

# Strategies for Blockchain Technology Adoption in Facility Management Practices in Nigeria

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## Abstract

The digitalisation in Nigeria's facility management sector is inadequate, leading to inefficient and complex procurement processes. As a result of the COVID-19 pandemic, blockchain technology could handle the challenges within the sector. Hence, this study aims to determine blockchain technology adoption strategies in Nigeria's facility management practices. A post-positivist philosophical approach guided a quantitative research methodology employing a questionnaire survey for this study. The population comprised builders, civil engineers, estate managers, and facility managers selected from professional institutes and associations within Lagos state. Using the random sampling technique, 389 questionnaires were distributed online and physically; 195 copies were retrieved, screened, and analysed using descriptive analysis, while Cronbach's Alpha tested the reliability. Results revealed that organisational culture, leadership, and stakeholder engagement were particularly important. While technological advancements, data security, and cost-effective solutions are also valued, the role of government policy, partnerships, and the development of skilled professionals are viewed as moderately significant, with a need for broader awareness and training to drive adoption further. The wide range of standard deviations across responses indicates that while general agreement exists on these strategies, the degree to which they are prioritised varies significantly among different respondents. The findings of this study provide invaluable insights that will enhance the effectiveness and efficiency of facility management practices through blockchain technology. The transition towards blockchain adoption requires concerted efforts from all stakeholders, including government agencies, educational institutions, and industry professionals, to create an enabling environment that fosters innovation, collaboration, and continuous learning in facility management.

**Keywords:** Blockchain, Contractual Arrangements, Facilities Management, Innovation, Nigeria, Stakeholders

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## 1. Introduction

Blockchain technology has emerged as a potential solution to the challenges of facility management (FM) practices, offering unique features such as security, immutability, transparency, and accountability (Guo & Yu, 2022). As a decentralised, secure, and transparent system, blockchain can transform facility management processes, revolutionising maintenance procedures and contract payments. By implementing a blockchain system, maintenance needs and repair contracts can be securely stored, with the ledger automatically updating through data from sensors that monitor appliance conditions and schedule routine check-ups. Furthermore, FM urgently needs to track and manage energy consumption in real time, reduce costs, and improve efficiency (Sweetlyn, 2023). The digitalisation of FM is fundamentally transforming the field, shifting from traditional document-based methods to advanced digital practices. As technology progresses towards smart buildings, FM must adapt and utilise tools to transition from digital dormancy to a digital revolution (Collins & Lindkvist, 2022). The advantages of implementing blockchain technology in the business procedure of the built environment are accelerated as scalability alternatives are also included with the proper growth of technology. The idea is to conduct

transactions off-chain and store and access data on the blockchain (Akinradewo et al., 2022). There is much that blockchain technology can offer to the facility management sector.

Blockchain could be the solution. Facilities can now manage data using a blockchain instead of a database. The Harvard Business Review states, "Blockchain Technology is among the most disruptive forces of the past decade with its power to record, enable, and secure huge numbers and varieties of transactions" (Vargas & Tapscott, 2019). While the technology is still in the early stages, understanding how Blockchain can enable construction companies to be more productive is important. Blockchain enables near-real-time settlement of all recorded transactions, allows for the debugging of potential conflicts and fraud prevention, and helps to reduce risks. Blockchain will profoundly impact how facilities managers operate and maintain buildings (Shi & Tay, 2019). Smart Contracts and Blockchain are the heart of innovative building management. Blockchain streamlines operations, reducing paperwork and administrative costs while optimising energy usage (Guo & Yu, 2022). One of the potential applications of blockchain technology in facility management is the management of building maintenance. According to Perera *et al.* (2020),

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blockchain technology can facilitate the sharing and updating of building maintenance data among stakeholders, including building managers, tenants, and contractors.

