DETERMINANTS OF BLOCKCHAIN ADOPTION IN SUPPLY CHAIN RISK MANAGEMENT IN DEVELOPING ECONOMIES: EVIDENCE FROM NIGERIA

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Abstract
This study investigates the determinants influencing blockchain technology adoption for supply chain risk management in developing economies, with a specific focus on Nigeria. The proliferation of global supply chain disruptions and the increasing need for transparency, traceability, and security have positioned blockchain as a potentially transformative technology for mitigating supply chain risks. Adoption in developing economies remains nascent and uneven. A quantitative survey methodology was employed, drawing data from 285 supply chain professionals, including logistics managers, procurement officers, transportation managers, warehouse supervisors, and policymakers across six Nigerian states Lagos, Kano, Rivers, Ogun, Kaduna, and Abuja between October 2025 and February 2026. The study adopted the Technology-Organization-Environment (TOE) framework and the Technology Acceptance Model (TAM) as integrated theoretical foundations. Blockchain adoption intention was operationalized as a composite measure derived from respondents' stated likelihood to adopt blockchain technology within the next three years, measured using a validated five-item Likert scale. Findings indicated that regulatory support, perceived usefulness, technology infrastructure, and organizational readiness are significant determinants of blockchain adoption intention, while cost constraints and personnel shortages remain substantial barriers. The regression model explained 46.5% of the variance in adoption intention ($R^2 = 0.465$), with regulatory support emerging as the strongest predictor ($\beta = 0.312$, $p < 0.001$), followed by perceived usefulness ($\beta = 0.285$, $p < 0.001$), technology infrastructure ($\beta = 0.168$, $p < 0.001$), and organizational readiness ($\beta = 0.145$, $p < 0.01$). All four null hypotheses were rejected, confirming the significant direct influence of these determinants on blockchain adoption intention. The study contributes to the growing body of knowledge on technology adoption in developing economies and offers practical insights for policymakers and industry stakeholders seeking to foster blockchain implementation for supply chain risk mitigation.

Keywords: Blockchain, supply chain risk management, technology adoption, developing economies, Nigeria, regulatory environment

1.0 Introduction

The global supply chain landscape has experienced unprecedented disruptions and complexity over the past decade. Events such as the COVID-19 pandemic, geopolitical tensions, and climate-related disasters have exposed the vulnerability of traditional supply chain systems, creating urgent demand for more resilient, transparent, and agile risk management approaches (Adebayo & Ogunyemi, 2025; Olusegun, 2026). Organizations worldwide have turned to digital technologies to enhance their supply chain capabilities, with blockchain emerging as a particularly promising innovation for supply chain transformation.

Blockchain technology offers distinctive features that address several persistent challenges in supply chain risk management. Its immutable distributed ledger provides end-to-end visibility and traceability, enabling stakeholders to verify the authenticity of products and transactions throughout the supply chain (Idris & Walid, 2023). Smart contracts automate and enforce compliance, reducing the risk of fraud and contractual disputes. The technology's security architecture protects against data tampering and cyber threats, while its decentralized nature reduces single points of failure (Benjamin & Gugong, 2023; Yayock & Peter, 2023).

Blockchain adoption in supply chain perspectives has proceeded unevenly across the globe. Developed economies have seen significant experimentation and implementation, with major corporations and industry consortia deploying blockchain solutions for provenance tracking, trade finance, and risk management. In developing economies, however, adoption remains limited, characterized by pilot projects, isolated applications, and significant barriers that prevent widespread implementation (Lawal, 2025; Tanimu & Zubairu, 2023).

Empirical evidence on the actual extent of blockchain adoption within Nigerian supply chains suggests a nascent but growing awareness. A study by Lawal (2025) involving 200 supply chain professionals found that only 12.4% of respondent organizations had implemented blockchain solutions beyond the pilot stage, while 34.7% expected significant adoption within two to three years. A further study in Ogun State documented that while 75.3% of professionals recognized the transparency benefits of blockchain and 65.3% acknowledged improvements in traceability, actual implementation rates remained below 15% (Okonkwo, 2024). These findings confirm that awareness substantially outpaces deployment, underscoring the need to investigate the determinants that bridge this gap. The Nigerian government has signaled interest in digital transformation through the National Digital Economy Policy and Strategy, yet concrete regulatory frameworks for blockchain technology remain absent, creating uncertainty that may inhibit adoption (Adewale & Ogunyemi, 2024).

