ER Environmental Review Journal

Volume 10 No. 1, 2025
ISSN:1118-7190

Empirical Assessment of Land Information Systems for Land Administration in Ebonyi State, Nigeria

James Achor Ewah [1], Ebele Josephine Emengini [2]

[1&2] Department of Surveying and Geoinformatics, Nnamdi Azikiwe University, Nigeria.

Abstract - This study critically examines the adoption, effectiveness, and limitations of the Land Information System (LIS) in Ebonyi State, Nigeria, to evaluate its role in modernizing land administration. Grounded in institutional theory and the Technology Acceptance Model (TAM), the research explores stakeholder awareness, system usage, operational challenges, and the potential impact of full digitalization. A mixed-methods approach was employed, combining structured questionnaires and in-depth interviews with 100 purposively selected participants, including government officials, landowners, and geospatial experts. Findings reveal low system penetration, with 52.8 % of respondents unaware of the LIS and only 20.8 % using it regularly. Major barriers to adoption include inadequate technical training, poor data reliability, and bureaucratic resistance. Despite these constraints, the LIS demonstrates value in enhancing transparency, accessibility, and the speed of land transactions. The study concludes that a fully digital LIS, supported by institutional reforms and capacity building, could reduce corruption, increase revenue generation, and minimize land-related disputes. Policy recommendations include targeted training programs, improved data integration, legal framework updates, and system optimization to ensure wider adoption and long-term sustainability.

Keywords **-** *Land Information System, Land Administration, GIS, Digital Transformation, Ebonyi State, Nigeria*

1. Introduction

Land remains one of the most critical resources in both developed and developing economies. It is central to economic development, social equity, food security, and environmental sustainability. In countries like Nigeria, where population growth and urbanization are rapidly increasing, the need for efficient land governance is more urgent than ever. Effective land administration systems are essential for managing land rights, facilitating land markets, supporting taxation, and resolving disputes. Central to modern land administration is the deployment of Land Information Systems (LIS)—an integrated set of technologies used for collecting, storing, managing, and disseminating land-related information (Williamson et al., 2010; Bennett et al., 2012).

Globally, the digitization of land information has transformed how land governance is managed. In countries such as Rwanda, Estonia, and Thailand, LIS has contributed to improved land tenure security, enhanced government revenue, increased transparency, and reduced corruption (Jones, 2019; Davis and Wilson, 2022). However, in many African countries, including Nigeria, the transition from analogue systems to digital platforms has been slow and fragmented due to institutional, technical, and financial constraints (Ogundele, 2019; Adewumi, 2021).

Ebonyi State, located in southeastern Nigeria, provides a unique case for studying LIS implementation. Established in 1996, the state has faced multiple challenges related to land administration, including overlapping claims, fraudulent registrations, land tenure insecurity, and bureaucratic inefficiencies. Despite efforts to introduce a digital LIS, the current system remains largely manual, with significant dependence on physical record-keeping and outdated processes. This has resulted in delays, errors, and increased opportunities for corruption in land registration and allocation (Ajayi & Adeyemo, 2023).

The need to modernize land administration in Ebonyi is also closely linked to broader goals of economic development and sustainable urban planning. As the state continues to experience demographic growth and land use intensification, the inability to provide reliable, accessible, and up-to-date land information hinders investment, infrastructure development, and service delivery. Moreover, the lack of integration among relevant departments and insufficient user training have further undermined the functionality and utility of the LIS.

The theoretical foundations of this study are drawn from several frameworks including the Technology Acceptance Model (TAM), the Unified Theory of Acceptance and Use of Technology (UTAUT), and Institutional Theory. TAM and UTAUT provide insights into the behavioral and technical factors affecting system adoption, while Institutional Theory helps explain resistance to change within public bureaucracies (Davis, 1989; Venkatesh et al., 2003; North, 1990). Together, these models help analyze the systemic barriers to LIS implementation and how policy, technology, and organizational behavior interact.

Although Nigeria has made progress in establishing LIS initiatives at the federal level and in selected states such as Lagos and the Federal Capital Territory, Ebonyi State still lags behind in achieving full digital transformation. The LIS system currently in place is underutilized, poorly maintained, and lacks comprehensive integration with geospatial datasets. This study, therefore, seeks to empirically assess the functionality, efficiency, and user perception of the LIS in Ebonyi State, identifying the

critical gaps that must be addressed to facilitate a sustainable and inclusive land governance framework.

