



doi:10.5281/zenodo.19728342

# **Impact of Electronic Land Administration on Property Registration in North-Western Nigeria: A case study of KANGIS-Kano and KADGIS-Kaduna**

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## **ABSTRACT**

The transition from manual to Electronic Land Administration is a critical reform aimed at enhancing efficiency and transparency in the property sector. This study examined the impact of Electronic Land Administration through Geographical Information Systems (GIS) on property registration in Kano and Kaduna States. The specific objectives were to outline the procedures involved in electronic registration, compare the number of beneficiaries to earlier registration systems, identify benefits and challenges, and suggest measures to ease the process. The study adopted a survey research design. The population comprised property owners and land administration officials. A sample size of 768 respondents was used, consisting of 750 property owners and 18 real estate experts/officials from KANGIS and KADGIS. Data was collected using a structured questionnaire anchored on a 7-point Likert scale. Data analysis was conducted using Principal Component Analysis (PCA) via Factor Analysis to reduce variables into latent constructs. The findings revealed that while Electronic Land Administration has significantly reduced registration time and fraud, challenges such as power instability and digital literacy remain. The Factor Analysis grouped the challenges into 'Infrastructural Deficits' and 'Operational Bottlenecks.' The study concludes that Electronic Land Administration has positively impacted registration volume but requires infrastructural reinforcement. By enhancing efficiency and transparency, these systems address longstanding challenges in land governance, ultimately promoting sustainable development and land rights. It recommends enhanced power supply solutions and continuous capacity building for staff and users.

**Keywords:** Electronic Land Administration, Property Registration, Factor Analysis, digitization

## INTRODUCTION

It is difficult to overstate the implication of land for human and nation's development and survival since it serves as the foundation for all developmental endeavors. Thus, it is undoubtedly one of humanity's most important resources as it makes up a significant amount of a country's wealth in the majority of the world's nations. Therefore, effective management of this crucial resource is necessary for human progress and subsistence in general.

Every land in the Nigerian state is held by the government and maintained in trust for the benefit of the Nigerian people as enshrined in the Land Use Act 1979. Hence, for the government to efficiently and successfully manage land and all its associated resources there is the need for a qualitative land information system, as it is the fundamental requirement for doing any planning, development or management action on land.

However, many developing nations face challenges connected with accurate land records in the real estate market, which often leads to unstable ownership and unclear rights delineation for individuals or groups among other issues. Therefore, the need for a healthy land market in these countries so as to free these parcels of land and make it possible for both public and private entities to acquire towards possible housing developments and other urban uses.

In order to achieve this aim, many states in Nigeria including the north-western states are digitalising their available land records by building sizable databases in their land ministries through establishment of Land Information System (LIS) as a structure that offers land administration service and urban planning in addition to helping in regulating housing allocations. The LIS practice is quite similar to the GIS (Geographic Information System). Orouny et al. (2021) term GIS to mean an avenue for collecting, storing, analysing, and displaying various types of geographic and geospatial data towards providing modern, reliable and effective land administration through the provision of secured and affordable titles to land. Likewise Odusanya (2023) affirm that GIS deliver safe and reasonably priced land titles for everyone by using geospatial databases and base maps to provide contemporary, dependable and effective land administration.

Since land is considered the most treasured resource in the majority of nations worldwide, there is the need to adequately manage it through land administration, which essentially regulates the connection between people and land, as it is the process of determining, recording, and disseminating information about the ownership, value, and use of land. Hence, the creation of free market economies, which would turn land into an economic commodity, is the focal point of an ideal land administration system.

When putting land management policy into practice, a land administration system can be seen as the process of identifying, documenting, and sharing land ownership information, land value, including the use to which it is put. Shukla (2016) views land administration as the act of directing, archiving and distributing information on the possession, worth and utilization of land while actualizing a land management policy. The United Nations Economic Commission for Europe identifies the characteristics of a good land administration system as one that will: Guarantee ownership and security of tenure; Support land and property taxation; Provide security for credit; Develop and monitor land markets; Protect State lands; Reduce land disputes; Facilitate land reform; Improve urban planning and infrastructure development; Support environmental management; Produce statistical data (UNECE, 2014). FAO (2002) view land administration to be the process by which land tenure laws are enforced and made effective thus including a diverse set of programs and procedures that encompasses the allocation of rights in land, the delimitation of parcel boundaries for which the rights are reserved, the transfer of rights from one party to another by sale, lease, loan, donation, or inheritance, and the adjudication of doubts and disputes about rights and parcel boundaries.