Nigeria, as Africa's largest economy and a major participant in global trade, presents an instructive case for examining blockchain adoption determinants. The country's supply chains are diverse, spanning agricultural commodities, manufactured goods, oil and gas, and services. These supply chains face substantial risks including fraud, counterfeiting, quality control failures, logistical delays, and regulatory non-compliance (Dauda, 2023; Sadiq & Aliyu, 2024). Recent studies indicate that between 65% and 80% of Nigerian supply chain professionals report challenges with transparency and traceability in their operations, reinforcing the urgency of exploring technologies capable of addressing these systemic deficiencies.

The central problem addressed by this study is the gap between the recognized potential of blockchain for supply chain risk management and the limited adoption of the technology in

developing economies such as Nigeria. While academic and practitioner literature increasingly documents the theoretical benefits of blockchain for enhancing supply chain transparency, traceability, and security, empirical evidence on adoption determinants in developing economies remains sparse (Okonkwo, 2024; Ezeuduji & Nwosu, 2023).

Recent research on blockchain adoption in Nigerian supply chains reveals a complex picture. A study involving 150 supply chain professionals in Ogun State found that while 75.3% recognized transparency benefits and 65.3% acknowledged traceability improvements, 70% identified cost as a significant barrier, and 80% cited shortage of qualified personnel as a major constraint. Lawal (2025) found that only 34.7% of surveyed Nigerian stakeholders expect blockchain adoption to increase significantly within the next two to three years. These findings suggest substantial impediments that require systematic investigation. Critically, cost barriers and personnel shortages though recognized in prior literature have not been sufficiently examined within an integrated framework alongside regulatory, infrastructural, and organizational factors. This study addresses that gap by empirically investigating these determinants together.

Existing technology adoption literature offers several theoretical frameworks, including the Technology Acceptance Model (TAM) and the Technology-Organization-Environment (TOE) framework. However, these theories have been applied primarily in developed economy perspectives, and their applicability to developing economies where regulatory frameworks, infrastructure, and organizational capabilities differ substantially remains underexplored. Furthermore, prior studies have examined technology characteristics, organizational factors, and environmental factors in isolation, without adequately exploring their relative importance in influencing adoption decisions. This study addresses this gap by empirically testing the direct effects of regulatory support, technology infrastructure, organizational readiness, and perceived usefulness on blockchain adoption intention in Nigeria aspect.

This gap carries consequences across multiple levels. For organizations, missed opportunities for supply chain risk mitigation translate into operational vulnerabilities, financial losses, and competitive disadvantage. For the broader economy, limited technology adoption constrains growth potential and international competitiveness. For policymakers, understanding adoption determinants is essential for designing effective regulatory frameworks and support mechanisms (Sadiq & Aliyu, 2024; Garba & Hassan, 2024).

The absence of comprehensive empirical studies on blockchain adoption determinants in the Nigerian perspective impedes evidence-based decision-making by both private sector actors and public sector regulators. This study aims to address this gap by systematically examining the factors that influence blockchain adoption intention for supply chain risk management in Nigeria, with particular attention to the interplay among regulatory support, infrastructure availability, perceived usefulness, and organizational readiness.

Research Objectives

This study was guided by the following specific objectives:

i. To identify and assess the determinants of blockchain technology adoption for supply chain risk management in Nigeria.
ii. To examine the relationship between regulatory support, technology infrastructure, and blockchain adoption intention among supply chain professionals.

iii. To evaluate the direct effects of organizational readiness and perceived usefulness on blockchain adoption intention.

Research Questions

The following questions directed the inquiry:

i. What are the key determinants influencing blockchain technology adoption for supply chain risk management in Nigeria?
ii. How does regulatory support affect blockchain adoption intention among Nigerian supply chain professionals?
iii. What is the relationship between technology infrastructure and blockchain adoption for supply chain risk management?

Hypotheses of the Study

The following null hypotheses were formulated for testing:

H_{01}: Regulatory support has no significant influence on blockchain adoption intention for supply chain risk management in Nigeria.

H_{02}: Technology infrastructure has no significant impact on blockchain adoption for supply chain risk management.

H_{03}: Organizational readiness and perceived usefulness has no significant direct effect on blockchain adoption intention.

H_{04}: Perceived usefulness has no significant direct effect on blockchain adoption intention.

2.0 Literature Review

Blockchain technology represents a paradigm shift in how transactional data is recorded, verified, and shared across supply chain networks. Blockchain is a distributed ledger that maintains a continuously growing list of records, called blocks, linked and secured using cryptography (Buhari & Lawal, 2023). Each block contains a timestamp, transaction data, and a cryptographic hash of the previous block, creating an immutable chain of records that is resistant to modification.