Nigeria's facility management (FM) field is still evolving and faces several challenges. Despite its growth and establishing the Nigerian chapter of the International Facilities Management Association (IFMA) in 1997, FM in Nigeria has not fully benefited from digital innovations that could enhance its effectiveness. One of the primary challenges is the public perception of FM as an "all-comers affair," which undermines practitioners' competence and the profession's overall image (Oyedele, 2019). The FM industry globally has seen significant technological disruptions, particularly in integrating smart technologies. However, the adaptation of digitalisation in Nigeria's FM sector remains poor, leading to inefficient and complex procurement processes. As a result, the potential of FM to add value to the built environment and achieve strategic organisational objectives is not fully realised (Nwokedi, 2020). Blockchain technology, a peer-to-peer distributed digital ledger, offers potential solutions to these challenges. It provides transparency in data handling, traceability of transactions, and ease of collaboration between parties. In the context of FM, blockchain can streamline operations, secure data, and enhance decision-making processes. However, its implementation in Nigeria's FM sector is fraught with challenges, including technological adoption barriers and the need for a framework that enables its practical

strategies for adopting blockchain technology in facility management practices in Nigeria. This philosophical viewpoint guided a quantitative research methodology employing a questionnaire survey. Creswell (2014) states that the quantitative research approach collects numerical data that may be categorised, ranked, or assessed using units of measurement. Using data from the reviewed literature, a closed-ended questionnaire was created for this study to collect data from the target population. The professionals and stakeholders involved in facility management in Lagos state were chosen as the study's population. These professionals are Builders, Civil Engineers, Estate Surveyors, and Facility Managers. A population frame of 14278 was established for the study based on the register of professionals in Lagos state obtained from the directories of professional bodies in Nigeria. The professional bodies are the Nigerian Institute of Building (NIOB), the Nigerian Society of Engineers (NSE), the Nigerian Institute of Estate Surveyors and Valuers (NIESV), and the International Facility Management Association (IFMA) within Lagos state, Nigeria. Taro Yamane's formula was used to calculate the sample size, resulting in 389 (Table 1). The number of respondents to be allotted to each of the groups of professionals in the construction industry was determined using the proportional stratified random sampling method. The random sampling method was used to select respondents to whom copies of the questionnaire would be administered. Years of professional registration were used to select respondents for each group.

**Table 1:** Determination of Sample Size for the Study

| S/N   | Professionals     | Population | Sample size |
|-------|-------------------|------------|-------------|
| 1     | Builders          | 1288       | 35          |
| 2     | Estate Managers   | 2180       | 58          |
| 3     | Civil Engineers   | 8500       | 231         |
| 4     | Facility Managers | 2370       | 65          |
| Total |                   | 14278      | 389         |

(Source: Author's Findings)

use (Omotayo *et al.*, 2021). Therefore, this research aims to identify strategies for adopting blockchain technology in facility management practices in Nigeria. It seeks to determine recommendable and workable strategies for the effective use of blockchain in FM processes, demonstrating its potential impact and addressing its implementation challenges. By doing so, the research hopes to contribute to the advancement of FM in Nigeria, ensuring it can leverage digital innovations to improve efficiency, security, and sustainability in managing facilities.

## 2. Research Methodology

Using empirical data, this study adopted a post-positivist philosophical approach to establish the

There were two distinct sections of the questionnaire. Section A collected background information from the respondents, while Section B concentrated on the adoption strategies. Participants used the survey's 5-point Likert scale to indicate their level of agreement or disagreement with the factors. A 5-point Likert-type scale increased answer quality and rate while reducing respondents' frustration (Joshi *et al.*, 2015; Akinradewo *et al.*, 2022; Ebiloma *et al.*, 2024). Tables and charts were used to derive statistical conclusions based on their responses. Microsoft Excel and the Statistical Package for Social Science (SPSS) software were used to analyse the responses. The mean item scores, percentiles, and frequencies were computed from the collected data.

Percentiles and frequencies were used to examine the respondents' demographic data, and the mean item score was used to sort the variables according to the respondents' answers. Out of the three hundred and eighty-nine (389) questionnaires administered to professionals and stakeholders across Lagos State, one hundred and ninety-five (195) were filled correctly and returned, representing a response rate of 50.13%. This response rate is considered robust for a study of this nature, significantly exceeding the 30% threshold commonly accepted as a satisfactory response rate in facility management and construction-related studies (Ryal-Net & Kaduma, 2015). The high response rate can be attributed to the comprehensive follow-up with respondents and the relevance of the research topic to current industry challenges. The responses obtained provide a broad and diverse representation of the opinions and experiences of professionals in facility management within Lagos State, making the findings of this research reliable for analysis. Each response was carefully reviewed to ensure completeness, and only

### 3. Findings and Discussion

#### 3.1. Respondents' Socio-economic Characteristics

Table 2 presents the socio-economic characteristics of the respondents based on the one hundred and ninety-five (195) questionnaires used for the analysis. These characteristics provide valuable insights into the demographic and professional background of the participants, which are essential for understanding their perspectives on the application of blockchain technology in facility management. The key characteristics analysed include profession, years of experience, educational qualifications, professional affiliation, and registration status with relevant industry bodies. This information helps to contextualise the findings and highlights the diversity of the respondent pool in terms of expertise and professional standing within the facility management industry in Lagos State.

