

Design and Implementation of a Secure E-Commerce Platform for Efficient Land Leasing Services in Developing Economies

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Abstract: This study presents a scalable and secure e-commerce platform for land leasing services aimed at addressing inefficiencies in traditional leasing systems. The primary motivation for this project is to bridge the critical gap between landowners with underutilized assets and potential lessees seeking accessible land, thereby creating a more transparent and efficient digital marketplace. The development process was guided by a user-centric methodology, initiated with comprehensive market research to identify key user pain points and requirements. This research directly informed the platform's architecture, leading to the integration of essential features such as advanced search functionality with filtering options for land type, size, location, and price, alongside secure, in-built communication tools to facilitate direct and protected negotiation between parties. The proposed system integrates advanced search mechanisms, secure online payment systems, and real-time communication features. Developed using PHP, MySQL, HTML, and Bootstrap, the system was evaluated against traditional methods. Results indicate improved transaction speed, enhanced data security, and increased user satisfaction. The study contributes to digital transformation in real estate systems within developing economies

Keywords: E-commerce, Land Leasing, Web Application, Digital Platform, Secure Systems

1. INTRODUCTION

A land lease system is a system that allows a land owner to rent a plot of land to an interested user for a fee. It often involves signing an agreement between the land owner (lessor) and the intended tenant [10]. The purpose of the lease may be for agricultural use, building a home, or opening a business.

Land lease could also be seen as the written document or contract, admissible in court of law, as an agreement between a landowner (lessor), and the tenant (lessee) which allows the tenant to occupy a piece of land for a particular period of time and for a specified purpose in exchange for rent [18]. So, when it comes to the land lease, certain things are involved: the land, the owner, the tenant, the rent, and the agreement.

In Nigeria, land lease constitutes a major component in real estate sector and national development. According to the revised statistics, the real estate sector contribution to Nigeria's GDP 2025 emerged as

the third largest economic sector with 12.8% in the second quarter Q2 [19]. Land leasing remains a vital economic activity, particularly in developing regions. However, traditional systems are plagued by inefficiencies such as manual processing, lack of transparency, and fraud risks.

A considerable body of research has focused on addressing the challenges affecting land leasing systems in Nigeria. Most of these researches centered on ineffective implementation of the 1978 land use act; addressing the haphazard urban expansion in satellite settlements; land administration and project management; and review of government policies surrounding land use. Very few researchers been done to bridge the challenge been faced by intending tenants to access available lands from remote locations and secure deals with transparency without the hassles of traditional paper-based land lease system [4][5][6][17].

In many regions of Nigeria, the key limitation to effective land use is not the lack of land or interested parties, but the absence of a reliable platform that connects landowners with potential tenants. The current leasing system relies more on the use of paper documents; the orientation of the land owner and the land agent; the reputation of the owner and the land agent; and the physical verification of the intended land. This could be frustrating for the tenants to conclude the transaction. Especially where the landlord or the agents do not have business orientation leading to inadequate or disorganized record-keeping; risk of fraud, forgery, manipulation of physical documents amongst others.

This study proposes a third-party electronic commerce (e-commerce) platform to streamline land leasing processes and improve accessibility. The performance of proposed system will be measured by its ability to allow both the owner to advertise his available land on the internet using a third-party platform and allow the intending tenant to secure the right to use the land after verification, signing of agreements, paying the rent, obtaining the necessary documents to use the land. To facilitate efficient land leasing, the system will offer features such as user registration, property listing management, secure online payments and an organized database for managing lease agreements. Ultimately, the project's primary objective is to increase transparency, accessibility and efficiency in land leasing

2. LITERATURE REVIEW

An e-commerce-based land leasing platform is a digital system designed to facilitate seamless interactions between landowners and prospective tenants by enabling online listing, negotiation, documentation, and payment processes. The integration of e-commerce technologies into real estate has significantly transformed traditional land transaction systems by improving accessibility, transparency, and operational efficiency [11][16].

