The Role of Blockchain Technology in Enhancing Tax Transparency and Revenue Collection in Nigeria's Oil and Gas Sector

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Abstract

Nigeria's oil and gas sector has historically faced systemic inefficiencies, significant revenue losses, and ambiguous tax regulatory frameworks. However, blockchain technology presents a transformative opportunity with its decentralised and immutable ledger system, which can significantly enhance transparency and efficiency in tax collection. By exploring the potential of blockchain to automate compliance, reduce fraudulent activities, and strengthen accountability in Nigeria, this study adopts a doctrinal methodology to develop a roadmap for modernising tax administration in this sector. Despite these benefits, challenges such as regulatory uncertainty, infrastructure gaps, and steep implementation costs pose significant barriers to adoption. To effectively leverage blockchain, the writer emphasises the urgent need for Nigeria to prioritise legal reforms and invest in robust digital infrastructure. These actions are essential and urgent in fostering collaborative stakeholder engagement and overcoming the substantial barriers to adoption. This critical analysis scrutinises these challenges, identifies key implementation hurdles, and proposes actionable strategies for overcoming them.

Keywords: Blockchain, Taxation, Oil and Gas, Tax Transparency, Revenue Collection, Nigeria

1. Introduction

Nigeria's economic growth significantly depends on taxation, especially from the oil and gas sector, which is crucial in government funding. Unfortunately, this industry faces challenges like inefficiencies, revenue leakage, and a lack of transparency in tax operations. Tax collection efforts are regularly compromised by tax evasion, inaccurate revenue reporting, and regulatory difficulties. The Nigerian Extractive Industries Transparency Initiative (NEITI) has frequently pointed out inconsistencies in tax payments and low compliance rates from oil companies, leading to substantial losses in revenue for the government. In this scenario, blockchain technology emerges as a transformative solution that can overhaul tax administration by offering a decentralised, unalterable, and transparent ledger system. This technology could significantly improve tax transparency and revenue collection in Nigeria's oil and gas sector by automating compliance through smart contracts, reducing the need for human input, and allowing for real-time tracking of transactions. Successful uses of blockchain in tax systems in Estonia and Australia illustrate its potential to boost efficiency and decrease fraud.

Despite the significant potential of blockchain technology, its implementation within Nigeria's tax administration faces numerous challenges, including institutional resistance, technological limitations, and regulatory uncertainty. The Petroleum Industry Act 2021 initiated reforms to improve fiscal governance in the oil and gas sector. However, it does not explicitly integrate blockchain technology as a mechanism for tax administration. This situation prompts an inquiry into the readiness of Nigeria's legal and institutional framework to support the incorporation of blockchain technology into tax processes. This study highlights the transformative potential of blockchain technology in enhancing tax transparency and revenue collection within Nigeria's oil

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and gas sector. Furthermore, it examines blockchain adoption's advantages, challenges, and legal implications, drawing upon global best practices. The argument suggests that, when implemented effectively, blockchain could revolutionise Nigeria's tax administration by mitigating revenue leakages, improving compliance, and strengthening public trust in the tax system.

2. Conceptual framework

Blockchain is a decentralised digital ledger that securely documents transactions across a network of computers. It is engineered to guarantee transparency, immutability, and tamper resistance, rendering it a revolutionary technology across several sectors, including banking, supply chain management, and law. Every transaction is recorded in a "block," and these blocks are sequentially interconnected by cryptographic hashes, creating a "chain" that is nearly impossible to modify retrospectively without the agreement of the network members[1].

The fundamental characteristics of blockchain include decentralisation, eliminating the need for a central authority by distributing control among numerous nodes; immutability, ensuring that recorded data remains unchangeable; and consensus mechanisms, which require the agreement of most network participants before adding new transactions. Blockchain features smart contracts—self-executing agreements with predetermined stipulations—that automate processes such as payments or compliance verifications. Originally introduced as the foundation of Bitcoin in 2008, blockchain technology has since evolved to encompass cryptocurrencies, decentralised finance (DeFi), non-fungible tokens (NFTS), and private blockchains for corporate use without depending on a central authority. It addresses the double-spending problem.[2]

2.1. Overview of Blockchain Applications in Taxation Globally

Blockchain technology has emerged as a transformative tool in tax administration, offering enhanced transparency, efficiency, and fraud prevention. According to the OECD, blockchain is recognised as a revolutionary technology capable of automating tax compliance, reducing fraud, and improving revenue collection[3]. Countries such as Estonia, the United Arab Emirates (UAE), and Singapore have integrated blockchain-based systems into their tax frameworks to achieve these benefits.

One of the key advantages of blockchain in taxation is its ability to create immutable tax records. Transactions recorded on a blockchain cannot be altered, ensuring accuracy and preventing fraud. Additionally, smart contracts enable automated tax compliance by calculating and deducting taxes automatically, thereby reducing human error. Blockchain also enhances transparency by providing tax authorities with real-time access to tamper-proof ledgers of tax payments. For instance, Estonia has integrated blockchain into its e-Government system to facilitate seamless real-time tax collection and financial audits. Similarly, the UAE has implemented blockchain for value-added tax (VAT) collection, significantly reducing fraud and administrative delays. In Singapore, blockchain-driven tax reporting systems ensure corporate tax compliance and promote international transparency. These examples illustrate the potential of blockchain to transform global tax administration. However, its application in developing economies like Nigeria remains largely underexplored.

[1]AWS, 'What is Blockchain?' (AWS Website, 31 July 2022) https://aws.amazon.com/what-is/blockchain/ accessed 21 March 2025.

