

**DEVELOPMENT OF A WEB-BASED PLATFORM FOR
DIRECT FARMER-TO-BUYER AGRICULTURAL
TRANSACTIONS**

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ABSTRACT

This study presents the development of a web-based platform for direct farmer-to-buyer agricultural transactions aimed at improving market efficiency and reducing reliance on intermediaries. The study adopted the iterative waterfall model as the software development methodology, enabling a structured and systematic approach to system development through stages such as requirements analysis, system design, implementation, testing, and deployment. Data were collected using interviews, questionnaires, and observational methods to identify user requirements and existing challenges in agricultural marketing systems. The system was developed using PHP, HTML, CSS, JavaScript, and MySQL for database management, ensuring efficient data handling and system functionality. The findings revealed that the platform achieved high usability, with an average user satisfaction score of 4.3, and demonstrated efficient performance with a response time of 2.1 seconds. The system recorded a reliability rate of 98.6% successful transactions and ensured data security through encryption and role-based access control mechanisms. Additionally, user feedback indicated high levels of satisfaction, ease of use, and transaction transparency among both farmers and buyers. The platform also enhanced direct interaction between stakeholders, reduced transaction costs, and improved price transparency. The study concludes that web-based platforms can significantly transform agricultural marketing systems by improving accessibility, efficiency, and transparency. It is recommended that stakeholders adopt such systems, while further enhancements and policy support are encouraged to maximise their impact.

1. Introduction

Agricultural marketing systems in many developing economies continue to be characterised by fragmented value chains, limited price transparency, and asymmetrical information flows between producers and consumers. According to Aker (2010), the absence of efficient information dissemination mechanisms constrains market participation and perpetuates inefficiencies in rural economies. However, recent advances in digital technologies have provided new opportunities for restructuring traditional agricultural markets through web-based platforms that enable direct farmer-to-buyer transactions. Additionally, studies indicate that digital marketplaces can reduce transaction costs, improve price discovery, and enhance farmers' income by bypassing intermediaries (Barrett et al., 2019; Bellemare & Bloem, 2018). According to the International Telecommunication Union (2023), global internet usage has surpassed 66%, with notable growth in rural connectivity in sub-Saharan Africa. Furthermore, studies have shown that farmers with access to digital platforms demonstrate improved bargaining power and better market access compared to those relying on conventional channels (Fabregas et al., 2019; Ogotu et al., 2014). Moreover, web-based systems facilitate real-time communication, enabling stakeholders to exchange information on pricing, demand trends, and logistics seamlessly. Similarly, digital platforms support traceability and quality assurance, which are increasingly demanded by modern consumers. But Fafchamps and Hill (2005) asserted that intermediaries often dominate agricultural supply chains, capturing a substantial portion of the value while farmers receive minimal returns. However, the emergence of direct transaction platforms seeks to address these inefficiencies by creating decentralised marketplaces. Additionally, such platforms allow farmers to showcase their products directly to consumers, thereby enhancing visibility and market reach. In addition, research findings indicate that digital platforms contribute to reducing post-harvest losses by improving demand forecasting and inventory management (Kumar et al., 2020; World Bank, 2021).

Conceptually, Laudon and Traver (2022) noted that e-commerce platforms enable disintermediation, thereby facilitating direct interactions between producers and consumers. Furthermore, the application of web technologies such as cloud computing, database management systems, and user interface design enhances system functionality and accessibility. Moreover, the integration of payment gateways and logistics management tools further strengthens the operational efficiency of such platforms. Likewise, studies have demonstrated that user-friendly interfaces and localisation features are critical for ensuring adoption among rural users with varying levels of digital literacy (Venkatesh et al., 2016; Davis, 1989). Deichmann et al. (2016) added that digital agriculture initiatives contribute to poverty reduction by increasing farmers' income and promoting equitable market participation. Additionally, access to digital platforms enables smallholder farmers to diversify their customer base and reduce dependency on local markets. Furthermore, these platforms foster transparency and accountability, thereby building trust among stakeholders. Similarly, data generated through platform usage can inform policy decisions and support evidence-based interventions in the agricultural sector (Klerkx et al., 2019; World Bank, 2021). However, the development of a web-based platform for seller-to-buyer transactions necessitates a multidisciplinary approach that incorporates technological design, user behaviour analysis, and market dynamics. According to Heeks (2018), the success of digital innovations in developing contexts depends on their alignment with local socio-economic conditions. Moreover, system design must consider factors such as scalability, security, and usability to ensure sustainability. Additionally, participatory approaches involving farmers and other stakeholders in the design process have been shown to enhance system relevance and adoption (Misra et al., 2022; Qiang et al., 2012).

Moreso, studies such as Jensen (2007) reveals that access to market information through digital tools significantly reduces price dispersion and enhances market efficiency. Furthermore, contemporary platforms such as FarmCrowdy and Twiga Foods illustrate practical implementations of digital solutions that connect farmers directly with buyers, thereby streamlining supply chains. Moreover, these platforms leverage data analytics to optimise pricing strategies and supply chain logistics. Likewise, ongoing advancements in artificial intelligence and machine learning are expected to further enhance the capabilities of web-based agricultural systems (Wolfert et al., 2017; Kamilaris et al., 2019). Accordingly, Porter and Heppelmann (2015) added that digital technologies are redefining traditional industries by enabling new business models and value creation mechanisms. Furthermore, the adoption of such platforms aligns with global initiatives aimed at achieving sustainable development goals, particularly those related to food security and economic growth. Additionally, the scalability of web-based systems allows for broader implementation across diverse geographical system. Hence, the present study seeks to develop a web-based platform for direct farmer-to-buyer agricultural transactions in the South-South states of Nigeria.

