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Usage of Blockchain Technology in Real Estate Transactions in Lagos State, Nigeria

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Abstract

The study examined the use of blockchain technology in real estate transactions in Lagos State, Nigeria, by assessing the level of adoption among estate surveying and valuation firms and the factors influencing its adoption. The data for this study were collected through questionnaires administered to estate surveying and valuation firms located on Lagos Island, Lagos State. The questionnaires provided the firms' opinions on the adoption of blockchain technology, their level of awareness of blockchain technology and the factors influencing its adoption. The data analysis revealed that real estate practitioners were very aware of various blockchain applications, including fintech, cryptocurrency, smart contracts, and cross-border transactions, which are useful tools that estate surveyors and valuers can adopt in real estate practice and transactions. Furthermore, the analysis revealed that regulatory challenges, trust issues, and poor internet provision compromise the adoption and usage of blockchain technology in Lagos State. The study recommends frequent sensitisation of members by the Nigerian Institution of Estate Surveyors and Valuers and the creation of an enabling environment by the government, as the use of this emerging technology is facilitated by infrastructure such as regular internet and electricity supply.

Keywords: *assessment, blockchain, blockchain technology, real estate and transaction*

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1. Introduction

The real estate market is a specialised market that requires efficiency, safety, transparency, a significant capital outlay, and a high level of risk. Despite the arduous requirements of the real estate market, it remains one of the most secure investment options, with relatively higher returns compared to other options (Bello, 2005). The use of intermediaries, the involvement of a third party for authentication, the associated financial and time costs associated with management, access, and verification of records, the lack of transparency regarding property ownership, and reliance on centralised systems vulnerable to security breaches are just a few of the issues that the real estate industry faces (Ahmad et al., 2021). Furthermore, Corluka & Lindh (2017) observed that numerous inefficiencies within the real estate world result in several unexplainable challenges ranging from problems associated with transparency, liquidity, high transaction costs, personal biases, and slow transaction processes, which trigger economic crises both on a micro and macro level. The volatility and uncertainty present in the real estate world have prompted individual and institutional investors to reassess the means of transacting in the real estate business to ensure the security of their funds and that real estate transactions are free from negative encumbrances (Corluka & Lindh, 2017).

One of the methods used to enhance real estate transactions is through technology, as technological advancements are a significant driver of economic growth. They provide critical support for transformation in all major economic sectors, particularly the financial and industrial sectors (Onipede, 2010). The development of the internet, which has helped to ease and facilitate how we live and operate our enterprises, is a good example of technological advancement. However, when the internet came to Nigeria in the 1990s, the average Nigerian was extremely cautious. This caution persisted until the year 2000 when the millennium bug was allegedly going to crash the computer system (Esharenana, 2005). However, the recent reception of Nigerians towards internet use has garnered massive attention. Ijeh (2021) noted that Nigeria has approximately 136 million internet users, which accounts for 66 percent of the reported population of 205 million as of 2020. Access to the internet has influenced the use of various forms of technological innovations, including blockchain technology, in solving human problems. Singh et al. (2021) described blockchain which encompasses cryptocurrency, bitcoin, tokenisation, and Ethereum as a purely peer–to–peer version of an electronic platform for transactions, eliminating the need for financial institution involvement.

The relevance of blockchain extends beyond serving a transitional role in the real estate industry; it will create a radical change, similar to the revolutionary impact of the Internet in ushering in the digital age. Blockchain technology, as proposed by Levy (2021), offers fifteen premises for its application, one of which includes real estate businesses, thereby justifying the applicability of blockchain to real estate transactions. With the advent of blockchain technology, many of these inefficiencies in real estate transactions could be reduced or eliminated by blockchains, which provide smart contracts that eliminate several chains of third-party involvement in real estate transactions.

The blockchain ledger's immutability can offer a secure environment for the real estate industry. Additionally, blockchain technology expedites background checks and provides concerned parties with access to personal digital keys, which aids in the verification process and reduces the risk of fraud (Ekemode et al., 2019). Despite its inherent benefits, the integration of blockchain technology presents challenges for real estate practitioners working in technology-driven sectors to perform their roles effectively and reliably in serving their clients and the broader public. Property managers must keep up-to-date with technological advancements to

remain relevant in the corporate sector. However, Jimoh et al. (2019) identified the principal challenge associated with blockchain technology is a need for more awareness, especially in sectors other than the financial sector, and an extensive lack of understanding of its functionality. This limited understanding hinders investment and innovation even among real estate practitioners and perpetuates the misconception that blockchain is synonymous with Bitcoin. In the Nigerian context, the limited understanding of blockchain technology hinders its expansion and adoption (Jimoh et al., 2019). To this end, an assessment of the adoption of blockchain technology among real estate practitioners becomes imperative, as some existing studies have emphasised how to successfully integrate blockchain technology into real estate practice, highlighting the benefits derivable from its adoption and application. Hence, the objective of this research work is to assess the use of blockchain technology in real estate transactions in Lagos, Nigeria.

