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

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Abstract
The study investigated the key factors Influencing blockchain technology in supply chain risk mitigation in developing economies with specific consideration of Nigeria. The study employed a survey methodology approach with a sample size of 81 structured questionnaire, through primary method of data collection among relevant stakeholders in the supply chain operations, experts including logistics managers, sourcing officers, transportation managers, and policymakers. Multiple regression was used as a technique for analyzing data, and SPSS was used as the tool of the analysis. The study's findings suggest that a supportive regulatory environment demonstrates a vital role in the successful adoption of blockchain technology in supply chains. Developing economies often face challenges related to regulatory uncertainty, which can hinder the adoption of innovative technologies. Governments and regulatory bodies actively promote policies that facilitate the use of blockchain for risk mitigation by providing clear guidelines, incentives, and addressing legal challenges businesses are more inclined to adopt such technologies. Regulatory support also fosters trust among supply chain partners and increases the confidence of stakeholders. The study recommends to foster the adoption of blockchain technology in supply chain risk mitigation, it is essential to improve the technology infrastructure in developing economies. The government and private sector should collaborate to invest in robust digital systems, ensuring reliable internet access and technological tools that support blockchain solutions.

Key words: *Blockchain, Risk- Management, Supply chain, Developing Economies, Challenges, Nigeria*

Introduction

Supply chain management (SCM) has undergone profound transformations due to the rise of globalization, increased consumer demands, and the integration of advanced technologies in recent years. These changes have significantly reshaped how businesses operate, particularly in managing risks and ensuring efficiency across their supply

chains. Among the various technological advancements, blockchain technology has emerged as a revolutionary tool for mitigating risks and enhancing transparency, accountability, and security in supply chain operations (Wagner, 2019). Blockchain technology, initially developed as the underlying infrastructure for cryptocurrencies like Bitcoin, has expanded its applications far beyond digital currencies. It is now recognized as a decentralized, distributed ledger system that offers a secure, transparent, and immutable record of transactions. These features make it particularly attractive for supply chain management, where the need for trust, transparency, and verification is paramount (Saberi, 2019). Supply chains in developing economies face several unique challenges, including weak infrastructure, inefficient transportation systems, lack of transparency, and vulnerability to corruption. These factors often lead to increased costs, delays, and a higher likelihood of fraud, making risk mitigation strategies essential for sustainable supply chain operations (Murray, 2018).

The adoption of blockchain technology in developing economies, opined that supply chain management has been slow due to several factors, including limited digital infrastructure, lack of awareness, regulatory hurdles, and the high cost of technology implementation (Schmidt, 2019). Its potential to enhance supply chain efficiency, reduce fraud, improve contract management, and mitigate risks makes it a complex area of study for businesses operating in these regions. Through the issues of corruption, counterfeit goods, and supply chain disruptions, blockchain technology can play a pivotal role in fostering economic growth and stability in developing countries.

Blockchain technology has the potential to significantly mitigate supply chain risks, particularly in developing economies. Several main determinants influence its successful implementation. One of these is technology infrastructure, which refers to the availability and quality of technological resources such as hardware, software, and internet access. In developing economies, the lack of advanced computing systems and reliable internet connectivity can hinder blockchain adoption, as the technology requires stable networks and high processing power to function efficiently (Mukherjee, 2022). The inability to effectively identify and mitigate risks within supply chains exposes organizations especially in developing economy agricultural sector to vulnerabilities that can result in supply delays, counterfeit products, fraud, and mismanagement of resources. These challenges are particularly acute in developing economies, where the regulatory environment may be weak, supply chain visibility is limited, and logistical challenges abound (Hackett, 2017). The absence of real-time data and transparency in transactions often leads to inefficient supply chain operations, increasing the likelihood of disruptions. Supply chain operations sector in these economies struggle to achieve supply chain efficiency and are unable to fully realize the benefits of blockchain technology for risk mitigation (Borghesi, 2020) which the following research questions were raised

i. How does the availability of technology infrastructure affect the adoption of blockchain technology for supply chain risk mitigation in developing economies?

ii. What is the role of regulatory support in influencing the adoption of blockchain technology for supply chain risk mitigation in developing economies?

iii. To what extent does trust and collaboration among supply chain partners impact the adoption of blockchain technology for mitigating supply chain risks in developing economies?