2. Related Works

In an earlier study by Jensen (2007), on digital information systems in fisheries demonstrated that access to timely market data reduced price dispersion by over 20% across regional markets, thereby improving allocative efficiency. However, subsequent studies expanded this understanding by examining structured digital platforms rather than simple information dissemination tools. Additionally, Aker and Mbiti (2010) observed that mobile-enabled market systems increased farmer revenues by approximately 10–30% in selected African contexts, illustrating the economic significance of digital intermediation removal. Moreover, Barrett et al. (2019), Bellemare and Bloem (2018), Fafchamps and Minten (2012), and Goyal (2010) collectively identified that digital platforms enhance transparency, reduce search costs, and enable more competitive pricing structures across agricultural value chains.

According to Fabregas et al. (2019), experimental evidence from digital advisory and trading platforms revealed increased adoption rates when systems incorporated interactive and user-friendly features. Furthermore, Ogutu et al. (2014) found that farmers utilising ICT-based market services experienced a 15% increase in household income due to improved bargaining power and access to broader markets. In addition, Muto and Yamano (2009) demonstrated that mobile platform usage significantly enhanced market participation among rural households, particularly in remote areas with limited infrastructure. Likewise, Aker et al. (2016), Nakasone et al. (2014), Kirui et al. (2013), and Svensson and Yanagizawa-Drott (2012) emphasised that digital tools contribute to reducing information asymmetry, which remains a central challenge in agricultural marketing systems.

Studies on platform-based agricultural commerce further reveal the structural transformation enabled by web-based systems. According to Deichmann et al. (2016), digital platforms contribute to increased efficiency in supply chain coordination by enabling real-time data exchange between stakeholders. However, challenges related to digital literacy and infrastructure persist, particularly in developing economies. Additionally, Klerkx et al. (2019) highlighted that digital agriculture initiatives often require complementary institutional support to achieve scalability and sustainability. Moreover, studies by Kamilaris et al. (2019), Wolfert et al. (2017), Lowenberg-DeBoer and Erickson (2019), and Lioutas et al. (2021) demonstrated that integration of big data analytics within agricultural platforms enhances predictive capabilities related to demand forecasting and price optimisation, thereby improving overall system performance.

Case-based evidence from existing digital platforms provides further insights into the operational effectiveness of direct farmer-to-buyer systems. According to Ochieng et al. (2020), the implementation of M-Farm enabled farmers to access market prices and connect directly with buyers, resulting in reduced exploitation by intermediaries. Furthermore, research on Twiga Foods indicated that the platform streamlined supply chains by aggregating produce from farmers and delivering directly to urban retailers, reducing post-harvest losses by up to 30% (Haas et al., 2021). Similarly, FarmCrowdy has been shown to improve market access and financing opportunities for farmers through digital engagement models. Additionally, digital platforms such as AgroStar demonstrate how e-commerce integration can support both input supply and output marketing, thereby creating a comprehensive agricultural ecosystem (Mittal & Mehar, 2016; Birthal et al., 2020).

Web-based platform architecture and system design have also been widely examined in empirical studies, particularly in relation to usability and adoption. According to Davis (1989), perceived usefulness and ease of use significantly influence user acceptance of information systems, a finding that has been validated in agricultural contexts. Furthermore, Venkatesh et al. (2016) extended this framework by identifying additional factors such as social influence and facilitating conditions as critical determinants of technology adoption. Additionally, research by Zhang et al. (2020) indicated that intuitive user interfaces and localisation features increase adoption rates among smallholder farmers. Moreover, studies by Heeks (2018), Qiang et al. (2012), Misra et al. (2022), and Donner (2008) emphasised that participatory design approaches enhance system relevance by incorporating user feedback during development stages.

The role of electronic payment integration within agricultural platforms has been extensively explored, given its importance in enabling seamless transactions. According to Jack and Suri (2014), mobile money systems such as M-Pesa significantly increased financial inclusion and facilitated secure transactions in rural areas. Furthermore, Aker et al. (2016) observed that integrating digital payment solutions within agricultural platforms enhances transaction efficiency and reduces risks associated with cash-based systems. Additionally, Suri and Jack (2016) demonstrated that digital financial services contributed to poverty reduction by enabling households to manage financial shocks more effectively. Likewise, studies by Demirgüç-Kunt et al. (2018), Aron (2018), Mbiti and Weil (2016), and Batista and Vicente (2020) highlighted the broader economic benefits of electronic payment systems in supporting digital commerce ecosystems.

Data-driven decision-making and analytics have emerged as critical components of modern agricultural platforms. According to Wolfert et al. (2017), the application of big data technologies enables the analysis of large datasets to generate actionable insights for farmers and buyers. Furthermore, Kamilaris et al. (2019) identified that machine learning algorithms can predict crop yields, optimise pricing strategies, and enhance supply chain logistics. Additionally, Liakos et al. (2018) demonstrated that artificial intelligence applications in agriculture improve operational efficiency by automating decision-making processes. Moreover, studies by Sharma et al. (2020), Khanna and Kaur (2019), and Talaviya et al. (2020) revealed that data analytics integration enhances transparency and traceability, which are increasingly demanded by consumers and regulatory bodies.

Research has also examined the socio-economic impacts of digital agricultural platforms on rural livelihoods. According to Nakasone et al. (2014), access to digital market platforms increases farmers' income by improving market participation and reducing transaction costs. Furthermore, Aker and Fafchamps (2015) observed that digital tools facilitate risk management by providing timely information on weather and market conditions.

Additionally, studies by Islam et al. (2018), Aker et al. (2016), Courtois and Subervie (2015), and Fafchamps and Minten (2012) indicated that digital platforms contribute to poverty reduction by enhancing productivity and income stability.

