Received: 10th May 2025, Accepted: 21st May 2025, Published: 24th May 2025

INTERNATIONAL JOURNAL OF REAL ESTATE
IJRE
ISSN: 2476-8073

ANALYSIS OF THE FACTORS AFFECTING THE ADOPTION OF GIS/LIS IN BIRNIN KEBBI, KEBBI STATE, NIGERIA

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DOI: https://doi.org/10.5281/zenodo.15505404

Abstract

The adoption of Geographic Information Systems (GIS) and Land Information Systems (LIS) is crucial for effective land administration and governance. This study investigates the factors influencing GIS/LIS adoption in Kebbi State, Nigeria, focusing on the role of the Geographic Information System Agency (KEBGIS). Using a combined theoretical framework that integrates the Theory of Planned Behavior (TPB), the Technology Acceptance Model (TAM), and the Diffusion of Innovation Theory (DOI), the study identifies key determinants of adoption, including perceived usefulness, ease of use, organizational support, and personal innovativeness. Data were collected through a structured questionnaire administered to 102 participants across various government ministries and land-related organizations. Structural equation modeling revealed that attitudes, perceived behavioral control, and personal innovativeness significantly influence adoption intentions, while subjective norms play a limited role. Key barriers identified include inadequate infrastructure, skill gaps, financial constraints, and resistance to change. The study recommends targeted awareness campaigns, enhanced organizational support, capacity building, and fostering personal innovativeness to improve adoption rates. These findings provide valuable insights for policymakers and stakeholders in developing robust land administration systems in Nigeria and similar contexts.

Key Words: Geographic Information Systems, Land Information Systems, Adoption, Kebbi State, Nigeria, Technology Acceptance Model, Diffusion of Innovation.

1.0 Introduction

Land administration is a fundamental component of governance that directly impacts economic development, environmental sustainability, and social stability. Effective land administration ensures equitable access to land resources, transparent property rights, and efficient land-use planning, all of which are vital for fostering sustainable development. In the context of developing countries, including Nigeria, these objectives are often hindered by systemic inefficiencies, outdated administrative frameworks, and limited technological integration (Ho & Rajabifard, 2016).

Geographic Information Systems (GIS) and Land Information Systems (LIS) have emerged as critical tools for addressing these challenges. GIS involves the capture, storage, analysis, and management of spatial data, enabling precise and efficient decision-making in land administration. LIS, as an extension of GIS, focuses specifically on land-related data, supporting activities such as cadastral management, land registration, and land-use planning (William, Enemark, Wallace, & Rajabifard, 2010). These technologies offer transformative potential for improving the efficiency, transparency, and accountability of land administration systems, particularly in places like Birnin Kebbi, Kebbi State, Nigeria, where traditional practices have often led to land disputes, revenue losses, and inefficiencies as reported in Bakuwai (2025; 2018).

Despite their recognized benefits, the adoption of GIS/LIS in developing regions remains limited (Zeng & Cleon, 2018). Several factors contribute to this slow uptake, including infrastructural deficiencies, lack of technical expertise, financial constraints, and resistance to change among stakeholders. Rogers' Diffusion of Innovation Theory (2003) provides a framework for understanding how technological innovations spread within a society, emphasizing the roles of knowledge, persuasion, decision-making, implementation, and confirmation in adoption processes. Similarly, the Technology Acceptance Model (TAM) (Davis, 1989) highlights perceived usefulness and ease of use as critical determinants of technology acceptance. These theoretical models, combined with the Theory of Planned Behavior (TPB) (Ajzen, 1991), form the basis for investigating the factors influencing GIS/LIS adoption in Kebbi State.

Kebbi State's reliance on agriculture and land-based activities underscores the importance of efficient land administration. The KEBGIS has been at the forefront of efforts to modernize land administration through the implementation of GIS/LIS technologies. However, these initiatives face significant barriers, including limited public awareness, inadequate infrastructure, and insufficient policy support (Bakuwai B. S., 2025). This study aims to address these gaps by examining the factors influencing GIS/LIS adoption in Kebbi State, with a particular focus on the roles of individual attitudes, organizational support, and socio-economic challenges.