The study aims to contribute to the ongoing discourse on land reform in Nigeria and provide practical recommendations for stakeholders, policymakers, and development agencies involved in land administration by focusing on both the technical and institutional dimensions of LIS. The findings are expected to serve as a decision-support tool for improving LIS adoption, reducing corruption, and enhancing transparency and efficiency in land registration and management processes in Ebonyi State and beyond.

2. Materials and Methods

2.1 Study Area

Ebonyi State is located in southeastern Nigeria and lies between latitudes 6°15' and 6°45' North and longitudes 7°30' and 8°45' East. The state spans approximately 5,935 square kilometers and has an estimated population exceeding **4 million people**, based on projections by the **National Population Commission (NPC, 2022)** derived from the 2006 population census. The state is predominantly rural and agrarian, with significant land use devoted to rice cultivation, cassava farming, and yam production.

Geologically, Ebonyi falls within the **Abakaliki geological formation**, characterized by relatively flat terrain interspersed with moderate elevation. The state experiences a **humid tropical climate**, with an average annual rainfall of approximately **2,500 mm** and an average temperature of **28°C**. Its natural vegetation is primarily tropical rainforest, transitioning into savanna in upland regions.

In recent years, **Abakaliki**, the state capital, has undergone rapid urbanization, significantly altering its land use dynamics. This urban growth has intensified the demand for secure land tenure systems and efficient land management frameworks, further highlighting the need for a robust and functional Land Information System (LIS).

2.2 Research Design

This study adopted a case study design within a qualitative research framework, with support from descriptive and inferential quantitative techniques to triangulate results. The case study approach was appropriate because it allowed for an in-depth exploration of the land information system (LIS) within a real-life context (Yin, 2018). The goal was to generate insights into how the LIS functions in Ebonyi State, what barriers exist to its full adoption, and what improvements can be made.

The research was conducted in three distinct phases:

Pre-fieldwork: Definition of research problem, formulation of objectives, review of existing LIS frameworks, and development of instruments.

Fieldwork: Administration of structured questionnaires and semi-structured interviews to key stakeholders in Ebonyi's Ministry of Lands and among LIS users.

Post-fieldwork: Data analysis using both qualitative interpretation and statistical techniques including Principal Component Analysis (PCA).

2.3 Sampling Design

A purposive sampling technique was employed to select 100 respondents from various stakeholder categories, including:

Officials from the Ministry of Lands, Survey and Urban Development

LIS operators and IT support staff

Registered landowners

Licensed surveyors and valuers

Real estate developers and urban planners

Participants were chosen based on their professional relevance, involvement with the LIS, and willingness to participate. The selection ensured balanced representation between service providers (government) and service users (public).

2.4 Data Collection Instruments

Two primary instruments were developed and validated:

Only one structured questionnaire was employed in this study. It was designed with closed-ended and Likert-scale questions and distributed both physically and electronically via Google Forms. This single instrument was administered across all respondent categories—government officials, landowners, and technical experts—but contained universally relevant questions that assessed LIS usage frequency, user satisfaction, accessibility, data accuracy, and perceived transparency.

Semi-Structured Interviews

Conducted with senior staff of the Ministry of Lands and LIS implementation units, these interviews sought deeper insights into institutional practices, resistance to digital transformation, and integration challenges.

Indicators for assessing LIS functionality were adapted from frameworks developed by Enemark et al. (2014) and Bennett et al. (2012), focusing on data quality, system performance, user interface design, transparency, and institutional coordination.

2.5 Method of Data Collection

Data collection was conducted over a two-month period. Survey links were sent via email and WhatsApp, while in-person interviews were scheduled with ministry staff at the state secretariat. Data was gathered under ethical conditions, with informed consent obtained from all participants.

The primary data was supplemented with secondary data from government reports, policy briefs, journal articles, and previous LIS assessments within Nigeria and similar developing economies.

2.6 Instrument Validation and Reliability

Content Validity:

Draft instruments were reviewed by three experts in land administration and GIS to ensure alignment with research objectives and LIS evaluation criteria.

Face Validity:

Instruments were piloted on a small group (n = 10) to assess clarity and comprehensiveness. Minor modifications were made accordingly.