2. Literature Review

In recent times, the significant economic fluctuations and uncertainty surrounding real estate transactions have prompted individual and institutional investors to reassess their methods for transacting in the real estate business, all to ensure the security of their funds (Corluka & Lindh, 2017). As such, real estate professionals are expected to be academically knowledgeable and technologically competent to serve their clients and the public effectively and reliably.

Satoshi Nakamoto, the pseudonymous creator of blockchain technology, described blockchain as a pure peer–to–peer version of an electronic platform for transactions without the involvement of a financial institution. It is also known as a distributed ledger that enables the creation of unchangeable and immutable records of transactions accessible to all stakeholders, which are irreversible and time-stamped on its network. A blockchain structure would eliminate the need for paper records, which are susceptible to natural disasters, theft, and mishandling.

Tangsakul and Sureeyatanapas (2024) examined the critical barriers to the adoption of blockchain technology within a logistics context. Utilising Interpretive Structural Modelling (ISM) and MICMAC methods, the study investigated the interrelationships among the significant barriers. The results highlight seven significant barriers within the logistics sector: lack of government support, operational standards, top management support, limited public awareness, trust issues, technical challenges, and difficulties in network collaboration. Notably, the lack of public awareness and inadequate governmental support form fundamental obstacles that drive various challenges. In turn, this study aims to examine the barriers to the adoption of blockchain technology in Nigeria's real estate sector.

Owarigbo and Onah (2023) assessed the level of awareness and application of blockchain technology among librarians for effective service delivery in University Libraries in the South-South region of Nigeria. A descriptive survey design was adopted for the study. The study population consisted of 643 librarians from 10 federal and state-owned universities in South-South Nigeria. A sample of 495 librarians was selected using a multistage sampling technique. An online questionnaire was used for data collection, which was shared via the state WhatsApp group. The data collected were analysed using mean and standard deviation. Of relevance to this research study, the findings showed that the majority of librarians studied have a low level of awareness of blockchain technology and needed further training in implementing it.

Ahmad et al. (2020) investigated the impact of a decentralised blockchain platform on real estate management. This research carefully analysed the management aspect of real estate transactions and their attendant issues, some of which are fraud-related, lengthy administrative processes, and verification problems. However, as this study was carried out in another country, it is thus imperative to weigh out what is obtainable within the Nigerian system.

Academicians in Nigeria have also researched the prospects of blockchain technology in the national context and explored the process of public education initiatives regarding this rapidly evolving technology. Jimoh et al. (2019) examined the adoption of blockchain technology in Nigeria, highlighting its relevance to developing economies. The study identified the possible challenges and limitations to implementation, including technical, governance, conceptual, cost, and educational aspects. However, the scope of the study was limited by the adoption of blockchain technology in government establishments and governance without recourse to other industries within the economy, such as the real estate industry. This omission is the gap this study intends to fill.

In Lagos, Nigeria, the current property transfer process requires buyers and sellers to register their property deeds at the Land Registry within the Ministry of Lands, located at the Lagos State Secretariat, Alausa. However, with the use of blockchain technology, once the administration initiates the authentication process and the transaction is verified, ownership is transferred instantly, and the system records this change. This technological revolution is already underway in areas such as India, Dubai, Brazil, and certain parts of Sweden, where past fraudulent acts have compelled governing entities to develop blockchain networks for land title recording. Lantmäteriet et al. (2016) stated that Sweden's land registry has been experimenting with and implementing blockchain to record property transactions since June 2016. Although Torres and Brann (2019) noted that it is essential to acknowledge that some applications of blockchain are still theoretical in terms of real-world applicability, while others have been deployed for implementation in various parts of the economy.

