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Smart Contracts as a Tool for Enhancing Public Procurement Transparency in Africa

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Abstract: ***Public procurement in Africa is hindered by systemic corruption, inefficiency, and a lack of accountability, undermining economic growth and public trust. This analysis examines the transformative potential of smart contracts, built on Distributed Ledger Technology (DLT), as an innovative solution to enhance transparency and integrity in the continent's procurement systems. The study analyzes how smart contracts, by embedding procurement rules into immutable code, minimize human discretion and create tamper-proof audit trails for processes from bid submission to payment. Drawing on global precedents and emerging African cases (including DLT use in Guinea-Bissau's public wage bill), the paper finds that while smart contracts are technically feasible and highly beneficial, their successful adoption is contingent upon overcoming significant structural barriers. These challenges include adapting outdated legal frameworks to recognize the legal personality of contract code, addressing low digital infrastructure compatibility, and managing cultural resistance from officials who benefit from the existing discretionary systems. The paper concludes with key recommendations for African governments, emphasizing the necessity of parallel legal reform, targeted capacity building, and strong political commitment to leverage this technology for achieving Sustainable Development Goal 16 (Peace, Justice, and Strong Institutions).***
Keywords: Smart Contracts, Public Procurement, Blockchain Technology, Governance, Africa, Anti-Corruption.

I. INTRODUCTION AND BACKGROUND

Public procurement represents a cornerstone of governance in Africa, accounting for an estimated 15–30 percent of GDP in many countries (World Bank, 2023). It is the primary channel through which governments deliver critical infrastructure, social services, and development outcomes. However, procurement systems across the continent remain plagued by systemic inefficiency, endemic corruption, and weak accountability mechanisms. According to Transparency International (2022) and a study by the IMF (Abdou et al., 2022), procurement consistently ranks among the most corruption-prone sectors, with practices such as bid-rigging, favoritism, and inflated contracts undermining both economic growth and public trust. These inefficiencies not only result in the waste of scarce financial resources but also erode institutional credibility and weaken citizens' confidence in government.

Over the years, governments and development partners have introduced a range of reforms to address these challenges. These include the establishment of procurement oversight agencies, the passage of Public Procurement Acts, and the gradual rollout of e-procurement systems. While such reforms have contributed to modest improvements, they remain constrained by fragmented implementation, weak enforcement, and limited technological capacity. Manual and paper-based processes still dominate in many countries, leaving significant loopholes for malpractice and fraud (OECD, 2025). This persistent governance gap underscores the urgent need for more innovative, technology-driven solutions that can deliver transparency, accountability, and efficiency at scale.

Blockchain technology, and specifically smart contracts, has emerged as a promising tool to address these systemic challenges. A blockchain provides a decentralized, immutable ledger for recording transactions, creating a single source of truth that is resistant to manipulation. Smart contracts function as self-executing agreements coded on the blockchain. In public procurement, this combination offers unprecedented opportunities to automate processes such as bid submission, evaluation, contract award, and payment. By embedding procurement rules directly into code, smart contracts significantly reduce human discretion, a primary source of corruption and bias (Akaba et al., 2024). This ensures that procurement outcomes are transparent, tamper-proof, and verifiable by all authorized stakeholders. Globally, several governments have begun experimenting with blockchain-enabled procurement systems. Estonia has leveraged blockchain to secure government records and strengthen accountability; Dubai has adopted a comprehensive blockchain strategy to enhance public service delivery, including procurement; while Chile has piloted blockchain in tendering processes to increase public trust (UNCTAD, 2024). In Africa, emerging examples from Kenya, Rwanda, and South Africa reflect a growing appetite for blockchain-based innovations to support governance reforms (Huubse, 2025).

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These early cases suggest that smart contracts could play a pivotal role in advancing transparency and efficiency in procurement across the continent, provided that appropriate legal, technical, and institutional frameworks are established.