[2] FutureLearn, 'Is DeFi the Killer Application for Blockchain Technology?' (FutureLearn, 2024) https://www.futurelearn.com/info/courses/introduction-to-blockchain-dlt/0/steps/263367 accessed 24 March 2025

[3]OECD, Blockchain for Tax Administration (2021) <www.oecd.org> accessed 20 March 2025.

2.2 Existing Studies on Blockchain and Tax Administration

A growing body of research has examined the potential role of blockchain in improving tax administration. Tapscott and Tapscott[4]argue that blockchain can eliminate tax fraud, enhance transparency, and streamline audits by enabling real-time verification of tax payments. The OECD emphasises that blockchain is particularly effective in high-risk sectors such as oil and gas, where issues like tax evasion and transfer pricing manipulation are prevalent[5]. Furthermore, PWC identifies blockchain as a critical tool for preventing revenue leakages in resource-rich economies with complex tax structures and regulatory loopholes[6].

Despite these benefits, challenges persist. Regulatory uncertainty, technological barriers, and stakeholder resistance have been recognised as significant obstacles to adoption. While blockchain has been successfully implemented for VAT collection and corporate tax compliance in certain jurisdictions, its application in oil and gas taxation remains underexplored. This gap highlights the need for further research into how blockchain can enhance tax transparency in Nigeria's petroleum sector.

2.3 Overview of Nigeria's Oil and Gas Sector

Nigeria possesses one of the largest oil reserves in Africa and is a significant player in the global oil market. The oil and gas sector has historically been the backbone of Nigeria's economy, contributing approximately 10% to the Gross Domestic Product (GDP) in recent years. It accounts for around 90% of the country's export earnings and about 70% of government revenue. With proven reserves estimated at over 36 billion barrels, Nigeria is a member of the Organisation of the Petroleum Exporting Countries (OPEC) and ranks among the top oil producers in Africa.[7]Despite its significant contributions, Nigeria's oil and gas sector faces considerable challenges, particularly in tax collection and transparency. Firstly, Corruption remains a significant obstacle, with various studies indicating that a substantial portion of revenues is siphoned off through corrupt practices. This undermines public trust and leads to decreased investments.[8] Secondly, the existing tax structures and collection processes are often seen as outdated and inefficient. This results in substantial revenue loss due to tax evasion, underreporting of income, and the lack of real-time data on production and sales.[9] Again, the absence of transparent reporting mechanisms makes tracking the flow of tax revenues from the sector difficult. This complicates accountability and fosters an environment for fraud and mismanagement.[10] Furthermore, Complex regulations and the lack of clarity regarding tax obligations confuse stakeholders, leading to non-compliance. Inconsistent tax policies may also discourage foreign investment.[11] Moreover, the sector has lagged in adopting modern

[4] Don Tapscott and Alex Tapscott, Blockchain Revolution: How the Technology Behind Bitcoin and Other Cryptocurrencies is Changing the World (Portfolio 2018) https://www.blockchain-revolution.com accessed 20 March 2025

[5]OECD, Blockchain for Tax Administration (2021) <www.oecd.org> accessed 20 March 2025

[6]PWC Nigeria, Blockchain and Taxation in Africa (2022) <www.pwc.com/ng> accessed 20 March 2025.

[7] Central Bank of Nigeria, 'Statistical Bulletin' (2022) <https://www.cbn.gov.ng/Out/2022/Statistics/StatBulletin.pdf> accessed 1 April 2025

[8] Transparency International, 'Corruption Perceptions Index 2022' (2022) <https://www.transparency.org/en/cpi/2022/index/ngr> accessed 1 April 2025

[9]Nigerian National Petroleum Corporation, 'Annual Financial Report' (2021) <https://www.nnpcgroup.com/annual-financial-report> accessed 1 April 2025

[10] Open Government Partnership, 'Strengthening Transparency in Nigeria's Oil Sector' <https://www.opengovpartnership.org/members/nigeria/> accessed 1 Aprl 2025

[11]Odusola, A. F., 'Tax Policy Reforms in Nigeria: What Are the Issues?' (2020) 15 Nigerian Journal of Taxation 1.

technologies that can enhance transparency and improve operational efficiency, thereby exacerbating issues related to tax collection.[12] Addressing these challenges is critical for maximising the sector's potential and ensuring that revenues contribute to national development. Integrating innovative solutions, such as blockchain, could transform the landscape for tax transparency and revenue collection in Nigeria's oil and gas sector.

3. Legal Framework for Oil and Gas Taxation in Nigeria

Nigeria's oil and gas taxation system operates under four principal legislative frameworks, with application determined by the nature and scope of company operations. This creates a tiered tax structure designed to capture revenue from different segments of the petroleum value chain. The evolution of oil and gas taxation in Nigeria is intrinsically linked to the nation's economic and political trajectory, reflecting a dynamic interplay between government policies, international influences, and the ever-changing landscape of the petroleum industry. Oil exploration and exploitation have been integral to Nigeria's economy for over half a century, commencing with the landmark discovery of oil in commercial quantities in Oloibiri, Bayelsa State, in 1956.[13]The discovery of oil in large commercial quantities in 1957 paved the way for the country's wealth and greatness shortly after its independence from Britain in 1960. Initially, the national government's involvement was primarily facilitative, focusing on collecting royalties, rents, and taxes from the oil companies.[14]With the country's independence in 1960, the legislative and fiscal landscape began to evolve, marked by the introduction of the Petroleum Profits Tax Act in 1959, which remains a cornerstone of petroleum taxation in Nigeria.[15]The transition from a primarily agricultural economy to one heavily reliant on oil revenues occurred rapidly in the 1970s, driven by favourable global oil prices and the government's increasing control over the petroleum sector.