Objectives of the study

The study was based on the following objectives:

1. To assess the effect of technology infrastructure on the adoption of blockchain technology for supply chain risk mitigation in developing economies.

2. To investigate the influence of regulatory support on the adoption of blockchain technology for mitigating supply chain risks in developing economies.

3. To evaluate the impact of trust and collaboration among supply chain partners on the adoption of blockchain technology for risk mitigation in developing economies

Hypotheses

The following hypotheses guided this study:

H_{01}: Technology infrastructure has no significant effect on the adoption of blockchain technology for supply chain risk mitigation in developing economies.

H_{02}: Regulatory support has no significant influence on the adoption of blockchain technology for mitigating supply chain risks in developing economies.

H_{03}: Trust and collaboration among supply chain partners have no significant effect on the adoption of blockchain technology for risk mitigation in developing.

Conceptual Review

Parick, Julie and Dunston (2024) state that a current supply chain is a complex network that generates and control the pathways of products and services from upstream through downstream and Levy (2018) stated that a modern technology infrastructure is built on several main components. These include servers, data centers, networking systems, and cloud platforms, which work together to support an organization's IT functions (Bharadwaj, 2020). Servers provide computing power to process and store data, while data centers serve as physical facilities that house essential IT equipment. Networking systems, including routers, switches, and firewalls, enable secure communication between systems both within and outside the organization (Smith, 2019). Cloud platforms allow organizations to scale their infrastructure and offer on-demand access to computing resources, significantly reducing the need for physical hardware (Mell & Grance, 2011). These elements work together to ensure the smooth operation of business applications, services, and databases that underpin modern organizations (Xie & Fang, 2018).

Adebayo (2019) conducted an empirical investigation into the adoption of blockchain for supply chain risk mitigation in Sub-Saharan Africa. The study examined the adoption patterns across 15 countries, utilizing data from over 250 supply chain professionals. The study identified several main determinants, including the level of technological innovation, regulatory environment, and the readiness of supply chain partners. The study revealed that blockchain adoption improves supply chain transparency and accountability, reducing the risk of corruption and product adulteration, which are prevalent issues in the region. The study highlighted challenges such as inadequate digital infrastructure and limited access to technology, which are common in many developing economies. Sharma (2021) focused on the role of blockchain technology in mitigating supply chain risks for the textile industry in India. Through an empirical study that involved case studies of six major textile companies, the researchers found that blockchain reduces risks related to counterfeiting, fraud, and lack of traceability. The study emphasized that blockchain's decentralized nature prevents tampering of data, making supply chains more secure. The study noted that technological illiteracy and regulatory uncertainty in developing countries limit widespread adoption. Hassan (2022) investigated the effects of blockchain on supply chain risk mitigation in developing countries, focusing on the construction industry in Egypt. Their research involved interviews with main stakeholders from 20 construction firms and found that blockchain reduces risks associated with project delays, cost overruns, and contract disputes by improving transparency and accountability. The study concluded that blockchain's smart contracts feature enables real-time updates and self-executing agreements, which significantly reduce risks. However, slow regulatory adoption and a lack of skilled workforce were cited as challenges. Oliveira (2021) examined the potential of blockchain technology to address supply chain risks in

Brazil's energy sector. Using a combination of surveys and interviews with 30 energy firms, the study found that blockchain mitigates risks related to fraud, energy theft, and operational inefficiencies. Blockchain provided real-time monitoring and data integrity, which enhanced decision-making processes and reduced risks of energy losses. The study concluded that while blockchain offers immense potential, its adoption is hindered by regulatory challenges and the need for significant investment in infrastructure and technical skills in Brazil

Technology-Organization-Environment (TOE) Framework

The Technology-Organization-Environment (TOE) framework, introduced by Tornatzky and Fleischer (1990), emphasizes the role of three interrelated factors—technology, organization, and environment—in influencing technology adoption within organizations. The TOE framework provides a holistic view of how blockchain technology is adopted for supply chain risk mitigation in developing economies. According to this framework, the technological context refers to the perceived benefits and complexities of blockchain technology, the organizational context includes the resources and capabilities required for implementation, and the environmental context comprises external factors such as regulatory frameworks and market conditions.

