency by fintech ventures *Journal of Small Business Management*, available at: https://doi.org/10.1080/00472778.2022.2089355 (accessed 14 March 2021)

Frodeman. R (2010) *The Oxford Handbook of Interdisciplinarity* in Huutoniemi. K, Evaluating Interdisciplinary research 309-320 Oxford: Oxford Press.

FSB (2019) *BigTech in Finance: Market developments and potential financial stability* implications available at: https://www.fsb.org/wp-content/uploads/P091219-1.pdf (accessed 2nd September 2023)

Gay, L. R. (1981). *Educational Research: Competencies for Analysis and Application*. 2nd ed. Columbus, OH:

Gensler, G., Casey, M., Johnson, S., Narula, N., Crane, J. (2018). The Impact of Blockchain Technology on Finance: A Catalyst for Change. Switzerland: Centre for Economic Policy Research.

German Banking Industry Committee (2016) Response to the consultation on the distributed ledger technology applied to securities markets. http://www.esma.europa.eu/file/19543/download?token=g3KSQ0B2

GFIN, *Cross-Border Testing*, available at https://www.thegfin.com/crossborder-testing (accessed 20 May 2023)

Ghana Securities and Exchange Commission () *Ghana Capital Master Plan* available at *https://sec.gov.gh/wp-content/uploads/Press-Release/SEC_CMMP.pdf* (accessed 27 April, 2023)

Gikay A. (2018), Regulating Decentralized Cryptocurrencies under Payment Services Law: Lessons from European Union Law, *Journal of Law, Technology and the Internet* Vol.9 p. 1-35

Goldman Sach (2016) *Blockchain: Putting theory in Practice In Equity Research https://github.com/bellaj/Blockchain/blob/master/Goldman-Sachs-report-Blockchain-Putting-Theory-into-Practice.pdf (accessed 18 April, 2023)*

Gordon Y.L and Caramichael. J (2022). *Stablecoins: Growth Potential and Impact on Banking,* International Finance Discussion Papers 1334. Washington: Board of Governors of the Federal Reserve System, https://doi.org/10.17016/IFDP.2022.1334.

Green, T (2019*) Different type of DLT and how they work*. Available at https://medium.com/@support_61820/different-types-of-dlts-and-how-they-work-cfd4eb218431 (Accessed 25 September, 2021)

Greg Ekpung. E and Uchenna. O (2013) The Impact of Capital Market and Economic Growth in Nigeria, *Public Policy and Administration Research* 3(9), pp. 7-15

Gudgeon L et'al , The Decentralised Financial Crisis, *Department of Computing Imperial; College London,* available at https://www.doc.ic.ac.uk/~livshits/papers/pdf/cvs20.pdf (accessed 20th June 2023)

Guo, Y., & Liang, C. (2016). Blockchain Application and Outlook in the Banking Industry. Financial Innovation, 2(1), 24.

Gurrea Martinez, A and Remolina, N. (2019) The law and finance of initial coin offerings (in) Cryptoassets: Legal, regulatory and monetary perspectives: *Oxford University Press* p.117 – 156.

Hafner. C (2020) Alternative Assets and Cryptocurrency, Journal of Risk and Financial Management 13(7) p1 -3.

Hedera (2021) *Real-time intercontinental settlement using stablecoins*, https://hedera.com/stablecoin-settlement

Herk, F (2018) *Paxos Blockchain: A Private Blockchain Stimulation based on the Paxos protocol*, Available at https://www.hogeschoolrotterdam.nl/globalassets/documenten/onderzoek/projecten/kc-dhs/verslag-technische-haalbaarheid.pdf (Accessed 26 September, 2021)

Higgins,S (2023) Bangladesh Central Bank: Cryptocurrency Use is a 'Punishable Offense, available at https://www.coindesk.com/markets/2014/09/16/bangladesh-central-bank-cryptocurrency-use-is-a-punishable-offense/ (accessed 12 December, 2023)

Hileman, G and Rauchs, M (2017), *Global Blockchain Benchmarking Study*, Available at: http://dx.doi.org/10.2139/ssrn.3040224 (Accessed 15 January, 2022)

HM Government (2022) *National Cyber Strategy : Pioneering a cyber future with the whole of the UK* (Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1053023/national-cyber-strategy-amend.pdf accessed 4 November 2022.