This secondary data analysis, based on a deep examination of scholarly research, international reports, and documented case experiences, examines the potential of smart contracts to transform public procurement in Africa. It analyzes how this technology can address existing governance gaps, what lessons can be drawn from global experiences, and which structural barriers must be overcome for successful adoption. Ultimately, the study aims to contribute to policy debates and practical strategies on how African governments can leverage digital technologies to strengthen accountability, enhance public trust, and achieve sustainable development goals through more transparent procurement systems.

II. THEORETICAL AND CONCEPTUAL FRAMEWORK

At the core of blockchain technology is the principle of decentralization. Unlike traditional procurement systems where a single central authority, such as a procurement agency, oversees and validates all transactions, a blockchain distributes the records across a network of participants. This ensures that no single actor has unilateral control over procurement data, thereby significantly reducing opportunities for corruption and manipulation (Olabode & Robertson, 2021). Complementing this is the concept of immutability, which guarantees that once records are entered into the blockchain, they cannot be altered or erased without a network consensus. This creates a reliable, tamper-proof audit trail for procurement transactions that strengthens accountability and provides a verifiable public record.

Smart contracts extend these advantages by embedding procurement rules directly into programmable code. For example, a smart contract can automatically evaluate whether a bid meets specified criteria, execute a contract award once all conditions are met, or trigger a payment upon the successful verification of goods or services delivered. This automation reduces administrative delays, limits human discretion, and ensures that procurement rules are applied consistently and impartially.

From a legal and regulatory perspective, the adoption of blockchain in procurement raises important considerations. Existing procurement laws in most African countries were designed for paper-based or, at best, traditional digital platforms that do not incorporate decentralized technologies. Adapting these laws to recognize smart contracts as legally binding instruments will be critical (Akaba et al., 2024). As Danielle Batista (2024) notes, robust records management is a cornerstone of procurement integrity, and integrating blockchain requires a legal framework that can accommodate its unique properties. Similarly, data protection frameworks, such as those influenced by the EU's General Data Protection Regulation (GDPR), must be reconciled with blockchain's immutable and distributed nature.

Furthermore, specific legal hurdles must be addressed. The legal framework must clarify the "legal personality" of a smart contract—whether the code itself constitutes the contract, or if it is merely the automated execution layer of a traditional agreement. This is critical for dispute resolution. The inherent immutability of the blockchain is in direct conflict with the traditional judicial need for corrective action; therefore, legal statutes must be modernized to grant courts the authority to interpret contract code and enforce remedies when execution errors or faulty external data (the off-chain source of information used to trigger contract execution) lead to incorrect, yet permanent, transactions. These challenges highlight the importance of building a robust legal and institutional framework in parallel with technological adoption.

III. METHODOLOGY AND CASE STUDY APPROACH

This study relies exclusively on secondary data, including peer-reviewed journal articles, policy reports from organizations such as the World Bank and the African Development Bank, publications from Transparency International, and documented experiences of blockchain adoption in public administration globally. The research design and scope are summarized in Figure 1 below. The use of secondary data is appropriate given the exploratory nature of the study and the limited number of large-scale, publicly documented blockchain procurement pilots in Africa to date. The geographical scope of the study includes selected African countries such as Kenya, Rwanda, and South Africa, which have demonstrated a clear interest in digital innovations for governance and procurement reform (Huubse, 2025). Comparative analysis is drawn from global leaders such as Estonia, Dubai, and Chile, where blockchain and smart contracts have already been applied to public sector processes. This dual perspective—analyzing both emerging African experiences and established global benchmarks—provides a balanced framework for understanding the opportunities, challenges, and best practices for adopting smart contracts in procurement.