Existing studies emphasize that the success of e-commerce platforms largely depends on the integration of secure payment systems, user-friendly interfaces, and scalable system architectures capable of handling diverse user demands [13][7]. Despite these advancements, there remains a notable research gap in the development of land leasing platforms specifically tailored for rural and semi-urban communities, where challenges such as low digital literacy and poor internet connectivity persist [14].

From a system development perspective, the effectiveness of an e-commerce land leasing platform is influenced by key factors including customer satisfaction, cost efficiency, infrastructure availability, and the use of data-driven decision-making models. Systematic reviews of e-commerce applications reveal that incorporating analytics and user behavior insights significantly enhances platform performance and

adoption rates [8][15]. This study therefore explores how e-commerce technologies can improve the efficiency of land leasing processes, particularly in areas such as documentation, negotiation, and secure payment execution.

Architecturally, modern land leasing systems are built around core components such as search and filtering mechanisms, secure payment gateways, and lease management dashboards. Search and filtering tools enable users to identify suitable land based on criteria such as location, size, and lease conditions, while payment gateways ensure secure and trustworthy financial transactions. Lease management dashboards further support users in handling agreements, renewals, and dispute resolution [8] [15].

Security remains a critical concern in e-commerce applications. [12] highlights the importance of integrating robust payment gateway systems that address privacy and transaction security challenges, thereby enhancing user trust and platform credibility. Similarly, the implementation of encryption protocols and authentication mechanisms is essential for protecting sensitive user and transaction data [11].

User experience (UX) also plays a pivotal role in the adoption and usability of land leasing platforms. Research indicates that intuitive navigation, responsive design, and accessibility features significantly improve user engagement and satisfaction [8][9]. For rural deployment, additional considerations such as multilingual support and low-bandwidth optimization are crucial for inclusivity and broader adoption [14].

Several practical implementations of digital land leasing systems demonstrate the viability of this approach. In India, agricultural land leasing platforms have enabled landowners to lease underutilized land to smallholder farmers via mobile applications, thereby enhancing agricultural productivity and income generation [1]. In Europe, public-private partnership models have facilitated urban land leasing through integrated online portals that connect stakeholders, including government agencies and private developers [2].

Globally, platforms such as LandFlip and PropertyPro Africa illustrate the growing adoption of digital real estate marketplaces that support land transactions, including leasing. In Nigeria, platforms like Nigeria Property Centre provide online property listings that enable users to search, evaluate, and transact on land and housing properties, demonstrating the applicability of e-commerce solutions within the local context.

Despite these advancements, several challenges hinder the effective implementation of e-commerce land leasing systems. These include limited internet access in rural areas, low levels of digital literacy, regulatory complexities associated with land ownership and leasing laws, and concerns regarding data security and privacy [3][16]. Addressing these challenges is critical

for ensuring the sustainability and scalability of such platforms.

In summary, the literature reveals that while e-commerce technologies offer significant potential for transforming land leasing services, there remains a critical gap in adapting these solutions to local socio-economic and regulatory contexts. This study contributes to existing knowledge by examining how tailored e-commerce platforms can enhance land leasing efficiency while addressing the unique challenges of developing regions.

3 METHODOLOGY

The Waterfall development model was adopted. Data collection involved interviews, observations, and focus group discussions. System analysis and design were conducted using UML diagrams and database modeling techniques.

3.1 Input of the Existing System

Fig. 1 illustrates the step-by-step procedure involved in the conventional manual land leasing system, including land inspection, agreement preparation, payment processing, and documentation.