3. Methodology

A quantitative research methodology was used in the study, focusing on a field survey among members of Lagos Island's estate surveying and valuation firms. The firms were targeted based on their official registration with the Nigerian Institution of Estate Surveyors and Valuers (NIESV), Lagos State chapter, and the Estate Surveyors and Valuers Registration Board of Nigeria (ESVARBON). The most senior estate surveyor and valuer from each firm was selected as the respondent. According to the 2022 NIESV Directory, Lagos Island has 112 estate surveying and valuation firms; thus, a total enumeration survey was adopted to ensure comprehensive data collection. Structured questionnaires were designed and administered to gather information about respondents' adoption of blockchain technology in real estate transactions and the factors influencing its use. The questionnaire was completed by 106 of the 112 estate surveying and valuation firms surveyed, representing a response rate of 94,6%. The high retrieval rate indicates a high degree of responsiveness, providing a solid foundation for further research. Weighted mean score and factor analysis were used to examine the data provided by the respondents.

4. Data analysis and discussion of results

This section of the study presents the analysis and discussion of data collected through copies of the questionnaires administered to estate surveying and valuation firms in the Lagos Island area of Lagos State. It evaluated the level of adoption of blockchain technology in real estate transactions in Lagos State, Nigeria, and the medium through which the respondents, estate surveyors and valuers, learned about it. In addition, it examined the key factors influencing the adoption and utilisation of blockchain technology, as well as the potential opportunities offered in its application in real estate transactions in the study area.

4.1. Assessment of the level of adoption of blockchain technology in Lagos State, Nigeria

To assess the level of adoption of blockchain technology in real estate transactions in Lagos State, estate surveying and valuation firms were asked to rate the level of adoption of 14 blockchain applications on a scale of 1-5, representing very low to very high. Responses were subjected to frequency distribution and weighted mean score analysis, and the results are presented in Table 1.

Respondent estate surveying and valuation firms were asked to rate their level of adoption of blockchain technology on a scale of 1-5, where 1 represents Very low to 5 represents Very high. Responses were analysed using weighted mean scores, and the results are presented in Table 1.

Table 1: Level of adoption of blockchain technology by estate surveying and valuation firms

Blockchain application	VL (1)	L (2)	A (3)	H (4)	VH (5)	WMS	Rank
Fintech	1	11	14	4	75	4.31	1st
Cryptocurrency	13	12	25	25	31	4.09	2nd
Smart contract	13	12	25	25	31	3.46	3rd
Cross-border transaction	11	12	36	21	26	3.37	4th
Internet of Things (IoT)	1	23	47	13	22	3.3	5th
Anti-money laundering tracking system	18	10	19	44	15	3.26	6th
Microlending payment network	5	18	57	16	10	3.08	7th
Real estate processing platform	19	25	17	25	20	3.02	8th
Tokenisation	27	22	11	26	20	2.91	9th
Personal identity security	19	43	15	5	24	2.74	10th
Property ownership transfer	15	42	22	19	8	2.65	11th
Financial data recording and management	14	37	38	9	8	2.62	12th
Wills and inheritances	35	21	18	22	10	2.54	13th

Supply chain management	18	56	21	10	1	2.25	14th

VL – Very Low, L – Low, A – Average, H- High and VH – Very High

Source: Field Survey (2023)

Results from Table 1 revealed the perception of the estate surveying and valuation firms on the level of adoption of blockchain technology. Fintech, cryptocurrency, smart contracts, and cross-border transactions ranked 1st, 2nd, 3rd, and 4th with mean scores of 4.31, 4.09, 3.46, and 3.37, respectively. The areas of application of blockchain technologies that the estate surveying and valuation firms perceived to be least adopted are personal identity security, property ownership transfer, financial data recording and management, wills and inheritances, and supply chain management, which ranked 10th, 11th, 12th, 13th, and 14th, with mean scores of 2.74, 2.65, 2.62, 2.54 and 2.25 respectively. The perceived level of adoption of blockchain technology by estate surveying and valuation firms suggests the inherent benefits of using blockchain technology in real estate transactions. This study aligns with the submission by Corluka and Lindh (2017). They argued that blockchain has the potential to alter the real estate sector and reduce inefficiencies fundamentally. Due to lower transaction costs, inefficiencies such as personal biases can be addressed and remedied, leading to a more liquid market.

4.2. Awareness of Blockchain Applications

Respondent estate surveying and valuation firms were asked to rate the means through which they found out about blockchain technology on a scale of 1-5, where 1 represents Not at all to 5 representing Very large extent. Responses were analysed using weighted mean scores, and the results are presented in Table 2.

