



THE EFFECT OF NLIMS DATA QUALITY ON LAND ADMINISTRATION IN NAIROBI COUNTY, KENYA

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Abstract

The National Land Information Management System (NLIMS), or "Ardhi Sasa," was launched in 2021 by Kenya's Ministry of Lands and Physical Planning with the aim of automating land administration in Kenya through achieving matters of record, online services, and procedures of land, as well as horn transparency. NLIMS applies the principles of current technologies, including Geographic Information Systems (GIS) and automated compliance tools, to deliver effective and efficient land administration services to the stakeholders. Despite its initial promise to address inefficiencies, corruption and a lack of transparency in traditional land administration, the system has encountered challenges such as low public awareness, resistance to change and concerns about data accuracy and accessibility. The specific objectives of this research were to assess the effect of NLIMS data quality on land administration in Nairobi County, Kenya. The study anchored on the Technology Acceptance Model, Institutional Theory and Diffusion of Innovation Theory. This study used a mixed-methods correlational design and 255

stakeholders were selected using stratified random sampling. The data were gathered by the use of validated semi-structured questionnaires and interview schedules, and the internal consistency of all the constructs were confirmed (Cronbach's $\alpha > .90$). The quantitative data were analysed using descriptive and inferential statistics, and the qualitative data were analysed thematically. The findings showed high positive correlations between data components and land administration effectiveness ($r = .890$, $p < .001$). Further there was a high explanatory power indicated by $R^2 = .791$, and a beta of ($\beta = .890$, $p = .000$). Based on the study, it is concluded that data quality is one of the major factors that affect the effectiveness of digital land governance. Land authorities are urged to establish ongoing data cleansing processes, establish real-time data validation processes, and improve interoperability arrangements within systems to maintain administrative efficiency. The conclusions and implications of these findings offer empirical insights for the optimization of digital land platforms in Kenya and other jurisdictions and for decision makers such as land administrators, system developers, and policymakers.

Keywords: Data quality, land administration, NLIMS, digital governance, Nairobi County

INTRODUCTION

Background of the Study

Land administration is a fundamental process that involves managing land ownership, tenure, boundaries, and land use alongside playing a crucial role in ensuring sustainable development, fair resource allocation, and legal clarity in property rights (Hassan *et al.*, 2024). Good land administration ensures tenure security, resource allocation equitability, and land efficient use. How land is administered has changed over the years to improve issues such as property disputes, ineffective service provision, and the absence of transparency in many parts of the world (Ager & Kituku, 2023). Most countries have thus embraced digital solutions in land administration to modernize it, increase governance internally, and improve service delivery. The key aspects of any management information system include data quality, usage rates, regulatory compliance, and scalability (Ager & Kituku, 2023). Data quality refers to the accuracy, reliability, and completeness of the information stored within the NLIMS, which is vital for informed decision-making and stakeholder trust (Knauer *et al.*, 2020).

Kenya implemented The National Land Information Management System (NLIMS) to streamline land administration (Tarus, 2024). However, Nairobi County experiences delays, conflicts, fraud, and scaling problems associated with inaccurate data, low usage, and poor enforcement (Kariuki *et al.*, 2018; Kuria & Mwikya, 2024). Other counties have provided lessons

on how these problems can be overcome: Baringo had to reorganize data to digitize (Maungu, 2023), Nyandarua had to train more people to adopt the system despite the higher accuracy (Njeri et al., 2022), and Kisii had to test its automated cleaning tools (Bernard, 2021).

Data quality is becoming crucial for credible land administration through factual data (Gartner, 2019). Vatsa and Chhaparwal (2021) conducted a qualitative case study of data validation tools in Estonia's e-government, focusing on accuracy and timeliness and finding them highly reliable. However, applicability in less digitized settings remains unclear. Nshuti (2021), using a mixed-methods approach, analyzed the Land Tenure Regularization Program in Rwanda and found that data quality improves record quality, overlooked verification burdens, and the land administration process. In Kisii County, Bernard (2021) adopted a specific 2021 case study to evaluate automated cleaning tools, focusing on accuracy; despite its improved records, no large-scale efficacy was tested. In Uganda, Musinguzi et al. (2020) assessed the Fit for Purpose Land Administration of the real-time validation that ensured integrity, indicating the need to use high-quality data to manage information systems efficiently. These studies emphasize the importance of data quality, but the gap in training, pre-implementation strategies, and interoperability between counties remains a core need for research focus.

Land administration is the discipline that deals with managing land use rights and transactions related to land, which is crucial to providing tenure security and fostering economic stability (Musinguzi et al., 2020). This, however, is not the case in most countries, Kenya included, that still have manual record-keeping systems, which are prone to inefficiencies, delays, and fraud (Kithui, 2020). In response to these challenges, the National Land Information Management System (NLIMS) was launched as a digital solution to improve service delivery, transparency, and accuracy in land records. Using descriptive survey research design, Wang'ondur et al. (2018) explored the challenges of NLIMS implementation in Kenya, where they collected data from 139 sampled staff and system vendors. It was found that governance, limited budgetary support, and weak ICT infrastructure were significant challenges to NLIMS implementation. However, this study focused on the administrative bottlenecks without analyzing NLIMS's impact on service delivery and efficiency. Therefore, the study fell short of assessing the overall effectiveness of NLIMS.