The findings of this study, similar to Zeng & Cleon (2018), are expected to contribute to the growing body of literature on GIS/LIS adoption in developing countries contexts and provide actionable recommendations for policymakers, land administrators, and other stakeholders. By understanding the dynamics of adoption and addressing the barriers identified, this research seeks to support the development of robust and sustainable land administration systems in Kebbi State and beyond.

https://doi.org/10.5281/zenodo.15505404

2.0 The study area

Birnin Kebbi, the capital of Kebbi State, is located in the northwestern region of Nigeria. Geographically, it lies between latitudes 10°06'N and 12°15'N and longitudes 3°30'E and 5°00'E. The city serves as the administrative, cultural, and economic hub of Kebbi State and occupies a land area of approximately 2,404 square kilometers.

Birnin Kebbi experiences a tropical continental climate characterized by two distinct seasons: a wet season lasting from May to October and a dry season from November to April. The average annual rainfall is about 800mm, and temperatures range between 21°C and 40°C throughout the year. The dry season is often influenced by the harmattan winds, which bring cool, dry air from the northeast.

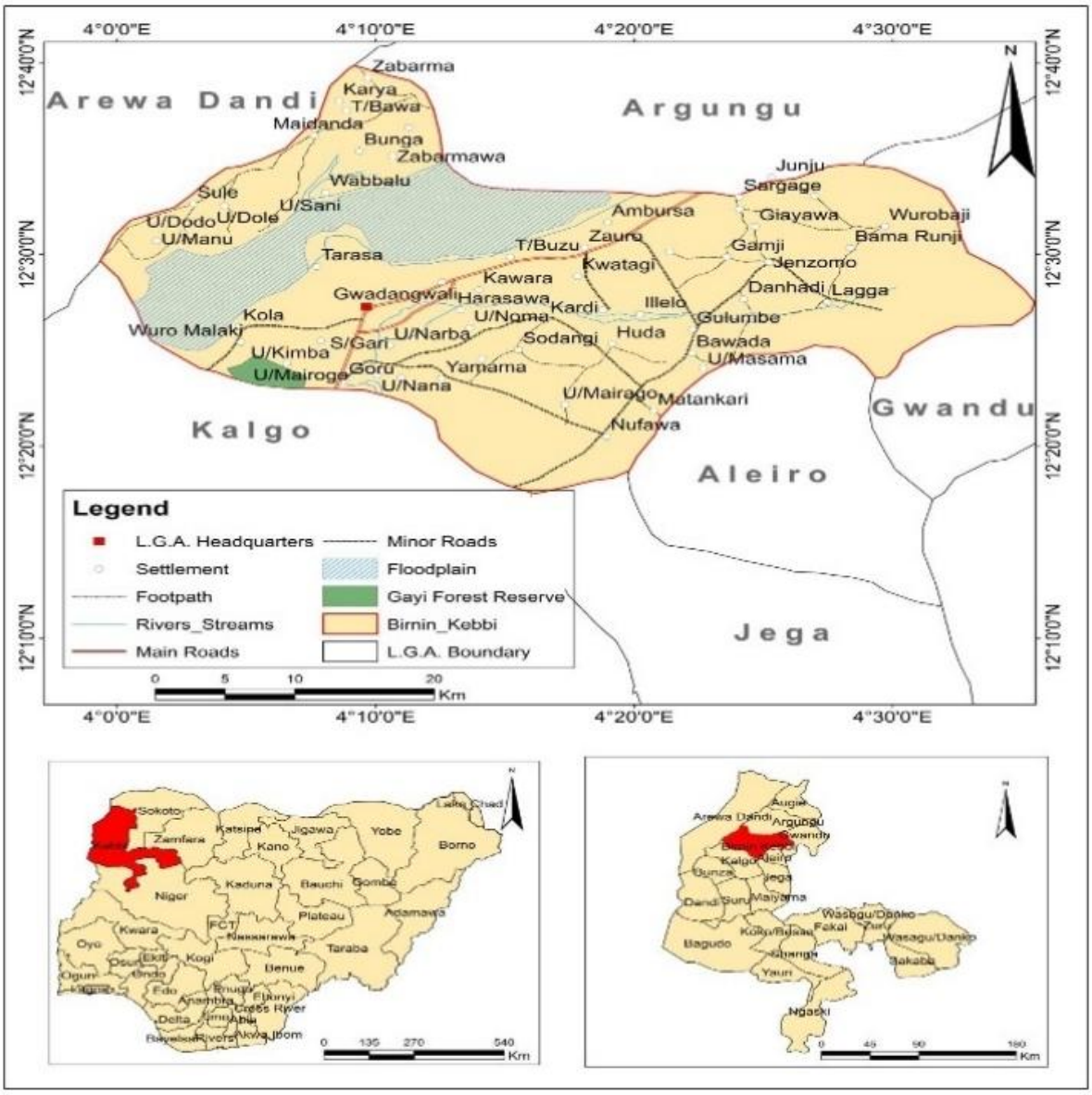


Figure 1: Study Area
Source: Adopted and Modified from KEBGIS

The city is situated along the Sokoto River, which provides a vital water source for agriculture, industry, and domestic use. The topography is predominantly flat, with occasional undulating terrain, making it suitable for both urban expansion and agricultural activities. The soil type in the area is largely sandy-loam, supporting the cultivation of staple crops such as millet, sorghum, and rice.

Birnin Kebbi's urban structure includes diverse land uses such as residential, commercial, institutional, and industrial areas. Notable landmarks include the Waziri Umaru Federal Polytechnic, Kebbi State University of Science and Technology, and the Kebbi International Airport. Additionally, the city is known for its cultural significance, hosting festivals such as the Argungu International Fishing Festival, which attracts visitors from across Nigeria and beyond.