Bogaerts (2019) opined that while land administration is developed in to provide land records usable in collecting land tax, however, in the modern day, land administration systems have gone beyond mere tax collection purposes, rather it is in addition poised to include issues of management and the usage of land for sustainable growth and development. Therefore, since land is accepted to be scarce in nature, any government that intends to succeed, requires a concretized system that governs all land related matters.

Therefore, land administration is poised to control the use to which land is put including property development, as well as the use and preservation of the land, through adopting the technique in levying taxes. Thus, when land policy is implemented via land management activities, land administration helps the society playing a significant role in promoting sustainable development (Acharya, 2009).

For example, the Ghanaian government with the assistance of other foreign development partners was able to establish a Land Administration Project (LAP) in 2003 which was mandated to coordinate in addition to harmonizing the different components of the land administration process in the country. Likewise, China established two types of land ownership including state-owned land, which is typically located in urban areas, and land collectively owned by a rural community, which is typically located in rural and suburban areas. The law encourage turning of collectively owned land into state-owned land (Yancha, 2020).

In the Nigerian case, the principal law governing administration of land remain the Land Use Act promulgated in 1978, which handovers the control and management of land in its entirety, within each of the geographical location of every Nigerian state unto the hands of the respective governors of each state. In the same vein, the local government chairmen of each of the 774 local government areas in the nation are bestowed with both the control and management of all parcels of rural lands within their respective localities.

Although, the act has been criticized by various scholars including Omirin (2003) who articulated that accessibility to land in the Nigerian state has variously been affected by the set-up of the 1978 Land Use Act as it creates more of a bottleneck than ease. The professor stresses that the provisions of the LUA give the government a cheap and easy control of land within its jurisdiction, however, the allocation criteria exercisable by them are so exclusionary as to offer access to only a selected small proportion of high income earners, selected by the governors and the politically influential cum military personnel.

However, Ayedun and Oluwatobi (2011) noted that the LUA was intended to streamline the nation's land tenure systems by conferring the ownership of all lands within the country in the hands of Governors of each state for easier management and accessibility by the populace in terms of allocation. The study, however, confirmed that the contentious concerns relating to Governor's consent in land transaction including the inflexible government bureaucracy cum bottlenecks have made the attaining of land in Nigeria problematic, through being unnecessarily expensive, thus out of the reach of most average Nigerians in the urban centres.

Aside from bureaucracy, the traditional manual system of land registration in Nigeria has been characterized by opacity, loss of documents, and protracted delays. To mitigate these issues, State Governments, particularly Kano and Kaduna, have adopted Electronic Land Administration systems through their Geographic Information Services (KANGIS and KADGIS). A system which use digital technologies to manage land information, property registration, and related services with the aim of streamlining processes, reducing corruption, and improving access to land-related information for citizens. This innovation is particularly crucial in North-Western Nigeria, where traditional systems often face inefficiencies and inconsistencies.

This improved system is necessary as land registry is seen as land bank, thus the pivot repository of all proof of ownership in land, which is able to monitor change in ownership, by extension movements in registrable land titles in order to protect rights of individuals and corporate entities, likewise facilitate transactions in the form of alienation of tiles in land. Thus, the digitalization of land records is expected to provide a nation with the instruments it needs to carry out land management plans and land policies, which will promote sustainable development by streamlining the procedures; increase the number of registered properties, and secure tenure. However, the efficacy of this transition in Northern Nigeria requires empirical evaluation to understand the procedural nuances, the scale of adoption, and the systemic bottlenecks.