Land administration needs to be efficient in order to improve property rights and reduce land disputes while supporting sustainable development and economic growth. A digital land administration platform like the National Land Information Management System (NLIMS) should guarantee fast secure and open land transactions through precise and easily accessible data distribution to all involved parties. The implementation of NLIMS in Nairobi County has not resolved fundamental land administration problems that hinder its effectiveness such as

prolonged registration procedures, insufficient records, restricted land information availability and persistent property conflicts. The system faces major questions about its ability to enhance essential outcomes including land tenure protection and land information accessibility and land planning capabilities and registration and titling processes and transaction efficiency. The performance gaps in the system prove to be connected with data quality, user adoption rates, regulatory compliance and system scalability yet these aspects remain uninvestigated within Nairobi County. Current research primarily examines different sectors and locations instead of identifying the specific land administration challenges which exist in Nairobi.

There exists a lack of practical data which evaluates whether NLIMS has fulfilled its planned outcomes or whether data quality needs better development for maximum effect. The research aimed to determine how NLIMS affects Nairobi County land administration by examining essential system elements. The study's results fills the current knowledge void while providing guidance for upcoming digital land governance enhancement. The objective of this study was to assess the effect of the National Land Information Management System (NLIMS) data quality on land administration in Nairobi County, Kenya. The study sought to ascertain how much NLIMS has succeeded in enhancing the land administration in Nairobi County, Kenya. The research excluded other counties because NLIMS began its initial testing and complete implementation within Nairobi County which established it as the sole geographic area with sufficient operational data for evaluation.

LITERATURE REVIEW

According to Gartner (2019), data quality refers to the fitness of data for its intended use in operations, decision making, and planning. Ali (2020) conducted a study to explore the relationship between information quality and data quality in Accounting Information Systems (AIS) and their impact on organizational performance within commercial and Islamic banks in Jordan. The study employed a proportionate stratified random sampling method among AIS users in sixteen banks in Jordan. Out of 600 distributed and self-administered questionnaires, 250 valid responses were obtained, yielding a valid response ratio of 41.1%. Using the partial least squares (PLS) approach for analysis, the study found that information quality significantly enhances organizational performance. However, contrary to expectations, data quality showed a negative and insignificant relationship with organizational performance. This suggests that high-quality information is crucial for organizational success, while data quality may not be as influential. The findings from the literature imply that in land administration, one must distinctly separate the quality of raw data from the transformation of that data into meaningful information.

Data quality is a cornerstone of effective land administration. High-quality data ensures accurate decision-making, minimizes disputes, and builds public trust. For example, Estonia's e-government system incorporates automated data validation tools to prevent errors during data entry, ensuring that records are accurate and up-to-date (Vatsa & Chhapparwal, 2021). Kenyan digital land systems will need to incorporate real-time feedback and validation processes for giving secure data entry. Aside from that, training of users and specific input protocols are also essential to avoid loss of data accuracy through human input errors.

In Africa, data quality often relates to historical land administration problems, such as incomplete land surveying and poorly kept records. One model for addressing such concerns is Rwanda's Land Tenure Regularizations Program. By conducting national land registration in which verification processes are pervasive, the quality of the land records in Rwanda is seriously improving (Nshuti, 2021). Such success depends further on investment in both data infrastructure and human capacity. Uganda's Fit for Purpose Land Administration has some real-time validation mechanisms that ensure that changes made to data are made according to the set regulatory requirements (Musinguzi et al., 2020). These checks on their validity can help maintain the integrity of the data throughout its existence and limit opportunities for errors or fraudulent changes.

Knauer et al. (2020) investigated the impact of Information System (IS) quality on data quality in the domain of management accounting (MA) and analyzed determinants influencing IS quality in MA. Conducting a cross-sectional survey among 143 medium-sized and large firms, the study employed a structural equation model to predict and find significant associations. Results indicate that IS quality significantly affects Management Accounting Data Quality (MADQ). The study underscores the importance of IS quality for management accountants' practice and provides insights into determinants of IS quality. However, the research focuses on medium-sized and large firms, possibly limiting generalizability to smaller organizations.

Getachew et al. (2022) conducted a study to examine data quality and its associated factors within the health management information system (HMIS) at health centres in Shashogo district, Hadiya Zone, Southern Ethiopia. They employed a facility-based cross-sectional survey from June 1 to July 1, 2021, involving 300 participants selected via simple random sampling. Data collection was facilitated by a self-administered questionnaire and subsequent analysis utilized EPI data version 3.1 and SPSS version 25. The study found HMIS data quality to be 83% in Shashogo district health centres, with accuracy, completeness and timeliness scores of 79%, 86% and 84%, respectively. Factors such as supportive supervision, accuracy checking, registration filling and confidence level were identified as positively associated with data quality.