The indigenisation decrees of the 1970s sought to increase Nigerian participation in the oil industry, impacting taxation policies and ownership structures.[16] This era saw the government's role evolve from merely collecting royalties to actively shaping the industry through legislation and participation in joint ventures. However, the oil boom also brought challenges, including debates over revenue allocation and the management of oil wealth. The initial facilitative approach of collecting royalties, rents, and taxes[17] evolved into a complex system of legislation, government directives, and contractual arrangements. Nigeria's oil and gas sector operates under a complex framework of tax laws and regulations that include:

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[12]Ahmed, S. and Olowokere, E., 'Digital Technology in the Oil and Gas Sector: Challenges and Opportunities in Nigeria' (2021) 19 Journal of Petroleum Technology 45.

[13]Ifeoma Pamela Enemo. Proposing a legal framework for decommissioning of oil and gas installation in Nigeria". Www.Tandfonline.Com, 2025, https://www.tandfonline.com/doi/full/10.1080/03050718.2019.1690532. Accessed 2 April 2025.

[14]OI Akpanika, "Technology Transfer and the Challenges of Local Content Development in the Nigerian Oil Industry" (July 12, 2013) https://doi.org/10.4314/gjer.v11i2.6 accessed 2 April 2025.

[15]Sylvanus AzuwuezeMadujibeya, "OIL AND NIGERIA'S ECONOMIC DEVELOPMENT" (Oxford University Press, July 1, 1976) 284 <https://doi.org/10.1093/oxfordjournals.afraf.a096735> accessed 2 April 2025.

[16]Francis D Udoh, Offiong I Akpanika and Okon Anietie N., "Local Content Policy and Enterpreneurship: Implications for Small and Medium Scale Industries in the Nigerian Oil and Gas Sector" (August 4, 2015) <https://doi.org/10.2118/178269-ms> accessed 2 April 2025.

[17]Adeyemi, and B. Ajani. "Petroleum Profits Tax Act in Nigeria: The Practice by Babatunde Ajani Adeyemi: SSRN." 2015, https://papers.ssrn.com/sol3/papers.cfm. Accessed 02 Apr. 2025.

iPetroleum Profit Tax Act (PPTA):The Petroleum Profit Tax Act LFN 2004[18] serves as the primary taxation framework for Nigeria's upstream oil and gas operations. Section 8 of this Act taxes profits from companies engaged in petroleum operations during each accounting period. The PPTA explicitly targets companies involved in upstream activities, including exploration, development, and crude oil production. This tax represents one of the most significant revenue streams for the Nigerian government from the oil and gas sector. Founded in 1959, the PPTA imposes a tax on profits derived from petroleum operations in Nigeria. The standard tax rate is 85% for onshore operations and 65.75% for offshore activities, reflecting a strategy to encourage exploration and production in offshore environments.

ii. Company Income Tax Act (CITA): While upstream operations fall under the PPTA, oil and gas companies engaged in downstream operations are regulated by the Company Income Tax Act (CITA) LFN 2004[19]. These downstream activities, including the refining, distributing, and marketing petroleum products, are subject to a tax rate of 30% on chargeable profits[20]. This distinction between upstream and downstream taxation creates a dual tax regime that addresses the different operational segments within the industry.

iii. Value Added Tax (VAT): VAT applies to the sale of goods and services, including transactions within the oil and gas sector. The current VAT rate is 7.5%, with specific exemptions and zero-rated supplies that can impact oil and gas transactions.[21]This was effective February 1, 2020. This adjustment brought previously exempt sectors under the VAT umbrella, including certain financial and professional services related to the oil and gas industry. This broadening of the tax base is designed to enhance revenue generation and ensure that more economic activities contribute to the national coffers.

IV. Hydrocarbon Tax: Introduced with the Petroleum Industry Act (PIA) of 2021, [22] the Hydrocarbon Tax represents a paradigm shift in Nigeria's approach to taxing hydrocarbon extraction. This new framework aims to better align Nigeria's tax policies with global best practices while promoting a competitive environment for investments in the oil and gas sector. The Hydrocarbon Tax is designed to replace the outdated tax structures that previously governed the industry, providing clarity and predictability for investors. Beyond these primary tax structures, additional frameworks, including the Education Tax Act LFN 2004[23], impose further fiscal obligations on oil and gas companies[24]. This multifaceted tax structure aims to ensure comprehensive revenue capture from petroleum operations, though its complexity creates challenges for administration and compliance.

v. Regulatory Agencies: Several key agencies oversee the implementation and enforcement of these tax laws, most notably the Federal Inland Revenue Service (FIRS)[25] and the Nigerian

[18]Petroleum Profits Tax Act (Cap P13, Laws of the Federation of Nigeria 2004).
[19]Companies Income Tax Act (Cap C21, Laws of the Federation of Nigeria 2004).
[20]"Oil And Gas Taxation In Nigeria - Sales Taxes: VAT, GST - Nigeria." n.d., https://www.mondaq.com/nigeria/sales-taxes-vat-gst/1004132/oil-and-gas-taxation-in-nigeria. Accessed 03 Apr. 2025.
[21]Value Added Tax Act (Cap V1, Laws of the Federation of Nigeria 2004)
[22] Hydrocarbon Tax (under the Petroleum Industry Act) Petroleum Industry Act 2021 (No. 6).
[23]Education Tax Act, Cap. E4, Laws of the Federation of Nigeria, 2004.
[24]"Oil And Gas Taxation In Nigeria - Sales Taxes: VAT, GST - Nigeria." n.d., https://www.mondaq.com/nigeria/sales-taxes-vat-gst/1004132/oil-and-gas-taxation-in-nigeria. Accessed 03 Apr. 2025.
[25]Federal Inland Revenue Service (FIRS): - Federal Inland Revenue Service (Establishment) Act (Cap F2, Laws of the Federation of Nigeria 2004).

