Development of a Web-Based Agricultural E-Marketplace Using Laravel

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***Abstract*— The agricultural sector plays a vital role in Indonesia's economic structure and food security, yet rural farmers often face significant challenges regarding market access and long, detrimental distribution chains. This study aims to design and build a web-based e-marketplace system that facilitates direct transactions between farmers and buyers to cut off conventional distribution lines. The system development method used is the Waterfall model, which includes requirements analysis, system design, implementation, and testing phases. The system was built using the PHP programming language with the Laravel framework for the back-end and MySQL for database management. The results indicate that the developed platform successfully provides features for managing products, categories, orders, and real-time sales reports. Based on Black Box testing on 10 main functional scenarios, the system proved valid and operated according to user specifications without functional errors. In conclusion, this e-marketplace is effective as a technological solution to expand the market reach of local farmers and increase the efficiency of agricultural product transactions.**

***Index Terms*— Agricultural Products; E-marketplace; Information System; Laravel; Waterfall**

I. Introduction

The agricultural sector is a fundamental pillar of Indonesia's economic structure, playing a crucial role in national food security and labor absorption. According to recent data, this sector contributes significantly to the livelihoods of the rural population [1]. However, despite its strategic importance, the agricultural distribution system in Indonesia faces systemic inefficiencies. A major bottleneck lies in the traditional supply chain, which is dominated by multiple layers of intermediaries (tengkulak). This structure creates a significant price disparity, where farmers receive low farm-gate prices while consumers pay high market prices. In rural areas such as Temanggung Regency, this issue is exacerbated by limited access to wider markets and a lack of real-time price information, leaving farmers with weak bargaining power [2], [3].

Specific observations at the "Berkah Tani" community in Temanggung reveal that the marketing process is still predominantly conventional. Farmers rely on local buyers who dictate prices, often resulting in minimal profit margins that do not cover production costs. Furthermore, the lack of digital infrastructure integration prevents these farmers from reaching potential buyers outside their region. While digital transformation concepts like e-marketplaces offer a solution to cut the distribution chain and promote price transparency [4], the adoption rate remains low due to the unavailability of platforms specifically tailored to the technical and functional needs of local farming communities [5].

To address these challenges, various technological approaches have been explored in previous studies. Susandi et al. developed an Android-based e-commerce system for agriculture [6]. However, this mobile-only approach limits accessibility for users who prefer desktop environments for managing large inventories. Another study by Sipayung et al. implemented a web-based marketplace using native PHP [7]. While functional, systems built on native PHP often suffer from security vulnerabilities, such as susceptibility to SQL Injection, and are difficult to scale compared to modern frameworks. Other research utilizing the Laravel framework focused on management but lacked comprehensive transactional features for external buyers [8].

A significant research gap exists in developing a secure, scalable, and user-friendly web platform that addresses both the security concerns of native development and the usability needs of rural farmers. This research aims to bridge this gap by developing an E-Marketplace using the Laravel Framework. Laravel was selected for its Model-View-Controller (MVC) architecture, which provides superior security features (such as CSRF protection), modularity, and ease of maintenance compared to native PHP or other legacy systems [9].

This study proposes the design and development of a robust web-based E-Marketplace specifically for the "Berkah Tani" community. The innovation of this research lies in the integration of a secure framework with a simplified user interface designed to accommodate the specific business processes of local farmers, such as harvest capability management and direct-to-consumer transactions. By digitizing the sales process, this system aims to shorten the supply chain, increase farmer's income by eliminating unnecessary intermediaries, and provide data-driven insights for better agricultural management.

II. Methodology

This research applies the Waterfall development model. This method was selected for its systematic and sequential characteristics, ensuring each phase from analysis to testing is thoroughly completed and documented before moving to the next [10]. The development stages are detailed as follows:

A. *Requirement Analysis*

This phase involves a comprehensive process of identifying software and hardware requirements through direct observations of the partner's business processes. The analysis aimed to determine the functional specifications needed to solve the partner's problems. The requirements gathering process involved direct engagement with key stakeholders. Primary data was collected through semi-structured interviews and field observations at the 'Berkah Tani' community in Temanggung, specifically involving Mr. Edi as the community leader. This ensured that the system modules, such as real-time sales reporting and coupon management, were directly aligned with the actual business needs of the local farmers. Functional requirements identified include robust authentication systems for admins and buyers, a product management module (CRUD), shopping cart functionality, and real-time order status tracking. The system was developed and tested within a specific runtime environment to ensure stability and security. The software stack includes PHP version 8.1.10, Laravel Framework version 9.33.0, and MySQL as the Database Management System. This environment provides native security features such as CSRF protection and Bcrypt password hashing, which are essential for a secure e-marketplace. On the software side, Visual Studio Code version 1.83.0 was chosen as the primary text editor, while XAMPP version 3.3.0 was used to simulate the local server environment.