Reliability:

Internal consistency was tested using Cronbach's Alpha, with an overall reliability coefficient of 0.82, indicating high reliability. Inter-rater reliability was ensured for interview transcription and thematic coding through cross-verification.

2.7 Data Analysis Techniques

Data analysis was carried out in two phases:

Descriptive Statistics

Frequencies, percentages, and bar/pie charts were used to describe the demographic characteristics of respondents, usage patterns, and system performance metrics. This analysis was done using Microsoft Excel and SPSS 25.0.

Principal Component Analysis (PCA)

Principal Component Analysis (PCA) was cautiously applied to a subset of numerically coded Likert-scale responses (e.g., levels of agreement with LIS constraints and adoption factors) to explore potential latent constructs influencing LIS adoption. Although the data were ordinal, PCA was used as

an exploratory tool after confirming sampling adequacy (KMO = 0.73) and inter-variable correlation (Bartlett's Test, $p < 0.01$). Five underlying components emerged: financial constraints, technical capacity gaps, policy bottlenecks, resistance to change, and trust in data accuracy. However, the results are interpreted with caution, and further validation using confirmatory methods is recommended.

The Kaiser-Meyer-Olkin (KMO) test yielded a value of 0.73, confirming sampling adequacy, while Bartlett's Test of Sphericity ($p < 0.01$) confirmed the appropriateness of factor analysis.

2.8 Ethical Considerations

All participants were informed of the voluntary nature of their involvement. Anonymity and confidentiality were maintained throughout the study. Ethical approval was obtained from the Department of Surveying and Geoinformatics, Nnamdi Azikiwe University, Awka.

3. Results and Discussion

3.1 Stakeholder Awareness and Usage Patterns

The study revealed a concerning lack of awareness and engagement with the Land Information System among stakeholders in Ebonyi State. Of the 100 respondents surveyed, 52.8% reported that they were unfamiliar with the existing LIS and its functionalities. This indicates that despite ongoing efforts by the Ministry of Lands to promote digital systems, a significant proportion of users remain unaware of the available tools. Additionally, only 20.8% of the respondents confirmed that they use the LIS on a daily basis. This low usage rate reflects both systemic limitations and insufficient user integration into everyday land administration workflows. It also indicates that LIS may not yet be perceived as a core operational tool by most stakeholders, particularly outside the technical departments, see figure 3.1 and 3.2.