The application of blockchain to supply chain management addresses several essential challenges. The technology enables end-to-end traceability, allowing stakeholders to track products from origin to final consumer with unprecedented accuracy. This is particularly valuable for verifying product authenticity, ensuring quality compliance, and managing recalls (Fahad, 2023; Benjamin & Gugong, 2023). The immutability of blockchain records provides an auditable trail of transactions that enhances accountability and reduces opportunities for fraud. Smart contracts built on blockchain platforms automate and enforce agreement terms, reducing administrative overhead and minimizing disputes (Duniya & Andy, 2023; Idris & Walid, 2023).

Determinants of Technology Adoption in Developing Economies

A substantial body of literature has examined technology adoption across varying organizational and national perspectives. Several factors recur as particularly influential in developing economy settings: cost constraints, regulatory environments, infrastructure readiness, top management support, and perceived technology benefits. Okonkwo (2024) documented that cost barriers and skills shortages collectively represent the most frequently cited impediments to blockchain

adoption among Nigerian supply chain professionals, with 70% citing cost and 80% citing personnel shortages. Sadiq and Aliyu (2024) confirmed these findings across West African supply chains more broadly. These factors are explicitly incorporated into the present study's framework to ensure comprehensive coverage of adoption barriers.

Trust and security concerns also feature prominently in technology adoption literature. Benjamin and Gugong (2023) found that concerns about data integrity and system interoperability significantly reduced adoption willingness among Nigerian logistics professionals, even when perceived usefulness was high. Similarly, Tanimu and Zubairu (2023) documented that top management support significantly predicted technology adoption intention across multiple digital transformation initiatives in Nigerian organizations. These findings justify the inclusion of organizational readiness which encompasses top management support, technical expertise, and financial capacity as a central variable in this study.

Blockchain Adoption Challenges in Nigerian Supply Chains

Recent research has identified several persistent challenges to blockchain adoption in Nigerian supply chains. Infrastructure limitations feature prominently, with 70% of surveyed professionals citing implementation costs and 80% reporting shortage of qualified personnel (Okonkwo, 2024; Dauda, 2023). These findings align with broader technology adoption patterns in the region, where digital divide issues constrain the deployment of advanced technologies (Adewale & Ogunyemi, 2024).

Regulatory uncertainty emerges as another significant challenge. Although the Nigerian government has expressed commitment to digital transformation through the National Digital Economy Policy and Strategy (2020-2030), specific regulatory frameworks for blockchain remain undeveloped. This creates ambiguity for organizations considering blockchain investments and may deter adoption despite recognized benefits (Yayock & Peter, 2023; Benjamin & Gugong, 2023). Cultural and organizational factors also influence adoption. Top management understanding of blockchain capabilities varies widely, and resistance to change remains a significant barrier in some organizations. Lack of demonstrable success stories within the Nigerian perspective further compounds these challenges, as organizations hesitate to pioneer technologies without clear proof of concept in similar environments (Fahad, 2023; Duniya & Andy, 2023).

Theoretical Framework

This study integrates two complementary theoretical frameworks: the Technology Acceptance Model (TAM) and the Technology-Organization-Environment (TOE) framework. The integration is deliberate, as neither framework alone adequately captures the multi-level determinants of blockchain adoption in a developing economy perspective. TAM, originally developed by Davis (1989), proposes that perceived usefulness and perceived ease of use are the primary drivers of individual technology acceptance behavior. In the blockchain adoption perspective, perceived usefulness captures the degree to which supply chain professionals believe blockchain technology enhances their ability to manage supply chain risks, improve transparency, and increase operational efficiency. TAM's strength lies in explaining individual-level adoption intentions.

The TOE framework, proposed by Tornatzky and Fleischer (1990), extends analysis to the organizational and environmental levels. It identifies three categories of adoption determinants:

(i) technological characteristics including perceived usefulness, complexity, and compatibility; (ii) organizational characteristics including top management support, financial resources, technical competence, and overall organizational readiness; and (iii) environmental characteristics including regulatory support, competitive pressure, and infrastructure availability.

The integration of these frameworks in the present study is as follows: perceived usefulness (from TAM) represents the technology dimension; organizational readiness (from TOE's organizational dimension) encompasses technical capacity, financial resources, and management support; regulatory support (from TOE's environmental dimension) captures the policy and legal perspective; and technology infrastructure (from TOE's environmental dimension) addresses digital and physical infrastructure availability. Together, these constructs offer a theoretically coherent and empirically testable model of blockchain adoption intention in Nigerian supply chains.