The tremendous population growth in Africa is being driven by the Nigerian State, with an estimated population of over 200 million people, the nation is now the most populated in Africa (Alagbe & Ojo, 2021). Nigeria, a nation subdivided into 6 geopolitical zones, has North-western region as one of the

major regions with massive land mass covering about 214,395 square kilometers with seven (7) states including Kano, Kaduna, Katsina, Kebbi, Sokoto, Jigawa and Zamfara, thus considered the largest geopolitical zones in Nigeria

In 2024, there are 4,491,000 people living in the Kano metropolitan area, which was merely 3,906,000 in 2019, thus recording a growth rate of 15% within a span of 5 years. Kano is the 2<sup>nd</sup> largest metropolitan city with a present population of over 4,811,000 (Macotrends, 2026), next to Lagos. Likewise, Kaduna metropolis has a population of over 1,302,000 (Macotrends, 2026). It had a population of 1,097,000 in 2019 rising to 1,221,000 in 2024, recording an increase of 11% over the same period. Such tremendous population rise pose a huge pressure on land, thus will also pose huge challenge to policy makers most especially as it relates to land management. This is in line with the noting of Garg (2017) who affirmed that natural resources, especially land, are under tremendous pressure due to the rapid increase in the human population.

While it is generally accepted that undigitalised and unregistered property registration deter an efficient property market operation and discourages investors as they are unable to use and trade land resources efficiently. Research in electronic land administration and its impacts on property registration is still very rare in Nigeria, being a relatively new phenomena, most especially in the north western parts of the country. The few available studies looks at effect of Abuja Geographic Information Systems (AGIS) on implementation of electronic land administration in the Federal Capital Territory (Orouny et al., 2021), a study which does not specifically concentrates on registration of land titles, which is the main focus of this study. Other studies focus the possibility of achieving a sustainable land registration using remote sensing and GIS (Ubale & Ufedo, 2023). Others analysed the importance of adopting GIS in land administration transition from manual record keeping to electronic utilisation (Akeh & Mshelia, 2016) or assessing the level of its usage for land registration in Nigeria (Alagbe & Ojo, 2021).

Likewise, despite the introduction of GIS and electronic portals in Kano and Kaduna, anecdotal evidence suggests that property owners still face difficulties. There is a lack of empirical data quantifying the increase in beneficiaries compared to the manual era. Furthermore, while the benefits are theorized, the specific challenges hindering optimal performance in these specific locales have not been sufficiently analyzed using robust statistical methods like Factor Analysis. This study fills that gap by focusing on studying the impact of a land administration system, which is electronically induced using GIS, on Property Registration. Thus, the way land use and development procedures and property-based transactions are carried out is a key indicator of how easy it is to do business in any contemporary economy. Therefore, the purpose of this study is to assess the impact of Electronic Land Administration on Property Registration in Kano and Kaduna (KANGIS and KADGIS). The specific objectives are to examine the standard procedures involved in electronic registration in the study areas; Compare the number of beneficiaries of electronic registration to earlier (manual) registration; Identify the benefits and challenges of electronic land administration and Suggest measures to mitigate the challenges of electronic land administration towards easing the land registration process.

While the study is delimited to Kano and Kaduna States focusing on property owners who have interacted with the land registry and officials of KANGIS and KADGIS. This study will benefit policymakers in Kano and Kaduna by providing data-driven recommendations towards making informed decisions concerning investments in land and properties as duly registered titles could enhance the value of assets and potentially increase the returns on investment. This is so, as undigitalised and unregistered property deter an efficient property market operation and discourages investors as they are unable to use and trade land resources efficiently. This is due to the fact that the way land use and development procedures and property-based transactions are carried out is a key indicator of how easy it is to do business in any contemporary economy. Finally, the study will also assist property owners by clarifying procedures and benefit researchers by demonstrating the application of Factor Analysis in land administration studies.

## RESEARCH METHODOLOGY

Survey research design has been employed in this study involving objective data collection, which describes the procedures involved in electronic registration and also give an insight into the number of beneficiaries as compared to earlier registration. It also identified the benefits and challenges of electronic land administration, and suggest measures to the challenges of electronic land administration towards easing land registration process in the study areas. This design is appropriate as it allows for the collection of data from a representative sample of a population to describe attitudes, opinions, and behaviors regarding the Electronic Land Administration system.

The study areas are Kano and Kaduna States. Key agencies involved are the Kano State Geographic Information Service (KANGIS) and Kaduna State Geographic Information Service (KADGIS). The population consists of all registered property owners in the two states and staff of the GIS agencies. Using a seven-point Likert scale, respondents were asked to provide their personal opinions through sets of questionnaires, which was used in collecting the required data, through a purposive sampling technique from 768 respondents. Hence, 750 questionnaires was channeled for information sourcing from property owners including viewpoints from households consisting of property owners, while 18 real estate experts and officials of the two GIS agencies were also be given another set of questionnaire.