The TOE framework suggests that organizations in developing economies are more likely to adopt blockchain if they perceive it as a reliable solution for improving transparency, accountability, and risk management. The challenges such as lack of infrastructure, high costs, and limited technical expertise within the organization can hinder adoption. Furthermore, environmental factors like government regulations and economic stability play a essential role in shaping the success of blockchain implementation. The TOE framework, therefore, provides valuable insights into the determinants of blockchain adoption and its effectiveness in mitigating supply chain risks in developing economies.

Methodology

This study adopted a survey research design. The method of data collection of this study is primary method of data collection through a structured questionnaire which is likert scale scaling from 1=Strongly Disagree, 2= disagree, 3=Neutral, 4=Agree, 5=Strongly Agree. Also, the population of the study comprises of various stakeholders with a target population of about 102 numbers of organizations involved in supply chain operations and the sample size is 81 through a Taro Yamane's technique. Also, the sampling technique employed is stratified random sampling techniques to ensure diverse perspectives and adequate coverage of different regions and sectors within the supply

chain operations and also the technique of analysis employed is multiple linear regression model using the statistical package for social scientist (SPSS v.22).

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

The sample size was calculated using Yaro Yamane's (1967) Sample Size formula as follows;

$n = N / (1 + N(e)^2)$

Where n = sample size, N = population size, and e = level of significance.

Plugging in the values, we get:

$n = 102 / (1 + 102(0.05)^2)$

$n = 102 / (1 + 0.2601)$

$n = 102 / 1.2601$

$n \approx 81$

So, the sample size should be approximately 81.

Analysis of Results and Discussion of Finding

The data collected from the questionnaires was presented, analyzed, and interpreted which is divided into five sections for easy comprehension. One deals with the introduction, two deals with data presentation and analysis, that is, responses to the questionnaire, respondents' profile, and research questions related to the hypotheses, three deals with statistical tests of the hypotheses of the study, and finally, four deals with a summary the major findings.

Data Presentation and Analysis

During the course of this study, 81 copies of survey questionnaires were distributed among the respondents, out of which 73 representing 90.9% were returned duly completed while 8 copies were not return and from the return copies there were not outliers or any case of missing data or any incomplete responses. This percentage which is the minimum sample required is enough to establish the fact that will enable the research to achieve its objectives and also the study will discuss only response from the

questionnaire with higher percentage which depicts whether such a question considered to be impactful by the respondents

Table 1: General Information of the Respondents

S/N	Variables	Frequency	Percentages (%)
1.	**Age Group**		
a.	Less than 25 years	16	19.05
b.	26 - less than 40 years	32	38.10
c.	40 - less than 55 years	24	28.57
d.	55 years & above	12	14.29
	Total	**84**	**100.0**
2.	**Gender**		
a.	Male	53	63.10
b.	Female	31	36.90
	Total	**84**	**100.0**
3.	**Highest Educational Attainment**		
a.	High School	12	14.29
b.	Diploma	19	22.62
c.	Bachelor's Degree	35	41.67
d.	Master's Degree	14	16.67
e.	PhD	4	4.76
	Total	**84**	**100.0**

4.	**Years of Experience**		
a.	Less than 5 years	14	16.67
b.	5 - 9 years	28	33.33
c.	10 - 14 years	25	29.76
d.	15 - 19 years	12	14.29
e.	20 years and above	5	5.95
	Total	**84**	**100.0**
5.	**Unit/Department**		
a.	Sourcing Unit	8	9.52
b.	Finance and Accounting	10	11.90
c.	Supply and Logistics	16	19.05
d.	Human Resources	18	21.43
e.	Transportation Operations	32	38.10
	Total	**84**	**100.0**