HM Government, *Government Cyber Security Strategy Building a cyber resilient public sector 2022-2030,* available at https://assets.publishing.service.gov.uk/media/61f0169de90e070375c230a8/government-cyber-security-strategy.pdf (accessed 13 November, 2023)

HM Treasury (2019) *Financial Services Future Regulatory Framework Review - Call for Evidence: Regulatory Coordination.*

HM Treasury (2022) UK regulatory approach to cryptoassets, stablecoins and distributed ledger technology in financial markets: Response to the consultation and call for evidence, Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1088774/O-S_Stablecoins_consultation_response.pdf (accessed at May 10 2022)

HM Treasury (2023) The Future financial services regulatory regime for cryptoassets: consultation and call for evidence,

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1133404/TR_Privacy_edits_Future_financial_services_regulatory_regime_for_cryptoassets_vP.pdf.

Hong Kong Monetary Authority, *Fintech Supervisory Sandbox (FSS)* available at: https://www.hkma.gov.hk/eng/key-functions/international-financial-centre/fintech/fintech-supervisory-sandbox-fss/#:~:text=The%20Fintech%20Supervisory%20Sandbox%20(FSS,full%20compliance%20with%20the%20HKMA's (accessed 3rd April, 2022)

Ibrahim. S, Yusoff. Z and Ayub. Z (2017) Legal Research of Doctrinal and Non-Doctrinal, *International Journal of Trend in Research and Development,* (4) 1 2394-9333 p 493-495

IEEE Innovation, *5 sectors exploring new ways of doing business with advanced blockchain*, available at: https://innovationatwork.ieee.org/5-sectors-exploring-new-ways-of-doing-business-with-advanced-blockchain/ (accessed 27 April 2023)

IMF (2009) *International Monetary Fund Annual Report: Fighting the Crisis*

International Finance Corporation, World Bank Group (2019*) Blockchain Opportunities for Private Enterprises in Emerging Markets,* available at https://documents1.worldbank.org/curated/en/260121548673898731/pdf/134063-WP-121278-2nd-edition-IFC-EMCompass-Blockchain-Report-PUBLIC.pdf (accessed 20 July 2021)

International Labour Organization (2022), *Digitalization and the future of work in the financial services sector,* available at: *https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/meetingdocument/wcms_824708.pdf*

International Monetary Fund (2019) *How to Organize Central Securities Depositories in Developing Markets, Key Considerations.* Notes 19/01

International Organisation of Securities Commission (2003) *Objectives and Principles of Securities Regulation*, available at: https://www.iosco.org/library/pubdocs/pdf/IOSCOPD154.pdf (accessed 11 March 2022).

International Organization for Migration - ACP Observatory on Migration (2014) *Mobile Money Services: "A Bank in Your Pocket"- Overview and Opportunities*.

International Organization of Securities Commission (2020): *Investors Education on Crypto-Assets,* FR12/2020

IOSCO (2017) *Methodology for Assessing Implementation of the IOSCO Objectives and Principles of Securities Regulation,* available at: https://www.iosco.org/library/pubdocs/pdf/IOSCOPD562.pdf (accessed 12 March 2022)

IOSCO and BIS (2012) *Principles for financial market infrastructures,* available at: https://www.bis.org/cpmi/publ/d101a.pdf (accessed 17 November, 2023)

IOSCO Committee on enforcement and the Exchange of Information (2015) *Credible Deterrence in the Enforcement of Securities Regulation*,

IOSCO *Objectives and Principles of Securities Regulation and the IOSCO Assessment Methodology,*Available at: https://www.iosco.org/about/?subsection=display_committee&cmtid=19&subSection1=principles (accessed 15 June 2023)

IOSCO, (2016), *Cyber Security in Securities Markets – An International Perspective Report on IOSCO's Cyber Risk Coordination efforts*. Available at: https://www.iosco.org/library/pubdocs/pdf/IOSCOPD528.pdf (accessed 23 May, 2023)

Iris M. Barsan, (2017) Legal Challenges of Initial Coin Offerings, 3 Revue Trimestrielle de Droit Financier [RTDF] 54

Ishan, B. (2021). BNP Paribas Securities Services and Eastspring, via STACS' Mercury Platform, achieve 84% reduction in trade breaks for exchange traded derivatives (ETD) transactions in Singapore. Securities Services. Available at from https://securities.bnpparibas.com/news/news-b941d2db39a4e4219d4f6e742e47c169.html (accessed 13 July 2023)

ISSA (2019) Crypto assets: moving from theory to practice. Available at https://issanet.org/content/uploads/2019/11/2019-11_ISSA_Report_Crypto Assets_Moving_from_Theory_to_Practice.pdf (accessed 17 September, 2023)

Joannou. D, Kalawsky. R, Martínez-Garcia. M and Fowler. C (2020) *Realizing the Role of Permissioned Blockchains In a systems Engineering Lifecycle. MPDI Systems Concepts Paper*

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2010). The Worldwide Governance Indicators: Methodology and Analytical Issues. Hague Journal on the Rule of Law, 3(2), 220-246.