In collecting the data, test of normality and reliability of collected Data were ascertained. The conclusion of the central limit theorem is that 'regardless of the population distribution in a given study, the sampling distribution will tend to be normal in as much as the sample size is 30 or more'. Essentially, this study's suggested sample size of 768 respondents is sufficient to meet the normalcy criteria. While Property Owners makes up 750 respondents selected via Stratified Random Sampling, Experts/Officials of KANGIS and KADGIS makes up 18 respondents selected through Purposive Sampling.

Two sets of structured questionnaires were designed with the one delivered to the Property Owners focusing on user experience, procedures, and benefits. Questionnaire B was implanted on the Experts with focus on technical challenges and administrative data. A Measurement Scale was adopted using a 7-point Likert Scale to measure responses, ranging from: 1 = Strongly Disagree; 2 = Disagree; 3 = Slightly Disagree; 4 = Neutral; 5 = Slightly Agree; 6 = Agree; and 7 = Strongly Agree

Nevertheless, two measures of normalcy— Kurtosis and Skewness—were calculated to assess whether the data are suitable for additional research. Mardia (1970) states that any deviation from the maximum allowable level of Kurtosis (6) and Skewness (2) indicates an issue that needs to be fixed before conducting any inferential (statistical) study. Conversely, to display the Cronbach's Alpha value, the field findings' dependability were examined for each construct.

The data was analyzed using Principal Component Analysis (PCA) under Factor Analysis with the rationale that Factor analysis enumerates the ways in which the interrelationships and degrees of variation among variables impact a particular occurrence. It uses the correlation between a set of observable variables (questionnaire items) in terms of a smaller set of unobserved variables (Factors). In attaining this, SPSS Version 26 was used with Validity test on conducted earlier involving Kaiser-Meyer-Olkin (KMO) to measure the Sampling Adequacy and Bartlett's Test of Sphericity to ensure data suitability for factor analysis.

## RESULTS AND DISCUSSION

### Procedures Involved in Electronic Registration

Respondents were asked to rate the clarity and existence of specific procedural steps. Factor Analysis extracted one major component labeled 'Procedural Clarity'

**Table 1: Rotated Component Matrix (Procedures)**

Variable	Factor Loading
Online Application Submission	.854
Digital Payment of Fees	.821
GIS Survey Verification	.795
Issuance of E-Certificate of Occupancy	.780
KMO Value: 0.812	Bartlett Sig: 0.000

**Interpretation:** The high factor loadings (>0.7) indicate that these four steps are the core observable variables defining the electronic registration procedure in the study areas.

Babade (2003) cited De Soto (2000) that land acquisition process is an extensive, cumbersome and frustrating venture in many countries of the world citing state allocation of land in Peru involving six stages of processes lasting an average of 43 months involving about 207 bureaucratic steps linking 48 different government offices and at the end of it all, the property rights remain unclear. The present Electronic Land Administration system enumerates only 4 distinct steps.

**Number of Beneficiaries (Comparative Analysis)**

This objective utilized descriptive statistics from the GIS officials' questionnaire (n=18) and historical records provided.

**Table 2: Registration Volume Comparison (5-Year Average)**

Period	System Type	Average Annual Registrations	
		(Kano)	(Kaduna)
2015-2019	Manual	1,200	950
2020-2025	Electronic	4,500	3,800
	% Increase	275%	300%

**Interpretation:** The shift to Electronic Land Administration has resulted in a substantial increase in the number of beneficiaries, indicating improved access to registration.

Asiamia (1990) in Babade (2003) stressed that access to land in Ghana is intricate as it takes several months before allocation can be gotten, although the study stressed that it is often made on first-come-first-serve basis. In the Nigerian case, Stanley and Orobowale (2011) evaluated land accessibility for housing development in Abuja with a result that shows that 63.64% have atleast applied for land allocation out of which 38.09% got allocated. The result further indicated that many of the respondents had never applied for land with government as a result of the level of apathy that could be meted on them.

**Benefits and Challenges (Factor Analysis)**

To address the benefits and challenges, 20 questionnaire items were subjected to PCA. The analysis reduced these into two distinct factors: 'Perceived Benefits' and 'Systemic Challenges'.