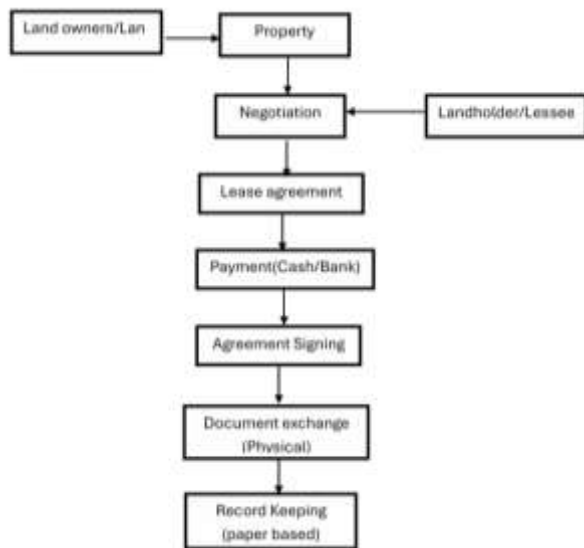


Figure 1 Traditional Land Leasing Process Flow

The manual land leasing system operates entirely through physical processes, without digital automation. This traditional approach requires paper documents, face-to-face interactions, and handwritten or typed records stored in filing systems. The input of this traditional system is usually the land lease agreement. Stating the parties involved and the responsibilities they owe to each other (See Figure1). This agreement is prepared by a lawyer.

3.2 Output of the Existing System

A manual land leasing system generates physical, paper-based outputs at every stage of the leasing process. Unlike digital systems, which produce electronic records, manual systems rely on handwritten documents, stamped approvals, and physical ledgers. This paper output is usually in form of a land certificate, which is issued to the tenant after all rents have been paid and the agreement has been certified by a lawyer.

3.3 Weakness of the Current System

The existing system is plagued with certain weaknesses. These are: errors and inaccuracies arising from wrong calculations; insufficient land leasing information; inconsistency and redundancy of data relating to the land; and high transaction costs result from costly agent commissions and intermediary fees. These weaknesses has affected the trust and patronage enjoyed by land owners.

3.4 Analysis of the New System

To address the limitations of the traditional system, a new system is proposed. The proposed system will be a web application that allows land owners and intending tenant to do business seamlessly.

The proposed system will maintain necessary records of relevant information about all leased land transactions made between landowners and lessees. It will record all leased land transactions made; produce timely and accurate lease reports for managerial use, aiding in planning, directing, and controlling land leasing activities, as well as supporting effective decision-making; and manage details for the rent and sale of land, accommodating any decisions related to client leasing.

4. SYSTEM ARCHITECTURE

The aim of this study is to create a website that makes renting land easier. Like an online marketplace for land, landowners can list their available land on the site. People who need land can easily search for it, see photos, and check the price. The goal is to replace slow, paper-based methods with a faster, safer, and more transparent system.

It includes secure online payments and checks to prevent scams, making the whole process more reliable for everyone involved. The user inter will be done using easy navigation to support users with varying levels of digital literacy. A centralized database with details like location, size, and price will be used to handle the property listing; where landowners can list available lands, as shown in Figure 2.

Other added features will include an advanced search and filtering tool; a secure payment system; and a lease management module to assist tenants find properties that match their expected criteria, to allow

safe transactions, and to allow management of correspondences between the land owner and the tenant, respectively.

The system consists of three major modules: User Management, Property Management, and Transaction Processing. The architecture ensures scalability, security, and efficient data handling.