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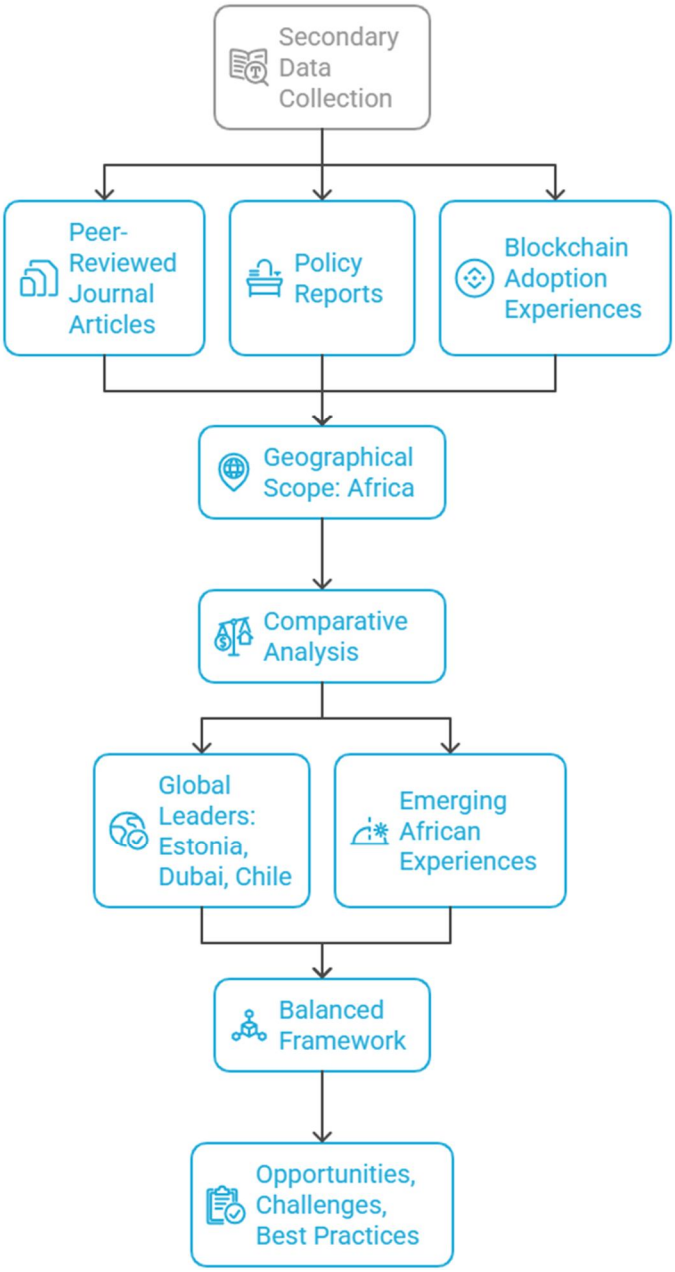


Figure 1. Research Methodology and Scope Flowchart

IV. IMPLEMENTATION OF SMART CONTRACTS IN PUBLIC PROCUREMENT

The application of smart contracts spans multiple stages of the procurement process. During the bid submission stage, vendors can upload proposals directly onto a blockchain, creating transparent and time-stamped records that prevent backdating or manipulation (Batista, 2024). In the evaluation phase, smart contracts can automatically check submissions against predefined criteria, reducing human bias and ensuring objectivity. Once a winning bid is identified, the contract award can be executed automatically, with the details recorded immutably on the blockchain for public verification. Finally, payments to contractors can be triggered automatically once the delivery of goods or services is verified, minimizing delays and reducing opportunities for payment fraud (Olabode & Robertson, 2021).

The benefits of such a system are substantial. Transparency is enhanced through the creation of tamper-proof, auditable records accessible to all authorized stakeholders. Efficiency improves as automation reduces administrative burdens and accelerates processing times.

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Fairness is strengthened by limiting human discretion, which often leads to biased or corrupt practices. Cost savings also arise from reduced fraud-related losses and administrative overheads. As Huubse (2025) notes, these strategies can contribute to building trustworthy governance structures by making processes visible and verifiable.

Nevertheless, implementation is not without significant challenges. Technological barriers include limited digital infrastructure in many African countries, interoperability issues with existing e-procurement systems, and cybersecurity risks associated with nascent blockchain technology. Legal challenges revolve around updating procurement laws and regulations to accommodate blockchain-based processes and recognizing smart contracts as legally binding instruments. Cultural and operational barriers, such as resistance to change among procurement officials and limited technical expertise, further complicate adoption. Finally, the high upfront cost of developing and deploying blockchain systems poses significant financial barriers, particularly for resource-constrained governments.