However, the study overlooks qualitative insights that could provide deeper understanding of the factors affecting data quality.

In their study, Kenyenga et al. (2021) aimed to explore the influence of technological factors on data quality within the Health Management Information System (HMIS) at Kenyatta National Hospital in Nairobi County, Kenya. They underscored the critical role of efficient HMIS in healthcare systems and decision-making processes, highlighting the need for quality data to inform policy planning effectively. Despite the proliferation of available information, the authors noted a persistent gap between the quantity of data and its quality. Employing a cross-sectional descriptive design, Kenyenga et al. (2021) integrated both quantitative and qualitative techniques. The study yielded a high response rate of 98.97%, revealing network issues as a significant concern among respondents. Although a majority perceived the HMIS as user-friendly and acknowledged the hospital's efforts to keep pace with technological trends in the health sector, notable associations between data quality and technological factors were observed. However, the study focused on technological factors, neglecting potential influences from organizational or procedural aspects. Secondly, the research was confined to Kenyatta National Hospital, limiting the generalizability of findings to other healthcare settings.

Data quality has long been a problem in land administration in Kenya. A manual record-keeping system ensured a system of inefficiency and disputes characterized by missing, duplicated, or outdated records. These data quality challenges are not unique to Nairobi but universal, judging by experiences in several counties and countries that have rolled out digital land systems. Maungu (2023), while digitizing land records in Baringo County, noted significant challenges: data fragmentation from legacy systems and a lack of historical records. This inconsistency had to be subjected to heavy verification, slowing down the system's rollout and operational inefficiencies. Pre-implementation audits were also crucial in addressing such challenges since they helped identify gaps in data integrity and established frameworks for quality improvement before migrating to digital platforms.

Nyandarua County has recorded the adoption of record management technologies with some successes and limitations. Njeri et al. (2022) noted that while new technologies reduced the rate of errors in land records, personnel who were supposed to enter and manage data were not well-trained. Hence, the challenge persisted. Untrained personnel often loaded the system with errors, complicating problems of securing reliable records. Kisii County was no exception, and according to Bernard (2021), manual records were often characterized by duplications, omissions, and outdated information, which posed a challenge during digitization. These tools also significantly improved the records' accuracy since automatic cleaning tools detected and corrected many errors during migration. The approach saves time and frees personnel who

would have had to go through the tedious work of manually verifying these entries. Bernard's (2021) work brought out how technology can turn around the quality of information, particularly for large-scale system transitions. This would enlighten the world with successful examples of what could be learned and used in Kenya's digital land administration systems.

In Kenya and many other countries, land administration has traditionally been an inflexible bureaucratic process utilizing manual record-keeping systems. These were slow, laborious, and prone to error and fraud, causing conflicts over land ownership corruption and slow delivery of services (Kithui, 2020). The Land Control Act of 1967 and the setting up of land registries marked the commencement of formal land administration in the country (Tarus, 2024). However, these systems were highly manual, paper record-based, error-prone, forged, and inefficient. The high volume of transactions in land, coupled with inadequate infrastructure, ensured that delays and widespread mistrust in the system became commonplace.

Digitisation pressure peaked in the early 2000s, driven mainly by improved transparency and efficiency demands. The Ministry of Lands and Natural Resources initiated the National Land Information Management System to upgrade land records and ensure smoother transactions on land (Wang'ondur et al., 2018). NLIMS had great promise but suffered from significant implementation challenges, including resource constraints and resistance by stakeholders to change from traditional ways. These challenges highlighted the need for stronger frameworks and stakeholder consultations in future initiatives.

The 2021 rollout of Ardhi Sasa marked a significant milestone in the lessons learned from NLIMS in developing a more user-friendly, scalable platform. Ardhi Sasa ushers in an integrated digital system that is purposed to remedy the deficiencies of its forerunners (Asamba, 2023). Ardhi Sasa seeks to regain the public's confidence and improve service delivery by operating real-time updates, doing online transactions, and introducing enhanced security features (Tarus, 2024). However, this system's success will depend on how it manages to overcome the persistent challenges in digital literacy, infrastructure, and integration of legacy records. From this, there can be deduced from Kenya's historical land administration an indication of adaptations in systems that are meant to handle the changing needs alongside the socio-economic and institutional barriers that exist.

An earlier descriptive survey study by Wang'ondur et al. (2018) found NLIMS substantially enhanced land records access and decreased data inconsistencies. This study, however, also highlighted hurdles to user adoption, with many stakeholders, including land officers, legal experts, and property developers, being either unaware of the system or relatively resistant to change. Additionally, technical difficulties such as downtimes, network failures, and

incomplete data migration have made the system increasingly challenging, necessitating continual improvements and training among stakeholders.