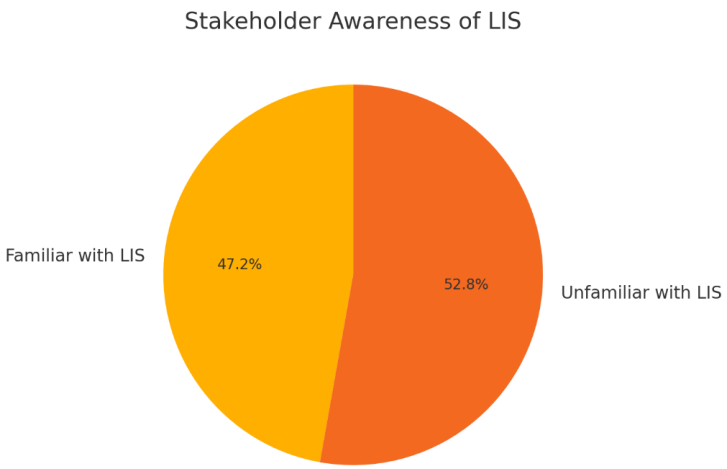


Figure 3.1: Stakeholder Awareness of LIS

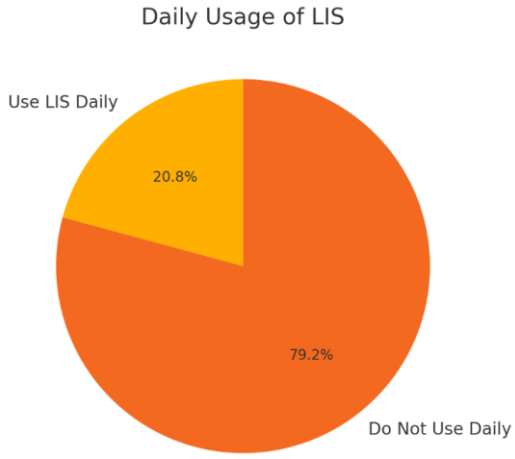


Figure 3.2: Daily Usage of LIS

3.2 Perceived Benefits and Functional Strengths of LIS

Despite the low usage levels, respondents who had interacted with the LIS acknowledged its potential to improve land administration. Approximately 65% agreed that the LIS has made data accessibility faster and more convenient. Many users emphasized that the ability to retrieve cadastral and ownership data electronically had reduced the time and effort required for land registration processes. Furthermore, 70% of respondents observed that the LIS had streamlined registration workflows, reduced unnecessary paperwork, and minimized bureaucratic delays. In terms of transparency, a significant proportion of respondents—close to 60%—felt that the system had enhanced public trust

by reducing the scope for human interference and discretionary decision-making in land allocation, see figure 3.3.

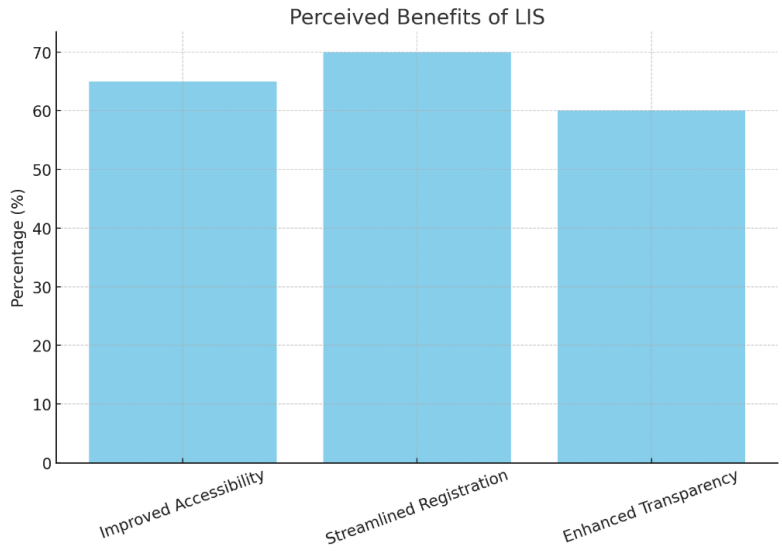


Figure 3.3: Perceived Benefits of LIS

3.3 Data Accuracy and Reliability Challenges

One of the most critical concerns identified in the study was the issue of data accuracy and reliability. About 64.2% of respondents expressed dissatisfaction with the accuracy of data within the LIS, citing problems such as outdated records, inconsistencies between paper-based and digital records, and missing cadastral details. These discrepancies were most prominent in rural and peri-urban areas, where land ownership records had not been properly digitized or updated. Some users also complained of duplicate entries and inconsistent boundary definitions, which hindered the usability of the system for planning and dispute resolution. These reliability issues diminish the LIS's credibility and reduce its adoption, especially among professionals such as surveyors, valuers, and legal practitioners who rely heavily on precise spatial data, see figure 3.4.