Despite its potential for growth, Birnin Kebbi faces challenges related to land administration, including land refrigeration. Large parcels of land allocated for public and institutional purposes often remain underutilized, creating urban voids and hindering coordinated physical development. The city's expanding population and increasing demand for land make it imperative to address these issues to ensure sustainable urban growth and efficient resource management. This study focuses on the patterns of land refrigeration in Birnin Kebbi and its implications for urban planning and development, with the goal of proposing actionable solutions to optimize land use and enhance the city's overall development trajectory.

3.0 Research model and hypotheses

3.1. Research model

According to the theory of Diffusion of Innovations (DOI), the diffusion of Geo-ICT technologies, such as GIS and LIS, is influenced by human, organizational, and managerial factors (Nedović-Budić & Godschalk, 1996). Previous studies have shown that GIS diffusion is affected by the nature of the technology, organizational structure, and the interaction between the two (Berisso & deVries, 2010; Masser & Campbell, 1996). Recent studies have also evaluated critical success factors for GIS implementation, such as management attitudes, organizational characteristics, and human factors (Eldrandaly, Naguib, & Hassan, 2015).

For example, research in Uganda demonstrated that the adoption of GIS by institutions followed a classic diffusion pattern consistent with DOI theory (Eria & McMaster, 2016). Based on these findings, it can be posited that an individual's decision to accept Geo-ICT-based LIS is primarily determined by psychological factors. Attitude-based intention models, such as the Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), and DOI, provide useful mechanisms for exploring factors influencing LIS adoption.

This study employs the TPB as its foundational premise, integrating it with other theories (e.g., TAM and DOI) to examine the determinants of LIS technology adoption among Kebbi State government employees. The TPB is particularly relevant as it applies to social behaviors and the adoption of information technology. Additionally, the TPB has been successfully utilized in various fields, including agricultural conservation (Borges, Tauer, & Lansink, 2016; Ozkan & Kanat, 2011; Van Hulst & Posthumus, 2016).

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One of the advantages of the decomposed TPB model is its ability to incorporate variables related to human characteristics and social change processes, thus enriching models of IT implementation. Constructs such as subjective norms and perceived behavioral control, which are absent from TAM, are integral to TPB. This study hypothesizes that employees' intentions to adopt LIS will be influenced by factors such as attitudes, subjective norms, and perceived behavioral control.