NLIMS was also meant to enhance efficiency in service delivery; land transactions are to be processed more quickly, and human intervention in processing records would be minimized, thereby reducing errors in land information. Based on descriptive research on the effect of the digitalization of land at the Ministry of Lands using 154 respondents, Tarus (2024) found a strong positive correlation between service delivery and online record-keeping systems. According to the study, transaction times had improved significantly, missing records had been reduced, and unwanted fraud cases had dropped under NLIMS. However, Tarus (2024) discussed some of the significant challenges with the broad-scale usage of the system, most notably slow adoption, the necessity for user training, and cybersecurity threats. Moreover, this study did not look at the role of institutional and regulatory frameworks of NLIMS, a gap that this study seeks to bridge.

NLIMS has been linked to several benefits, although its implementation has faced several barriers, including insufficient funding, inadequate information communication technology infrastructure, and governance issues (Wang'ondur et al., 2018). This study, conducted with NLIMS project staff, management, and vendors, revealed that budgetary constraints restricting system expansion and poor governance resulted in inconsistent policy enforcement. Similarly, Kithui (2020) carried out a case study of land information systems in Kiambu County, revealing that networking and inter-departmental coordination were among the challenges in integrating digital land platforms. Furthermore, one of the hindrances to digital transformation has been stakeholder resistance to the process, where land officers preferred manual processes due to having set knowledge, thus paving the way for the opportunity for corrupt behavior (Tarus, 2024). Such challenges underscore the importance of improving policy enforcement, allocating impactful resources, and establishing comprehensive learnings to ensure that full adoption of the NLIMS can be sustained over time.

The Theoretical Framework

This research was anchored on three major theories: The Institutional Theory, the Technology Acceptance Model and Diffusion of Innovations Theory. The theories were chosen based on their relevance in providing a wide lens for adopting digital land administration systems and the institutional regulations and structures determining their success.

The Technology Acceptance Model was proposed by Davis in 1989 to include the models already laying the foundations for understanding technology adoption and use behavior (Davis et al., 2020). It postulates that two dimensions are critical to user acceptance or rejection

of the technological system: perceived usefulness and ease of use. Perceived usefulness refers to the degree to which a user believes the technology will enhance their job performance is related to perceived usefulness. On the other hand, perceived ease of use means the effort one needs to invest in working with the system (Davis et al., 2020). These two characteristics, in turn, influence the user's attitude toward the technology and are further correlated with behavioral intention to use and actual use behavior.

In NLIMS, TAM is useful in assessing how land administrators, stakeholders, and the public view and interact with the system. For example, the users will accept the NLIMS if they perceive it as a tool that facilitates land transactions by saving time and limiting mistakes. On the other hand, when users find the system complicated and unintelligible, their acceptance of the same may be reduced. Therefore, PU and PEOU provide the basis for adoption challenges and opportunities regarding system usability (Davis et al., 2020). PU and PEOU determine the usage rates of NLIMS by different stakeholders and whether they will become regular users.

Although TAM has provided rich information on user adoption, it embodies several limitations. Critics argue that this model simplifies the process of adoption by overemphasizing cognitive factors at the expense of contextual variables like organizational culture and socio-economic factors (Njeri et al., 2022). Njumwa (2021) indicated that land administration in Nairobi County had been based on long-standing traditions, resource constraints, and power relations that TAM can hardly capture. It was thus be essential to embed the TAM within other theoretical frameworks, such as institutional theory, to understand the adoption and performance of NLIMS in a more holistic perspective.

Everett Rogers' Diffusion of Innovations (DOI) theory of 1962 is a broad theory to study how new ideas, technology, or practices are spread in a social system over time. In essence, DOI theory describes how an innovation is diffused through specific channels by members of a social system (García-Avilés, 2020). This theory comes into play when applying to digital transformation projects like the National Land Information Management System (NLIMS) where the institutional and individual actors need to accept and adapt to new systems for the initiative to succeed. DOI identifies five innovation characteristics: relative advantage, compatibility, complexity, trialability, and observability that have a direct impact on rates of adoption and degrees of success of technology.

By DOI in this study, one can think of independent variables that is data quality, in relation to the impact they exert on the perceived value and adoption of NLIMS by the stakeholders. For example, relative advantage, which measures the degree to which a particular system is superior to the prior system, can be used to show the superiority of NLIMS to traditional land administration practice (García-Avilés, 2020). Once customers are convinced

that computer systems provide greater accuracy in data, speed of transactions, and error minimization rates, they will use and reuse the system time and time again thereby escalating the level of use and participation altogether. Relative advantage, therefore, will help in explaining the effect of data quality in NLIMS in improving land administration in Nairobi County. Compatibility also considers how NLIMS falls into place compared to existing legal frameworks, user requirements, and institutional practice. Where the system is perceived to be consistent with local land governance values and practices, it promotes institutional compliance and support more generally. Compability as a component of DOI is used to indicate the effect of regulatory compliance in NLIMS usage to improve land administration outcomes.