Table 2: Awareness of blockchain technologies by estate surveying and valuation firms

Medium of awareness	NA (1)	SE (2)	ME (3)	LA (4)	VLE (5)	WMS	Rank
Internet	8	1	15	15	67	4.25	1st
Print Media	3	0	23	37	43	4.1	2nd
Social media	4	15	21	8	58	3.95	3rd
Television and radio programs	9	6	31	25	35	3.67	4th
Mandatory Continuing Professional Development (MCPD)	15	30	13	9	39	3.25	5th
Seminars/conferences	4	24	46	9	23	3.22	6th
NIESV Website	10	33	39	15	9	2.81	7th
Awareness campaigns	43	17	12	19	15	2.49	8th
Pre-Sensitization tours	39	27	12	20	8	2.35	9th
Organised excursions	50	22	8	15	11	2.2	10th

NA – Not at all, SE – Small extent, ME – Moderate extent, LA – Large extent and VLE – Very large extent

Source: Field Survey (2023)

Results from Table 2 showed that most estate surveying and valuation firms discovered blockchain technology through the internet, print media, and social media; with the internet

being the most common source, ranked 1st, followed by print media (ranked second) and social media (ranked third), with mean scores of 4.25, 4.1, and 3.95, respectively. The medium through which estate surveyors and valuers became least aware of blockchain technology was through awareness campaigns, pre-sensitisation tours, and organised excursions, which ranked 8th, 9th, and 10th, with mean scores of 2.49, 2.35, and 2.2, respectively. This emphasises the complementary roles of the internet, print, and social media in enhancing awareness and understanding of blockchain. The Internet offers a dynamic and participatory platform for mass education, while print media gives authoritative insights to a more conventional audience. Social media enables reaching millions in minutes, keeping people informed in real time. These communication platforms help make blockchain technology widely known, enabling people and companies to tap into its potential.

4.3 Factors influencing the adoption of blockchain technology in the study area

Respondent estate surveying and valuation firms were asked to rate the factors influencing the usage and adoption of blockchain technology using a 5-point Likert scale, ranging from 1 (Indifferent) to 5 (Strongly agree). The results of the analysis are presented in Table 3.

Table 3: Factors influencing the adoption and usage of blockchain technology by estate surveying and valuation firms

Factors	I	SD	D	A	SA	WMS	Rank
Regulatory Challenge	8	1	15	15	67	4.25	1st
Trust Issues	7	10	14	25	50	3.95	2nd
Poor Internet Provision	7	10	14	25	50	3.95	3rd
Volatility and Market Risks	0	11	31	30	34	3.82	4th
Integration	13	17	0	25	51	3.79	5th
Conceptual factor	13	17	0	25	51	3.79	6th
Complexities and Dependencies	22	7	22	29	26	3.28	7th
The decision of the firm	15	30	13	9	39	3.25	8th
Data quality	19	20	15	24	28	3.21	9th
Access to the credit facility	9	24	39	8	26	3.17	10th
Infrastructure	37	6	9	33	21	2.95	11th
Cost implications	25	23	20	19	19	2.85	12th
Poor Investment in research	25	23	20	19	19	2.85	13th
Privacy	50	22	8	15	11	2.2	14th
Availability of trained personnel	50	22	8	15	11	2.2	15th

I – Indifferent, SD – Strongly Disagree, D - Disagree, A- Agree, and SA – Strongly Agree

Source: Field Survey (2023)

Table 3's results demonstrated that the most significant factors influencing the adoption and use of blockchain technology by estate surveying and valuation firms are regulatory challenges,

trust issues, poor internet provision, volatility and market risks, and trust integration, validating the study of Tangsakul and Sureeyatanapas (2024). These factors ranked first, second, third, fourth, and fifth, respectively, with mean scores of 4.25, 3.95, 3.95, 3.82, and 3.79. The absence of clear regulations governing blockchain technology creates compliance and legal uncertainties, which can deter firms from adopting or integrating such innovations. Scepticism among stakeholders who are unfamiliar with the technology can lead to concerns about data security, potential fraud, and the irreversibility of blockchain transactions; thereby hindering trust among estate surveying and valuation firms. Additionally, in Nigeria, where internet infrastructure is inadequate, estate surveying and valuation firms may struggle to implement and utilise blockchain effectively, resulting in operational inefficiencies and increased costs.