Upstream Petroleum Regulatory Commission (NUPRC).[26] The FIRS ensures compliance with tax obligations and revenue collection, while the NUPRC is responsible for licensing, regulating, and overseeing petroleum operations. These agencies play a vital role in fostering a conducive business environment through effective regulatory oversight.

3.1 Major Sources of Tax Evasion and Revenue Leakage in the Oil and Gas Sector

Nigeria's oil and gas sector suffers from multiple sources of revenue leakage, collectively undermining the country's fiscal position. These issues range from corporate tax avoidance strategies to systemic administrative weaknesses. According to legal expert Olisa Agbakoba, Nigeria loses approximately N3 trillion annually due to tax avoidance practices within the oil and gas sector, with a significant portion attributed to oil rig companies that have allegedly formed a cartel to evade taxes[27]. The Nigerian Maritime Administration and Safety Agency (NIMASA) reportedly does not collect taxes from oil rigs, representing a massive loss of potential government revenue estimated at 15% of Nigeria's 2024 national budget.[28]

Again, Transfer mis-pricing represents a significant source of revenue leakage in Nigeria's petroleum sector. This practice involves multinational companies artificially manipulating transaction prices between subsidiaries to shift profits to jurisdictions with lower tax rates[29]. Despite regulatory efforts, Nigeria loses an estimated $ 15-20 billion annually due to tax evasion and avoidance, with most of this loss occurring in the oil and gas sector.

Furthermore, Ineffective tax administration contributes substantially to revenue leakages. Issues include inadequate enforcement of tax compliance, limited transparency in the operations of tax authorities, and reduced competency among tax administrators[30]. These systemic weaknesses create tax avoidance and evasion opportunities that significantly impact revenue collection. Again, Illegal oil bunkering and artisanal mining operations result in substantial government revenue losses through unreported or underreported production and sales of natural resources[31]. These activities result in direct revenue losses and erode the integrity of production reporting mechanisms across the sector.

Many businesses in the petroleum value chain deliberately underreport their income or employ sophisticated accounting techniques to minimise tax obligations[32]. This practice primarily affects the accurate assessment of taxable income, resulting in substantial revenue losses for the government. Finally, Bribery, kickbacks, and embezzlement by public officials responsible for

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[26] Nigerian Upstream Petroleum Regulatory Commission (NUPRC) Petroleum Industry Act 2021 (No. 6) <https://www.cbn.gov.ng/Out/2022/Statistics/StatBulletin.pdf> accessed 2 April 2025

[27] Esifiho, F. "Nigeria loses N3trn yearly to oil tax avoidance – Agbakoba - Businessday NG." *Businessday NG*, 2024, https://businessday.ng/news/article/nigeria-loses-n3trn-yearly-to-oil-tax-avoidance-agbakoba/. Accessed 03 Apr. 2025.

[28] Ibid..

[29] "Transforming Nigeria's Tax Landscape: Tackling Transfer Pricing in the Oil & Gas Sector | Sustainable finance hub." *Transforming Nigeria's Tax Landscape: Tackling Transfer Pricing in the Oil & Gas Sector | Sustainable Finance Hub*, n.d., https://sdgfinance.undp.org/news-events/transforming-nigerias-tax-landscape-tackling-transfer-pricing-oil-gas-sector. Accessed 03 Apr. 2025.

[30] "Revenue Leakages and Their Implications on The Nigeria's Economic Development - International Journal of Research and Scientific Innovation (IJRSI)." *International Journal of Research and Scientific Innovation (IJRSI)*, 2024, https://rsisinternational.org/journals/ijrsi/articles/revenue-leakages-and-their-implications-on-the-nigerias-economic-development/. Accessed 03 Apr. 2025.

[31] Ibid.

[32] Ibid.

revenue collection and management represent another significant source of revenue leakage[33]. Corruption in the allocation of oil blocks, the award of contracts, and the distribution of oil revenues has eroded public trust and resulted in substantial fiscal losses[34].

3.2 Economic Implications of Revenue Leakages

The extensive revenue leakages from Nigeria's oil and gas sector produce profound and far-reaching economic consequences that impede national development. When revenue leaks occur, the government's ability to collect its rightful share of petroleum proceeds is severely compromised, thereby restricting its capacity to invest in critical development areas, including infrastructure, healthcare, education, and other essential sectors for economic growth[35]. This reduction in fiscal capacity directly constrains Nigeria's development potential.

Again, the government frequently borrows or raises taxes to compensate for revenue losses due to leakages, thereby creating additional financial burdens for citizens and businesses[36]. This increased pressure on the compliant tax base creates an unfair distribution of the tax burden, potentially discouraging legitimate business activity and foreign investment.