Complexity, another DOI attribute, has significant implications for usability of the system and institutional ease of take-up (Min et al., 2021). A system that is overly complex and non-intuitive can deter frontline users and institutional actors from making full use of NLIMS functionality, reducing levels of utilization and data consistency. Conversely, system design simplification, offering proper training, and technical support improve both data input quality and usage. This allows the establishment of accurate, complete, and consistent land records that form the basis of the land administration system's reliability and credibility. Trialability and observability also support adoption as they allow potential users or institutions to try out the system and achieve tangible benefits. Min et al. (2021) conducted a study showing some of the benefits included reduced fraud, quicker title processing, improved enforcement of compliance before making final adoption decisions.

DOI provides a structured approach also to how dependent variables, and more particularly land administration outcomes, evolve as innovations like NLIMS are adopted. More successful land administration outcomes such as enhanced tenure security, reduced corruption, more transparent land transfers, and improved equity in land service access, depend upon successful diffusion of the system to both individual users and institutional organizations. Similarly, scalability, which is one of the independent variables, relies on the ability of the system to be adopted by other counties or regions, an activity that DOI calls mimetic learning, change agents, and early adopters.

Conceptual framework

As shown in Figure 1, the conceptual framework presents how the independent variables, the features of NLIMS, are associated with the dependent variables of land administration outcomes. These relate to data quality, utilization rates, compliance, and scalability, considered the four essential drivers of digital systems. These influence efficiency, transparency, and realization in service delivery while undertaking land administration. For

instance, high data quality ensures that the records are correct and reliable, which makes disputes minimal and increases confidence in the system. Similarly, a higher usage rate means greater adoption by stakeholders, an issue of utmost importance for the maximum impact of the systems. Regulatory compliance measures the capacity of the systems to enforce legal frameworks to suppress fraud and irregularities; scalability ensures that the systems will support increases in demand without compromising performance.

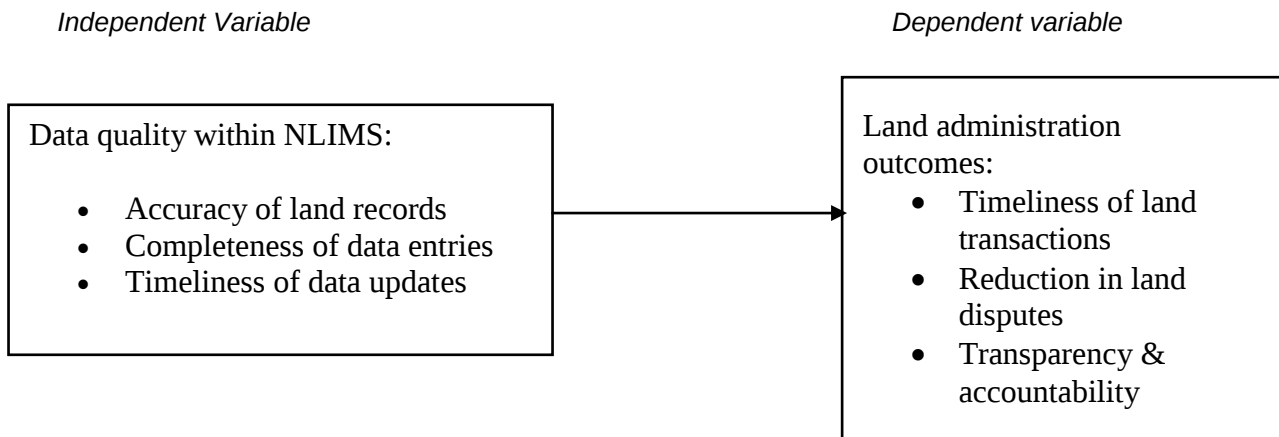


Figure 1 *Conceptual framework*

RESEARCH METHODOLOGY

The study used a correlational research design in mixed methods research approach and followed positivist research philosophy. Research design serves as the road map in determining research procedures to be used in data collection and analysis (Dannels, 2018). Positivism posits that there is a reality that is independent from the researcher's perception in which the researcher can study and research it using measurable evidence so that the influence of researchers on the object being studied can be minimized by using standardized instruments (Ali, 2024). The correlational design was suitable to establish the relationships between the variables and to test the study hypotheses. The study was carried out in Nairobi County, which is an ideal location due to the high number of land transactions, varying land ownership, increasing urbanization, and high demand for land-related services. The target population was 760 land administration stakeholders obtained from the Human Resource Department of Nairobi County Government which included Land Registry Officers, land administration officers, system administrators, surveyors, lawyers and registered valuers. Stratified random sampling was used to assure representation of the different categories of the stakeholders and to reduce sampling bias (Iliyasu & Etikan, 2021). Sample size was determined using Krejcie and Morgan formula and 255 respondents were obtained from the target population. The sample distribution was as

indicated in Table 1 below. Self-administered questionnaires and semi-structured interviews were used to gather data. The questionnaires used a five point Likert scale from Strongly Disagree (1) to Strongly Agree (5), and the interviews collected further information on the use of NLIMS, its scalability, the quality of the data, regulatory compliance and land administration outcomes.