B. *System Design*

In this stage, the system architecture is visualized using Unified Modeling Language (UML) to create a blueprint of the software. The design process comprises creating Use Case diagrams to model the interactions and privileges between actors (Admin, Customer Service, and Buyers) and the system.

Furthermore, Activity diagrams are developed to illustrate the logic flow of business processes, ranging from user registration to the complexity of order completion. Simultaneously, the database structure is designed using Entity Relationship Diagrams (ERD) to define the schema and relationships between key tables such as users, products, and orders, ensuring data integrity and normalization before the coding phase begins.

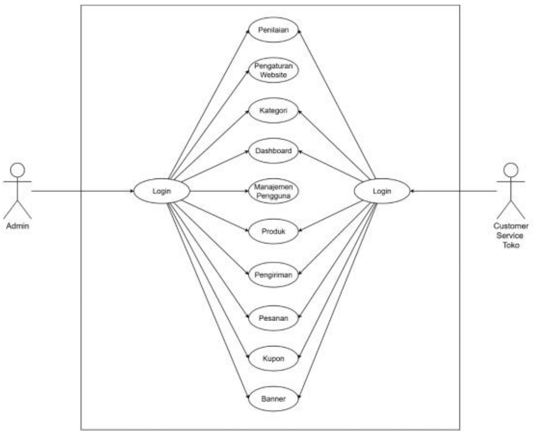


Fig. 1. Use Case Diagram Admin and Customer Service

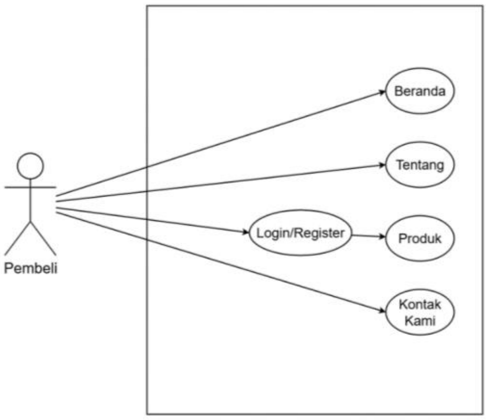


Fig. 2. Use Case Diagram Buyers

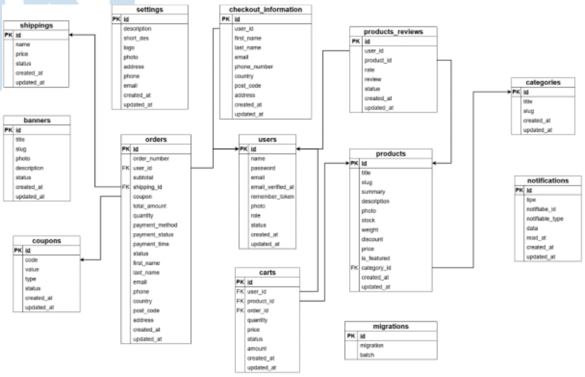


Fig. 3. Entity Relationship Diagram

C. *Implementation*

The implementation phase translates the design blueprints into executable program code. The back-end logic is constructed using the PHP programming language within the Laravel 9 framework environment. Laravel was specifically chosen for its Model-View-Controller (MVC) architecture, which separates business logic from the user interface, making the code more modular and maintainable. The system utilizes Laravel's Eloquent ORM for efficient and expressive database interactions using MySQL as the Database Management System (DBMS). Additionally, the system incorporates built-in security features to protect against common vulnerabilities such as SQL Injection and Cross-Site Request Forgery (CSRF). The front-end interface is developed using Blade templating, combined with HTML and CSS to ensure a responsive and user-friendly experience.