Previous studies have demonstrated that constructs related to the use-productivity contingency, such as perceived usefulness, ease of use, and job fit, are strong predictors of adoption behavior. In this model, TAM factors, such as perceived usefulness and perceived ease of use, are considered in the context of information system usage, which relates to outcome expectations (Ozkan & Kanat, 2011).

Social factors, particularly subjective norms, are assumed to have two components: injunctive norms (beliefs about what ought to be done) and descriptive norms (beliefs about what others are doing). In this study, visibility (the degree to which one can see others in the organization using the system) is adapted from the DOI model (Van Hulst & Posthumus, 2016).

Perceived behavioral control is represented as a hierarchical model consisting of perceived self-efficacy and perceived controllability. External factors, such as organizational support, are considered critical for providing individuals with the resources, control, and opportunities necessary to adopt LIS (Zhang, Guo, & Chen, 2011).

Since LIS technologies are relatively new to Kebbi State, theoretical guidance is essential for individuals to understand and adopt them. The model incorporates personal innovativeness as a key construct to represent adopters' characteristics. According to DOI theory, more innovative individuals actively seek information about new technologies and adopt them earlier than others (Agarwal & Prasad, 1998; Rogers, 2005).

Ultimately, the research model comprises 11 constructs:

i. **Independent Variables:** Perceived usefulness, perceived ease of use, normative beliefs, visibility, self-efficacy, and organizational support.
ii. **Intervening Variables:** Attitude, subjective norms, perceived behavioral control, and personal innovativeness.
iii. **Dependent Variable:** Intention to adopt LIS.

The theoretical model is graphically presented in Figure 2. This study tests the hypothesized relationships within the model to explain their influence on employees' intentions to adopt LIS in Birnin-Kebbi.

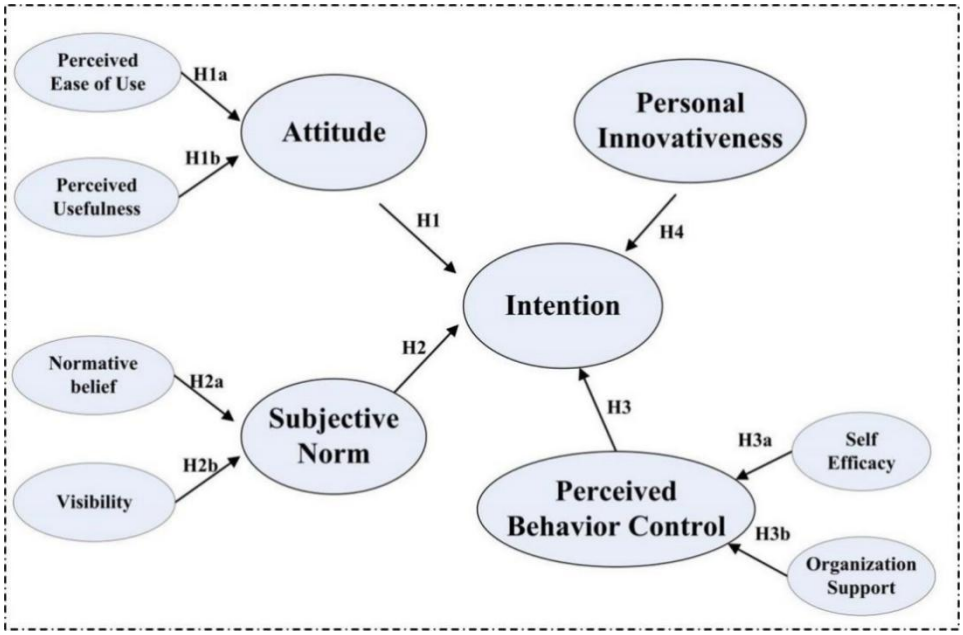


Figure: 2. The theoretical model
Source: Adopted from Rogers (2005)

3.2. Survey Design

The questionnaire was designed to capture demographic data, knowledge of LIS, attitudes toward adoption, perceived usefulness and ease of use, organizational and social factors, and personal innovativeness. Responses were recorded on a five-point Likert scale. The constructs and their indicators were adapted from validated instruments used in similar studies (Cheng et al., 2006; Venkatesh et al., 2003).