The data in Table 3 also showed that infrastructure, cost implications, inadequate research investment, privacy concerns, and the availability of trained personnel are the least significant factors affecting the adoption and use of blockchain technologies. These factors ranked 11th, 12th, 13th, 14th, and 15th, respectively, with mean scores of 2.95, 2.85, 2.85, 2.2, and 2.2. Given the stronger focus on data reduction, the variables were subjected to further analysis using factor analysis. The most senior estate surveyors and valuers from 106 estate surveying and valuation firms provided the data for analysis. Tables 4, 5, and 6 present the findings of the analysis, respectively.

Table 4: KMO measure of sampling adequacy and Bartlett's test of sphericity

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.621
Bartlett's Test of Sphericity	Approx. Chi-Square	1283.814
	Df	300
	Sig.	.000

Source: Field Survey (2023)

The result of the Kaiser-Meyer-Olkin (KMO) adequacy test in Table 4 revealed a KMO value of 0.621, which implies an "adequate" degree of common variance (Field, 2018) and exceeds the minimum threshold of 0.60 as indicated by Norusis (1993). This study also employed Bartlett's test of sphericity (BTS) to examine the suitability of the Principal Component Analysis (PCA) for factor extraction (Field, 2018). The BTS test yielded a Chi-square value of 1283.814 and a minimal significance value ($p = 0.000$, $df = 300$), indicating, as Chan (2013) identified, that the correlation matrix is not an identity matrix. Given the above, the research data met the prerequisites; hence, factor analysis could be carried out with reliability.

Table 5: Communalities of factors influencing the adoption and usage of blockchain technology

Factors	Initial	Extraction
Conceptual factor	1	0.971
Regulatory Challenge	1	0.947
Poor Internet Provision	1	0.884
Trust Issues	1	0.848
Complexities and Dependencies	1	0.778
Volatility and Market Risks	1	0.745
Privacy	1	0.971
Infrastructure	1	0.947
Data quality	1	0.873
Integration	1	0.587
Poor Investment in research	1	0.884
Cost implications	1	0.848
Access to a credit facility	1	0.746
The decision of the firm	1	0.669
Availability of trained personnel	1	0.667

Source: Field Survey (2023)

Table 5 shows that the majority of commonalities exceed 0.70, indicating that the sample is sufficient for factor analysis (Field, 2018).

Table 6: Total variance explained by factors influencing the adoption and usage of blockchain technology

	Initial eigenvalues			Extraction of sums of squared loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.635	30.897	30.897	4.635	30.897	30.897
2	2.567	17.114	48.011	2.567	17.114	48.011
3	2.23	14.864	62.875	2.23	14.864	62.875
4	1.641	10.942	73.817	1.641	10.942	73.817
5	1.292	8.611	82.428	1.292	8.611	82.428
6	0.901	6.01	88.438			
7	0.603	4.02	92.458			
8	0.471	3.143	95.601			
9	0.433	2.231	97.832			
10	0.387	1.512	99.344			
11	0.373	1.734	100			
12	0.347	1.549	100			
13	0.296	1.49	100			
14	0.24	1.389	100			
15	0.205	1.185	100			

Source: Field Survey (2023)

The eigenvalues corresponding to each factor component are presented in Table 6, both before and after extraction and rotation. Fifteen linear components (services) were identified in the dataset before extraction. The variance explained by the linear arrangement, expressed as a percentage of variation explained, is represented by the eigenvalues corresponding to each factor. The table also demonstrates that five components with a minimum variance of 8.611 were retrieved. A cumulative total squared loading of 82.428% was achieved by clustering the services, indicating the factors that impact the adoption and utilisation of blockchain technology in the study area across the five components. This indicates that the five components represent 82.428% of the characteristics of the 15 factors. Consequently, the cumulative effect of the five extracted components explains 82.428% of the total variation of factors influencing the adoption and usage of blockchain technology in the study area. Therefore, the five components identified should be the focus of efforts to determine the factors influencing the adoption and usage of blockchain technology in the study area.