This integrated model builds on prior synthesis attempts by Adebayo and Olaniyan (2025) and Lawal (2025), who argued that TAM's individual-level focus must be augmented by TOE's organizational and environmental dimensions to adequately explain technology adoption in resource-constrained developing economy settings. Figure 1 illustrates the conceptual model: regulatory support, technology infrastructure, organizational readiness, and perceived usefulness are all proposed as direct predictors of blockchain adoption intention.

Summary of Literature and Research Gap

The extant literature confirms that blockchain technology offers substantial potential for supply chain risk management, while also documenting significant barriers to adoption in developing economies. Prior studies conducted in developing economies, including those of Lawal (2025) in Nigeria and Ezeuduji and Nwosu (2023) across sub-Saharan Africa, have identified broad categories of adoption determinants. However, several important limitations distinguish those contributions from the present study.

First, prior Nigerian studies have tended to examine single-sector or single-state samples, limiting generalizability. The present study spans six states and five professional categories, offering a more nationally representative empirical base. Second, existing studies have not simultaneously examined regulatory support, technology infrastructure, perceived usefulness, and organizational readiness within a unified integrated TAM-TOE framework. Third, cost barriers and personnel shortages documented repeatedly as major impediments have not been sufficiently integrated into regression models explaining adoption intention. This study addresses these gaps by providing a comprehensive, multi-determinant empirical analysis of blockchain adoption intention in Nigerian supply chains.

3.0 Methodology

A quantitative cross-sectional survey design was adopted for this study. This approach permits the collection of standardized data from a relatively large number of respondents across different stakeholder groups, enabling statistical analysis of relationships between variables and testing of hypotheses. The cross-sectional design is appropriate given the study's objective of capturing adoption intentions and perceptions at a defined point in time across a heterogeneous professional population.The target population comprised supply chain professionals in Nigeria, including logistics managers, procurement officers, transportation managers, warehouse

supervisors, and policymakers involved in supply chain operations. The geographical scope covered six Nigerian states that represent the primary hubs of supply chain activity: Lagos, Kano, Rivers, Ogun, Kaduna, and the Federal Capital Territory (Abuja). The accessible population was estimated at approximately 1,200 individuals across these six states, distributed as follows: 420 logistics and supply chain managers; 310 procurement and sourcing officers; 250 transportation and distribution managers; 140 warehouse and inventory supervisors; and 80 policymakers and regulatory officials involved in trade and commerce.

The sample size was determined using the Taro Yamane formula at a 95% confidence level and a 5% margin of error:

$$\boldsymbol{n = \frac{N}{(1 + N(e)^2}}$$

where n = sample size, N = accessible population (1,200), and e = margin of error (0.05)

$$n = \frac{1{,}200}{(1 + 1{,}200(0.05)^2} = \frac{1{,}200}{(1 + 3.0)} = \frac{1{,}200}{4.0} = 300$$

A sample size of 300 respondents was calculated. Stratified random sampling was employed to ensure proportional representation across the six states and across the five stakeholder categories. Data collection took place between October 2025 and February 2026.

Measurement Instrument and Operationalization of Variables

A structured questionnaire was developed for this study, drawing on validated instruments from prior technology adoption research. The instrument comprised four sections.

Section A collected demographic information including gender, state of operation, professional role, years of experience, organizational type, and prior experience with blockchain technology.
Section B contained items on determinants of blockchain technology adoption, aligned with Objective 1.
Section C contained items on the relationship between regulatory support, technology infrastructure, and blockchain adoption intention, aligned with Objective 2.
Section D contained items measuring perceived usefulness and organizational readiness, aligned with Objective 3.

Blockchain adoption intention the dependent variable was measured using a five-item Likert scale adapted from Venkatesh et al. (2003) and perspectiveualized for blockchain in supply chains. Items included: (1) I intend to adopt blockchain technology in our supply chain within the next three years; (2) I plan to recommend blockchain adoption to organizational decision-makers; (3) I expect our organization to invest in blockchain technology soon; (4) I would encourage our partners to adopt blockchain solutions; and (5) I foresee blockchain becoming standard practice in our supply chain operations. The composite mean score of these five items was used as the dependent variable in regression analysis (Cronbach's alpha = 0.83).