D. Testing

The final phase is system testing, which is conducted using the Black Box Testing method. This approach focuses on validating the input-output functionality of the application without inspecting the internal code structure [11]. The testing process involves executing a series of test scenarios that cover 10 critical features of the e-marketplace, including login validation, product data management, cart updates, and the checkout process. The primary objective is to verify that the system functions 100% according to the initial requirements and is free from functional errors before deployment.

III. Result and Discussion

The implementation of the E-Marketplace system utilizing the Laravel framework has been successfully deployed to assist the "Berkah Tani" community in Temanggung. Previously, marketing and transaction processes were conducted manually, relying heavily on intermediaries (tengkulak) and limited local interactions. The proposed system digitizes these processes, offering distinct interfaces for Administrators and Buyers to facilitate seamless transactions.

A. User Interface Implementation

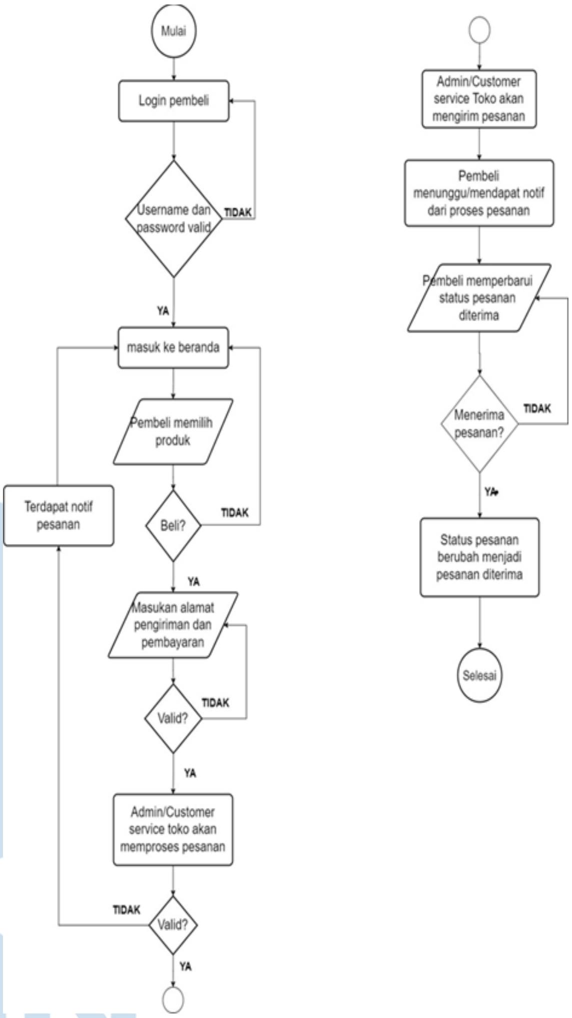
The system's design focuses on user-friendliness to ensure adoption by farmers and buyers. Before detailing the specific interface pages, the overall operational flow of the system is presented to illustrate the business logic.

A.1. System Workflow (Flowchart).

The fundamental logic of the application is visualized through a flowchart, as shown in Figure 1. This diagram maps the complete transaction cycle, starting from the user login validation, proceeding to the product selection by the buyer, and culminating in the secure checkout process. It also illustrates the backend decision-making process where the admin verifies the order before the transaction is finalized. This logical flow serves as the blueprint for the interface implementation described in the subsequent sections.

A.2. Admin Dashboard.

The dashboard serves as the central control unit for the administrator. As shown in Figure 5, it visualizes critical data such as total products, categories, incoming orders, and a graphical representation of monthly sales. This visualization allows the admin to monitor business performance in real-time, a capability not present in the conventional method.



Mulai
Login pembeli
Username dan password valid
TIDAK
YA
masuk ke beranda
Pembeli memilih produk
Beli?
TIDAK
YA
Terdapat notif pesanan
Masukan alamat pengiriman dan pembayaran
Valid?
TIDAK
YA
Admin/Customer service toko akan memproses pesanan
TIDAK
Valid?
YA
Admin/Customer service Toko akan mengirim pesanan
Pembeli menunggu/mendapat notif dari proses pesanan
Pembeli memperbarui status pesanan diterima
Menerima pesanan?
TIDAK
YA
Status pesanan berubah menjadi pesanan diterima
Selesai

Fig. 4. System Purchasing Flowchart

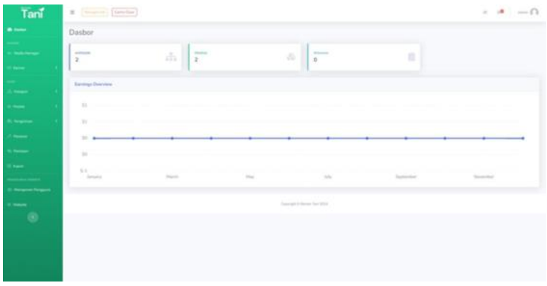


Fig. 5. Admin Dashboard

A.3. Product Management Interface.