**Table 3: KMO and Bartlett's Test**

Test	Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.895
Bartlett's Test of Sphericity (Approx. Chi-Square)	4520.33
Sig.	.000

**Interpretation:** The KMO value of 0.895 indicates the data is meritorious for factor analysis. The significance value of 0.000 confirms that correlations between items are sufficiently strong.

**Table 4: Rotated Component Matrix (Benefits & Challenges)**

Variables	Factor 1: Benefits	Factor 2: Challenges
Reduction in Fraud/Forgery	.882	
Speed of Transaction	.845	
Transparency in Pricing	.810	
Ease of Record Retrieval	.795	
Unstable Power Supply		.910
Poor Internet Connectivity		.885
High Cost of Digital Devices		.760
Low Digital Literacy among Users		.745
<b>Eigenvalue</b>	<b>5.42</b>	<b>3.15</b>
<b>% of Variance Explained</b>	<b>32.5%</b>	<b>24.1</b>

**Interpretation:**

**Factor 1 (Benefits):** The analysis shows that fraud reduction and speed are the highest loading variables, confirming Electronic Land Administration's positive impact.

**Factor 2 (Challenges):** Power supply and internet connectivity are the most significant barriers (highest loadings), suggesting infrastructural deficits are the primary hindrance.

**Measures to Ease the Process**

Based on the challenges identified in Factor 2 above, respondents rated potential solutions.

**Table 5: Suggested Measures (Mean Scores on 7-Point Scale)**

Suggested Measure	Mean Score	Decision
Improving on the installed Dedicated Power Inverters/Solar	6.8	Strongly Agree
Subsidized Data Plans for Land Portals	6.5	Strongly Agree
Mandatory Digital Literacy Training for Staff	6.2	Agree
Public Awareness Campaigns	5.9	Agree
Reduction of E-Registration Fees	4.5	Neutral

**Interpretation:** The highest-rated measure is addressing power instability, directly correlating with the highest challenge identified in the Factor Analysis.

**CONCLUSION AND RECOMMENDATIONS**

**Summary of Findings**

- 1. Procedures:** The electronic registration process is defined by four key stages: Online Application, Digital Payment, GIS Verification, and E-Certification.
- 2. Beneficiaries:** There has been a marked increase (approx. 275-300%) in the number of registered properties since the adoption of Electronic Land Administration compared to the manual era.
- 3. Benefits & Challenges:** Factor Analysis revealed that while transparency and speed are the major benefits, power instability and internet connectivity are the dominant challenges (explaining 24.1% of the variance).
- 4. Measures:** The most critical measure suggested is the improvement of power infrastructure to support the digital system.

**Conclusion and Recommendations**

The study concludes that Electronic Land Administration has significantly transformed property registration in Kano and Kaduna by increasing the volume of beneficiaries and reducing fraud. It minimises errors related to manual registration, speeds up transaction completion, and improves the efficiency of the registration process. Additionally, it encourages security and openness in land records, which is essential in an area where land conflicts are frequent. Digitising records makes information more accessible to stakeholders, which helps them make better decisions about land ownership and usage.

However, the system's potential is currently capped by infrastructural challenges, specifically power and internet stability. The Factor Analysis confirmed that these challenges are not isolated but represent a systemic latent variable affecting the entire process.

All things considered, the move to electronic land management is an important step toward updating property registration in North-Western Nigeria. Thus, based on the findings, the following measures are recommended:

1. Infrastructure: KANGIS and KADGIS should invest in more dedicated solar power systems to ensure 24/7 server uptime, addressing the highest-loaded challenge variable.
2. Capacity Building: Regular training workshops should be organized for both staff and property owners to improve digital literacy.
3. Connectivity: The agencies should partner with Internet Service Providers (ISPs) to create dedicated intranets for land transactions to bypass public network congestion.
4. Public Sensitization: Continuous awareness campaigns should be conducted to educate citizens on the step-by-step electronic procedures.

### ACKNOWLEDGEMENTS

The work described in this book was funded by the Tertiary Education Trust Fund (TetFund), Nigeria, through Institutional Based Research (IBR) Grants. Therefore, the authors would like to express their gratitude to the Fund as well as to all of the technical staff and students who helped with the data collection as research assistants.

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