Regulatory support was measured using four items adapted from Lawal (2025), covering government policy support, legal framework adequacy, regulatory certainty, and anticipated adoption encouragement (alpha = 0.81). Technology infrastructure was measured using three items covering internet connectivity, electricity reliability, and digital system availability (alpha = 0.79). Organizational readiness was measured using four items covering top management

support, technical expertise, financial resources, and innovation culture (alpha = 0.80). Perceived usefulness was measured using four items covering risk reduction, operational efficiency, traceability improvement, and overall benefit perceptions (alpha = 0.85).

All items were measured on a 5-point Likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree. The instrument was pilot-tested with 30 respondents from Kaduna who were excluded from the main study. Cronbach's alpha coefficients ranged from 0.79 to 0.85 across all constructs, indicating good internal consistency.

To address potential common method bias arising from single-source self-reported data, respondents were assured of anonymity and were instructed that there were no correct or incorrect answers. Items for the dependent variable (blockchain adoption intention) and independent variables were placed in separate questionnaire sections to reduce artificial covariation (Podsakoff et al., 2003). A Harman single-factor test was conducted as a post-hoc diagnostic; the first unrotated factor accounted for 28.6% of variance below the 50% threshold suggesting that common method bias is unlikely to be a serious concern in these data.

The study utilized both descriptive and inferential statistical tools with the aid of Statistical Package for Social Sciences (SPSS) version 23. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize and interpret respondents' opinions on blockchain adoption determinants. A decision benchmark of 3.50 was adopted, where mean scores equal to or above 3.50 indicated agreement, while scores below 3.50 indicated disagreement.

Multiple regression analysis was employed to test the formulated hypotheses and determine the direct relationships between independent variables (regulatory support, technology infrastructure, organizational readiness, perceived usefulness) and the dependent variable (blockchain adoption intention). All four independent variables were entered simultaneously into the regression model. Hypothesis $H_0$1 and $H_0$2 were evaluated on the basis of direct effect coefficients, consistent with the revised hypotheses stated in Section 1.5.

4.0 Results and Discussion

A total of 300 questionnaires were distributed, of which 285 were returned and fully completed, representing a response rate of 95%.

Demographic Profile of Respondents

Table 1:

Demographic Characteristics of Respondents (N=285)

Variable	Category	Frequency	Percentage (%)
Gender	Male	178	62.5
	Female	107	37.5
	Total	285	100.0
State of Operation	Lagos	102	35.8
	Abuja (FCT)	58	20.4
	Kano	45	15.8
	Rivers	35	12.3
	Ogun	28	9.8
	Kaduna	17	6.0
	Total	285	100.0

Professional Role	Logistics Manager	118	41.4
	Procurement Officer	82	28.8
	Transportation Manager	53	18.6
	Warehouse Supervisor	27	9.5
	Policymaker/Regulator	5	1.8
	Total	285	100.0
Years of Experience	0-5 years	45	15.8
	6-10 years	82	28.8
	11-15 years	98	34.4
	16+ years	60	21.1
	Total	285	100.0

Source: Authors Compilation, 2026.

The demographic profile shows that male respondents (62.5%) outnumbered female respondents (37.5%), indicating a gender imbalance in supply chain professional roles in Nigeria consistent with the male-dominated nature of logistics and procurement sectors in the country. Lagos contributed the largest proportion of respondents (35.8%), followed by Abuja (20.4%) and Kano (15.8%), reflecting the concentration of supply chain activity in these commercial hubs. Rivers (12.3%) and Ogun (9.8%) also contributed substantially, while Kaduna had the lowest representation (6.0%).

Regarding professional roles, logistics managers constituted the largest group (41.4%), followed by procurement officers (28.8%) and transportation managers (18.6%). Warehouse supervisors (9.5%) and policymakers (1.8%) were less represented. Over 50% of respondents had 10 or more years of experience, indicating substantial industry knowledge and the capacity to provide informed responses on technology adoption determinants.

Determinants of Blockchain Technology Adoption

Table 2:

Perceptions of Blockchain Adoption Determinants

S/N	Item	Mean	SD	Interpretation
	Technology Characteristics			
1	Blockchain provides enhanced supply chain transparency and traceability	4.52	0.67	Strongly Agree
2	Blockchain technology is compatible with our existing supply chain systems	3.28	0.95	Disagree
3	Blockchain is complex to implement and maintain	4.08	0.82	Agree
4	The benefits of blockchain outweigh the implementation challenges	3.75	0.88	Agree
	Organizational Readiness			
5	Top management supports blockchain technology adoption	3.42	0.92	Disagree
6	Our organization has adequate technical expertise for blockchain implementation	2.85	1.04	Disagree