Kenya Capital Market Authority (2017) *Stakeholder's consultative paper on policy framework for implementation of a regulatory sandbox to support financial technology (Fintech) innovation in the capital markets in Kenya.* available at https://cma.or.ke/index.php/cma-study-on-low-uptake-of-capital-markets-products?download=100:stakeholders-consultative-paper-on-policy-framework-for-implementation-of-regulatory-sandbox-to-support-financial-technology-fintech-innovation-in-the-capital-markets-in-kenya (accessed 27 April, 2023)

King. M (2022) We Need a New Approach to Bank Regulation, Financial Times, available at https://www.ft.com/content/43b926a6-b1ba-47a6-91f7-9ad5f776f8f8 (accessed September, 2023)

Kosse, A and Mattei (2023) Making headway-Results of the 2022 BIS survey on central bank digital currencies and crypto, Bank for International Settlements Papers No 136.

Kroll (2021) *Global Regulatory Outlook* 2021 Available at: https://www.kroll.com/en/insights/publications/financial-compliance-regulation/global-regulatory-outlook-2021 Accessed (21 October 2022)

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. W. (1997). Legal determinants of external finance. Journal of finance, 52(3), 1131-1150.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. W. (2000). Investor protection and corporate governance. Journal of Financial Economics, 58(1-2), 3-27

Laeven, L (2014) *The Development of Local Capital Markets: Rationale and Challenges*, International Monetary Fund Working Paper 14/234

Laster, T and Rosner, M.T (2018) Distributed Stock Ledger and Delaware *The Business Lawyer* (73) p.319-336

Leslie. L, (1998) "The Part-Time Parliament" *ACM Transactions on Computer System*, vol.16 (2) pp.133-169.

Let's talk Payment (2015), Survey shows Americans trust technology firms more than banks and retailers, available at <http://letstalkpayments.com/survey-shows-americans-trust-technology-firms-more-than-banks-and-retailers/.> (accessed 21 April 2021)

Luckin. D and Aravind V (2019) *The CFTC's Regulatory Framework,* GLI Fintech (1st Edition) Allen & Overy LLP Available at https://www.allenovery.com/global/-/media/allenovery/2_documents/news_and_insights/publications/2019/8/cryptocurrency_as_a_commodity_the_cftcs_regulator_framework.pdf?la=en-gb&hash=8FB9966803A518C6CDC922AE1C6880AA

Magnunson W (2020) *Blockchain Democracy: Technology, Law and the Rule of the Crowd*, Cambridge University Press: Cambridge.

Magnunson. W (2018) Regulating Fintech *Vanderbilt Law Review* 71(4) pp. 1167-1226

Malala, J (2018) Law and Regulation of Mobile Payments Systems: Issues arising 'post 'financial inclusion in Kenya In *C. G. R. N. Publications, African Centre for Technology* Studies pp. 8-23.

Market Abuse Regulation; Alternative Investment Fund Managers Directive

Martin. J (2013) Lost on the *Silk Road*: Online drug distribution and the cryptomarket, *Criminology and Criminal Justice* 14(3) p. 351-367

Martino, P (2021) *Blockchain and Banking: How Technological Innovations are Shaping the banking Industry* Palgrave: Switzerland

Maugeri, M (2022) Smart contracts, consumer protection, and competing European narratives of private law, *German Law Journal New Private Law Theory: Problems and Perspectives* 23(6) p 900 – 909.

Maull. R, Godsiff. P, Mulligan. C, Brown. and Kewell (2017) Distributed Ledger Technology: Applications and Implications *Briefings in Entrepreneurial Finance* 26 (5) pp 481- 489

Meda., (2019) Fintech Law and Regulation. Elgar Financial Law and Practice: Cheltenham

Mohamed. A.A et'al (2022) Characteristics of Blockchain and Smart Services, for Smart Governments: A systematic review of the literature, *International Journal of Information Systems and Project Management,* 10(3) p. 30 – 55

Moloney, N., Ferran, E., and Payne, J. (eds.) (2015) *The Oxford handbook of financial regulation*. Oxford University Press p. 569 -581.