Revenue shortfalls resulting from leakages frequently lead to the postponement or cancellation of planned development projects when the government cannot meet its spending targets[37]. These constraints create developmental delays that compound over time, significantly impacting Nigeria's economic growth trajectory.[38]

Furthermore, the prevalent practice of domiciling funds derived from crude oil production in foreign banks, often for extended periods before remittance to the Central Bank of Nigeria, represents a significant impediment to the nation's financial sector and broader economic development. This pattern of delayed repatriation deprives Nigerian banks of valuable business opportunities, specifically access to substantial capital flows that could be channelled into domestic lending and investment. Furthermore, it inhibits the potential multiplier effects typically associated with increased financial activity within the national economy, curtailing potential avenues for stimulating more widespread economic growth and diversification.[39] In response to these challenges, on January 8, 2025, the CBN suspended the approval of extensions to repatriate export proceeds. This policy aims to ensure the timely foreign exchange inflow, bolster the domestic financial sector, and enhance economic stability. [40]Furthermore, the delayed repatriation of oil earnings affects the availability of foreign exchange within the domestic market, impacting the naira's stability and the overall economic environment. The CBN's directive to expedite the repatriation of export proceeds is intended to address these issues by

[33]Ibid.
[34]N.39
[35]N.42
[36] Victor Chukwunweike Ehiedu, A. C. Onuorah, and Benedicta Owonyé, 'Effect of Revenues Leakages on Economic Development in Nigeria' (2022) 13(3) IOSR Journal of Economics and Finance 39-48.
[37] N.39
[38]Mamman, E. Juliet, and Umesi, E. Ruth, 'Causes and Effects of Delay on Public Construction Projects Delivery in Nigeria' (2022) 24(4) African Scholar Journal of Built Environment and Geological Research 22-29.
[39]Central Bank of Nigeria, 'CBN Issues Directives on Foreign Currency Cash Pooling by Banks on Behalf of IOCs in Nigeria' (Aluko &Oyebode, 14 February 2024) <https://www.aluko-oyebode.com/insights/cbn-issues-directives-on-foreign-currency-cash-pooling-by-banks/> accessed 22 May 2025.
[40]Ayoola, G. "Suspension of Export Proceeds Repatriation Extension: Implications for Nigerian Economy." *Market ForcesAfrica*, 2025, 2025, https://dmarketforces.com/suspension-of-export-proceeds-repatriation-extension-implications-for-nigerian-economy/. Accessed 03 April 2025.

increasing foreign exchange liquidity and supporting the naira.[41] Addressing the challenges associated with the delayed repatriation of crude oil proceeds is crucial for enhancing the capacity of Nigerian banks to support domestic economic activities, thereby fostering sustainable economic growth and diversification.

4. Blockchain Technology and Its Potential in Nigeria's Oil and Gas Sector

Blockchain technology, characterised by its decentralised, immutable, and transparent nature, presents a novel paradigm for revolutionising operations across diverse sectors, and the Nigerian oil and gas industry benefits significantly from its adoption. Emerging economies are beginning to recognise the potential of blockchain to enhance service delivery, calling for integrated Information Communication Technology ecosystems and the adoption of emerging technologies.[42]By enabling peer-to-peer transactions transparently, this technology eliminates the need for intermediaries, fostering trust through cryptography and a decentralised architecture.[43]

Blockchain's inherent characteristics, such as enhanced transparency, security, and efficiency, align perfectly with the challenges plaguing the oil and gas sector, offering solutions to issues like opacity in transactions, revenue leakages, and operational inefficiencies[44]The architecture of blockchain, with its distributed ledger system, ensures that every transaction is securely and reliably recorded, reducing the exposure of data to cyber threats and unauthorised manipulations.[45].Blockchain technology can substantially enhance transparency and efficiency across diverse oil and gas industry facets.[46]. The country's oil and gas sector has been plagued by corruption and mismanagement, hindering its growth potential[47]. Blockchain introduces a decentralised and immutable record-keeping system that can combat these issues effectively.Blockchain technology couldrevolutionise how taxes are collected in Nigeria's oil and gas sector. By creating a transparent and immutable ledger of transactions, blockchain can help eliminate corruption and increase accountability. This technology can also make tracking revenue streams easier and ensure all payments are correctly recorded. Overall, the use of blockchain in tax collection has the potential to improve efficiency and transparency in the industry significantly.

Additionally, blockchain can streamline the auditing process by providing real-time access to financial data, reducing the likelihood of errors and fraud. This increased transparency can also help build trust between the government and industry stakeholders, leading to a more stable and prosperous sector. With the potential to transform tax collection in Nigeria's oil and gas sector, blockchain technology represents a significant opportunity for modernisation and progress in the

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[41]Ibid.

[42]An Overview of Blockchain Technology Adoption Jimoh, Abdullahi, *Ibrahim Journal of Computer Science and Information Technology*, 2019Volume 7, Issue 2

[43] Xiong et al. "*Frontiers in Blockchain*, 2020, https://www.frontiersin.org/journals/blockchain/articles/ 10.3389/fbloc.2020.00007/full. Accessed 04 Apr. 2025.

[44] *Yue Y and Shyu JZ, Blockchain Based Open Network in Technology Intermediation (2023) http://arxiv.org/abs/2309.00032*Accessed 4 Apr, 2025

[45] Mann S and others, "Blockchain Technology for Supply Chain Traceability, Transparency and Data Provenance," *Proceedings of the 2018 International Conference on Blockchain Technology and Application* (ACM 2018) n.d., https://dl.acm.org/doi/10.1145/3301403.3301408. Accessed 04 Apr. 2025.