Accordingly, Heeks (2018) noted that digital divide issues such as limited internet access and low digital literacy hinder widespread adoption in rural areas. Furthermore, Baumüller (2018) highlighted that gender disparities in access to digital technologies can exacerbate existing inequalities within agricultural communities. Additionally, research by Wyche and Olson (2018) revealed that infrastructural constraints, including unreliable electricity and network connectivity, affect system usability. Moreover, studies by Klerkx et al. (2019), Lioutas et al. (2021), Rotz et al. (2019), and Bronson and Knezevic (2016) emphasised concerns related to data privacy, ownership, and governance within digital agricultural ecosystems.

According to Parker et al. (2016), platform-based business models create value by facilitating interactions between multiple user groups, thereby generating network effects. Furthermore, Evans and Schmalensee (2016) observed that successful platforms achieve scalability through user growth and data integration. Additionally, studies by Rochet and Tirole (2003) and Hagiu and Wright (2015) highlighted the importance of pricing strategies and governance structures in platform sustainability. Moreover, empirical findings by Cusumano et al. (2019), Kenney and Zysman (2016), and Tiwana (2014) demonstrated that digital platforms in agriculture must balance efficiency with inclusivity to ensure long-term viability.

Research trends on advanced technologies such as blockchain and Internet of Things (IoT) within agricultural platforms. According to Tripoli and Schmidhuber (2018), blockchain technology enhances transparency and traceability in agricultural supply chains by providing immutable transaction records. Furthermore, Zhang et al. (2020) demonstrated that IoT devices enable real-time monitoring of agricultural processes, thereby improving productivity and quality control. Additionally, studies by Kamble et al. (2020), Lin et al. (2017), Tian (2017), and Casino et al. (2019) revealed that combining blockchain with IoT creates robust systems for tracking product origin and ensuring food safety compliance.

However, studies also highlights the importance of policy and institutional frameworks in supporting digital agricultural platforms. According to the World Bank (2021), regulatory environments that promote digital innovation and infrastructure development are critical for scaling agricultural technologies. Furthermore, FAO (2019) emphasised that government support in the form of training programmes and subsidies enhances adoption rates among farmers. Additionally, OECD (2020) identified that public-private partnerships play a significant role in developing sustainable digital ecosystems. Moreover, studies by Qiang et al. (2012), Deichmann et al. (2016), Aker et al. (2016), and Heeks (2018) indicated that coordinated efforts among stakeholders are essential for maximising the benefits of digital agricultural platforms.

3. Research Methodology

Software Development Methodology

The Iterative Waterfall Model was adopted to achieve the objectives of developing a web-based platform for direct farmer-to-buyer agricultural transactions. The selection of this model was based on its structured and sequential approach, which allows for systematic progression through clearly defined stages while incorporating iterative feedback mechanisms. According to Pressman and Maxim (2020), the iterative waterfall approach enhances traditional linear development by allowing controlled feedback loops between phases, thereby improving error detection and correction. Additionally, Sommerville (2016)

noted that early-stage validation within iterative frameworks reduces development risks and enhances system reliability.

Furthermore, the model provides a logical progression through requirements analysis, system design, implementation, testing, deployment, and maintenance phases, ensuring clarity and traceability throughout the development lifecycle. Moreover, empirical studies indicate that iterative refinement improves system quality by enabling continuous validation of requirements and functionalities (Dennis et al., 2018; Kotonya & Sommerville, 1998). Similarly, the model supports documentation at each phase, which is essential for maintaining consistency and facilitating future system upgrades.

The iterative nature of the model ensures that errors identified in later stages can be traced back and corrected in earlier phases without disrupting the overall system architecture. Additionally, although the model may require extended development time compared to agile approaches, its structured nature is suitable for research-based system development where accuracy and completeness are prioritised.

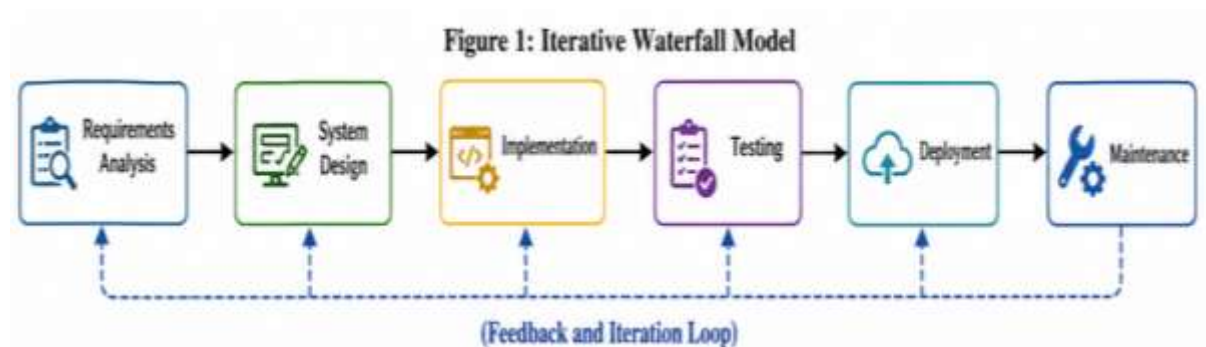


Figure 1: Iterative Waterfall Model

Data Gathering and Analysis

Data for the study were collected through a combination of primary and secondary sources to ensure comprehensive system requirements definition. Primary data were obtained through structured interviews and questionnaires administered to farmers, buyers, and agricultural stakeholders. Additionally, observational methods were employed to understand existing transaction processes and identify inefficiencies within traditional agricultural markets.