3.3. Data Collection

A total of 102 participants, representing various government ministries and land-related organizations in Birnin-Kebbi, completed the survey based on convenience and purposive sample selection methods. Participants were categorized based on their familiarity with LIS, computer usage, and work experience. The diverse sample ensured a comprehensive understanding of LIS adoption dynamics within the city.

4. Findings and discussion

4.1 Concept of LIS in Birnin Kebbi, Kebbi State

a. Knowledge and Awareness of LIS in Birnin Kebbi, Kebbi State

Knowledge and awareness of Land Information Systems (LIS) are pivotal factors in their adoption and effective utilization. Awareness campaigns and education on LIS functionalities help in dispelling misconceptions about their complexity and emphasize their potential benefits. Stakeholders often lack a clear understanding of how LIS can enhance land administration by improving transparency, efficiency, and revenue generation (Enermark, Mclaren, & Lemmen, 2016).

https://doi.org/10.5281/zenodo.15505404

Research has shown that knowledge significantly correlates with technology adoption. For example, the Diffusion of Innovation Theory highlights the role of information in persuading early adopters to accept and implement new technologies (Rogers, 2005). In the context of Kebbi State, awareness initiatives are constrained by inadequate funding and limited stakeholder engagement, particularly in rural areas where literacy levels are generally low. The survey revealed varying levels of LIS awareness, with 50% of respondents reporting good to excellent knowledge. However, only 35% had direct experience with LIS, indicating a significant gap between awareness and practical usage. Similar patterns have been observed in other developing regions where technological diffusion is nascent (Dhakal, 2016). Table 1: provides an overview of the levels of knowledge and awareness of LIS among key stakeholders in Birnin-Kebbi, based on a survey conducted for this study.

Table 1: Levels of Knowledge and Awareness of LIS Among Stakeholders in Birnin Kebbi, Kebbi State

Stakeholder Group	Percentage with Basic Awareness (%)	Percentage with Comprehensive Knowledge (%)	Remarks
Government Officials	60	25	Basic training received, limited application.
Private Sector Professionals	75	40	High interest, but training opportunities are limited.
Community Leaders	30	10	Low awareness due to lack of outreach.
General Public	20	5	Minimal exposure to LIS technologies.

The data reveals significant gaps in knowledge, particularly among community leaders and the general public. Government officials and private sector professionals exhibit higher levels of awareness, but comprehensive knowledge remains low across all groups. These findings underscore the need for targeted training programs and outreach campaigns to bridge the knowledge gap and foster greater adoption of LIS technologies. Improving knowledge and awareness of LIS is crucial for their successful implementation in land administration systems. Policymakers should prioritize education and training initiatives, leveraging both traditional and digital platforms to disseminate information about LIS benefits and applications. By addressing the existing knowledge gaps, Birnin Kebbi and indeed Kebbi State, can accelerate the adoption of LIS technologies and unlock their potential for sustainable land management and economic development.

b. Attitude and Perceived Usefulness

Respondents generally perceived LIS as beneficial for job productivity and land administration efficiency. Positive attitudes were significantly influenced by perceived usefulness and ease of use, emphasizing the need for intuitive system design and training. These findings align with the Technology Acceptance Model (Davis, 1989).

c. Organizational and Social Factors

While organizational support was a critical enabler of adoption, subjective norms played a less significant role. This finding suggests that intrinsic motivation and institutional resources outweigh peer influences in this context (Taylor & Todd, 1995).