Elaborating on the technological and cultural challenges, two key areas emerge: compatibility and human resistance. Many African public sectors rely on centralized, proprietary legacy systems, making the seamless integration of a decentralized Distributed Ledger Technology (DLT) highly complex and costly. This is compounded by inconsistent or inadequate internet connectivity and power supply in some regions, which can compromise the integrity and latency (real-time operation) of a distributed network. Culturally, the greatest barrier is often the internal "resistance to change" from officials who prefer the discretionary power—and associated opportunity for illicit gains—of the old system. Smart contracts, by rigidly enforcing rules through code, directly challenge this administrative culture, necessitating mandatory change management and a strong political commitment to transparency

V. ANALYSIS AND DISCUSSION

Evidence from secondary data suggests that smart contracts can significantly enhance procurement transparency and integrity, but successful implementation requires careful consideration of local contexts. Global case studies demonstrate that blockchain is not a theoretical concept but a practical tool with measurable benefits. In Estonia, blockchain has been used to secure government data, significantly reducing the risk of tampering. Dubai's blockchain strategy has introduced greater efficiency in public service delivery, including procurement, while Chile's blockchain experiments in tendering have increased public confidence in contract awards.

African countries can draw important lessons from these global experiences. First, pilot projects are essential for testing blockchain applications in procurement before scaling up nationally, as highlighted by David et al. (2025) in their study on smart contracts in the South African construction industry. Second, as suggested by Olabode and Robertson (2021), legal and policy reforms must accompany technological innovations to ensure enforceability and compliance. Third, investment in capacity-building is critical to ensure that officials, vendors, and auditors can effectively use blockchain systems. However, a limitation of this study's reliance on secondary data is that it does not capture the country-specific political dynamics or institutional resistance that often shape procurement reforms in Africa.

While the document mentions emerging examples, the value of DLT in securing public expenditure is best illustrated by specific implementation cases like the one in Guinea-Bissau. Supported by the IMF, Guinea-Bissau successfully implemented a blockchain-based platform to manage its public service wage bill. This system securely stores and tracks salary and pension information in a tamper-proof ledger, enabling near real-time monitoring of eligibility and disbursements. This initiative directly addresses corruption by eliminating payroll fraud ("ghost workers") and unauthorized modifications, demonstrating blockchain's power to secure the integrity of public expenditure at a foundational level—a direct precursor to securing procurement. Furthermore, the analysis must acknowledge that the reluctance to adopt a transparency-enhancing system is often a calculated act of resistance by those who benefit from the status quo, transforming the adoption challenge into a governance issue that requires political will more than mere technical capacity.

VI. CONCLUSION AND RECOMMENDATIONS

Smart contracts present a transformative opportunity for Africa's public procurement systems by embedding transparency, accountability, and efficiency into each stage of the procurement cycle. They reduce opportunities for corruption, streamline administrative procedures, and create permanent audit trails that enhance public trust (Batista, 2024). Although significant challenges remain, the evidence from global and emerging African experiences demonstrates that blockchain-based procurement is both feasible and beneficial. To realize this potential, several recommendations emerge. First, African governments should update procurement laws to recognize blockchain records and smart contracts as legally binding, and establish frameworks for digital dispute resolution. Second, investment in digital infrastructure, including reliable internet access and cybersecurity safeguards, is essential to support widespread blockchain deployment.