**Table 2:** Socio-economic Characteristics of the Respondents

| Characteristics                 | Frequency | Percentage |
|---------------------------------|-----------|------------|
| <b>Profession</b>               |           |            |
| Civil Engineer                  | 88        | 45.1%      |
| Estate Manager                  | 30        | 15.4%      |
| Facility Manager                | 37        | 19.0%      |
| Builder                         | 40        | 20.5%      |
| <b>Years of Experience</b>      |           |            |
| 1-5                             | 35        | 17.9%      |
| 11-15                           | 28        | 14.4%      |
| 16-20                           | 28        | 14.4%      |
| 21-25                           | 39        | 20.0%      |
| 6-10                            | 31        | 15.9%      |
| Above 25                        | 34        | 17.4%      |
| <b>Education</b>                |           |            |
| B.Sc                            | 44        | 22.6%      |
| HND                             | 35        | 17.9%      |
| M.Sc                            | 35        | 17.9%      |
| OND                             | 42        | 21.5%      |
| PhD                             | 39        | 20.0%      |
| <b>Professional Affiliation</b> |           |            |
| AFMPN                           | 37        | 19.0%      |
| NIESV                           | 30        | 15.4%      |
| NIOB                            | 40        | 20.5%      |
| NSE                             | 88        | 45.1%      |

(Source: Author's Survey)

fully completed questionnaires were included in the final analysis. This high response rate strengthens the validity of the study's findings. It contributes to the depth of insights regarding adopting blockchain technology in facility management practices in Lagos State. Cronbach's alpha was used to assess the study instrument's reliability; the results showed an alpha value of 0.930, confirming the validity of the data obtained from the questionnaire survey.

Regarding professional background, the data reveals that 45.1% of respondents are Civil Engineers, 15.4% are Estate Managers, 19.0% are Facility Managers, and 20.5% identify as Builders. This diverse representation emphasises the multidisciplinary nature of facility management, highlighting the relevance of various professional perspectives in assessing blockchain technology. The high representation of civil engineers and builders is significant, as these roles directly

involve operational aspects where blockchain could enhance efficiency, transparency, and data integrity. The distribution of years of experience among respondents indicates that 17.9% have 1-5 years of experience, 36.9% have 6-10 years, 20.0% have 21-25 years, and varying percentages have experience in other brackets. This mix of experience levels is beneficial for gaining a well-rounded understanding of the industry. Notably, the significant percentage of respondents with 6-10 years of experience suggests they have been exposed to recent technological advancements,

### 3.2. *Strategies for Adopting Blockchain Technology in Facility Management in Lagos State*

Table 3 presents the analysis of strategies for adopting blockchain technology in facility management in Lagos State based on the perceptions of 195 respondents. The responses were evaluated using mean scores and standard deviations, which provide insight into the most effective strategies according to the participants and the level of consensus around these strategies.

**Table 3:** Strategies for Adopting Blockchain Technology in Facility Management Practices

| Strategies                              | Mean | Std. Deviation | Rank |
|-----------------------------------------|------|----------------|------|
| Positive Organisational Culture         | 3.29 | 1.436          | 1    |
| Incentives for Early Adopters           | 3.22 | 1.412          | 2    |
| Strong Leadership and Vision            | 3.17 | 1.414          | 3    |
| Stakeholder Engagement                  | 3.13 | 1.359          | 4    |
| Technological Advancements              | 3.07 | 1.381          | 5    |
| Enhanced Data Security                  | 3.04 | 1.425          | 6    |
| Cost-Effective Solutions                | 3.03 | 1.418          | 7    |
| Government Policy and Legislation       | 3.00 | 1.503          | 8    |
| Public-Private Partnerships             | 2.99 | 1.518          | 9    |
| Industry Collaboration and Partnerships | 2.98 | 1.407          | 10   |
| Availability of Skilled Professionals   | 2.92 | 1.432          | 11   |
| Increased Awareness and Training        | 2.90 | 1.492          | 12   |
| Development of Standardised Protocols   | 2.88 | 1.401          | 13   |

(Source: Author's Survey)

including blockchain. Insights from this cohort are valuable as they can offer perspectives on the practicality and relevance of blockchain applications in their day-to-day operations.