Table 1 *Sample and Strata Distribution*

Stakeholder Group	Population	Sample Size
Land Registrar	110	37
Land Administration Officers	110	37
System Administrators	15	5
Lawyers	274	92
Surveyors	131	44
Registered valuers	120	40
Total	760	255

Content, face and construct validity were used to establish the instrument validity. The instruments were reviewed by experts who are specialists in land administration and information systems from University of Kabianga to determine whether they were relevant, clear, comprehensive and aligned to the research goals. The instruments were also pilot-tested in Nakuru County to strengthen the construct validity of the instruments, owing to similarities between the two counties (Price et al., 2015); factor analysis, convergent validity and divergent validity were also carried out. Cronbach's alpha was used to assess the reliability of the instrument, which resulted in high internal consistency of the instrument (Sürücü & Maslakci, 2020) with a value of 0.941 that meets the criterion of reliability in terms of internal consistency. After obtaining authorization from the Ministry of Lands and Physical Planning, NACOSTI, University of Kabianga, and Nairobi County Government, data collection was started. Questionnaires were completed both online and offline and interviews were conducted both online and offline depending on the preference of the respondents. Training of the research assistants on administration procedures, interviewing, support of the respondents and confidentiality. After collection, quantitative data was analysed using descriptive and inferential statistics. Respondents' perceptions were summarised using means, medians, modes, standard deviations, and ranges, while linear regression analysis was used to investigate how the data quality, usage rates, regulatory compliance, and system scalability affect land administration outcomes. Data were analyzed using SPSS Version 25 and ethical issues were addressed by

informed consent, voluntary participation, confidentiality, anonymization, secure data management, and participants' right to withdraw at any time. Throughout the study, ethical considerations and research protocols were adhered to ensure the protection of participants and the reliability and trustworthiness of the results.

FINDINGS AND DISCUSSION

Descriptive Statistics

NLIMS Data Quality

Table 1 shows the descriptive statistics for the data quality construct, which includes items assessing the accuracy, completeness, consistency, timeliness and reliability of land-related information in NLIMS.

Table 1 *Descriptive Statistics of Data Quality*

Statement	SA (5) f (%)	A (4) f (%)	N (3) f (%)	D (2) f (%)	SD (1) f (%)	Mean	Std. Dev.
Data entered into NLIMS goes through adequate accuracy checks (DQ1)	35 (13.7)	102 (40)	99 (38.8)	19 (7.5)	0 (0.0)	3.60	0.816
NLIMS ensures that all required data fields are completed during land transactions (DQ2)	37 (14.5)	118 (46.3)	85 (33.3)	15 (5.9)	0 (0.0)	3.69	0.789
Land information within NLIMS is consistent across all system modules (DQ3)	38 (14.9)	104 (40.8)	96 (37.6)	17 (6.7)	0 (0.0)	3.64	0.815
NLIMS provides real-time access to current land information (DQ4)	30 (11.8)	114 (39.2)	97 (38.0)	14 (5.5)	0 (0.0)	3.63	0.762
I trust the reliability of the land information from NLIMS (DQ5)	31 (12.2)	119 (46.7)	90 (35.3)	15 (5.9)	0 (0.0)	3.65	0.768
Aggregate Mean and Standard Deviation						3.6424	0.69357

The distribution shows the consensus of the 255 respondents, who indicated that NLIMS has established data management procedures that facilitate accurate record-keeping and informed decision-making. The relatively small standard deviation points to consistent perceptions from occupational roles. However, item-level analysis shows some differences: ensuring all the required data fields are completed during land transactions was rated the

highest ($M = 3.69$, $SD = 0.789$), indicating that there are system-enforced mandatory field requirements that help to minimize data entry omissions. Additionally, respondents confirmed their trust of the reliability of the land information that they retrieved from NLIMS ($M = 3.65$, $SD = 0.768$), indicating that stakeholders view the system as a credible source for land-related decision-making. The aggregate mean score is 3.6424 and the standard deviation is 0.69357 indicating a moderate level of the data quality in NLIMS in Nairobi County.

Land Administration Effectiveness

The descriptive statistics of the dependent variable, land administration effectiveness (processing speed of land transactions, reduction in dispute, transparency, accountability, and improved overall effectiveness in land administration), are reported in Table 2.