Table 7: Rotated component matrix of factors influencing the adoption and usage of blockchain technology

	Component				
	1	2	3	4	5
Infrastructure	0.465				
Poor Internet Provision	0.838				
Complexities and Dependencies	0.566				
Regulatory Challenge		0.465			
Access to a credit facility		0.546			
Poor Investment in research		0.838			
Conceptual factor			0.694		
Availability of trained personnel			0.475		
The decision of the firm			0.444		
Trust Issues				0.578	
Volatility and Market Risks				0.465	
Data quality				0.644	
Privacy					0.694
Integration					0.594
Cost implications					0.578

Source: Field Survey (2023)

Table 7 presents the factor loadings influencing the adoption and usage of blockchain technology in the study area, grouped into five principal components. Factor loadings less than 0.4 were suppressed to ensure an accurate and quality interpretation of the obtained results, consistent with Field's (2013) recommendation to suppress factor loadings of less than 0.3 and Guadagnoli and Velicer's (1988) assertion that scores greater than 0.4 are considered stable. The figures in the table represent the correlation between each variable and its respective components, with values ranging from 0 to 1. The higher the variable loading, the closer the variable is correlated with the component in question. Positive values indicate direct relationships, while negative values represent inverse relationships. These correlations help identify the most significant factors influencing the adoption of blockchain technology. Hence, the most significant factors influencing the adoption of blockchain technology are poor internet provision, poor investment in research, conceptual factor, privacy and data quality, with

correlation matrix of 0.838, 0.838, 0.694, 0.694 and 0.644, respectively, validating the findings of Tangsakul and Sureeyatanapas (2024).

Table 8: Cluster grouping of factors influencing the adoption and usage of blockchain technology

Cluster groupings	Communalities	Factor loadings	Eigenvalues	Variance (%)
Factors related to the lack of infrastructural facilities				
Infrastructure	0.947	0.465	4.635	30.897
Poor internet provision	0.884	0.838		
Complexities and dependencies	0.778	0.566		
Factors related to government policies and regulations				
Regulatory challenge	0.947	0.465	2.567	17.114
Access to a credit facility	0.746	0.546		
Poor investment in research	0.884	0.838		
Factors related to inadequate technical know-how				
Conceptual factor	0.971	0.694	2.23	14.864
Availability of trained personnel	0.667	0.475		
The decision of the firm	0.669	0.444		
Factors related to uncertainty				
Trust Issues	0.848	0.578	1.641	10.942
Volatility and market risks	0.745	0.465		
Data quality	0.873	0.644		
Security factors				
Privacy	0.971	0.694	1.292	8.611
Integration	0.587	0.594		
Cost implications	0.848	0.578		
Total variance				**82.428**

Source: Field Survey (2023)

The analysis of the factors influencing the adoption and usage of blockchain technology in Lagos State, Nigeria, yielded five distinct factors (presented in Table 8). Factor 1, labelled "lack of infrastructural facilities", encompasses infrastructure, poor internet provision, and complexities and dependencies. These factors have high factor loadings, indicating they strongly influence the usage and adoption of blockchain technology in real estate transactions. The implication is that inadequate infrastructure and poor internet connectivity hinder the adoption of this technology in real estate transactions in Lagos State. Hence, addressing these infrastructural challenges is critical for leveraging blockchain's potential to enhance transparency, security, and efficiency in real estate transactions in Lagos State. The eigenvalue for this cluster is 4.635, representing 30.897% of the total variance in the factors influencing the usage and adoption of blockchain technology in the study area.

Factor 2, considered as "government policies and regulations," consists of regulatory challenges, access to credit facilities, and poor investment in research. These factors have high factor loadings, indicating that they influence the usage and adoption of blockchain technology

in real estate transactions in Lagos State, with a variance of 17.114%. Hence, for blockchain to be effectively adopted in Nigeria, the federal government has a crucial role to play, which includes enacting an enabling law to foster its adoption, among other measures. Agbakoba (2021) supports this perspective, arguing that the regulatory challenge surrounding blockchain stems from an inadequate knowledge about the technology and proposes enhanced awareness at all governmental levels to comprehend the emerging technology.

Factor 3 categorised "inadequate technical know-how" incorporates the conceptual factor, availability of trained personnel, and the firm's decision, with a total variance of 14.864%. Addressing both inadequate technical know-how and uncertainty is crucial for improving operational efficiency, reducing risks, and enabling better strategic decision-making.

Factor 4, labelled "uncertainty", comprises variables related to trust issues, volatility, market risks, and data quality that account for a total variance of 10.942%. Factor 5 labelled "security," includes privacy, integration, and cost implications, contributing 8.611% to the total variance. This suggests that one of the factors influencing the usage and adoption of blockchain technology is security. Lantmäteriet et al. (2016) found that blockchain technology significantly enhances security by minimising the risk of fraudulent possibilities and document loss, thereby leading to a faster and more secure transaction process.