7	Our organization has sufficient financial resources for blockchain investment	2.68	1.12	Disagree
8	Our organizational culture encourages technology innovation	3.55	0.85	Agree
	Environmental Factors			
9	The regulatory environment supports blockchain adoption	2.35	1.08	Disagree
10	Nigeria has adequate technology infrastructure for blockchain implementation	2.58	1.10	Disagree
11	Competitive pressure is driving organizations to adopt blockchain	3.82	0.84	Agree
12	Partners and suppliers are supportive of blockchain adoption	3.18	0.96	Disagree

N = 285. Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree. Mean ≥ 3.50 indicates agreement.

Source: Authors Compilation, 2026.

The findings reveal a nuanced picture of blockchain adoption determinants. Perceived usefulness scored very high (mean = 4.52), indicating strong recognition that blockchain provides enhanced transparency and traceability capabilities. This aligns with findings from Ogun State where 75.3% of respondents identified transparency improvements and 65.3% acknowledged traceability benefits (Okonkwo, 2024). However, perceived complexity was also high (mean = 4.08), suggesting that professionals view blockchain implementation as technically challenging. Compatibility scored below the agreement threshold (mean = 3.28), reflecting concerns about integration with existing supply chain systems.

Organizational readiness emerged as a significant concern. Top management support scored below threshold (mean = 3.42), while technical expertise (mean = 2.85) and financial resources (mean = 2.68) were rated even lower. These findings are consistent with the 80% personnel shortage and 70% cost barrier documented in prior studies (Okonkwo, 2024; Dauda, 2023). Notably, cost constraints and personnel shortages two of the most frequently cited impediments in the literature manifest clearly in these low organizational readiness scores, confirming their centrality to the adoption problem. Organizational culture encouraging technology innovation scored above threshold (mean = 3.55), suggesting some openness to innovation despite resource constraints.

Environmental factors presented the most challenging picture. Regulatory support received the lowest mean score (2.35), indicating that respondents perceive a significant gap between digital policy commitments and concrete regulatory frameworks for blockchain. Technology infrastructure also scored poorly (mean = 2.58), reflecting persistent connectivity and power challenges. Competitive pressure scored above threshold (mean = 3.82), suggesting market dynamics are driving adoption interest despite these barriers. Partner support scored below threshold (mean = 3.18), indicating limited ecosystem readiness.

Relationship between Regulatory Support, Technology Infrastructure, and Blockchain Adoption Intention

Table 3:
Regulatory Support and Technology Infrastructure Assessment

S/N	Item	Mean	SD	Interpretation
1	Government policies actively support blockchain innovation	2.28	1.12	Disagree
2	Legal frameworks adequately accommodate blockchain applications	2.42	1.08	Disagree
3	Regulatory uncertainty significantly inhibits blockchain adoption	4.35	0.78	Strongly Agree
4	Nigeria has adequate internet connectivity for blockchain implementation	2.45	1.15	Disagree
5	Reliable electricity supply exists for digital technology operations	2.22	1.18	Disagree
6	Regulatory support would significantly encourage blockchain adoption	4.48	0.72	Strongly Agree

Source: Authors Compilation, 2026.*N = 285. Scale: 1 = Strongly Disagree, 5 = Strongly Agree.*

The findings reveal that regulatory uncertainty is perceived as a major barrier to blockchain adoption (mean = 4.35). Respondents strongly agreed that the lack of clear regulatory frameworks creates uncertainty that inhibits investment in blockchain technology. Legal frameworks for blockchain remain undeveloped (mean = 2.42), and government policies were rated poorly (mean = 2.28). Most significantly, respondents strongly agreed (mean = 4.48) that regulatory support would encourage blockchain adoption, highlighting the critical role of government in creating an enabling environment.

Infrastructure limitations are severe. Electricity supply received the lowest rating (mean = 2.22), reflecting the persistent power challenges affecting digital transformation in Nigeria. Internet connectivity also scored poorly (mean = 2.45), indicating that the digital infrastructure required for blockchain implementation remains inadequate. These findings align with broader infrastructure challenges documented in the literature (Dauda, 2023; Adewale & Ogunyemi, 2024).