Table 2 Descriptive Statistics of Land Administration

Statement	SA (5) f (%)	A (4) f (%)	N (3) f (%)	D (2) f (%)	SD (1) f (%)	Mean	Std. Dev.
Land transactions are now processed much more quickly due to NLIMS (LA1)	27 (10.6)	117 (45.9)	99 (38.8)	12 (4.7)	0 (0.0)	3.62	0.737
NLIMS has reduced the bureaucratic hurdles associated with land transactions (LA2)	34 (13.3)	110 (43.1)	99 (38.8)	12 (4.7)	0 (0.0)	3.65	0.768
NLIMS has reduced land disputes related to ownership (LA3)	29 (11.4)	121 (47.5)	97 (38.0)	8 (3.1)	0 (0.0)	3.67	0.716
NLIMS has increased transparency in land administration (LA4)	30 (11.8)	116 (45.5)	95 (37.3)	14 (5.5)	0 (0.0)	3.64	0.761
NLIMS has created more accountability within land administration (LA5)	35 (13.7)	108 (42.4)	98 (38.4)	14 (5.5)	0 (0.0)	3.64	0.785
Aggregate Mean and Standard Deviation						3.6447	0.66643

The highest rated indicator under item-level analysis was the speed at which land transactions are now processed, largely due to NLIMS ($M = 3.67$, $SD = 0.716$), which showed that most respondents were aware that the processing time for land transactions has been significantly reduced compared with traditional methods. Respondents also strongly agreed that NLIMS has minimized administration friction associated with land transactions ($M = 3.65$, $SD =$

0.768), reflecting that the removal of unnecessary manual approvals and centralized data repositories has successfully minimized administrative friction.

NLIMS Data Quality and Land Administration

A simple linear regression model was used to test the first hypothesis. The results were presented as follows.

Table 3 *Model Summary for NLIMS Data Quality and Land Administration*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.890a	.791	.790	.30504

The model summary in Table 3 indicates that data quality explains 79.1% of the variation in land administration effectiveness ($R^2 = 0.791$). This implies that data quality has a substantial explanatory power on land administration outcomes in Nairobi County. The remaining 20.9% is explained by other factors not included in the model.

Table 4 *ANOVA for NLIMS Data Quality and Land Administration*

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	89.269	1	89.269	959.381	.000b
Residual	23.541	253	.093		
Total	112.810	254			

The ANOVA results show that the regression model is statistically significant ($F = 959.381$, $p < 0.05$). This implies that data quality significantly predicts land administration effectiveness of NLIMS in Nairobi County.

Table 5 *Regression Coefficients for NLIMS Data Quality and Land Administration*

Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	T	Sig.
1 (Constant)	.531	.102		5.193	.000
Data Quality	.855	.028	.890	30.9748	.000

A correlation analysis revealed a strong, positive and statistically significant relationship on land administration effectiveness and data quality ($r = .890$, $p < .001$). This meant that there

was a link between improved outcomes in land administration and improved data quality in Nairobi County. The regression analysis also revealed that data quality statistically significantly positively influenced land administration effectiveness ($\beta = .890$, $p = .000$). In other words, for every one-unit improvement in the quality of NLIMS data, there would be .890-unit improvement in land administration effectiveness, with other variables being held constant.

The test result failed to accept the null hypothesis that there is no statistically significant effect of NLIMS data quality on land administration in Nairobi County, Kenya as it was found that the p-value is below 0.05. The results suggest that data quality is a key component to the success of digital land administration systems. A positive beta coefficient means that an increase in data quality, consistency, completeness and reliability makes an important contribution to the better delivery of services, minimising land dispute, increasing transparency and public confidence in land administration processes. The results also indicate that if the data underlying digital land systems is of poor quality, then the goals set forth for these systems will not be met.

The aim of this study was to analyse NLIMS data quality and its impact on land administration effectiveness in Nairobi County, Kenya. The results offer strong empirical evidence to support the fact that data quality is key and statistically significant in administrative performance of digital land governance. The descriptive and inferential findings are combined in the discussion below, which is set in the context of the previous empirical literature, includes the statements of the stakeholders in the qualitative portion of the study, and culminates in a comparison of the findings with the theories underlying the study.

The descriptive analysis indicated that most of the respondents had a general view that NLIMS Data Quality was well implemented with an average score of 3.64 and SD value of 0.69. The top-rated indicators were in relation to mandatory field completion during land transactions ($M = 3.69$, $SD = 0.79$) and trust in the reliability of the information retrieved from the land ($M = 3.65$, $SD = 0.77$). Overall, these findings indicate that automated data capture procedures and system-mandated data completeness have been able to reduce data omissions and improve stakeholder trust in digital records. The result is in line with Vatsa and Chhaparwal (2021), who found that the automation of validation mechanisms in e-government systems could greatly enhance the accuracy of administration and trust of the public. Likewise, Nshuti (2021) noted that real-time verification in Rwanda's Land Tenure Regularization Program (LTRP) streamlined manual reconciliation processes and improved land administration outcomes. The observed low standard deviations for all the items suggest uniformity in the experiences of the stakeholders, thus supporting the idea of NLIMS having institutionalized good data management practices in the various professional roles in Nairobi County.