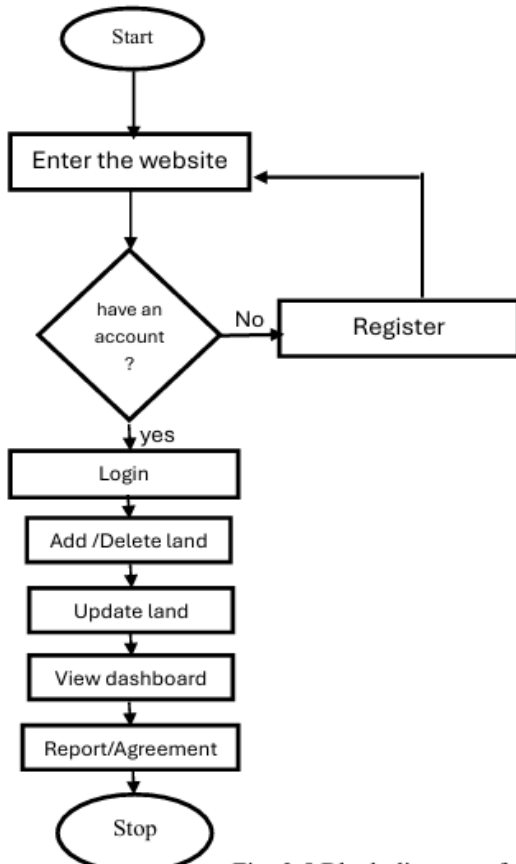


Figure 2: Architecture of the Proposed Land Leasing System

This proposed system is dependent on an administrator who has access to the entire system and can view or make changes as needed. It's open and closed for administrators and administrators alike. It is open to extension and closed to modification for landowners and landholders. Each owner can login and make an advertisement for his/her land. The entire data set is stored in a database, which is managed by an administrator. Landholders can select the desired land by reviewing the advertisement. Basically, the Figure 2 presents the overall structure of the proposed e-commerce land leasing platform, showing the interaction between users, database, payment system, and administrative modules. When users access this site, they are presented with various data entry choices and the methodology employed. Additionally, they can navigate the platform to discover its features, including user profiles, news feeds, other content,

group management tools, and more. The diagram below illustrates the different system modules accessible to users with restricted permissions, as well as those available to administrators, who have complete system access.

This diagram illustrates the capabilities of the system administrator, who has the highest level of control over the platform.

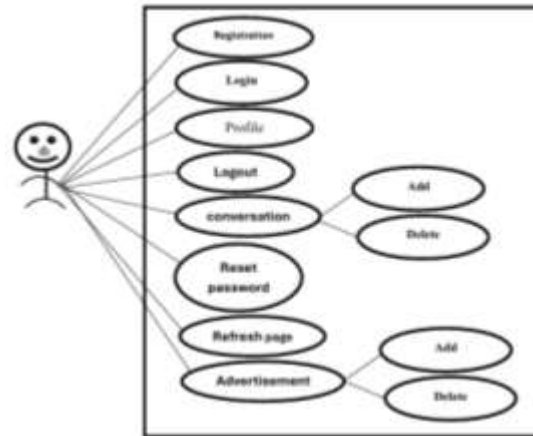


Figure3: Admin use case diagram

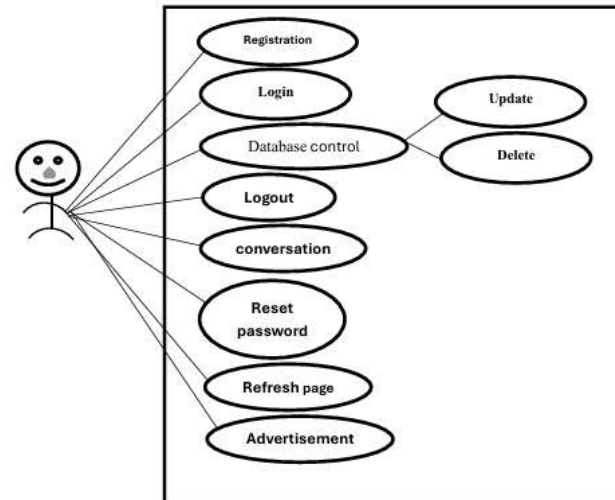


Figure 4: Landowner use case

The admin acts as a supervisor, ensuring the system runs smoothly and securely. He can view all users (landowners and tenants); manage all property listings (edit or remove listings if necessary); oversee the entire database; and monitor of the system as shown in the use case diagram (see Figure 3)

The use case diagram in Figure 4 shows the actions available to a landowner (or lessor) on the platform. It focuses on managing their properties and interacting with potential tenants. A landowner can add a new property for lease, providing details like location, size, and price. They can manage their existing listings (edit information or mark them as unavailable). The

diagram also likely shows their ability to communicate with tenants and manage lease agreements digitally.