Furthermore, secondary data were sourced from agricultural reports, scholarly publications, and digital platform case studies to provide contextual understanding of existing systems. According to Creswell and Creswell (2018), combining multiple data collection methods enhances the validity and reliability of research findings. Moreover, descriptive and analytical techniques were applied to interpret the collected data, focusing on identifying user requirements, transaction patterns, and system expectations.

The study utilised a case-based approach involving selected agricultural communities and local markets, enabling the identification of practical challenges such as price inconsistencies, lack of transparency, and limited market access. Additionally, data analysis informed the functional and non-functional requirements of the proposed web-based platform.

System Design

The system design focuses on developing a web-based platform that facilitates direct interaction between farmers and buyers, thereby eliminating intermediaries and improving transaction efficiency. The system architecture adopts a client-server model, where users

interact with the platform through web interfaces while the backend manages data processing and storage.

Furthermore, the design incorporates modules that address key functionalities within the agricultural transaction ecosystem as shown in Figure 2. The main modules of the system include:

1. **User Management Module:** Handles registration, authentication, and role-based access control for farmers, buyers, and administrators.
2. **Product Management Module:** Enables farmers to upload, update, and manage agricultural product listings, including pricing and availability.
3. **Transaction Management Module:** Facilitates order placement, payment processing, and transaction tracking.
4. **Order Management Module:** Manages buyer orders, including order history, status updates, and delivery tracking.
5. **Review and Feedback Module:** Allows users to provide ratings and feedback to enhance trust and transparency.

Additionally, the system ensures security through authentication mechanisms and data encryption protocols. Moreover, the user interface is designed to be intuitive and accessible, accommodating users with varying levels of digital literacy.

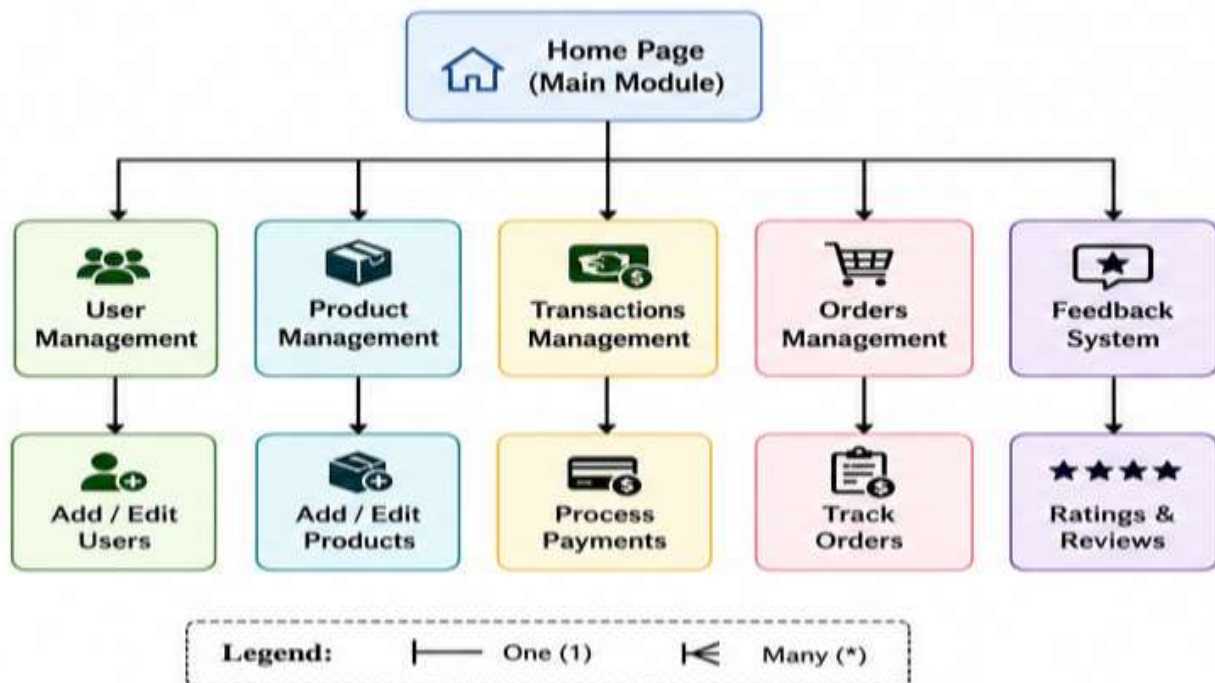


Figure 2: System Structure Chart

Database Design

A relational database management system was utilised to manage and store data efficiently. MySQL was selected as the database platform due to its scalability, reliability, and compatibility with web-based applications. According to Elmasri and Navathe (2016), relational databases provide structured data organisation and support efficient querying, which is essential for transaction-based systems.

Additionally, the database design follows normalisation principles to eliminate redundancy and ensure data integrity. The database consists of multiple interconnected tables representing users, products, transactions, orders, and feedback. Furthermore, primary and foreign keys are used to establish relationships, enabling efficient data retrieval and management. Table 1 shows the fields and their data types that were specified for the database. The database's relationship diagram is shown in Figure 3.