Descriptive results were confirmed by inferential statistical analysis. The results of the Pearson correlation showed that high quality NLIMS data was strongly positively correlated with the effectiveness of land administration ($r = .890$, $p < .001$), meaning that there is a close relationship between the improvement of the accuracy, completeness, and timeliness of NLIMS data and improved land administration outcomes. The results of the simple linear regression analysis showed that data quality is significant in explaining the variance of land administration effectiveness, $R^2 = .791$, $p < .001$. The unstandardized regression coefficient $B = .855$ indicates that, for every one unit increase in perceived data quality, land administration effectiveness also increases by .855 units. The standardized beta coefficient $\beta = .890$, $p < .001$, is excellent in indicating the predictability of the regression. Thus, the null hypothesis which assumed that the quality of the data at NLIMS has no statistically significant impact on the land administration was rejected with great certainty. These statistics clearly demonstrate how important having accurate digital records is to help shorten verification times, prevent ownership disputes, and improve transparency in institutions. The effect size is larger than is usually reported in the digital public service literature, indicating that data integrity is not just an add-on, but a key prerequisite to successful operation in high volume markets such as the city of Nairobi.

Taken together with the quantitative data, the qualitative findings from the key informants provided a qualitative understanding of how the statistical relationships that were identified in the data were manifested in day-to-day administrative practices. An automated cross-checking of parcel numbers by one land registrar led to almost half the time needed for verification, and a surveyor indicated that clean data avoided boundary dispute resolution for weeks. These word-for-word reports validate the regression results, and show that automated data validation and legacy data reconciliation directly impacts measurable workflow efficiency and litigation costs. But, respondents also cited continued issues, especially the continued existence of substandard historical records that need to be audited on an ongoing basis prior to migration. This qualitative difference brings about some differences in perception about the consistency of data across modules, and reinforces the need to have committed data cleansing procedures in place when implementing the technology.

The results are also supported by the Technology Acceptance Model (TAM) that suggests that perceived usefulness of the system is strongly dependent on the reliability and accuracy of information output. The more stakeholders feel confident that NLIMS keeps comprehensive and up-to-date data, the more likely they are to embrace and fully use the platform regularly, further boosting administrative effectiveness. Institutional Theory also supports this explanation because it offers a way to understand how the use of standardized data protocols and automated compliance checks institutionalize accountability and decreases

discretionary problematic behaviors. The empirical results corroborate Bernard (2021)'s findings that automated cleaning tools significantly enhanced the accuracy of land records in Kisii County, and Maungu (2023) who found that pre-implementation audit significantly improved land records accuracy in Baringo County. The results are inconsistent with the results reported by Ali (2020) who found an insignificant relationship between data quality and organizational performance in the banking environment in Jordan. The difference may be due to the contextual differences, because land administration is based on accurate and verified spatial and ownership data, while accounting information systems is based on processed financial data over the accuracy of the data inputs. The present study has therefore found that in land governance, quality data is essential for successful operations.

Finally, the results of the discussion are summarized to confirm that the data quality of NLIMS has significant and positive effect on the effectiveness of land administration in Nairobi County in a statistically significant way. The blend of descriptive consistency, robust regression predictive power, supporting qualitative findings and theory alignment shows that robust, complete and reliable digital land records are the operational backbone of modern land governance. These gains can be further strengthened by implementing continuous validation protocols and establishing automated accuracy checks. The results offer empirical evidence-based actionable recommendations to policymakers, system developers and land administration practitioners to optimize digital land platforms in Kenya and similar jurisdictions.

Summary of Findings

The objective aimed at assessing the impact of NLIMS data quality on land administration in Nairobi County, Kenya. The study confirmed that data quality was positively significant and strongly related to the effectiveness of land administration. There was a high positive correlation between the data quality and land administration effectiveness and the regression analysis also confirmed that the data quality was found to be statistically significant with the land administration effectiveness. Qualitative results also verified that automated tools for validation, real-time systems for verification, and GIS-based records increased the confidence in the land information and filters out deceptive land transactions.

CONCLUSIONS

Based on the summary of findings of the first objective that NLIMS data quality was positively significant and strongly related to the effectiveness of land administration in Nairobi County, Kenya, the study concludes that increased data accuracy, completeness, consistency and reliability significantly improve transparency, minimise land disputes, deliver improved

services and boost public confidence in land administration processes. This demonstrate that digital land administration systems can only realize their desired goals if reliable and of good quality data management frameworks support them.

RECOMMENDATIONS

Based on the conclusion that increased data accuracy, completeness, consistency and reliability significantly improve transparency, minimise land disputes, deliver improved services and boost public confidence in land administration processes, the study suggests that the Ministry of Lands and Physical Planning should enhance the real-time data validation systems, institutionalize periodic data quality audits and strengthen the integration of GIS technologies into NLIMS. The ministry should also provide greater training of its staff on digital records management and standardize the procedures for data entry and verification to minimize inconsistencies and improve the reliability of land records. Future studies should also further investigate the influence of cybersecurity frameworks, digital trust and stakeholders' perceptions on the adoption and sustainability of the digital LAS in Kenya. Further, comparative studies across several counties should be done to highlight contextual differences that influence effectiveness of NLIMS in various regions in Kenya.

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Conflict of Interest

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