4.2 LIS adoption in Birnin Kebbi, Kebbi State

The study examines key factors influencing the adoption of LIS and hypothesizes that these factors collectively shape users' intentions to adopt LIS. These hypotheses are anchored in theoretical and empirical studies on technology adoption, particularly in developing regions (Berisso & deVries, 2010). The study hypothesizes that these factors collectively influence LIS adoption intentions. The hypotheses are grounded in empirical research on technology adoption in developing regions (Berisso & deVries, 2010).

Table 2 below shows the list of variables identified as influencing LIS adoption. Each factor is analyzed based on the percentage of respondents who selected "Strongly Agree," "Agree," "Neutral," "Disagree," or "Strongly Disagree."

a. Attitude:

Attitude towards LIS refers to individuals' overall evaluation of the system, particularly the belief that adopting LIS will lead to positive outcomes in land administration. According to the Technology Acceptance Model (TAM) proposed by (Davis, 1989), a favorable attitude often stems from the perception that a system is valuable and relevant to one's tasks. In the context of LIS, attitudes are shaped by its perceived efficiency in streamlining land administration processes, improving accuracy, and promoting transparency in operations. A high percentage of respondents (55% strongly agree, 35% agree) believe LIS positively impacts land administration, showing a strong favorable perception.

b. Perceived Usefulness and Ease of Use:

Perceived usefulness represents the degree to which individuals believe that utilizing LIS will enhance their job performance. Complementing this is perceived ease of use, which denotes the extent to which users view LIS as simple and intuitive to operate. These constructs, derived from TAM (Davis, 1989), suggest that when technology is perceived as both effective and user-friendly, its adoption becomes more likely. In LIS, these factors are critical, as the complexity of land administration tasks requires tools that are not only effective but also accessible to a broad range of users. 90% of respondents (60% strongly agree, 30% agree) find LIS beneficial for enhancing job performance. 90% of respondents perceive LIS as user-friendly, indicating its accessibility.

c. Organizational Support:

Organizational support encompasses the institutional backing provided to individuals or departments in adopting LIS. This includes resources, training, technical assistance, and managerial encouragement. As highlighted by Igbaria and Iivari (1995), organizational support plays a pivotal role in overcoming resistance to change and fostering a culture conducive to technology adoption. In the case of LIS, such support ensures that users have the necessary skills and confidence to integrate the system into their workflows. Organizational encouragement seems weaker compared to other factors, with only 45% strongly agreeing and 30% agreeing.

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d. **Personal Innovativeness:**

Personal innovativeness refers to an individual's propensity to embrace and experiment with new technologies. Agarwal and Prasad (1998) describe this trait as a critical determinant in the adoption process, as innovative individuals are more likely to perceive the potential benefits of technology and overcome initial challenges. For LIS, individuals with high personal innovativeness may act as early adopters, setting a precedent for wider acceptance within their organizations. Slightly lower agreement percentages indicate individual readiness to adopt technology varies.

e. Subjective Norms:

Subjective norms capture the influence of social factors, such as peers, supervisors, and societal expectations, on an individual's decision to adopt LIS. According to Taylor and Todd (1995), social pressure can significantly impact behavioral intentions, particularly in collectivist cultures where group consensus is valued. In LIS adoption, the endorsement and encouragement from influential figures within an organization or community can act as a powerful motivator for users to engage with the system. Social influence is significant, with 90% (52% strongly agree, 38% agree) reporting it affects their LIS adoption intentions.

Table 2: Key Factors Influencing LIS Adoption in Birnin Kebbi (Percentages)

Key Factor	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
Attitude	55%	35%	7%	2%	1%
Perceived Usefulness	60%	30%	6%	3%	1%
Perceived Ease of Use	50%	40%	7%	2%	1%
Organizational Support	45%	30%	15%	7%	3%
Personal Innovativeness	40%	35%	15%	7%	3%
Subjective Norms	52%	38%	6%	3%	1%

4.3. Challenges in LIS Adoption

The adoption of Land Information Systems (LIS) in Birnin-Kebbi is hindered by several challenges that span technical, financial, institutional, and socio-cultural dimensions. These barriers are not only interconnected but also reflective of the broader systemic issues affecting technology adoption in developing regions.