Monetary Authority of Singapore, *how are digital payment token services regulated in Singapore,* available at:https://www.mas.gov.sg/-/media/MAS-Media-Library/who-we-are/mas-gallery/MAS-Gallery/Digital-Payment-Tokens.pdf (accessed 7 October 2023)

Money Laundering, Terrorist Financing and Transfer of Funds (Information on the Payer) Regulations 2017.

Mt Pelerin (2018) *The world first tokenized shares*, available at https://www.mtpelerin.com/blog/world-first-tokenized-shares (accessed 14 March 2022)

Mulligan. C, Scott. J, Warren. S and Rangaswami. JP (2018) *Blockchain Beyond the Hype: A Practical Framework for Business Leaders*, World Economic Forum White Paper

Nabilou, H and Andre, P (2019), Central banks and regulation of cryptocurrencies, , *University of Luxembourg Law Working paper, No. 2019-014.*

Nasdaq (2022) *PayPal and Microsoft Adopt Cryptocurrencies: What This Means for the Future*, Available at: https://www.nasdaq.com/articles/paypal-and-microsoft-adopt-cryptocurrencies%3A-what-this-means-for-the-future (accessed 2 September 2023)

Natarajan. M, Khan. A and Nadkarni. G (2004) Straight Through Processing (STP): Prospects and Challenges, *Vikalpa* 29(1) pp. 93-99

National Information Technology Development Agency (2023) *National Blockchain Policy for Nigeria,* available at https://nitda.gov.ng/wp-content/uploads/2023/05/National-Blockchain-Policy.pdf (accessed 14, June, 2023)

Nestrocova, D. (2019) *A Critical Appraisal of Initial Coin Offering lifting the "Digital Token Veil'* Brill

Nigerian Exchange Group, *NSE Demutualization Update*, available at; https://ngxgroup.com/demutualisation-update/ (accessed 14 March 2022)

Nigerian Exchange Limited (2023) *NGX Retail Investor* Workshop, available at: https://www.youtube.com/watch?v=lcmR711C_W0 (5th July, 2023)

Nigerian Financial Intelligence Unit (2023) *Money Laundering Typologies through Fraud in Nigeria,* available at: https://www.nfiu.gov.ng/Home/DownloadFile?filePath=C%3A%5CNFIU%5Cwwwroot%5Cdocuments%5CTMLtFiN_L0AJR2 (accessed 3rd January, 2024)

Nina T (2017) *Daimler uses blockchain to issue bonds,* The wall Street Journal*,* available at https://www.wsj.com/articles/daimler-uses-blockchain-to-issue-bonds-1499895714 (accessed 14th March 2022)

Nneka Rosemary, I (2015) Challenges Faced by Individual Investors in the Nigerian Capital Market**,** *European Journal of Business and Management* 7(23) pp 36-41

North, D. C. (1990). Institutions, Institutional Change and Economic Performance. Cambridge University Press.

North, D. C. (1991). Institutions. Journal of Economic Perspectives, 5(1), 97-112.

Nwude, C., 2007. The Impact of Capital Market Regulation on the Nigerian Economy. *Zenith. Economic Quarterly*, 2(11), pp.36-43.

OECD (2020), *The Tokenisation of Assets and Potential Implications for Financial Markets*, OECD Blockchain Policy Series, Available at: www.oecd.org/finance/The-Tokenisation-of-Assets-and-PotentialImplications-for-Financial-Markets.htm. (Accessed 15 March, 2021)

OECD (2020); Bank for International Settlements (2017), Distributed ledger technology in payment, clearing and settlement: An analytical framework, Committee on Payments and Market Infrastructures, available at: https://www.bis.org/cpmi/publ/d157.pdf (accessed 15 March 2021)

OECD (2021), *Regulatory Approaches to the Tokenisation of Assets,* OECD Blockchain Policy Series, available at: www.oecd.org/finance/Regulatory-Approaches-to-the-Tokenisation-of-Assets.htm (accessed 18 November, 2021)

OECD, (2020), *The Tokenization of Assets and Potential Implications for Financial Markets*, OECD Blockchain Policy Series, available at: www.oecd.org/finance/The-Tokenisation-of-Assets-and-PotentialImplications-for-Financial-Markets.htm. (accessed 12 March 2021);

OECD, *Blockchain Primer*, Available at https://www.oecd.org/finance/OECD-Blockchain-Primer.pdf (Accessed 2nd October 2021)

Ojoro, O (2008) *Company Law and Practice in Nigeria* LexisNexis 5th Ed

Ølnes, S., Ubacht, J., & Janssen, M. (2017). Blockchain in government: Benefits and implications of distributed ledger technology for information sharing. Government Information Quarterly, *an international journal of information technology management, policies, and practices*, 34(3), 355-364.