Figure 6 illustrates the product management page where farmers (via admin/CS) can upload commodities. The system allows detailed input including product names, categories, prices, stock availability, and images. This digital catalog replaces the traditional method of physical product display, enabling 24/7 visibility to potential buyers.

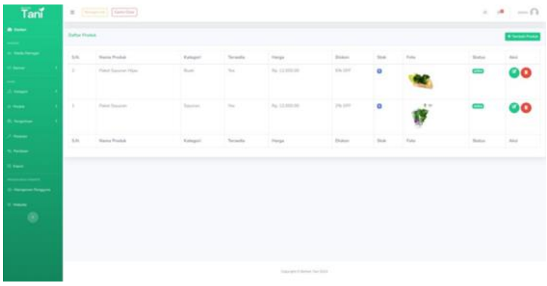


Fig. 6. Product Management Interface

A.4. Transaction and Order Processing.

The transaction interface allows admins to manage incoming orders. As depicted in Figure 7, details such as customer information, total price, and payment status are recorded systematically. This feature eliminates recording errors common in manual bookkeeping. Admins can update the status from "New Order" to "Delivered" through this interface.

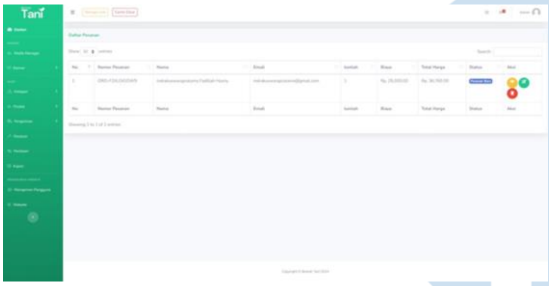


Fig. 7. Order Processing Interface

A.5. Shipping Management Interface.

Shipping is a critical component of e-commerce. The shipping management interface (Figure 8) allows the admin to manage shipping rates and track delivery status. As shown in the implementation, the admin can input receipt numbers directly into the system, which will then be visible to the buyer. This transparency builds trust in the transaction process.

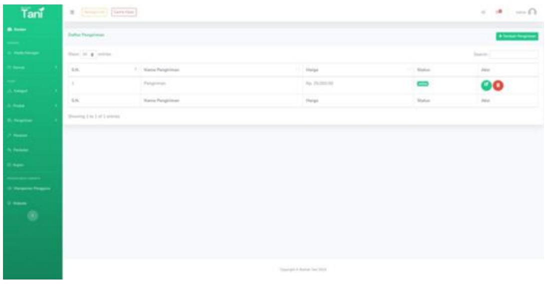


Fig. 8. Shipping Management Interface

A.6. Coupon and Discount Management.

To attract more buyers, a coupon feature was implemented. Figure 9 shows the coupon management page where admins can create discount codes (e.g., "DISKON10"), set the value (percentage or fixed amount), and determine the validity period. This feature provides flexibility for "Berkah Tani" to run promotional campaigns.

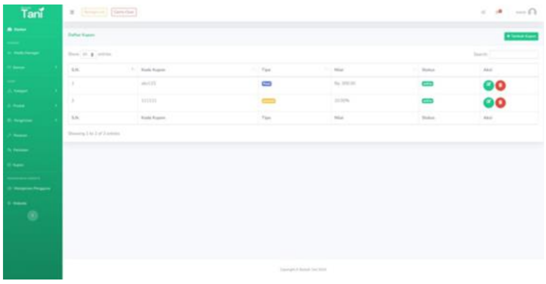


Fig. 9. Coupon Management Interface

A.7. Product Rating and Review Interface.