4.4 The prospects of blockchain technology for real estate practice in the study area

The respondent estate surveying and valuation firms were asked to rate the potential contributions of blockchain technology to real estate transactions using a Likert scale ranging from 1-5, where 1 represents Indifferent and 5 represents Strongly Agree. Responses were analysed using weighted mean scores, and the results are presented in Table 9.

Table 9: Prospect of blockchain technology for real estate practice in Lagos State by estate surveying and valuation firms

The prospect of blockchain technology	I (1)	SD (2)	D (3)	A (4)	SA (5)	WMS	Rank
Standardised property data/ data bank	5	9	17	17	62	4.11	1st
Means of payment, especially on cross-border transactions / real estate finance	7	10	14	25	50	3.95	2nd
Blockchain technology reduces fraud and streamlines the title search process.	0	11	31	30	34	3.82	3rd
Marketing of vacant properties	14	10	8	23	51	3.82	4th
Expedite pre-lease due diligence in residential and commercial property transactions	13	17	0	25	51	3.79	5th
Simplified property management process	22	7	22	29	26	3.28	6th

by introducing smart contracts							
Aid facility management	19	20	15	9	28	3.21	7th
Aid asset management	9	24	39	8	26	3.17	8th
Aid land registration	19	25	18	20	24	3.05	9th
Aid feasibility and viability appraisal	14	19	37	24	12	3.01	10th
Aid real estate development	37	6	9	33	21	2.95	11th
Token securitisation	25	23	20	19	19	2.85	12th

I – Indifferent, SD – Strongly Disagree, D - Disagree, A- Agree, and SA – Strongly Agree

Source: Field Survey (2023)

Results from Table 9 revealed that the majority of the estate surveying and valuation firms in the study area ranked standardised property data/data bank, means of payments, especially on cross-border transactions/real estate finance; blockchain technology reduces fraud and streamlines title search process and marketing of vacant properties as 1st, 2nd, 3rd and 4th of the possible prospects of blockchain technology with mean scores of 4.11, 3.95, 3.82 and 3.82 respectively. Land registration, feasibility and viability appraisal, real estate development, and token securitisation were the least ranked with mean scores of 3.05, 3.01, 2.95, and 2.85. This finding demonstrates that blockchain technology could facilitate the creation of a standardised data bank for all real estate stakeholders, thus serving as a reference point for property information. Furthermore, it will enhance the payment process during real estate transactions without requiring a visit to another entity, which in turn will lead to a high level of privacy for real estate data. These findings corroborate the study by Rawat et al. (2020), which posited that blockchain technology can be applied in various sectors, including real estate, finance, insurance claims and payments, global payments, and cryptocurrency.

5. Conclusion and recommendations

This study examined the usage of blockchain technology in real estate transactions in Lagos State, Nigeria, to assess its level of adoption and inherent prospects. The study revealed the potential benefits of utilising blockchain technology in real estate transactions within the region. Blockchain technology adoption can create a standardised data bank from which information relating to properties can be inferred, among other benefits, in the real estate business. The study further identified regulatory challenges, trust issues, inadequate internet provision, volatility, market risks, and conceptual factors that significantly influence the use and adoption of blockchain technology in the area.

In light of the findings above, the Nigerian government should create an enabling environment through policy formulation, implementation, and operation that facilitates the use and adoption of blockchain technology. This would improve service providers' internet performance, thereby improving speed and reducing costs. Additionally, fostering an enabling environment would enhance the power supply, thus improving the efficiency of blockchain technology usage. This would further promote the platform, allowing more individuals to engage with this rapidly growing technology in the country.

The Nigerian Institution of Estate Surveyors and Valuers should create a platform to educate and further train its members on the application of blockchain technology in their daily activities, ensuring they remain on par with their colleagues worldwide. This will streamline the demanding daily transaction processes. Furthermore, the Nigerian Institution of Estate Surveyors and Valuers should collaborate with the Departments of Estate Management at higher educational institutions on research regarding the application of blockchain technology in real estate practice.

Despite the relevance and timeliness of this research, the following limitations were encountered in the course of the study:

i. The study employed a relatively small sample size, which may not adequately represent the entire real estate ecosystem in Nigeria. This limitation affects the generalisability of the findings to a broader population within Nigeria.
ii. Some of the Estate Surveying and Valuation firms were unwilling to share information due to confidentiality concerns, despite several assurances given.

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