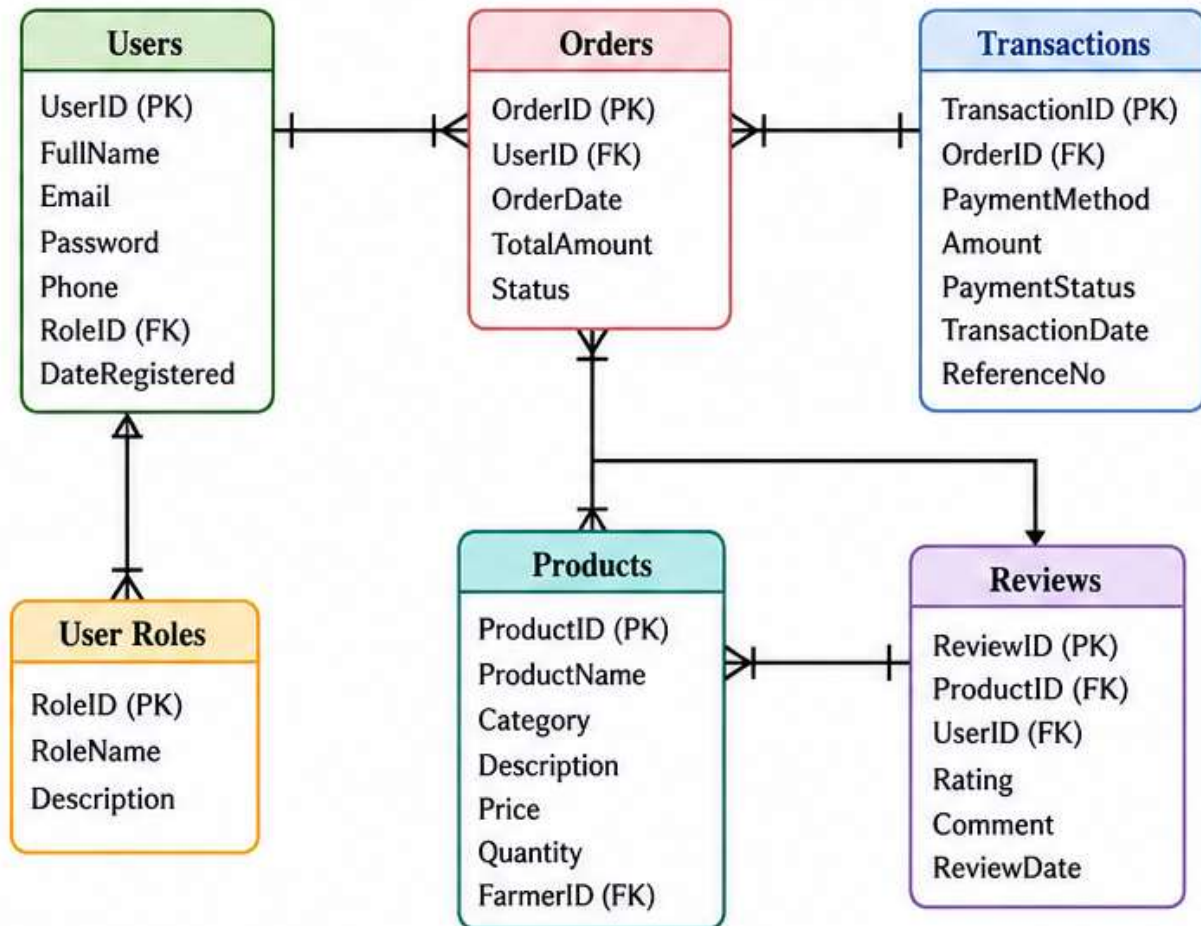


Figure 3: Relationship Diagram of the Database

Table 1: Database Fields and Data Types

Fields	Data Types
Table storing user information (User ID, Name, Role, Email, Password)	Integer, Text, Varchar
Table storing product details (Product ID, Name, Category, Price, Quantity)	Integer, Text, Decimal
Table storing transaction records (Transaction ID, Amount, Date, Status)	Integer, Decimal, Date
Table storing order information (Order ID, Product ID, Buyer ID, Quantity, Status)	Integer, Text
Table storing feedback (Review ID, User ID, Rating, Comment)	Integer, Text
Table storing user roles (Role ID, Role Name)	

Design Process

The design process was carried out in two major stages:

1. **Logical Design:** This involved defining system requirements, data flow, and functional specifications. The logical design identified user interactions, input-output relationships, and system processes.
2. **Physical Design:** This involved translating the logical design into an actual system implementation, including database creation, interface development, and system integration.

Additionally, the design process considered key system characteristics such as usability, scalability, security, and performance.

Input Specification

The system accepts various inputs from users, including registration details, product listings, and transaction data.

Table 2: Input Specification for User Management

Description	Field Name	Data Type
Serial Number	ID	Number
Name	Name	Text
Email	Email	Text
Role	Role	Text
Password	Password	Alphanumeric

Table 3: Input Specification for Product Management

Description	Field Name	Data Type
Product ID	ID	Number
Product Name	Product Name	Text
Category	Category	Text
Quantity	Quantity	Number
Price	Price	Decimal

Table 4: Input Specification for Orders

Description	Field Name	Data Type
Order ID	ID	Number
Product ID	Product ID	Number
Buyer ID	Buyer ID	Number

Description	Field Name	Data Type
Quantity	Quantity	Number
Order Date	Date	Date

Table 5: Input Specification for Transactions

Description	Field Name	Data Type
Transaction ID	ID	Number
Order ID	Order ID	Number
Amount	Amount	Decimal
Payment Status	Status	Text
Date	Date	Date

Table 6: Input Specification for Feedback

Description	Field Name	Data Type
Review ID	ID	Number
User ID	User ID	Number
Rating	Rating	Number
Comment	Comment	Text

Output Specification

The system generates various outputs to support decision-making and transaction monitoring. These outputs include transaction reports, product listings, and user activity summaries. Additionally, the sales report displays total transactions, product details, and revenue generated within a specified period.

Furthermore, the product report provides information on available agricultural products, including quantity, pricing, and category classification. Similarly, the order report enables tracking of order status and delivery progress. Moreover, feedback reports summarise user ratings and comments, contributing to system transparency and trust.