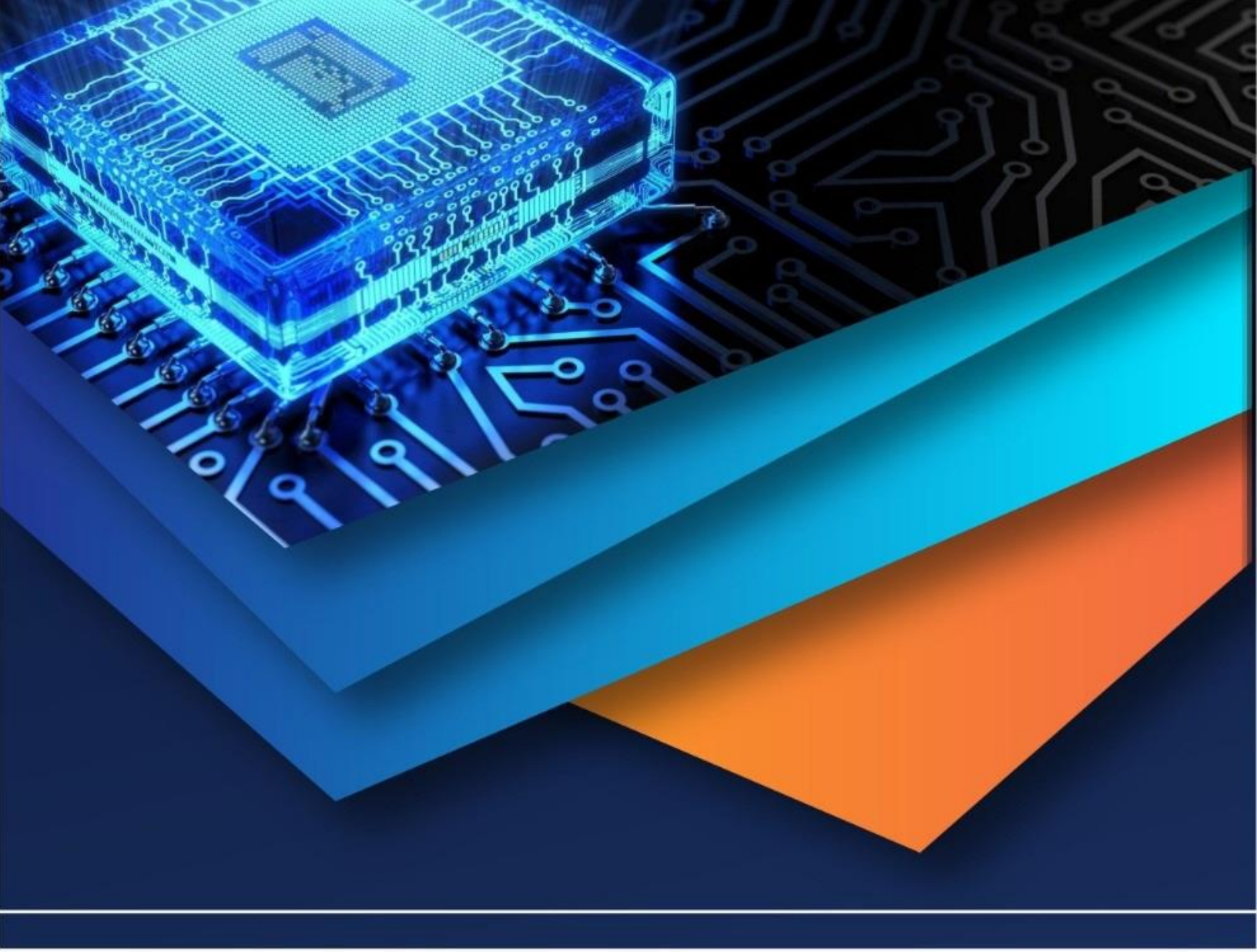
Third, capacity-building initiatives must target procurement officials, auditors, and vendors to ensure smooth adoption and overcome cultural resistance. Fourth, governments should begin with pilot projects in selected ministries or sectors to test feasibility before scaling nationally, focusing on high-risk, high-value procurement areas. Finally, broad stakeholder engagement, including civil society, private sector actors, and citizens, is crucial for building trust and ensuring inclusivity in adoption.

The future of procurement in Africa will depend on the willingness of governments to embrace technological innovation while addressing structural barriers. If implemented effectively, smart contracts can contribute significantly to sustainable development by ensuring that public resources are managed transparently, efficiently, and in the best interest of citizens, directly supporting the achievement of Sustainable Development Goal 16 (Peace, Justice, and Strong Institutions).

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