One of the most significant challenges is the lack of infrastructure. Many areas of Birnin-Kebbi, particularly the hinterland areas, lack the necessary technological infrastructure, such as reliable internet access and electricity, to support LIS implementation. Financial constraints further exacerbate the problem, as both public institutions and private stakeholders struggle to secure the funding required for acquiring and maintaining LIS technologies.

Human resource limitations also pose a critical barrier. The scarcity of skilled personnel with expertise in GIS/LIS undermines the effectiveness of adoption efforts. Existing staff often require extensive training to utilize these systems effectively, adding to the financial burden. Institutional resistance to change, driven by entrenched bureaucratic practices and a lack of political will, further delays the adoption process. Finally, socio-cultural factors, including low literacy levels and resistance to technological change, particularly among older stakeholders, contribute to the slow uptake of LIS technologies. Table 3 below illustrates the key challenges in LIS adoption as identified in the study.

Table 3: Key Challenges in LIS Adoption

Challenge	Description	Impact on Adoption
Inadequate Infrastructure	Poor internet connectivity and unreliable power supply.	Limits system accessibility and functionality.
Financial Constraints	High costs of LIS software, hardware, and maintenance.	Discourages investment in LIS technologies.
Human Resource Limitations	Lack of skilled personnel and inadequate training programs.	Reduces operational efficiency and effectiveness.
Institutional Resistance	Bureaucratic practices and lack of political support.	Slows down decision-making and implementation processes.
Socio-Cultural Barriers	Resistance to change and low literacy levels in rural areas.	Hinders stakeholder engagement and acceptance of LIS technologies.

Addressing these challenges requires a multi-faceted approach. Policymakers should prioritize investments in infrastructure development and capacity-building initiatives. Financial incentives, such as subsidies and grants, can encourage both public and private sector participation. Additionally, institutional reforms aimed at streamlining bureaucratic processes and fostering a culture of innovation are essential. Finally, targeted awareness campaigns should focus on educating stakeholders about the benefits of LIS adoption and addressing cultural resistance to change.

Improving knowledge and awareness of LIS is crucial for their successful implementation in land administration systems. Policymakers should prioritize education and training initiatives, leveraging both traditional and digital platforms to disseminate information about LIS benefits and applications. By addressing the existing knowledge gaps, Kebbi State can accelerate the adoption of LIS technologies and unlock their potential for sustainable land management and economic development.

a. Infrastructure deficiencies:

One of the most pressing challenges in adopting Land Information Systems (LIS) is the lack of adequate infrastructure, including limited access to necessary hardware, such as computers, servers, and data storage facilities, as well as software specifically designed for land administration tasks. Additionally, unstable power supply and unreliable internet connectivity, which are common in many developing regions, further exacerbate the problem. Without robust infrastructure, the implementation and operation of LIS are significantly hindered.

https://doi.org/10.5281/zenodo.15505404

b. Skill gaps:

The successful adoption and utilization of LIS depend heavily on the technical skills of public servants and other stakeholders. However, many individuals tasked with implementing LIS often lack the required training and expertise to operate the system efficiently. The absence of comprehensive training programs and capacity-building initiatives results in a workforce that is ill-equipped to handle the technical and operational demands of LIS, leading to inefficiencies and errors.

c. Financial barriers:

Implementing LIS involves substantial financial investment, including the procurement of technology, infrastructure development, and capacity-building initiatives. Many government institutions, particularly in resource-constrained settings, struggle to allocate the necessary funds. The high costs of acquiring software licenses, maintaining hardware, and hiring skilled personnel often become prohibitive, delaying or halting LIS implementation efforts.

d. Resistance to change:

Transitioning from traditional, paper-based systems to a digital LIS often encounters significant resistance from stakeholders. This hesitancy stems from various factors, including fear of the unknown, reluctance to learn new systems, and concerns about job security. Long-established practices and processes create a sense of familiarity and comfort, making stakeholders resistant to adopting innovative approaches. Without effective change management strategies, this resistance can pose a major obstacle to LIS adoption.