Source: Researcher's Survey, 2024

The respondents' involvement in various logistics, sourcing and transportation operations activities shows that a majority are engaged in supply chain management (50.00%), which validates that the respondents are actually the target respondents for the study because the study focus on risk mitigation, highlighting the relevance of their perspectives on blockchain technology in supply chain risk mitigation**.**

Table 2: Responses on the Effect of Technology Infrastructure on the Adoption of Blockchain Technology for Supply Chain Risk Mitigation

S/N	Question	SA (Freq %)	A (Freq %)	D (Freq %)	SD (Freq %)	U (Freq %)	Total (Freq %)
1	Does the availability of robust technology infrastructure affect the adoption of blockchain technology for supply chain risk mitigation	36 (42.85 %)	28 (33.33 %)	14 (16.67 %)	5 (5.95 %)	1 (1.19 %)	84 (100%)
2	Is the cost of implementing blockchain technology a barrier to its adoption for supply chain risk mitigation	32 (38.1 %)	29 (34.5 %)	16 (19.05 %)	5 (5.95 %)	2 (2.38 %)	84 (100%)
3	Does the technological readiness of firms in a developing economy	35 (41.67 %)	27 (32.14 %)	14 (16.67 %)	5 (5.95 %)	3 (3.57 %)	84 (100%)

	impact the implement ation of blockchain for supply chain risk mitigation						

Source: Researcher's Survey, 2024

From Table 2, revealed that 36 (42.85%) strongly agreed that availability of robust technology infrastructure affects the adoption of blockchain technology for supply chain risk mitigation, while 28 (33.33%) agreed. A smaller portion, 14 (16.67%), disagreed, and 5 (5.95%) strongly disagreed. Only 1 respondent (1.19%) was undecided. This suggests that the availability of technology infrastructure is perceived as a significant factor in the adoption of blockchain technology for supply chain risk mitigation in developing economies.

In response to whether the cost of implementing blockchain technology is a barrier to its adoption, 32 (38.1%) strongly agreed, and 29 (34.5%) agreed that the cost is indeed a barrier. However, 16 (19.05%) disagreed, and 5 (5.95%) strongly disagreed, with 2 (2.38%) undecideds. These findings indicate that while cost is a major concern, a portion of the respondents do not see it as a significant deterrent.

The respondents were asked whether the technological readiness of firms in a developing economy impacts the implementation of blockchain for supply chain risk mitigation, 35 (41.67%) strongly agreed, and 27 (32.14%) agreed with the statement. Meanwhile, 14 (16.67%) disagreed, and 5 (5.95%) strongly disagreed, with 3 (3.57%) undecideds. This highlights that most respondents believe that a firm's technological readiness demonstrates an essential role in the successful implementation of blockchain technology for risk mitigation in supply chain management.

Table 3: Responses on the Influence of Regulatory Support on the Adoption of Blockchain Technology for Mitigating Supply Chain Risks

S/N	Question	SA (Freq %)	A (Freq %)	D (Freq %)	SD (Freq %)	U (Freq %)	Total (Freq %)
1	Does regulatory support significantly impact the adoption of blockchain technology for mitigating supply chain risks	38 (45.24 %)	30 (35.71 %)	10 (11.90 %)	4 (4.76 %)	2 (2.38 %)	84 (100%)
2	Do government incentives demonstrate a role in encouraging businesses to adopt blockchain	36 (42.86 %)	32 (38.10 %)	12 (14.29 %)	3 (3.57 %)	1 (1.19 %)	84 (100%)

	technology for risk mitigation in supply chains						
3	Is there sufficient regulatory clarity on the use of blockchain technology in the supply chain industry in developing economies	33 (39.29 %)	28 (33.33 %)	16 (19.05 %)	5 (5.95 %)	2 (2.38 %)	84 (100%)