[46]Giannoni C, Medda F and Bartolucci S, "Blockchain Technologies and Art: Opportunities and Open Challenges" [2023] SSRN Electronic Journal https://papers.ssrn.com/abstract=4439318Accesssed

[47]Udoh FD, Akpanika OI and Anietie N. O, "Local Content Policy and Enterpreneurship: Implications for Small and Medium Scale Industries in the Nigerian Oil and Gas Sector," *All Days* (SPE 2015) https://onepetro.org/spenaic/proceedings-abstract/15naic/15naic/spe-178269-ms/184368. Accessed 04 Apr. 2025.

country's economy. By utilising blockchain technology, Nigeria's oil and gas sector can enhance its reputation for accountability and reliability, attracting more foreign investment and partnerships. Furthermore, blockchain can save costs and improve operational efficiency, benefiting government agencies and industry players.

As Nigeria continues to explore ways to diversify its economy and reduce its reliance on oil revenue, embracing blockchain technology could be a crucial step towards achieving long-term sustainability and growth in the sector[48]. By streamlining processes and increasing transparency, blockchain can help combat corruption and ensure that funds are allocated appropriately for infrastructure projects and social programs. This will boost investor confidence and pave the way for a more sustainable and prosperous future for Nigeria's oil and gas industry. With the potential to revolutionise the sector, blockchain technology has the power to transform Nigeria into a global leader in energy production and management.[49]By embracing blockchain technology, Nigeria can attract more foreign investment and partnerships, increasing job opportunities and economic development. The presence of multinational technology companies like Microsoft and Facebook in Nigeria has already resulted in the creation of job opportunities and economic growth, fostering an atmosphere that promotes innovation and collaboration. Additionally, blockchain can improve accountability and reduce the risk of fraud within the industry, ultimately creating a more stable and efficient market. With the proper implementation and regulation, Nigeria's oil and gas sector can thrive and contribute significantly to the country's overall growth and development.[50]

Blockchain technology could revolutionise how energy resources are managed and distributed in Nigeria. The industry can operate more efficiently and securely by utilising smart contracts and transparent ledgers. When combined with smart microgrids, blockchain technology can revolutionise Nigeria's energy industry by enabling efficient energy management, integration of renewable sources, and peer-to-peer energy trading[51]. This increased transparency can also help build trust with domestic and international stakeholders, further boosting the country's standing in the global energy market. With the right strategies, Nigeria can leverage blockchain technology to solidify its position as a key player in the energy sector and drive sustainable growth for years. Additionally, blockchain technology can help combat corruption and inefficiency that have plagued the Nigerian energy sector for years.

By providing an immutable record of transactions and promoting accountability, blockchain can help reduce waste and ensure that resources are allocated more effectively. This will benefit the industry as a whole and improve the lives of Nigerian citizens by providing more reliable and

[48] Uba SA, "Perceptions of Blockchain Adoption in the Oil and Gas Supply Chain: A Qualitative Utaut Investigation" (*Strath.ac.uk*, 2023) <http://stax.strath.ac.uk/downloads/1c18dg36b> accessed April 4, 2025

[49] Muhdiarta U, "Blockchain Technology for Public Administration: Enhancing Accountability and Good Governance" (2025) *2 International Journal of Innovation and Thinking* 39 <https://ij-it.com/index.php/ijit/article/view/9> accessed April 4, 2025

[50] Agbeyangi A, Makinde A and Odun-Ayo I, "Nigeria's ICT and Economic Sustainability in the Digital Age" (2024) <http://arxiv.org/abs/2401.03996>accessed April 4, 2025

[51] Jack, K.E., Ezugwu, E.O., Ogomaka, C.C., Omokere, O.K., Adeniji, S.A. and Ogbenfore, G.T., 2024. The Convergence of Blockchain, Smart Microgrid, and Energy Market. https://www.researchgate.net/profile/oghenekaroomokere/publication/380327030_the_convergence_of_blockchain_smart_microgrid_and_energy_market/links/663b78c435243041537e850b/the-convergence-of-blockchain-smart-microgrid-and-energy-market.pdf. Accessed 04 Apr. 2025.

affordable energy services. Ultimately, embracing blockchain technology could lead to a brighter and more prosperous future for Nigeria's energy sector. Blockchain technology has been proposed for implementation in the Nigerian financial industry, including the central bank, to address transactional challenges and high operational costs. The Central Bank of Nigeria has considered implementing Central Bank Digital Currency (CBDC) called eNaira. However, there are controversies surrounding crypto currency investments due to a temporary embargo on related accounts. Blockchain technology is a potential solution to improve the payment system in Nigeria and make transactions more efficient and secure.

By utilising blockchain technology, the financial industry in Nigeria could see reduced transaction times, increased transparency, and lower operational costs. This innovative technology has the potential to revolutionise the way monetary transactions are conducted in Nigeria, paving the way for a more streamlined and modernised payment system that benefits both businesses and consumers alike. As the country continues to explore the possibilities of blockchain technology, it is clear that this could be a significant step towards a brighter and more prosperous future for Nigeria's energy sector. Blockchain technology has been proven to increase financial reports' transparency, reliability, and timeliness, affecting Nigeria's financial reporting quality[52]. Professional accountants consider blockchain technology a disruptive technology that will change traditional financial reporting practices.[53]

By embracing blockchain technology, Nigeria can also improve security measures and reduce the risk of fraud in financial transactions. Additionally, increased efficiency and accuracy in blockchain technology can help boost investor confidence in the country's financial system, attracting more foreign investments and stimulating economic growth. As Nigeria continues on this path of technological advancement, the government and financial institutions must work together to ensure a smooth transition and widespread adoption of blockchain technology across the country. By embracing blockchain technology, Nigeria can improve security measures and reduce the risk of fraud in financial transactions. The synergy between blockchain and cyber security provides a robust and multi-layered approach to securing financial transactions in fin tech platforms[54].