The educational qualifications of respondents reveal that 22.6% hold a Bachelor of Science (B.Sc), 17.9% possess a Higher National Diploma (HND), 20.0% have a Doctor of Philosophy (PhD), and varying percentages have attained other qualifications. This diverse educational background indicates that the respondents are well-equipped with the knowledge and expertise necessary to provide informed insights into the application of blockchain technology in facility management. The data on professional affiliations shows that 19.0% are members of the AFMPN, 15.4% belong to NIESV, 20.5% are affiliated with NIOB, and 45.1% are part of NSE. The significant representation of professional affiliations indicates that respondents are engaged with recognised professional bodies, ensuring that their insights come from qualified professionals who are likely to be familiar with best practices and the latest facility management and technology developments. This professional engagement reinforces the validity of the study's findings, as these affiliations often require adherence to industry standards and continuous professional development.

The outcome revealed that all the strategies are critical to adopting blockchain technology in facility management practices in the study area. Starting positive organisational culture, which received the highest mean score of 3.29, suggests that respondents believe a supportive and adaptable organisational environment is crucial for successfully adopting blockchain technology in facility management. The relatively high standard deviation (1.436) indicates that while many respondents agree on the importance of organisational culture, there are varying levels of emphasis on this strategy, possibly depending on the current culture within their organisations. Incentives for early adopters also scored highly (mean 3.22, SD 1.412), reflecting a strong belief that offering rewards or incentives can encourage the uptake of blockchain technology. However, responses varied, indicating different views on how significant such incentives should be. Strong leadership and vision were another key strategy identified, with a mean score of 3.17 (SD 1.414). This shows that respondents value the role of leadership in setting a clear direction for blockchain adoption. However, the moderate standard deviation suggests that the impact of leadership varies across different organisations. Stakeholder engagement scored a mean of 3.13 (SD 1.359), highlighting that involving all relevant parties—such as government, businesses, and end-users—is a moderately important strategy. The relatively lower standard deviation indicates consistency in the belief that engaging stakeholders is

essential for blockchain's integration into facility management.

Regarding technological support, technological advancements received a mean score of 3.07 (SD 1.381), indicating that respondents believe ongoing technological improvements are necessary to facilitate blockchain adoption. However, the high standard deviation suggests that opinions vary on how well current technological developments support blockchain implementation. Enhanced data security also scored moderately (mean 3.04, SD 1.425), emphasising the importance of secure data handling as a driver for blockchain adoption. However, some respondents may see this as more critical than others. Similarly, cost-effective solutions (mean 3.03, SD 1.418) were identified as a necessary strategy, indicating that the financial feasibility of blockchain must be demonstrated to ensure widespread adoption. The relatively high response variability suggests that cost concerns differ across organisations depending on their budgets and scale.

Regarding the role of governance, government policy and legislation received a mean score of 3.00 (SD 1.503), showing that while respondents believe that supportive legal frameworks are necessary, there is significant variation in opinions, with some respondents placing more emphasis on policy than others. Public-private partnerships scored similarly (mean 2.99, SD 1.518), suggesting that collaborations between the government and private sector are seen as moderately effective in driving blockchain adoption, though again, opinions differ widely. Industry collaboration and partnerships (mean 2.98, SD 1.407) received a slightly lower score, indicating that while collaboration within the industry is viewed as important, it is not seen as a top priority compared to other strategies. Other strategies, such as the availability of skilled professionals (mean 2.92, SD 1.432), increased awareness and training (mean 2.90, SD 1.492), and the development of standardised protocols (mean 2.88, SD 1.401), all scored below 3.00, suggesting that these are seen as less critical, although still relevant. The relatively high standard deviations across these responses indicate various opinions on the importance of skill development, awareness, and standardisation for blockchain adoption. This could reflect different levels of organisational readiness or varying degrees of familiarity with blockchain technology among respondents.

In summary, the analysis highlights several key strategies for promoting blockchain adoption in facility management in Lagos State, with organisational culture, leadership, and stakeholder engagement seen as particularly important. While technological advancements, data security, and cost-effective solutions are also valued, the role of government policy, partnerships, and the development of skilled

professionals are viewed as moderately significant, with a need for broader awareness and training to drive adoption further. The wide range of standard deviations across responses indicates that while general agreement exists on these strategies, the degree to which they are prioritised varies significantly among different respondents.