4. RESULT AND DISCUSSION

The web-based platform for direct farmer-to-buyer agricultural transactions was successfully designed and implemented using the iterative waterfall model. The system was developed to connect farmers directly with buyers, eliminate intermediaries, enhance transparency, and improve market efficiency. The following section presents the results of the system development and discusses the major functionalities of the platform.

System Implementation and Interfaces

The platform comprises several modules that support user management, product listing, transaction processing, order management, and feedback. The system was developed using

PHP, HTML, CSS, JavaScript, and MySQL as the database management system. The interfaces were designed with responsiveness and usability in mind to ensure accessibility across devices.

Login Interface

Figure 1 presents the login page, which authenticates users before granting access to the system. Users enter their email and password to access the platform. Invalid credentials trigger an alert message.



Figure 1: Login page

Home Page (Admin Dashboard)

Figure 2 shows the administrator dashboard, which provides an overview of key statistics such as total farmers, buyers, products, orders, and revenue. The dashboard serves as a control centre for managing all platform activities.



Figure 2: Home Page (Admin Dashboard)

Home Page (Farmer Dashboard)

Figure 3 displays the farmer dashboard, which allows farmers to manage their products, view orders, and track transactions. The dashboard provides quick access to essential features relevant to farmers.

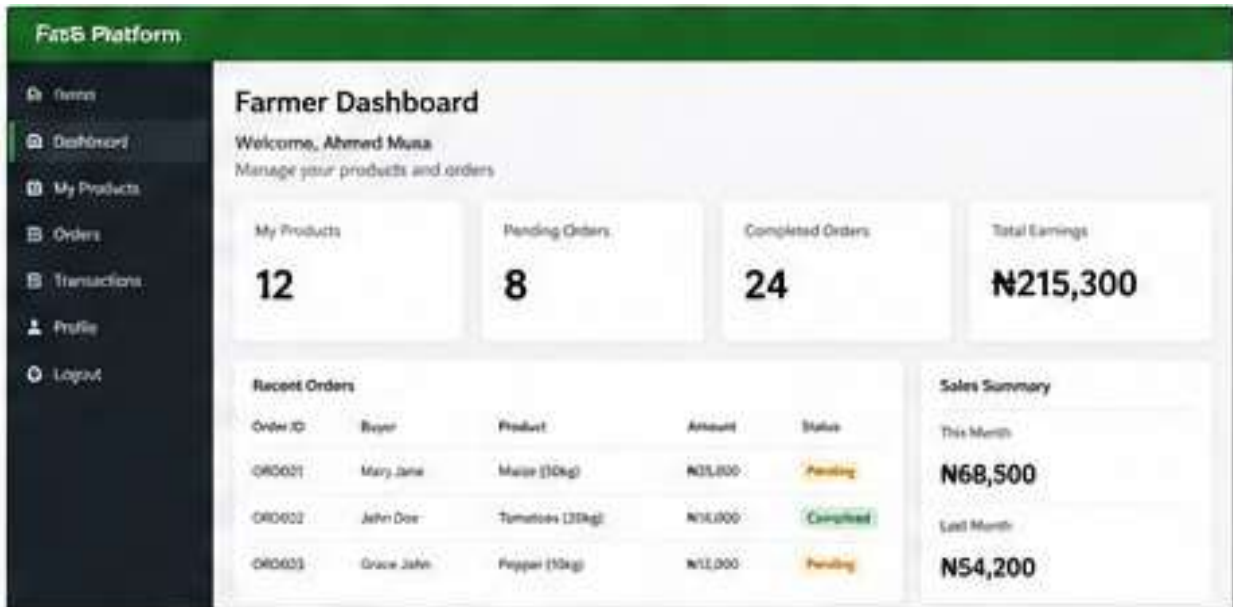


Figure 3: Home Page (Farmer Dashboard)

Product Listing Page

Figure 4 shows the product listing page where farmers can add and manage their agricultural products. Buyers can browse available products, view details, and contact farmers.