4.1 Case Studies of Blockchain Implementation in Tax Collection

Blockchain technology has been increasingly used across many industries due to its capacity to facilitate safe, transparent, and irreversible transactions. Blockchain can transform how governments monitor, authenticate, and enforce tax collection. This article will examine case studies of several nations that have effectively integrated blockchain technology into their tax-collecting systems, emphasising the advantages and obstacles encountered during implementation. Analysing these real-world instances enhances our comprehension of blockchain's prospective influence on augmenting tax compliance and revenue collection. Certain nations, such as Estonia, have already incorporated blockchain technology into their tax

[52]Johnson, K. T., and E. I. Okoye. *UBS Journal of Business and Economic Policy*, n.d., vol. 1, no. 4, n.d., pp. 29-44. https://journals.unizik.edu.ng/ubsjbep/article/view/3225. Accessed 04 Apr. 2025.

[53]Ibid.

[54]Odio PE and others, "Blockchain and Cybersecurity: A Dual Approach to Securing Financial Transactions in Fintech" (2025) 3 Gulf Journal of Advance Business Research 380 <https://fegulf.com/index.php/gjabr/article/view/89>Accessed 04 April 2025.

systems, enhancing efficiency and lowering administrative expenses.[55] Estonia has been at the forefront of implementing blockchain technology in tax collection through its e-Residency program. This innovative initiative allows individuals and businesses to become virtual residents of Estonia, enabling them to access government services, including filing taxes, online.[56] By leveraging blockchain technology, Estonia has been able to streamline its tax collection process, reduce administrative costs, and improve transparency. Estonia's e-Residency program allows individuals from anywhere worldwide to establish and manage an EU-based company online. By incorporating blockchain technology into its tax collection system, Estonia has not only made it easier for e-Residents to fulfil their tax obligations. However, it has attracted businesses and investors seeking a transparent and efficient tax system. This innovative approach has positioned Estonia as a leader in digital governance and has sparked interest from other nations looking to modernise their tax collection processes.[57]The success of Estonia's e-Residency program has not gone unnoticed, with several countries now considering implementing similar initiatives to attract global talent and investment. By embracing technology and fostering a business-friendly environment, Estonia has positioned itself as a leader in the digital economy. As more countries look to emulate Estonia's model, the future of global business is likely to become even more interconnected and accessible to individuals around the world.

Again, moving on to our following case study, Georgia's Property Registry System offers another example of how blockchain technology can be leveraged to enhance government services and promote economic growth. Georgia's Property Registry System has successfully utilised blockchain technology to create a secure and tamper-proof property ownership records database. By implementing blockchain, Georgia has reduced fraud in property transactions, increased trust in the registry system, and streamlined the buying and selling process. The efficiency and transparency of blockchain in the property registry system have benefited the government and its citizens and attracted foreign investors looking for a reliable and secure investment environment. The success of Georgia's Property Registry System serves as a testament to the potential of blockchain technology in revolutionising government services and driving economic development.[58]

Implementing a digital tax system using blockchain technology has significantly improved property tax collection in Australia. By securely recording and tracking property transactions in real-time, the Australian government has reduced errors and instances of fraud, leading to higher compliance rates among taxpayers. This increased transparency and efficiency have boosted government revenue and improved overall financial governance in the country. The success of Australia's digital tax system serves as a prime example of the potential benefits of blockchain technology in revolutionising tax collection on a global scale.[Ad]opting digital tax systems, including blockchain technology, has shown promising results in increasing revenue collection

[55]David R and Samer Hassan "Blockchain-based application at a governmental level: disruption or illusion? T case of E, "Blockchain-Based Application at a Governmental Level: Disruption or Illusion? The Case of Estonia" https://academic.oup.com/policyandsociety/article-abstract/41/3/386/6566828Accessed 04 April 2025

[56] Eric Burger "E-residency and blockchain, "E-Residency and Blockchain" https://www.sciencedirect.com/science/article/pii/S0267364917300845 Accessed 04 April 2025

[57]Cortez EK, "Data Protection around the World" https://link.springer.com/content/pdf/10.1007/978-94-6265-407-5.pdf Accessed 04 April 2025

[58]Alex N and Dirk D, "Integration of Blockchain Technology into a Land Registration System for Immutable Traceability: A Casestudy of Georgia" https://link.springer.com/chapter/10.1007/978-3-030-30429-4_15 Accessed 04 April 2025

and promoting transparency. As more countries implement these systems, we can expect further improvements in tax compliance and overall efficiency in the global tax landscape. Using blockchain technology in tax collection can revolutionise how governments collect and manage tax revenue, leading to a more equitable and sustainable tax system for all stakeholders involved. Overall, the future of blockchain in tax collection looks bright as more governments recognise the benefits of this innovative technology. Using blockchain can help reduce fraud and errors in tax reporting, ultimately leading to a fairer and efficient system for taxpayers and tax authorities. With continued advancements in blockchain technology, we can expect to see even greater improvements in tax compliance and revenue collection in the years to come.

5. Conclusion and Recommendations

Despite the challenges and considerations, the potential benefits of implementing blockchain technology in Nigeria's tax system are significant. Increased compliance, transparency, and revenue collection are all possible outcomes. By learning from successful case studies and addressing the challenges head-on, Nigeria can revolutionise its tax system and improve overall financial stability. It is crucial for the government to carefully consider the costs, integration with existing systems, and regulatory framework to implement blockchain technology and reap its many benefits successfully.