#### 4. Discussion of Findings

This study identified several key strategies to enhance blockchain technology adoption in Nigeria's facility management sector. Respondents highlighted the most effective strategies as fostering a positive organisational culture, offering incentives for early adopters, and establishing strong leadership with a clear vision for technological advancement. These findings are consistent with global best practices for technology adoption, which indicate that organisational support and effective leadership are crucial in overcoming resistance and promoting innovation in emerging technologies (Venkatesh et al., 2003). A positive organisational culture encourages collaboration, innovation, and acceptance of new technologies, while strong leadership can provide the necessary guidance and resources for implementation. The results underscore the importance of engaging stakeholders and developing supportive government policies for blockchain integration into facility management. Engaging stakeholders, including facility managers, service providers, and tenants, is essential for identifying specific needs and ensuring that blockchain solutions are tailored to address these needs effectively. Research indicates that stakeholder engagement is critical for successfully implementing new technologies, as it fosters collaboration and aligns interests across various parties (Zhu et al., 2012). Furthermore, supportive government policies can enable blockchain adoption, offering frameworks for standardisation, regulation, and funding that facilitate implementation.

The findings indicate that the skills gap remains a significant barrier to effective blockchain adoption. Therefore, comprehensive education and training initiatives should be developed to ensure that all facility management professionals are well-equipped to utilise blockchain technology effectively. Training programs should not only focus on technical skills but also encompass understanding the strategic benefits of blockchain, case studies, and best practices to build confidence among professionals. Additionally, enhancing industry-specific education can help bridge the gap between theoretical knowledge and practical application. Partnerships with educational institutions can facilitate the development of specialised training programs tailored to the unique needs of facility management professionals. Such initiatives could also include certification programs that validate professionals' expertise in blockchain technology, thus

fostering greater confidence in its adoption. The study also highlighted the importance of continuous feedback and improvement in the adoption process. Establishing channels for ongoing communication between stakeholders can facilitate the identification of challenges and allow for iterative adjustments to blockchain implementation strategies. This aligns with agile methodologies, emphasising flexibility and responsiveness to change, making them well-suited for dynamic environments like facility management.

In summary, implementing these strategies can pave the way for more effective blockchain integration in facility management, ultimately leading to enhanced operational efficiency, improved data security, and better service delivery. Future research should explore additional strategies for effectively implementing blockchain technology, considering both local challenges and international best practices in technology adoption (Hosseini et al., 2016; Newton & Chileshe, 2012). By fostering a culture of innovation, incentivising early adopters, ensuring stakeholder engagement, and prioritising training and education, the facility management sector can unlock the transformative potential of blockchain technology and significantly improve its operations and service delivery.

## 5. Conclusion and Further Research

The study identified several critical strategies essential for enhancing the adoption of blockchain technology in facility management. The most significant strategies included fostering a positive organisational culture that embraces innovation, providing incentives for early adopters to encourage experimentation and implementation, and ensuring access to comprehensive training programs that equip professionals with the necessary skills. The findings of this study provide

invaluable insights that will enhance the effectiveness and efficiency of facility management practices through blockchain technology. This will improve project outcomes and pave the way for more sustainable and innovative practices in the industry. The transition towards blockchain adoption requires concerted efforts from all stakeholders, including government agencies, educational institutions, and industry professionals, to create an enabling environment that fosters innovation, collaboration, and continuous learning in facility management.

The following areas are recommended for future studies: researching to develop a comprehensive framework for implementing blockchain technology in facility management within Nigeria, addressing local challenges and opportunities, investigating the impact of blockchain technology on operational efficiency, service delivery, and client satisfaction within facility management practices in Nigeria; this can provide quantitative and qualitative data to support the adoption of blockchain solutions, conducting comparative analyses of successful blockchain implementations in facility management across different countries, identifying best practices and lessons learned that can be adapted for the Nigerian context. Others are undertaking longitudinal studies to assess the long-term effects of blockchain adoption on facility management outcomes, including cost savings, operational improvements, and overall project success; also, to explore the intersection of blockchain technology with other emerging technologies (such as IoT and AI) in the context of facility management, examining how these technologies can work synergistically to enhance operations.

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