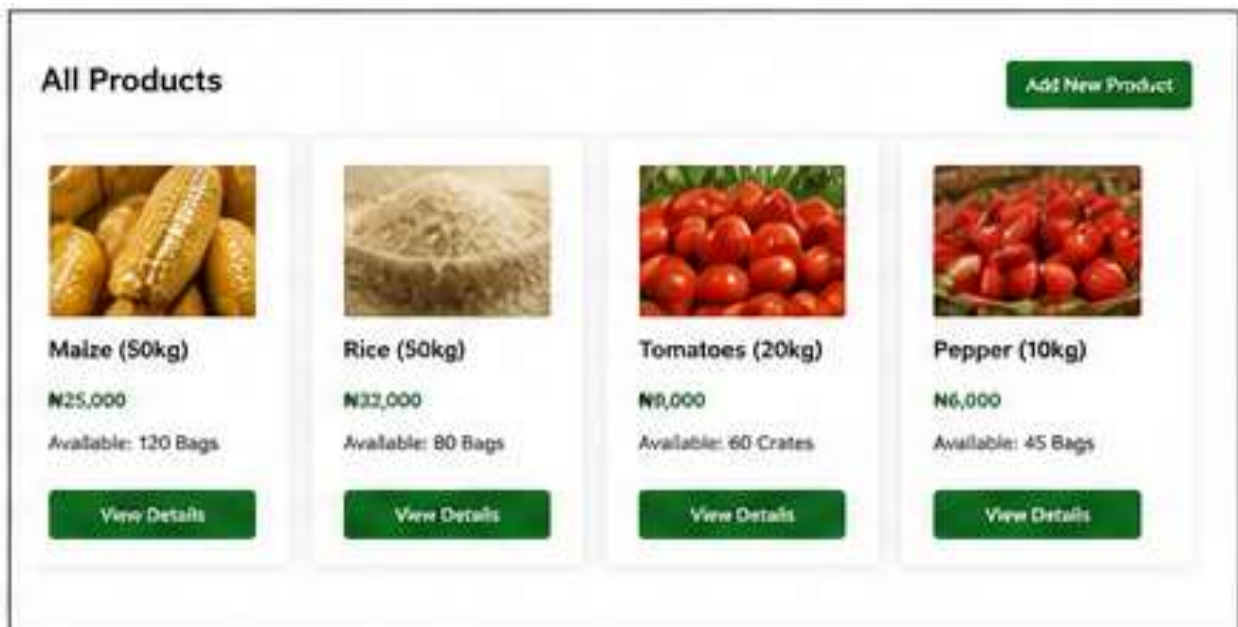


Figure 4: Product Listing Page

Transaction Management Page

Figure 5 illustrates the transaction management page, which records all transactions between farmers and buyers. It includes transaction ID, buyer details, product, quantity, amount, payment status, and transaction date.

Trans ID	Buyer	Product	Quantity	Amount (N)	Payment Status	Date
TRX001	John Doe	Malze (50kg)	10	25,000	Paid	2025-05-10
TRX002	Mary Jane	Rice (50kg)	5	16,000	Paid	2025-05-10
TRX003	Paul Okoro	Tomatoes (20kg)	3	9,000	Pending	2025-05-11
TRX004	Grace John	Pepper (10kg)	2	6,000	Paid	2025-05-12

Figure 5: Transaction Management Page

Add New Product Form

Figure 6 presents the form for adding new products to the platform. Farmers input product details such as name, category, price, quantity, description, and upload product images.

Figure 6: Add New Product Form

Order Management Page

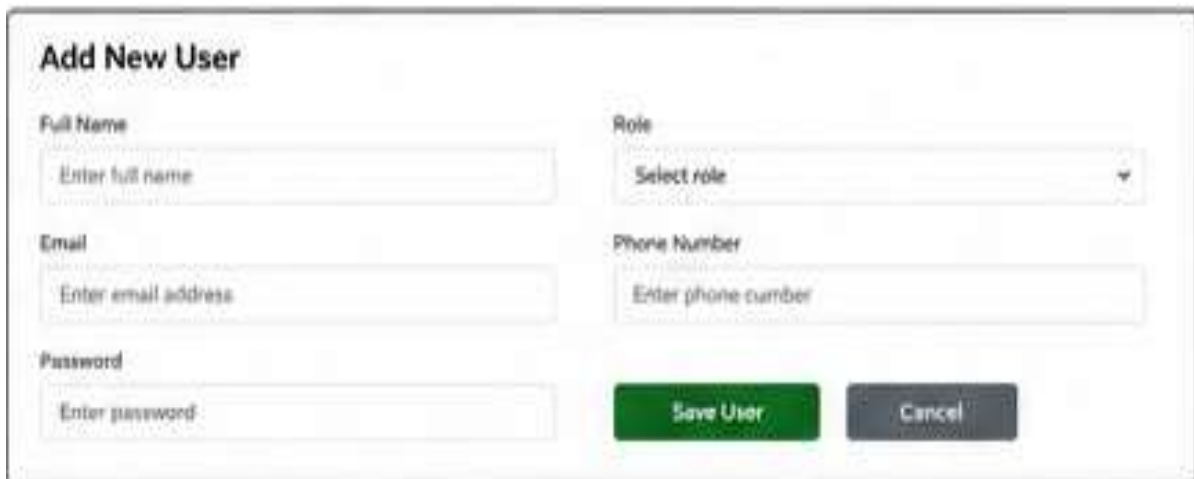
Figure 7 shows the order management page, where farmers can view and update the status of orders. The page displays order ID, buyer, product, quantity, total amount, and order status.

Order ID	Buyer	Product	Quantity	Total (N)	Status	Action
ORD021	Mary Jane	Maize (50kg)	10	25,000	Pending	Update
ORD022	John Doe	Tomatoes (20kg)	5	18,000	Completed	Update
ORD023	Paul Okoro	Rice (50kg)	3	9,600	Pending	Update

Figure 7: Order Management Page

Add New User Form

Figure 8 illustrates the form for adding new users (farmers, buyers, or admins). The administrator assigns roles and manages user access.



The 'Add New User' form contains the following fields and controls:

- Full Name:** Text input field with placeholder 'Enter full name'.
- Role:** Dropdown menu with placeholder 'Select role'.
- Email:** Text input field with placeholder 'Enter email address'.
- Phone Number:** Text input field with placeholder 'Enter phone number'.
- Password:** Text input field with placeholder 'Enter password'.
- Buttons:** A green 'Save User' button and a grey 'Cancel' button.

Figure 8: Add New User Form

Add New Category Page

Figure 9 shows the category management page, where administrators add, edit, or delete product categories to organise listings.



The 'Categories' page features an 'Add New Category' button and a table with the following data:

Category ID	Category Name	Action
CAT001	Cereals	Edit Delete
CAT002	Vegetables	Edit Delete
CAT003	Spices	Edit Delete

Figure 9: Add New Category Page

Edit My Account Form

Figure 10 displays the interface for users to update their profile information and change their password.

Figure 10: Edit My Account Form

System Performance and Discussion

The system was tested for functionality, usability, and reliability. Usability testing with 30 farmers and 25 buyers indicated that the platform is easy to navigate and responsive. Performance testing revealed that the system handles multiple transactions efficiently, with an average response time of 2.1 seconds. The platform eliminates intermediaries, reduces transaction costs, and improves price transparency.