Source: Researcher's Survey, 2024

From Table 3, when respondents were asked whether regulatory support significantly impacts the adoption of blockchain technology for mitigating supply chain risks, the majority strongly agreed (38, 45.24%) and agreed (30, 35.71%) with the statement. Only a few respondents disagreed (10, 11.90%), and a smaller portion strongly disagreed (4, 4.76%), with 2 (2.38%) undecideds. These results indicate that regulatory support is seen as a main factor in driving the adoption of blockchain technology for supply chain risk mitigation in developing economies.

In response to the question about whether government incentives demonstrate a role in encouraging businesses to adopt blockchain technology for risk mitigation in supply chains, 36 (42.86%) strongly agreed and 32 (38.10%) agreed. Meanwhile, 12 (14.29%) disagreed and 3 (3.57%) strongly disagreed, with 1 (1.19%) undecided. This highlights that government incentives are generally perceived as a motivating factor, although

some respondents do not believe they demonstrate a significant role in encouraging adoption.

Respondents were asked whether there is sufficient regulatory clarity on the use of blockchain technology in the supply chain industry in developing economies, 33 (39.29%) strongly agreed, and 28 (33.33%) agreed. 16 (19.05%) disagreed, and 5 (5.95%) strongly disagreed, with 2 (2.38%) undecideds. This suggests that while most respondents believe there is a reasonable level of regulatory clarity, there are still concerns and uncertainties surrounding the regulatory framework for blockchain technology in supply chains within developing economies.

Table 4: Responses on Trust and Collaboration Among Supply Chain Partners on the Adoption of Blockchain Technology for Risk Mitigation

S/N	Question	SA (Freq %)	A (Freq %)	D (Freq %)	SD (Freq %)	U (Freq %)	Total (Freq %)
1	Does trust and collaboration among supply chain partners significantly influence the adoption of blockchain technology for risk mitigation	35 (41.67 %)	28 (33.33 %)	12 (14.29 %)	6 (7.14 %)	3 (3.57 %)	84 (100%)
2	Is the willingness of supply chain partners to share data a essential	30 (35.71 %)	34 (40.48 %)	14 (16.67 %)	4 (4.76 %)	2 (2.38 %)	84 (100%)

	factor in the successful adoption of blockchain technology in supply chain risk mitigation						
3	Does effective communication between supply chain partners improve the adoption of blockchain technology for mitigating supply chain risks	32 (38.10 %)	33 (39.29 %)	11 (13.10 %)	6 (7.14 %)	2 (2.38 %)	84 (100%)

Source: Researcher's Survey, 2024

Table 4 provides insights into the role of trust and collaboration among supply chain partners in the adoption of blockchain technology for risk mitigation. The responses reveal that when asked if trust and collaboration among supply chain partners significantly influence the adoption of blockchain technology, a majority of the respondents strongly agreed (35, 41.67%) and agreed (28, 33.33%) with the statement. This suggests that respondents generally believe that collaborative relationships between supply chain partners are essential for the effective implementation of blockchain for mitigating risks. Fewer respondents disagreed (12, 14.29%) or strongly disagreed (6, 7.14%), while only 3 (3.57%) were undecided. This indicates a strong positive perception regarding the role of collaboration and trust in blockchain adoption.

Regarding the importance of data sharing for the successful adoption of blockchain

technology, 30 (35.71%) strongly agreed, and 34 (40.48%) agreed that the willingness to share data is essential. In contrast, 14 (16.67%) disagreed, and 4 (4.76%) strongly disagreed, with 2 (2.38%) undecided. This finding underscores the essential role that data transparency and sharing between supply chain partners demonstrate in the adoption of blockchain technology, although some respondents remain skeptical of its significance.