Implementing blockchain technology in Nigeria's tax system could reduce fraud and corruption, as all transactions would be securely recorded and traceable. Furthermore, blockchain technology's enhanced efficiency and accuracy could streamline the tax collection process, saving both time and resources for the government. By taking proactive steps to modernise their tax system through blockchain technology, Nigeria has the potential to become a leader in digital innovation and financial transparency on the African continent. This could attract more foreign investment and boost economic growth in the country. Additionally, the transparency and accountability provided by blockchain technology would increase trust between the government and its citizens, ultimately leading to a more stable and prosperous society. Overall, embracing blockchain technology in Nigeria's tax system can revolutionise the country's financial sector and pave the way for a more efficient and equitable tax system for all. By implementing blockchain technology in tax collection, Nigeria could set an example for other countries in the region and beyond. This could lead to increased cooperation and partnerships with international organisations and tech companies, further solidifying Nigeria's position as a leader in digital innovation. With a more transparent and efficient tax system, the government would have access to more resources to invest in infrastructure, education, and healthcare, ultimately improving the quality of life for all citizens. Embracing blockchain technology in the tax system is a step towards modernisation and a significant leap towards a brighter future for Nigeria.

By implementing blockchain technology in the tax system, Nigeria could set a precedent for other developing nations to follow suit. This innovative approach could attract foreign investment and boost economic growth, creating more jobs and wealth distribution opportunities. Ultimately, embracing blockchain technology in the tax system could pave the way for a more prosperous and sustainable future for Nigeria and its people. With increased transparency and efficiency in tax collection, the government would be better equipped to fund essential services and infrastructure projects, improving Nigerian citizens' overall quality of life. Additionally, blockchain technology could help reduce corruption and ensure tax revenue is allocated correctly and utilised for the country's benefit. Overall, the integration of blockchain technology in the tax

system has the potential to revolutionise the Nigerian economy and drive progress for years to come.

5.1 Policy recommendations for integrating blockchain into Nigeria's tax administration within the oil and gas sector

To fully realise the benefits of blockchain technology in the tax system, policymakers must prioritise its implementation and integration into existing processes. By embracing this innovative technology, Nigeria can enhance tax collection efficiency and transparency while fostering a more accountable and sustainable financial system. Decision-makers must recognise the transformative potential of blockchain in driving economic growth and development and take proactive steps to adopt it within the tax system. The time to act is now, and the future of Nigeria's economy depends on it. Implementing blockchain technology in the tax system could revolutionise how taxes are collected and managed in Nigeria. Blockchain enables the government to reduce fraud, increase accuracy, and streamline the tax process. This will ultimately result in a more efficient and effective tax system that benefits the government and taxpayers. Policymakers must seize this opportunity and take steps to integrate blockchain technology into the tax system as soon as possible. The future success of Nigeria's economy hinges on embracing this cutting-edge technology and reaping its numerous benefits. To effectively integrate blockchain technology into Nigeria's tax administration within the oil and gas sector, a comprehensive set of policy measures is essential to ensure enhanced transparency, accountability, and revenue collection. Based on the findings of this study, blockchain-based supply chain tracking systems should be prioritised to establish immutable and tamper-proof ledgers that record every transaction from extraction to export. This level of transparency will significantly mitigate revenue leakages by providing tax authorities and stakeholders with real-time, verifiable data on oil production volumes, sales, and exports.

Additionally, the findings of this study suggest that the deployment of smart contracts presents a promising avenue for automating tax compliance processes, including royalty payments, value-added tax (VAT), and other levies. Smart contracts, which self-execute when predefined conditions are met, can ensure timely and accurate tax deductions at each stage of the supply chain, thereby reducing human error and opportunities for corruption.

Regulatory bodies such as the National Information Technology Development Agency (NITDA) and the Securities and Exchange Commission (SEC) must establish and expand blockchain regulatory sandboxes to foster innovation while managing risks. These controlled environments will enable pilot testing of blockchain applications tailored to tax administration, allowing for iterative improvements before nationwide deployment. Moreover, creating a blockchain consortium comprising key stakeholders, including the Nigerian National Petroleum Corporation (NNPC), the Federal Inland Revenue Service (FIRS), and major oil companies, will facilitate the secure and synchronised sharing of production and tax data. As argued by an earlier study, this collaboration will enhance data integrity, reduce discrepancies, and protect sensitive information through permissioned access protocols.[59]

Also consistent with an earlier study, capacity building remains a critical component. Therefore, expanding blockchain education and training programs for tax officials will equip them with the

[59]P r il, A. "Blockchain: Overview of the Potential Applications for the Oil and Gas Market and the Related Taxation Implications." *Deloitte.Com*, https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Energy-and-Resources/gx-oil-gas-blockchain-article.pdf. Accessed 7 May 2025.

technical expertise to effectively audit, verify, and manage blockchain-enabled tax systems. Finally, integrating blockchain platforms with international trade and compliance frameworks will strengthen cross-border monitoring of oil transactions, thereby curbing transfer pricing abuses and tax evasion schemes that have historically undermined Nigeria's revenue base. Collectively, these policy recommendations align with the objectives of Nigeria's National Blockchain Policy and address the sector-specific challenges of opacity and inefficiency in tax administration. By adopting these measures, Nigeria can leverage blockchain technology to build a more transparent, efficient, and accountable tax system that maximises revenue from its vital oil and gas sector.