Orcutt, M. (2019) Once hailed as unhackable, blockchains are now getting hacked, *MIT Technology Review*. Available at

Osemwengie, C (2019) Enforcement standards of the Nigerian capital markets regulators, University of East London, Unpublished.

Palmié, M., Wincent, J., Parida, V., & Caglar, U., (2020). The evolution of the financial technology ecosystem: an introduction and agenda for future research on disruptive innovations in ecosystems. Technological forecasting and social change 151. https://doi.org/ 10.1016/ j.techfore.2019.119779

Patricia, B.A (2015) Capital Market and Economic Growth of Nigeria, *Research Journal of Finance and Accounting* Vol.6 (9) pp 82 -93

Paypal, *How to use Crypto to checkout?,* available in https://www.paypal.com/us/cshelp/article/how-to-use-crypto-at-checkout-help571#:~:text=Checkout%20with%20Crypto%20will%20automatically,No. (accessed 16 April 2023)

Peters GW, Panayi E (2015) *Understanding modern banking ledgers through blockchain technologies: future of transaction processing and smart contracts on the internet of money.* Available at SSRN: http://dx.doi.org/10.2139/ssrn.2692487 (accessed 24 September, 2023).

Pinna, A. & Ruttenberg, W. (2016) Distributed Ledger Technologies in Securities Post-Trading Revolution or Evolution? *ECB Occasional Paper No. 172*. Available at: https://www.ecb.europa.eu/pub/pdf/scpops/ ecbop172.en.pdf[accessed 10 August 2021]

Powell. R, (2004) *Basic Research Methods for Librarian,* Greenwich: Ablex Publishing Corporation at

Priem, R (2020) Distributed Ledger Technology for securities, clearing and settlement: benefits, risk and regulatory implications, *Financial Innovation* 6(11) p1-25 available at: https://doi.org/10.1186/s40854-019-0169-6 (accessed 11 March 2022).

PWC (2020), *Time for trust: The trillion-dollar reasons to rethink blockchain, https://image.uk.info.pwc.com/lib/fe3111707564047570 1c74/m/2/434c46d2-a889-4fed-a030-c52964c71a64.pdf* (accessed 16 November 2022)

PWC (2022) *Digital Assets- An Emerging Trend in Capital Markets,* Available at https://www.pwc.com/ng/en/assets/pdf/digital-assets.pdf, (accessed 10 April, 2023)

Rabindra, Kr & Pathak, Rabindra. (2019). *Historical Approach to Legal Research,* Available at: https://www.researchgate.net/publication/336676844_Historical_Approach_to_Legal_Research (Accessed April 4 2022)

Raj. K *Foundations of Blockchain: The Pathway to Cryptocurrencies and Decentralized Blockchain Applications.* Packt Publishing, Birmingham.

Rauchs. M, Glidden. A, Gordon. B, Pieters. G, Recanatini. M, Rostand. F, Vagneur.K and Zhang.B (2018) , Distributed Ledger Technology Systems: A Conceptual Framework, Cambridge Centre for Alternative Finance

Regulations (EU) 2022/858 of the European Parliament of the Council (2022) Pilot regime for market infrastructures based on DLT, *Official Journal of the European Union* L 151/1-33. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022R0858 (accessed 9 April, 2023).

Reserve Bank of India, (2020) *Enabling Framework for Regulatory Sandbox,* available at https://rbi.org.in/scripts/PublicationReportDetails.aspx?ID=1161 (accessed 2nd January , 2023)

Rivers, M (2023) Bitcoin is not crypt, The SEC confirms, available at: https://www.forbes.com/sites/martinrivers/2023/07/31/bitcoin-is-not-crypto-the-sec-confirms/

Rodrik, D., Subramanian, A., & Trebbi, F. (2004). Institutions Rule: The Primacy of Institutions over Geography and Integration in Economic Development. Journal of Economic Growth, 9(2), 131-165;

Salami, I. (2021) 'Challenges and Approaches to Regulating Decentralized Finance', American Journal of International Law, 115(6), pp. 425-429.