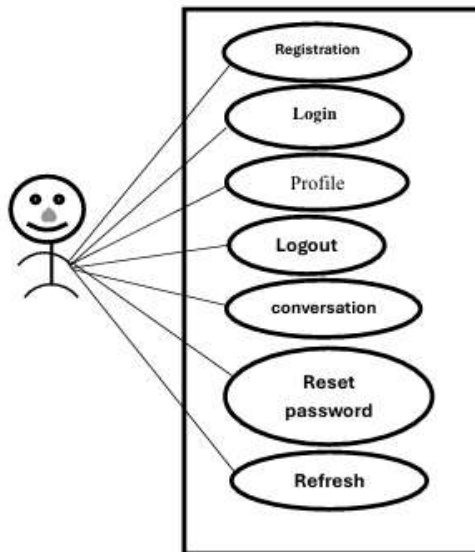


Figure5: Tenant use case diagram

The use case diagram in Figure 5 outlines the activities performed by tenants within the system, including searching for land, viewing property details, communicating with landowners, and making lease payments. It focuses on searching for properties and managing their lease. A tenant can search and filter the available land listings based on their criteria (location, size, price).

Figure 6: Input of the Proposed System

They can view detailed property information and communicate with landowners. The key actions would also include initiating a lease agreement and making secure online payments through the platform.

5 IMPLEMENTATION

The proposed system was implemented using HTML, CSS, Bootstrap for frontend development, PHP for backend logic, and MySQL for database management. XAMPP server was used for deployment and testing.

5.1 Input Design

Lessees provide their information to the system. This data is then used to display a list of available land for lease and to provide them with feedback. Figure 6 shows the input interface of the proposed system where users provide registration details and login credentials to access the platform. To sign up, a new user must fill in their details in the registration form. After registering, a user logs in by providing just two pieces of information: his Username (A unique nickname choose by the user), and his Password.

5.2 Output Design

The output of a web-based land leasing system will involve pages list images of the land and their property details as shown in Figure 7. These details were entered by the land leassor.

Figure7: Output of the Proposed System

6. DISCUSSION

The developed land leasing platform performed better than the traditional manual leasing system in several important areas. By moving the leasing process online, the system made it easier and faster for users to search for available land, communicate with landowners, and complete leasing transactions without unnecessary delays. Unlike the conventional method that depends largely on physical meetings, paperwork, and land agents, the proposed platform allows users to access property information from anywhere through the internet. Features such as property search and filtering also helped users find suitable land more conveniently based on their preferred location, size, and price range.

The system also improved the way leasing records are stored and managed. In many traditional land leasing systems, records are kept manually, which often leads to missing documents, duplicated information, and poor record organization. With the use of a centralized database, the proposed system provided a more reliable and organized way of handling land information and transaction records. Security was also

considered during the development of the platform through the use of login authentication and secure data handling techniques, helping to reduce the risk of unauthorized access and fraudulent activities.

Furthermore, the study shows how digital technologies can help improve land leasing services, especially in developing economies where manual systems are still common. The platform provides a practical and user-friendly solution that promotes transparency, accessibility, and efficiency in land leasing transactions. Although factors such as internet availability, digital literacy, and existing land regulations may still affect the adoption of the system in some rural areas, the overall findings indicate that the proposed platform has strong potential to modernize and simplify land leasing processes for both landowners and tenants.

7. CONCLUSION

The increasing demand for land leasing, driven by information technology's impact on both developing and developed nations, highlights a growing challenge: ensuring access to genuine land and avoiding scams. To address this, an e-commerce website has been developed to provide efficient land leasing services, benefiting both landlords and tenants. This platform offers significant advantages, streamlining the payment and communication processes and enabling seamless transactions for authentic land leases. A major advantage of this new platform is its accessibility; because it runs on the internet, it is available to a wide range of people anywhere in the world. The system is also dependable and user-friendly, making it a trustworthy tool that can be used from any location.