The low descriptive mean scores for regulatory support (2.35) and infrastructure (2.58) reflect respondents' perceptions of the current state of these enablers indicating that both are severely deficient at present. However, the regression results presented in Section 4.5 demonstrate that even within this constrained perspective, variation in perceived regulatory support is the strongest predictor of variation in adoption intention. This is theoretically consistent: when regulatory support is absent or weak, even small improvements in its availability have a disproportionately large effect on adoption intentions, as professionals are acutely sensitive to

any signals of regulatory clarity. This apparent paradox low mean but high predictive power is a well-documented phenomenon in enabler-constrained environments (Lawal, 2025; Sadiq & Aliyu, 2024) and underscores the urgency of regulatory reform as the highest-leverage intervention available to policymakers.

Perceived Usefulness and Organizational Readiness Assessment

Table 4:

Organizational Readiness and Perceived Usefulness Items

S/N	Item	Mean	SD	Interpretation
1	Blockchain would substantially reduce supply chain risks	4.58	0.65	Strongly Agree
2	Blockchain would significantly improve operational efficiency	4.45	0.70	Strongly Agree
3	Significant skills development is needed before successful adoption	4.62	0.58	Strongly Agree
4	Substantial infrastructure investment is required	4.55	0.64	Strongly Agree
5	Comprehensive training programs would facilitate adoption	4.42	0.72	Strongly Agree
6	Blockchain demonstration projects would build confidence	4.35	0.75	Strongly Agree

Source: Authors Compilation, 2026.*N = 285. Scale: 1 = Strongly Disagree, 5 = Strongly Agree.*

All items received strong agreement, with mean scores ranging from 4.35 to 4.62. Skills development received the highest rating (mean = 4.62), indicating that respondents recognize the essential need for capacity building before successful blockchain adoption. This finding aligns with the 80% personnel shortage reported in previous studies (Okonkwo, 2024), and reinforces cost constraints and human capital deficiencies as the most pressing organizational barriers requiring direct policy and managerial attention. Infrastructure investment also scored very high (mean = 4.55), reflecting recognition of the foundational requirements for technology implementation. The strong agreement on risk reduction (mean = 4.58) and operational efficiency (mean = 4.45) confirms that supply chain professionals perceive substantial benefits from blockchain adoption, consistent with the high perceived usefulness rating in Objective 1. Training programs (mean = 4.42) and demonstration projects (mean = 4.35) received strong endorsement, suggesting that practical capacity-building approaches would facilitate adoption. These findings highlight the importance of addressing cost and skills barriers concurrently with regulatory and infrastructure improvements.

Test of Hypotheses

Table 5:

Multiple Regression Analysis of Blockchain Adoption Determinants

Variable	Unstandardized B	Standardized Beta	t	Sig.
(Constant)	0.845	-	2.145	0.032
Regulatory Support	0.428	0.312	6.892	0.000
Technology Infrastructure	0.215	0.168	3.745	0.000
Organizational Readiness	0.187	0.145	3.218	0.001
Perceived Usefulness	0.356	0.285	5.934	0.000

Source: Authors Compilation, 2026.*$R = 0.682$; $R^2 = 0.465$; Adjusted $R^2 = 0.457$; $F = 62.135$; $p = 0.000$*

The regression model was statistically significant ($F = 62.135$, $p = 0.000$), explaining 46.5% of the variance in blockchain adoption intention ($R^2 = 0.465$). The model thus accounts for nearly half of the variation in adoption intention among Nigerian supply chain professionals, with the remaining variance attributable to factors not captured within the current framework, such as individual risk attitudes, inter-organizational trust, and sector-specific pressures.

Regulatory support emerged as the strongest predictor ($\beta = 0.312$, $p = 0.000$), consistent with Lawal (2025). Perceived usefulness followed as the second strongest predictor ($\beta = 0.285$, $p = 0.000$), supporting TAM's emphasis on perceived usefulness as a primary adoption driver. Technology infrastructure ($\beta = 0.168$, $p = 0.000$) and organizational readiness ($\beta = 0.145$, $p = 0.001$) also demonstrated significant positive direct relationships with adoption intention.

H_{01}: Regulatory support has no significant influence on blockchain adoption intention. The regression analysis showed that regulatory support significantly predicted blockchain adoption intention ($\beta = 0.312$, $t = 6.892$, $p = 0.000 < 0.05$). Therefore, $H_0 1$ is rejected. This finding underscores the critical role of clear regulatory frameworks in encouraging technology adoption in developing economies.

H_{02}: Technology infrastructure has no significant impact on blockchain adoption. Technology infrastructure demonstrated a significant positive direct relationship with adoption intention ($\beta = 0.168$, $t = 3.745$, $p = 0.000 < 0.05$). Therefore, $H_0 2$ is rejected. This finding aligns with evidence that infrastructure limitations significantly constrain blockchain implementation in Nigeria, and confirms that investments in digital infrastructure would facilitate adoption.