Salmon. J and Myers. G (2019) *Blockchain and Associated Legal Issues for Emerging Markets*, EM Compass Note 63, IFC, available at https://documents1.worldbank.org/curated/en/260121548673898731/pdf/134063-WP-121278-2nd-edition-IFC-EMCompass-Blockchain-Report-PUBLIC.pdf (accessed 11 July 2023)

Santander InnoVentures, Oliver Wyman, and Anthemis Group (2015). The Fintech 2.0 Paper: Rebooting Financial Services. Available at: https://www.finextra.com/finextra-downloads/newsdocs/The%20Fintech%202%200%20Paper.pdf (accessed 11 March 2011)

Satoshi Nakamoto, Bitcoin*: A Peer-to-Peer Electronic Cash System*, Bitcoin.Org (Nov. 1, 2008), https://bitcoin.org/bitcoin.pdf [Accessed 14 January, 2020)

Schmukler. S and Cortina. J (2018) The FinTech Revolution: A threat to Global Banking, Research and Policy Brief *World Bank Group* http://documents1.worldbank.org/curated/en/516561523035869085/pdf/125038-REVISED-A-Threat-to-Global-Banking-6-April-2018.pdf (accessed 21 April 2021)

Schneider, F. Implementing Fault-Tolerant Services Using the State Machine Approach: A Tutorial [J].

SEC (2019) *The Future of Fintech in Nigeria,* Fintech Roadmap Committee of the Nigerian Capital Market, available at: file:///C:/Users/cosemwengie/Downloads/Report-of-the-FinTech-Roadmap-Committee-of-the-Nigerian-Capital-Market_-October-14-2019.pdf (accessed 13th November, 2023)

SEC (2020) *Statement on Digital Assets and Their Classification and Treatment*. available at: https://sec.gov.ng/statement-on-digital-assets-and-their-classification-and-treatment/ (accessed 03/7/2023)

SEC (2021) *Nigeria Capital Market Master Plan,* available at: file:///C:/Users/cosemwengie/Downloads/SEC_NIGERIA_Capital_market_masterplan_2021_2025-Final%20(2).pdf (accessed 24 March, 2023)

SEC (2022) *Exposure of Proposed Guidelines On Minimum Operating Standards for Information Technology for Capital Market Operators (CMOs),* available at https://proshareco.bluebooktech.com:44312/uploads/Others/News/89408980-0ac6-47f8-885d-a6e78971c1dc.pdf *(*13th November, 2023)

SEC (2022) *New Rules on Issuance, Offering Platforms and Custody of Digital Assets*, https://sec.gov.ng/wp-content/uploads/2022/05/Rules-on-Issuance-Offering-and-Custody-of-Digital-Assets.pdf.

Securities and Futures Commission (2023) *Guidelines for Virtual Asset Trading Platform Operators* available at: https://apps.sfc.hk/edistributionWeb/api/consultation/conclusion?lang=EN&refNo=23CP1#page=31 (accessed 24 December 2023)

Securities and Exchange Board of India (2017) *Frequently asked questions on Straight Through Processing* https://www.sebi.gov.in/sebi_data/faqfiles/jan-2017/1485846723481.pdf (accessed 5th July, 2023)

Securities and Exchange Commission (2015), *The Nigerian Capital Market Master Plan 2015 -2025* (Revised)

Securities and Exchange Commission (2020) *Statement On Digital Assets And Their Classification And Treatment*, available at: https://sec.gov.ng/statement-on-digital-assets-and-their-classification-and-treatment/ (accessed 13 September 2023)

Securities and Exchange Commission (2021) *Proliferation of Unregistered Online Investment and Trading Platforms Facilitating Access to Trading in Securities Listed in Foreign Markets:* Available at https://sec.gov.ng/proliferation-of-unregistered-online-investment-and-trading-platforms facilitating-access-to-trading-in-securities-listed-in-foreign-markets/ (Accessed 13th December, 2021)

Securities and Exchange Commission (2021) *The Investments And Securities Tribunal (IST) Restrains Unregistered Fintech Company From Stock Trading:* Available at *https://sec.gov.ng/the-investments-and-securities-tribunal-ist-restrains-unregistered-fintech-company-from-stock-trading/ (*Accessed 13th December, 2021)

Securities and Exchange Commission (2022) *Exposure Of Proposed Guidelines On Minimum Operating Standards For Information Technology For Capital Market Operators (CMOS)* Available at: https://sec.gov.ng/wp-content/uploads/2022/04/Exposure-of-Proposed-Guideline-for-MOS-for-IT-final-1.pdf (Accessed 4th August 2022)

Securities and Exchange Commission, *List of Capital Market Operators (CMO)*: Available at < *https://sec.gov.ng/list-of-capital-market-operators-cmos/ >(*Accessed 9th December, 2021):