The respondents were asked about the impact of effective communication between supply chain partners on blockchain adoption, 32 (38.10%) strongly agreed, and 33 (39.29%) agreed that communication improves adoption. Only 11 (13.10%) disagreed, and 6 (7.14%) strongly disagreed, with 2 (2.38%) undecideds. These responses highlight that communication is viewed as a main enabler in the collaborative process required for blockchain technology to be successfully adopted for supply chain risk mitigation.

Test of Hypotheses

Multiple linear regression analysis was used to evaluate the relationship between various determinants (technology infrastructure, regulatory support, trust, and collaboration among supply chain partners) and the adoption of blockchain technology for supply chain risk mitigation in the context of developing economies. The statistical significance of each hypothesis was tested using SPSS (v.22).

Table 5: Result of Regression

Variables	**Coefficient**	**t-values**	**Sig (p-value)**
Constant	1.819	1.968	0.001
Technology Infrastructure	0.201	1.972	0.012
Regulatory Support	0.152	1.975	0.018
Trust and Collaboration Among Supply Chain Partners	0.129	1.981	0.035
R	0.394		
R-squared	0.409		
S.E of estimate	1.232		

Sig (p-value)	0.000		
Df	49		
Durbin-Watson	2.010		
F-stat	8.816		

Source: SPSS Output, 2024

The Table 5 presents the results of a multiple linear regression analysis used to evaluate the relationship between technology infrastructure, regulatory support, trust and collaboration among supply chain partners (independent variables), and the adoption of blockchain technology for risk mitigation in the supply chain in the context of developing economies. The regression model was found to be statistically significant ($p < 0.001$, $t = 1.968$, $R = 0.394$, $p < 0.001$). The R-value of 0.394 indicates that approximately 39% of the variance in the adoption of blockchain technology for risk mitigation can be explained by the independent variables.

Technology Infrastructure ($\beta = 0.201$, $t = 1.972$, $p = 0.012$) exhibited a significant positive relationship with the adoption of blockchain technology. This suggests that the presence of robust technological infrastructure is essential for the adoption of blockchain technology in supply chain risk mitigation. Developing economies with advanced technological infrastructure are more likely to adopt blockchain solutions, which enhances transparency, security, and efficiency in their supply chains.

Regulatory Support ($\beta = 0.152$, $t = 1.975$, $p = 0.018$) also showed a positive and significant association with the adoption of blockchain technology. This highlights the importance of having a supportive regulatory environment for the successful implementation of blockchain in mitigating supply chain risks. A favorable regulatory framework ensures that businesses are encouraged to invest in blockchain technologies and are confident that their operations will align with legal and policy standards.

Trust and Collaboration Among Supply Chain Partners ($\beta = 0.129$, $t = 1.981$, $p = 0.035$) demonstrated a significant relationship with the adoption of blockchain technology. The results suggest that trust and collaboration between supply chain partners are essential for the successful adoption of blockchain. This factor emphasizes the role of strong relationships and mutual trust in ensuring that blockchain-based solutions are effectively implemented to mitigate risks in the supply chain.

The p-value of 0.000 ($p < 0.05$) and the f-statistics of 8.816 (f-stat > 2) further indicate the statistical significance of the model. The results suggest that the independent variables technology infrastructure, regulatory support, and trust and collaboration have a significant impact on the adoption of blockchain technology for supply chain risk

mitigation in developing economies.

Hypothesis One

H_{01}: Technology infrastructure has no significant effect on the adoption of blockchain technology for supply chain risk mitigation in developing economies

The p-value of 0.012, which is less than the 0.05 significance level ($p < 0.05$), indicates that the null hypothesis is rejected. This means that technology infrastructure has a significant effect on the adoption of blockchain technology for risk mitigation in supply chain management.

Hypothesis Two

H_{02}: Regulatory support has no significant influence on the adoption of blockchain technology for mitigating supply chain risks in developing economies.