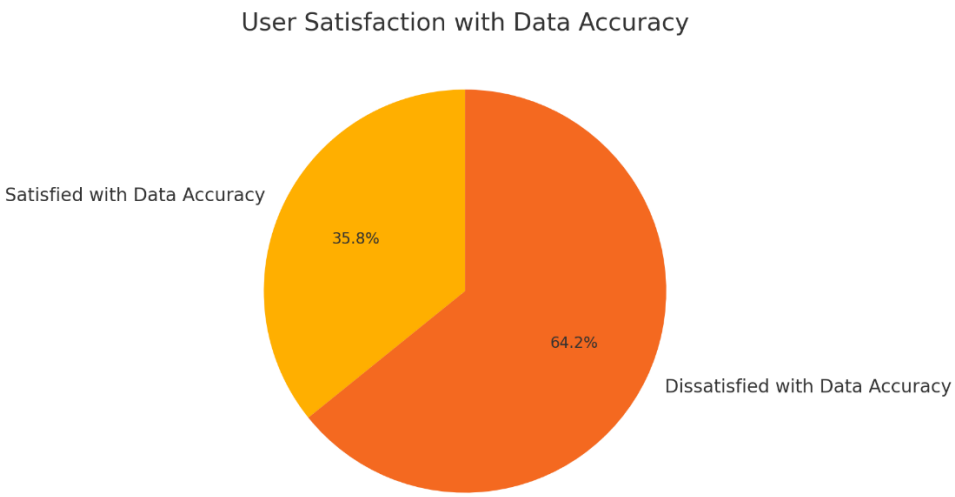


Figure 3.4: User Satisfaction with Data Accuracy

3.4 Barriers to Adoption and Institutional Constraints

Several institutional and operational challenges were reported as major obstacles to the successful adoption and full utilization of the LIS. A substantial 72% of respondents cited inadequate training and lack of technical support as key factors limiting effective use. This issue was particularly prevalent among older staff members who were more accustomed to traditional analogue processes. Another 66% identified poor system integration across different departments as a significant hindrance. For instance, cadastral mapping, land registration, and valuation services often operated in silos, using non-interoperable systems, thereby causing data fragmentation. Additionally, 58% of the respondents believed that resistance to change by long-serving civil servants, driven by a fear of losing influence or job roles, was delaying full system implementation. Interestingly, 44% also hinted at deliberate institutional sabotage, suggesting that certain actors within the system benefitted from the opacity of analogue processes and actively resisted transparency-driven digital reforms, see figure 3.5.

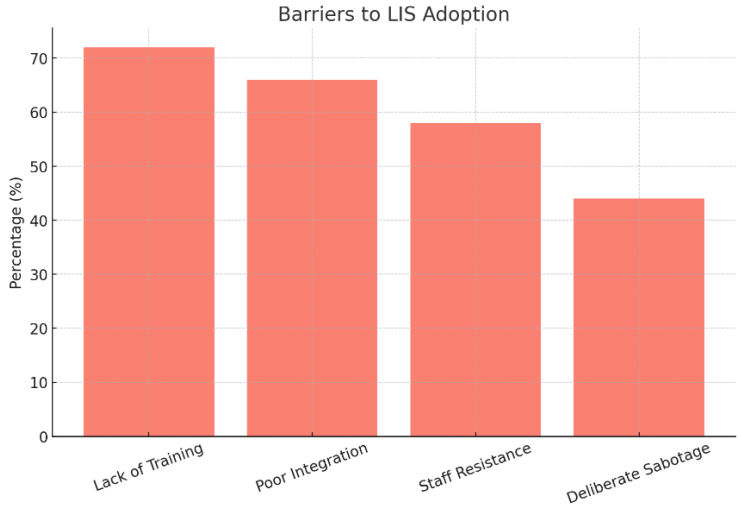


Figure 3.5: Barriers to LIS Adoption

3.5 Evaluation of LIS Impact on Land Administration

When asked to assess the overall impact of the LIS on land administration outcomes, 68% of the respondents agreed that the system had made some positive contributions, particularly in improving land parcel traceability and reducing document loss. Additionally, about 55% indicated that customer service had improved since the system was introduced, noting faster response times and more efficient service delivery. However, only 34% felt that the LIS had significantly reduced land disputes or fraudulent registrations, indicating that the system's current functionality is insufficient to address deeper structural problems in land governance. The gap between expectation and outcome reinforces the need for system redesign, legal modernization, and a more user-centric approach to LIS deployment, see figure 3.6.