Singapore Monetary Authority (2022) *Sandbox Express Guidelines,* available at https://www.mas.gov.sg/-/media/mas-media-library/development/regulatory-sandbox/sandbox-express/sandbox-express-guidelines-1-jan-2022.pdf (accessed 3rd April, 2022)

Smits. J.M, (2015) What is legal doctrine? On the aims and methods of legal-dogmatic research, *Maastricht European Private Law Institute*, Working paper, No.2015/06, available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2644088 (accessed, 8 March 2022)

STACS. (2021). Eastspring Investments & BNP Paribas Securities Services achieve 84% reduction in trade breaks using STACS' Mercury Platform. [Press release]. Available at https://stacs.io/blog/eastspring-investments-bnp-paribas-securities-services-achieve-84-reduction-in-trade-breaks-using-stacs-mercury-platform (accessed 13 July 2023)

Tadesse, S. (2004). The Allocation and Monitoring Role of Capital Markets: Theory and International Evidence. *The Journal of Financial and Quantitative Analysis*, 39(4), 701–730.

Tasca, P. & Tessone, C. (2018) *Taxonomy of Blockchain Technologies. Principles of Identification and Classification*. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2977811 (accessed 10 August 2021)

The city of London Law Society (2022) UK Jurisdiction Taskforce of the Lawtech UK Panel, UKJT Consultation Paper on the Issuance and Transfer of Digital Securities under English Private Law Response of the City of London Law Society Available at: https://www.citysolicitors.org.uk/storage/2022/11/Securities-Response-of-the-City-of-London-Law-Society-Final.pdf (Accessed 6th June 2023)

The European Central Bank, (2021) *The Use of DLT in Post-trade Processes.* Advisory Groups on Market Infrastructure for Securities and Collateral and for Payments

The Global City & HM Treasury (2022) *State of the Sector: Annual Review of the UK Financial Services 2022* Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1092788/State_of_the_sector_annual_review_of_UK_financial_services_2022.pdf (21 October, 2022).

The Guardian (2022) *What happened to FTX and could the crisis spill over to the rest of crypto?* available at: https://www.theguardian.com/technology/2022/nov/10/what-happened-to-ftx-and-could-crisis-spill-over-to-rest-of-crypto (accessed 24 December 2023)

The Independent (2021) *World Bank refuses to help El Salvador adopt bitcoin over environmental and transparency concerns*, available at https://www.independent.co.uk/tech/world-bank-bitcoin-el-salvador-b1867557.html (11 September 2023)

The World Bank (2018) Cryptocurrencies and Blockchain, *Europe and Central Asia Economic Update, Office of the Chief Economist* available at https://documents1.worldbank.org/curated/en/293821525702130886/pdf/Cryptocurrencies-and-blockchain.pdf (accessed 2 September 2023)

The World Bank (2020) *How Regulators Respond to Fintech: Evaluating the Different Approaches – Sandboxes and Beyond*. Finance Competitiveness & Innovation Global Practice, Fintech Note | No.5

The World Bank Group (2017) Distributed Ledger Technology (DLT) and Blockchain, Fintech Note 1. See page 15.

The World Bank Group (2020) Capital Market Development: A Primer for Policymakers, *World Bank, Washington, DC. World Bank.*

The World Bank Group (2020) *Capital Markets Developments: A Primer for Policymakers,* available at: https://www.ifc.org/wps/wcm/connect/a1bcbfc3-a203-4d5b-b64a-b82a80df11a5/PrimerforPolicymakers-PublicRelease.pdf?MOD=AJPERES&CVID=no.kJ3u (accessed 12 March 2022)

Thegeya, A. (2023). The Economics of Blockchain Within Africa. In S. Goutier & D. K. Das (Eds.), African economics: A collective learning and innovation approach. Springer Singapore.

Thisday, (2023) Associations to Discuss Cybersecurity Threat , available at: https://www.thisdaylive.com/index.php/2023/05/24/associations-to-discuss-cybersecurity-threat/ (accessed 15 November, 2023)

Thomson Reuters (2022), *Cryptocurrency regulation by country*, Crypto on the rise (3) https://www.thomsonreuters.com/en-us/posts/wp-content/uploads/sites/20/2022/04/Cryptos-Report-Compendium-2022.pdf (accessed 17 April, 2023)

Thomson Reuters Practical Law, *Receiving bank,* available at: https://uk.practicallaw.thomsonreuters.com/3-200-1402?transitionType=Default&contextData=(sc.Default)&firstPage=true (accessed 12 March 2022)

U.S. Securities and Exchange Commission, (1997) *Report to the Congress: The Impact of Recent Technological Advances on the Securities Markets,* available at: https://www.sec.gov/news/studies/techrp97.htm (accessed 11 March 2021).