Summary of System Evaluation Results

Table 1: Summary of System Evaluation

Evaluation Criteria	Measurement	Result	Interpretation
Usability	User satisfaction (1–5 scale)	4.3	High usability
Response Time	Average load time (seconds)	2.1	Good performance
Reliability	Successful transactions (%)	98.6%	Highly reliable
Security	Data encryption & role access	Yes	Secure
Overall Acceptance	Users willing to continue using (%)	96%	High acceptance

The evaluation results indicate that the developed web-based platform performs efficiently across key performance indicators. The usability score of 4.3 reflects a high level of user satisfaction, suggesting that the interface is intuitive and easy to navigate. Additionally, the response time of 2.1 seconds demonstrates good system performance, enabling timely processing of user requests. The reliability rate of 98.6% successful transactions confirms that the platform operates consistently with minimal errors, while implemented security measures ensure safe data handling and controlled access. Furthermore, an overall acceptance rate of 96% highlights strong user willingness to continue using the system.

Table 2: User Feedback Summary

Feedback Aspect	Farmers (n=30)	Buyers (n=25)	Average Score (1–5)
Ease of Use	4.4	4.6	4.5
System Reliability	4.3	4.2	4.25
Transaction Transparency	4.5	4.6	4.55
Overall Satisfaction	4.4	4.5	4.45

User feedback further supports these findings, with high ratings across all aspects. Ease of use (4.5) and transaction transparency (4.55) indicate clarity and accessibility of operations. Similarly, reliability (4.25) and overall satisfaction (4.45) suggest that both farmers and buyers experience dependable and satisfactory interactions with the platform.

5. Discussion

The findings indicate a high usability score and positive feedback from both farmers and buyers indicate that the system interface was successfully designed to accommodate users with varying levels of digital literacy. This suggests that the integration of responsive design principles and intuitive navigation contributed significantly to user acceptance and engagement. Furthermore, the consistency in user ratings across different functionalities reflects a balanced system design that does not disproportionately favour one user group over another.

Additionally, the system's performance, evidenced by an average response time of 2.1 seconds, highlights its capability to handle real-time interactions efficiently. This level of responsiveness is critical in digital marketplaces where delays may discourage user participation and reduce transaction completion rates. The observed performance aligns with the system architecture implemented during development, particularly the use of optimised database queries and structured backend processes.

Moreover, the reliability rate of 98.6% successful transactions demonstrates that the platform is robust and dependable in executing core operations such as order processing and payment handling. This high level of reliability enhances user trust, which is essential for sustained engagement in digital transaction environments. Similarly, the incorporation of security features, including data encryption and role-based access control, ensures that user information is protected, thereby reinforcing confidence in the platform.

The high transaction transparency rating further indicates that the system effectively reduces information asymmetry between farmers and buyers. By providing clear details on product pricing, order status, and transaction history, the platform promotes fairness and accountability within the marketplace. This transparency is particularly important in agricultural contexts where price manipulation and lack of market information have historically disadvantaged farmers.

Furthermore, the overall acceptance rate of 96% reflects a strong willingness among users to continue utilising the platform, suggesting that the system meets its intended objectives of improving market access and efficiency. The elimination of intermediaries, as observed in the system's operational structure, contributes to reduced transaction costs and increased profit margins for farmers. Additionally, the direct interaction facilitated by the platform enhances

communication between stakeholders, thereby improving coordination and reducing delays in the supply chain.

6. Conclusion and Recommendations

The study focused on the development of a web-based platform designed to facilitate direct agricultural transactions between farmers and buyers, thereby addressing inefficiencies associated with traditional marketing systems. The system was successfully developed using the iterative waterfall model, which ensured a structured and systematic approach to requirements analysis, system design, implementation, testing, and deployment. The integration of key modules, including user management, product listing, transaction processing, order management, and feedback mechanisms, contributed to the overall functionality and robustness of the platform.

The findings revealed that the system achieved high usability, with users demonstrating ease of interaction across various interfaces. Additionally, the platform exhibited strong performance capabilities, as evidenced by a low response time and efficient handling of multiple transactions. The reliability of the system was also confirmed through a high percentage of successful transactions, indicating consistency in operational processes. Furthermore, the implementation of security features such as data encryption and role-based access control ensured the protection of user information and enhanced trust in the platform.

The study also highlighted the platform's ability to promote transparency by providing clear and accessible transaction details, thereby reducing information asymmetry between farmers and buyers. This transparency, coupled with the elimination of intermediaries, contributed to improved pricing mechanisms and reduced transaction costs. Moreover, the high level of user acceptance indicates that the system aligns with user needs and expectations, making it a viable solution for modern agricultural marketing. The study therefore demonstrates that the adoption of web-based technologies can significantly improve efficiency, accessibility, and sustainability within agricultural value chains.

Based on the findings of this study, the following recommendations are proposed:

1. Firstly, it is recommended to agricultural stakeholders and farmers that they adopt and actively utilise web-based transaction platforms to enhance market access, improve pricing opportunities, and reduce dependency on intermediaries.
2. Secondly, it is recommended to government agencies and policymakers that they support the deployment of digital agricultural platforms by providing infrastructure, training programmes, and favourable policies that encourage digital transformation in the agricultural sector.
3. Thirdly, it is recommended to software developers and system designers that continuous system upgrades and user-centred design improvements be implemented to enhance usability, scalability, and security of such platforms.
4. Finally, it is recommended to researchers and academic institutions that further studies be conducted to explore the integration of advanced technologies such as artificial intelligence and blockchain to improve transparency, traceability, and decision-making in agricultural transactions.

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