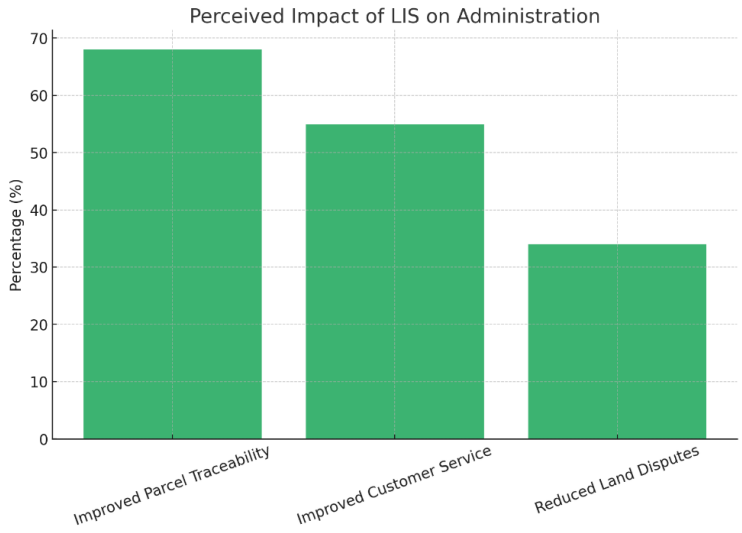


Figure 3.6: Perceived Impact of LIS on Administration

4. Discussion of Results

The findings of this study provide important insights into the current state, limitations, and potential of the Land Information System (LIS) in Ebonyi State. The results confirm that while the state has initiated digital land administration processes, the LIS remains underutilized, poorly integrated, and constrained by institutional and technical barriers. This section interprets the results in relation to the research hypotheses and situates them within the broader context of land governance reform and digital transformation in developing economies.

4.1 Low Awareness and Limited Adoption of LIS

The study revealed that 52.8% of respondents were unfamiliar with the LIS and only 20.8% used it regularly. This lack of awareness and limited adoption aligns with the Technology Acceptance Model (TAM), which posits that perceived usefulness and ease of use significantly affect system acceptance (Davis, 1989). The findings are also consistent with similar assessments in other developing contexts where LIS remains underutilized due to low user education, poor interface design, and minimal public sensitization (Zeng & Cleon, 2018; Ogundele, 2019). This indicates that any effort to improve LIS performance in Ebonyi must begin with targeted training and stakeholder engagement.

4.2 Recognized Benefits but Incomplete Functional Integration

While a majority of respondents acknowledged the benefits of LIS in improving accessibility and reducing bureaucratic delay, the system was still seen as limited in functional scope. The LIS was reported to streamline registration but lacked the interoperability needed to integrate cadastral, legal, and valuation databases. This reflects findings from Kalantari et al. (2015), who noted that LIS performance is highly dependent on system architecture and the ability to connect across administrative departments. The Unified Theory of Acceptance and Use of Technology (UTAUT) also emphasizes "facilitating conditions" as a determinant of technology usage, particularly system support and cross-platform compatibility (Venkatesh et al., 2003).

4.3 Persistent Issues with Data Accuracy and Reliability

A significant proportion (64.2%) of users expressed concerns regarding data accuracy, citing issues such as outdated records and inconsistencies between physical and digital databases. This aligns with the Delone and McLean Information System Success Model, which identifies data quality as a foundational component of system success (DeLone& McLean, 2003). It also resonates with past studies showing that LIS in sub-Saharan Africa often suffer from poor data capture, lack of regular updates, and absence of field validation protocols (Adewumi, 2021; Bennett et al., 2012). This undermines user trust and diminishes the system's potential for supporting tenure security and planning.

4.4 Institutional Resistance and Technological Inertia

One of the more nuanced findings of this study was the resistance to LIS adoption among long-serving staff and bureaucratic actors. Many respondents pointed to deliberate slowdowns in digital system rollout due to vested interests in opaque manual procedures. This supports Institutional Theory, which holds that established norms and power structures often impede the adoption of transformative innovations (North, 1990; De Vries, 2015). The evidence indicates that internal resistance is not just a matter of skill deficits but also political economy—where actors benefit from inefficiencies and discretionary decision-making.

4.5 Comparative Lessons from Other Jurisdictions

The experience in Ebonyi State parallels international case studies in countries like Rwanda, Thailand, and Colombia, where successful LIS reform was achieved through phased implementation, participatory design, and sustained training investments (Williamson et al., 2010; Smith, 2020). For example, Rwanda's Land Tenure Regularization Program combined digital tools with local surveyors

and grassroots involvement, creating both technical efficiency and community buy-in (Davis & Wilson, 2022). These models indicate that technological improvements must be matched by institutional change and capacity building to be effective.

The findings of this study underscore the need for a multi-pronged strategy in LIS reform in Ebonyi State. Firstly, technical upgrades must be paired with comprehensive staff retraining and user education campaigns. Secondly, inter-departmental system integration and legal reforms are essential to enable full digitization of land registration processes. Thirdly, governance reforms aimed at improving transparency and accountability are necessary to combat resistance and restore public confidence. These steps will require strong political commitment, adequate funding, and sustained engagement with civil society and professional associations.