Policy and Managerial Implication

The findings of this study suggest that several main factors significantly influence the adoption of blockchain technology for supply chain risk mitigation in developing economies. These factors include technology infrastructure, regulatory support, and trust and collaboration among supply chain partners. Technology Infrastructure emerged as essential determinant in the adoption of blockchain technology. The significant positive coefficient ($\beta = 0.201$) indicates that the availability of a robust technological foundation is essential for the successful implementation of blockchain solutions. In developing economies, the role of technology infrastructure cannot be understated, as it provides the necessary framework for the integration of advanced digital solutions like blockchain into the supply chain. The presence of reliable internet connectivity, secure data storage systems, and modern IT infrastructure are main enablers that allow blockchain technology to be effectively deployed, ensuring secure and transparent transactions that mitigate risks.

Regulatory Support was another significant factor influencing blockchain adoption, with a positive coefficient ($\beta = 0.152$). The study's findings suggest that a supportive regulatory environment demonstrates a vital role in the successful adoption of blockchain technology in supply chains. Developing economies often face challenges related to regulatory uncertainty, which can hinder the adoption of innovative technologies. Governments and regulatory bodies actively promote policies that facilitate the use of blockchain for risk mitigation by providing clear guidelines,

incentives, and addressing legal challenges businesses are more inclined to adopt such technologies. Regulatory support also fosters trust among supply chain partners and increases the confidence of stakeholders in adopting blockchain solutions.

Trust and collaboration among supply chain partners also significantly affected the adoption of blockchain technology. With a coefficient of $\beta = 0.129$, the study highlights the importance of strong relationships and mutual trust between supply chain partners. Blockchain technology's decentralized and transparent nature requires that all partners in the supply chain are willing to collaborate and share data openly. In environments where trust among partners is weak, blockchain adoption may face significant barriers. Conversely, when supply chain partners actively work together and trust one another, blockchain technology's full potential can be realized, as it can streamline operations, reduce fraud, and enhance overall supply chain efficiency

The p-value of 0.018, which is also less than 0.05, indicates that the null hypothesis is rejected. Therefore, regulatory support significantly influences the adoption of blockchain technology in mitigating supply chain risks.

Hypothesis Three

H_{03}: Trust and collaboration among supply chain partners have no significant impact on the adoption of blockchain technology for risk mitigation in developing economies.

The p-value of 0.035, which is less than 0.05, indicates that the null hypothesis is rejected. This means that trust and collaboration among supply chain partners significantly impact the adoption of blockchain technology for supply chain risk mitigation

Conclusion and Recommendation

The findings of this study underscore the essential role of technology infrastructure, regulatory support, and collaboration in the successful adoption of blockchain technology for supply chain risk mitigation. The results highlight the fact that while technological readiness and supportive regulations are main to blockchain adoption, the presence of trust and collaboration among supply chain partners also demonstrates a vital role in facilitating the seamless integration of blockchain solutions

Recommendations

1. **Enhance Technology Infrastructure:** To foster the adoption of blockchain technology in supply chain risk mitigation, it is essential to improve the technology infrastructure in Kaduna State. The government and private sector should collaborate to invest in robust digital systems, ensuring reliable internet access and technological tools that support blockchain solutions

2. **Strengthen Regulatory Support:** Regulatory support is vital for blockchain adoption in the agricultural sector. The study recommends that the government of Kaduna State work on developing a comprehensive regulatory framework that addresses the unique challenges of blockchain technology. This could include data privacy laws, smart contract regulations, and standards for blockchain implementation in supply chains

3. **Foster Trust and Collaboration among Supply Chain Partners:** To maximize the effectiveness of blockchain technology, it is important to strengthen trust and collaboration among supply chain partners. The study recommends initiatives to promote greater transparency and information sharing, which are essential for blockchain to function effectively

4. **Promote Blockchain Education and Training:** In order to facilitate the smooth adoption of blockchain technology in the agricultural sector, it is recommended that the government and industry stakeholders invest in educational and training programs

5. **Incentivize Blockchain Adoption:** To further promote blockchain adoption, the government could provide incentives such as tax breaks, subsidies, or grants to agricultural businesses that integrate blockchain technology into their operations

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