5.0 Conclusion and recommendations

5.1 Conclusion

The successful adoption and implementation of Geographic Information Systems (GIS) and Land Information Systems (LIS) in Kebbi State are contingent upon addressing the critical barriers and leveraging the key enablers identified in this study. The findings underscore the importance of overcoming challenges such as inadequate infrastructure, skill gaps, financial constraints, and resistance to change. By addressing these obstacles, stakeholders can unlock the potential of LIS to transform land administration practices.

To achieve this, raising awareness among stakeholders about the benefits of LIS is crucial. Targeted campaigns, workshops, and demonstration projects can help demystify the technology, fostering greater acceptance and understanding. Equally important is strengthening organizational support, which includes allocating sufficient resources, providing technical assistance, and creating policies that prioritize LIS integration. These measures can help create an institutional framework that facilitates seamless adoption and use of the system.

Additionally, investments in infrastructure and capacity building are pivotal. Governments and agencies must ensure the availability of reliable IT infrastructure and provide comprehensive training programs to equip personnel with the necessary skills. A skilled and confident workforce is essential for the effective operation of LIS, ensuring its long-term sustainability and success.

Promoting personal innovativeness among individuals is another critical factor. Encouraging early adopters to champion LIS within their organizations can accelerate acceptance, while fostering a culture of continuous learning and innovation can help sustain adoption momentum. Recognizing and rewarding individuals who embrace the technology can further motivate others to follow suit.

By focusing on these strategies, policymakers and stakeholders can create a conducive environment for LIS general acceptance and full adoption in Kebbi State. This will not only enhance the efficiency and transparency of land administration but also contribute to improved governance, reduced disputes, and sustainable development. Ultimately, the successful implementation of LIS can serve as a model for other regions seeking to modernize their land administration systems.

5.2 Recommendations

a. **Enhancing Awareness**

To promote the widespread adoption of LIS, government agencies like KEBGIS should implement targeted awareness campaigns designed to inform stakeholders about the system's benefits. These campaigns can include workshops, public demonstrations, and community outreach programs that emphasize how LIS improves land administration efficiency, reduces disputes, and enhances transparency. Partnerships with local media outlets, community leaders, and traditional authorities can also help to disseminate information more effectively. Additionally, leveraging success stories from other regions where LIS has been successfully implemented can further illustrate its advantages and motivate stakeholders to embrace the technology (Rogers, 2005).

b. **Strengthening Organizational Support**

Creating an enabling environment for LIS adoption requires robust organizational support. This includes allocating sufficient funding for system development and operation, providing continuous technical assistance, and ensuring the availability of required hardware and software. Organizations should also establish clear policies that prioritize LIS integration and offer incentives, such as professional development opportunities or recognition programs, to encourage staff participation. Furthermore, leadership commitment is essential; managers and decision-makers must actively advocate for LIS and demonstrate its value to organizational goals (Igbaria & Iivari, 1995).

c. **Addressing Infrastructure and Training Needs**

A major barrier to LIS adoption is inadequate infrastructure and the lack of skilled personnel. Governments must prioritize investments in modern IT infrastructure, including reliable internet connectivity, server facilities, and secure data storage systems. Alongside this, comprehensive training programs must be developed to equip users with the necessary skills to operate LIS effectively. These training programs should cater to various levels of expertise, from beginners to advanced users, and incorporate hands-on sessions to ensure practical understanding. Additionally, periodic refresher courses can help users stay updated on system upgrades and best practices (Eria & McMaster, 2016).

https://doi.org/10.5281/zenodo.15505404

d. **Promoting Personal Innovativeness**

Encouraging individuals to take initiative in adopting LIS is crucial for its success. Organizations should identify and empower early adopters who are willing to experiment with the system and serve as advocates within their teams. These early adopters can act as role models, demonstrating the benefits of LIS and helping to build confidence among other users. Incentives such as recognition, awards, or career advancement opportunities can further motivate individuals to embrace innovation. Additionally, creating a culture that values continuous learning and experimentation will foster an environment where personal innovativeness thrives (Agarwal & Prasad, 1998).

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