5. Conclusion

This study set out to assess the current state, challenges, and opportunities of the Land Information System (LIS) in Ebonyi State, Nigeria, with a focus on technical, institutional, and operational dimensions. Through the administration of structured questionnaires, semi-structured interviews, and descriptive statistical analyses, the research uncovered critical insights into the usage, perception, and functionality of LIS within the public land administration framework.

Findings reveal that while the LIS has introduced notable improvements in terms of accessibility, transaction speed, and transparency, it remains significantly underutilized and constrained in operation. Over 50% of respondents were unfamiliar with the LIS, and only a small fraction reported regular usage. This limited adoption stems from multiple, interrelated factors, including inadequate user training, lack of interdepartmental integration, outdated or unreliable data, institutional resistance to change, and insufficient funding for system maintenance and upgrade.

Despite these setbacks, stakeholders acknowledged the potential of LIS in supporting key land administration functions such as cadastral mapping, land registration, and land use planning. The system is widely perceived as a tool capable of reducing bureaucratic inefficiencies and curbing corrupt practices associated with analogue, paper-based land governance processes.

To validate these insights, the study employed descriptive analysis and thematic interpretation, rather than dimensionality reduction techniques like PCA, which are better suited to large-scale continuous datasets. Analyses confirmed that the most commonly cited barriers were financial limitations, poor

data accuracy, and institutional inertia. These patterns were consistent across stakeholder groups, including government officials, landowners, and technical experts.

The findings strongly suggest that a fully digital, integrated, and interoperable LIS could lead to improved land governance outcomes, such as faster registration times, higher internally generated revenue, reduced land disputes, and increased public trust in land-related institutions.

However, for these outcomes to materialize, several reforms must be pursued:

- Enhancing data reliability through regular updates and field validation
- Promoting inter-agency data integration and platform interoperability
- Investing in human capacity development through targeted training
- Institutional and legal reforms to reduce bureaucratic resistance

Lessons from global best practices in countries such as Rwanda, Estonia, and Thailand indicate that LIS reform is not merely a technical undertaking. Rather, it demands political will, policy coherence, stakeholder inclusion, and a strong legal framework.

References

Adewumi, A. (2021). *Land Information System Development in Nigeria*. Journal of Geoinformatics, 15(2), 33-47.

Ajayi, T. & Adeyemo, B. (2023). *Digital Governance in Nigerian Land Sector*. Land Policy Review, 8(1), 45-59.

Bennett, R., et al. (2012). *Cadastral Futures: Building a New Vision for Land Administration*. Land Use Policy, 29(4), 729–739.

Davis, F. D. (1989). *Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology*. MIS Quarterly, 13(3), 319–340.

Enemark, S. (2005). *Understanding the Land Management Paradigm*. GIM International, 19(4), 16–19.

Food and Agriculture Organization (FAO). (2012). *Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests*. Rome: FAO.

Green, T. & Black, P. (2017). *Land Digitization in Emerging Economies*. Land Journal, 3(1), 55-73.

Jones, A. (2019). *Smart Cadastral Systems: An International Review*. Journal of Spatial Data Infrastructure, 5(2), 21–33.

Kalantari, M., et al. (2015). *Digital Transformation in Land Registration*. Computers, Environment and Urban Systems, 50, 40–49.

Karikari, B. (2006). *Challenges in LIS Implementation in Africa*. Geospatial World, 12(1), 14–18.

North, D. C. (1990). Institutions, institutional change, and economic performance. Cambridge University Press.

Ogundele, J. (2019). *Evaluating LIS Infrastructure in Sub-National Units of Nigeria*. GIS Today, 7(4), 60–73.

Rakhmonov, M., &Abdurakhimova, M. (2021). *GIS-Based Land Administration Systems*. International Journal of Land Management, 9(2), 91–103.

Robinson, D. et al. (2019). *Building LIS in Post-Conflict Nations: Lessons from Colombia and Uganda*. Survey Review, 51(364), 305–319.

Smith, L. (2020). *Innovations in Land Administration: Global Experiences*. Land Use Journal, 6(3), 40–55.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, *27*(3), 425–478.

Williamson, I. P., Enemark, S., Wallace, J., &Rajabifard, A. (2010). *Land Administration for Sustainable Development*. ESRI Press.