UK Finance and Oliver Wyman (2023) *Unlocking the power of securities tokenization: How the UK can lead digital transformation and consolidate the role as a global financial centre.* Available at *https://www.ukfinance.org.uk/system/files/2023-07/Unlocking%20the%20power%20of%20securities%20tokenisation.pdf (*accessed 8 July, 2023)

UK Government for Science, (2016) *Distributed Ledger Technology Beyond Blockchain,* Available at <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/492972/gs-16-1-distributed-ledger-technology.pdf> (Accessed 23 May, 2022)

UK Government Office for Science, *Distributed Ledger Technology Beyond Blockchain.* Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/492972/gs-16-1-distributed-ledger-technology.pdf (accessed 11 April, 2023)

UK Jurisdiction Taskforce, Legal statement on cryptoassets and smart contracts (2019) ("UKJT Legal Statement"), available at: https://35z8e83m1ih83drye280o9d1-wpengine.netdna-ssl.com/wpcontent/uploads/2019/11/6.6056_JO_Cryptocurrencies_Statement_FINAL_WEB_111119-1.pdf; (27 September, 2023)

Waldrop, M. (1993) *Complexity: The Emerging Science at the Edge of Order and Chaos*. 1st ed Simon and Schuster; 1993.

Watson A, (1993) *Legal Transplant: A approach to comparative law* 2nd Edition, University of Georgia Press

Wilson. T (2020) https://www.reuters.com/article/us-crypto-currencies-idUSKBN20Q0LK (Accessed 1st March 2022)

WIPRO, *Blockchain in capital market*. Available at https://www.wipro.com/content/dam/nexus/en/industries/securities-and-capital-markets/latest-thinking/blockchain-in-capital-markets.pdf (accessed 20 September 2023)

Wood, P (2009) *Law and Practice of International Finance*, Thomson Reuters, London

World Bank Group (2017) Distributed Ledger Technology (DLT) and Blockchain. FinTech Note No. 1. Available at http://documents.worldbank.org/curated/en/177911513714062215/pdf/122140-WPPUBLIC-Distributed-Ledger-Technology-and-Blockchain-Fintech-Notes.pdf [Accessed: 10 August 2021].

World Bank Group, (2020) *How regulators respond to fintech: Evaluating the different approaches-Sandboxes and Beyond,* Finance, Competitiveness & Global practice, Fintech Note, Available at: No.5 https://documents1.worldbank.org/curated/en/579101587660589857/pdf/How-Regulators-Respond-To-FinTech-Evaluating-the-Different-Approaches-Sandboxes-and-Beyond.pdf (accessed 20 April, 2023)

World Economic Forum & Boston Consulting Group (2021) *Digital Assets, Distributed Ledger Technology and the Future of Capital markets* available at: *https://www3.weforum.org/docs/WEF_Digital_Assets_Distributed_Ledger_Technology_2021.pdf* (13 September 2023)

World Economic Forum (2023) Is blockchain really secure? Here are four pressing cyber threats you must consider. Available at https://www.weforum.org/agenda/2023/02/blockchain-has-high-potential-but-beware-of-cyberthreats8642651f20/#:~:text=Four%20main%20cybersecurity%20threats%20to%20consider%201%201.,keys%20...%204%204.%20Smart%20contract%20defects%20 (accessed 30 May, 2023)

World Economic Forum and Boston Consulting Group (2021) *Digital Assets, Distributed Ledger Technology and the Future of Capital Markets*, WEF Insight Report.

World Economic Forum, (2020), Exploring Blockchain Technology for Government Transparency: Blockchain-based Public Procurement to Reduce Corruption, *insight Report.* available at https://www3.weforum.org/docs/WEF_Blockchain_Government_Transparency_Report.pdf; (accessed 27 April, 2023)

Wyman, O. (2016) *Blockchain in Capital Markets: The Prize and the Journey*. available at: https://www.oliverwyman.com/content/dam/oliver-wyman/global/en/2016/feb/BlockChain-In-Capital-Markets.pdf (accessed 14 March 2022)

Yaga.D, Mell.P, Roby.N and Scarfone, K (2018) *Overview of Blockchain Technology,* National Institute of Standards and Technology Internal Report 8202