H_{03}: Organizational readiness has no significant direct effect on blockchain adoption intention. Organizational readiness showed a significant positive direct relationship with adoption intention ($\beta = 0.145$, $t = 3.218$, $p = 0.001 < 0.05$). Therefore, $H_0 3$ is rejected, confirming that organizations with greater technical expertise, financial capacity, and managerial support are more inclined toward blockchain adoption.

H_{04}: Perceived usefulness has no significant direct effect on blockchain adoption intention. Perceived usefulness demonstrated a significant positive direct relationship with adoption intention ($\beta = 0.285$, $t = 5.934$, $p = 0.000 < 0.05$). Therefore, $H_0 4$ is rejected. Professionals who perceive blockchain as delivering tangible improvements in transparency, traceability, and risk reduction are significantly more likely to intend adoption, consistent with TAM predictions.

5.0 Conclusion and Recommendations

This study investigated the determinants of blockchain technology adoption for supply chain risk management in Nigeria. Drawing on an integrated TAM-TOE theoretical framework and data from 285 supply chain professionals across six states, the findings confirm that blockchain adoption intention is significantly influenced by four key determinants: regulatory support, perceived usefulness, technology infrastructure, and organizational readiness. All four null hypotheses were rejected based on direct-effect multiple regression analysis.

The study contributes to the growing body of knowledge on technology adoption in developing economies by providing empirical evidence from the Nigerian perspective that simultaneously examines these four determinants within a unified framework. The finding that regulatory support is the strongest predictor of adoption intention carries important policy implications: even modest improvements in regulatory clarity may generate disproportionately large increases in adoption willingness, particularly in perspectives where regulatory absence is currently a binding constraint. The low descriptive means for both regulatory support and infrastructure confirm that these enabling conditions are severely deficient at present, making them priority areas for intervention.

Organizational readiness encompassing technical expertise, financial capacity, and management support also exerts a significant direct influence on adoption intention. Cost constraints and personnel shortages manifest clearly in the low organizational readiness scores and in respondents' strong endorsement of capacity-building initiatives. These barriers must be explicitly addressed alongside regulatory and infrastructure improvements if blockchain adoption is to progress beyond the pilot stage.

The results validate both the Technology-Organization-Environment framework and the Technology Acceptance Model as useful, complementary lenses for understanding technology adoption in developing economies. The integrated model explains 46.5% of variance in adoption intention, a substantial proportion that confirms the combined explanatory power of the selected determinants while acknowledging that additional factors including inter-organizational trust, individual risk tolerance, and sector-specific dynamics warrant future investigation.

Recommendations

Based on the findings, the following recommendations are advanced:

For Policymakers: Develop clear, actionable regulatory frameworks for blockchain technology, including implementation guidelines, data protection standards, and legal recognition of blockchain records. The significant influence of regulatory support in the regression model suggests that targeted regulatory reform would substantially improve adoption rates. Policymakers should also invest in broadband infrastructure and electricity supply, as both received critically low ratings from respondents. Public-private partnerships for infrastructure development, including rural electrification and expanded fibre connectivity, would reduce the infrastructural barriers that constrain blockchain deployment. Funding mechanisms such as tax incentives or subsidized loans for blockchain pilot projects should also be considered, given the pervasive cost barriers identified in the data.

For Organizations: Invest in human capital development to build in-house technical expertise, through training programs, partnerships with technology providers, and engagement with blockchain consortia. Given the strong endorsement of blockchain demonstration projects (mean = 4.35), organizations should prioritize proof-of-concept implementations to build organizational knowledge, demonstrate return on investment, and reduce perceived risk before committing to large-scale deployment. Senior leadership must also champion blockchain initiatives, as top management support scored below the agreement threshold (mean = 3.42), indicating a gap that constrains organizational readiness. Budgetary planning for blockchain investment should explicitly account for implementation, training, and integration costs, which respondents identified as the most significant organizational barrier.

For Academia: Conduct further empirical research on blockchain adoption patterns across different sectors and geographic regions to identify perspective-specific determinants and barriers. Future studies should explore the moderating and mediating roles of variables such as inter-organizational trust, top management support, and organizational culture. Longitudinal designs would also be valuable to track how adoption intention translates into actual implementation over time. Researchers should also explore the potential integration of blockchain with complementary technologies such as artificial intelligence and the Internet of Things for comprehensive supply chain risk management.

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