This digital platform will provide users with continuous access to genuine land listings and a secure payment process. If fully implemented, this service will not only solve the persistent challenges of searching for land for lease but also provide a continuous, scalable, and secure system that will drive long-term success and market competitiveness. Future enhancements will include AI-based recommendation systems, blockchain integration for land verification, and mobile application development.

8. REFERENCES

- [1] Ali, D., Deininger, K., & Harris, A. (2019). E-commerce platforms for agricultural land leasing: Lessons from India. *World Development*.
- [2] Bertolini, L., Pagliacci, F., & Russo, M. (2018). Urban land leasing in Europe: A case study of digital transformation. *Urban Studies*.
- [3] Deininger, K. (2019). Land policies and e-commerce: Legal considerations for digital platforms. *World Bank Publications*.
- [4] Ekele, J. O., & Bello, A. M. (2025). Land administration and leasing challenges in Nigeria:

Policy and practice review. *Journal of African Real Estate Studies*.

- [5] Enoguanbhor, E. C., Gollnow, F., Walker, B. B., Nielsen, J. O., & Lakes, T. (2021). Land use dynamics and urban expansion in Nigeria. *Land Use Policy*, 103, 105–123.
- [6] Halim, A., & Ifediora, C. U. (2023). Governance and policy constraints in land leasing systems in developing countries. *Land Policy Review*, 12(2), 45–60.
- [7] Johnson, R., & Lee, T. (2019). Automation and efficiency in land leasing platforms. *Journal of Land Management*.
- [8] Kumar, S., Singh, P., & Gupta, R. (2020). User experience design for land leasing websites. *International Journal of Human-Computer Interaction*.
- [9] Lafontaine, P. (2019). Creating effective e-commerce platforms: Best practices for user experience. *E-Commerce Insights*, 11(2), 78–95.
- [10] Molly, S., & Aly, H. (2024). Fundamentals of land lease agreements and legal frameworks. *International Journal of Property Law*, 18(1), 22–34.
- [11] Nakasumi, M. (2017). Blockchain for transparent and secure land transactions. *Journal of Digital Innovation*.
- [12] Prajapati, K. (2020). Secure payment gateway for e-commerce platforms in land leasing. *Journal of E-Commerce Security*, 9(2), 58–71.
- [13] Smith, J., Brown, A., & Taylor, L. (2020). E-commerce models for land leasing: A comprehensive review. *Journal of Agricultural Economics*.
- [14] United Nations Development Programme (UNDP). (2021). *Inclusive digital platforms for land leasing in developing countries*.
- [15] Wang, Y., Li, X., & Chen, Z. (2022). AI applications in e-commerce platforms for land leasing. *Artificial Intelligence in Agriculture*.
- [16] World Bank. (2022). *World development report: Challenges in adopting digital land leasing systems*.
- [17] Madubuike, C. E., Egbe, S. I, Ugboaja, S. G., Ikedilo, O. E. & Eme, O. (2025). Design and Implementation of a Web-based Lodge Leasing System (A Case Study of Student Lodges at Unwana community), *Int'l Journal of Modern Science and Research Technology*, 3(9), 38-47.
- [18] Law Insider. (2026). Land lease definition. *Law Insider*. [lawinsider.com. https://www.lawinsider.com/land-lease-agreements](https://www.lawinsider.com/land-lease-agreements)

- [19] Ozioma, E. (2025, November 2). Real estate contribution to Nigeria's GDP 2025 hits 12.8% in Q2 growth report. PropertyAccess Nigeria. <https://propertyaccess.ng/real-estate-contribution-to-nigerias-gdp-2025/> [1, 2]