To maintain service quality and trust, a Rating and Review Interface was developed for the administrator. As shown in Figure 10, this dashboard page is designed to provide comprehensive access for admins to view, manage, and analyze feedback submitted by buyers regarding purchased products. The system utilizes a star-based rating scale (ranging from 1 to 5) to quantify customer satisfaction levels visually. The interface presents a structured table listing essential details such as the reviewer's identity, product title, written comments, and the submission date. Furthermore, admins are equipped with moderation tools, allowing them to view specific details or remove reviews that violate community guidelines or are deemed irrelevant, ensuring the integrity of the feedback displayed on the public storefront.

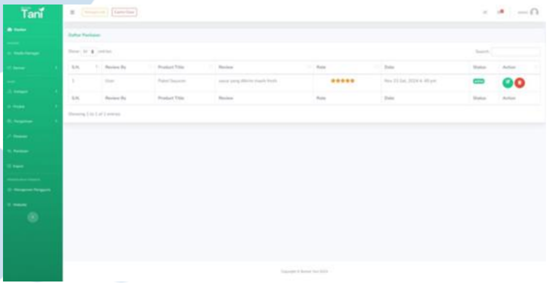


Fig. 10. Product Rating and Review Interface

A.8. User Management Interface.

Security and role management are critical components of the system's administration. The User Management Interface, as depicted in Figure 11, is designed to facilitate the administrator in overseeing all registered accounts within the e-marketplace. This module provides a comprehensive view of system users, ranging from other administrators to customers or buyers. The interface is equipped with full control capabilities, allowing the main admin to add new users (such as appointing new Customer Service staff), edit existing user profiles (including role assignment), and permanently delete accounts that are no longer active or valid. This centralization of user data ensures that system access remains secure and organized.

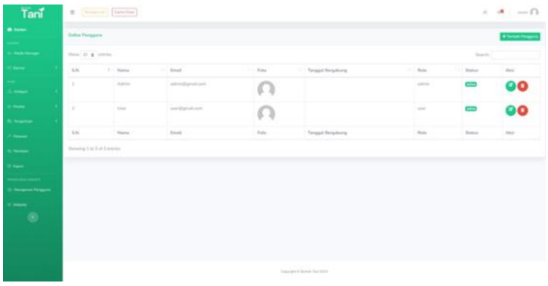


Fig. 11. User Management Interface

B. *System Testing Results*

System testing constitutes a critical phase in the software development lifecycle, aiming to ensure quality and identify potential functional defects before deployment. To verify that the system meets the functional requirements defined in the design phase, the Black Box Testing method was employed. This approach focuses strictly on the validity of inputs and outputs, assessing whether the application functions according to user specifications without inspecting the internal code structure or logic. The testing process involved executing a comprehensive set of test scenarios using various data inputs to validate ten critical modules of the E-marketplace, ranging from user authentication to transaction processing. The summary of these testing results is presented in Table 1.

C. *Discussion*

The results of this study demonstrate that the developed e-marketplace successfully digitizes the agricultural trading process in Temanggung, offering distinct advantages over previous solutions in terms of accessibility. When compared to the Android-based system developed by Susandi et al. [6], this web-based platform offers superior flexibility. While Android applications are limited to specific mobile devices and require installation, the proposed e-marketplace is platform-independent, allowing farmers and buyers to access the system via any browser on desktops, laptops, or smartphones. This cross-platform capability ensures that technological barriers regarding device specifications do not hinder market participation for the "Berkah Tani" community.

From a technical perspective, this research addresses the security vulnerabilities often found in native development, such as the system by Sipayung et al. [7]. By implementing the Laravel framework's Model-View-Controller (MVC) architecture, the system inherently benefits from built-in protection against SQL Injection and CSRF attacks, providing a significantly more secure environment for transaction data compared to native PHP solutions. The system's robustness is further confirmed by the 100% validity rate in Black Box testing, indicating that the logic is stable. Additionally, the dashboard visualization feature serves as a crucial decision support tool, effectively resolving the problem of data opacity found in the conventional manual recording method used previously.

TABLE I. BLACK BOX TESTING RESULT

No	Detail				
	Tested Module	**Test Scenario**	**Expected Result**	**Result**	**Status**
1	User Login	Input valid email & password	Redirect to Dashboard	Successful	Valid
2	User Login	(Negative) login with empty fields	System displays validation error	Successful	Valid
3	User Login	(Negative) login with wrong password	System displays "Email/Password salah"	Successful	Valid
4	Dashboard	Access dashboard page	Display stats & graphs	Successful	Valid
5	Category Mgmt	Add/Edit/Delete Category	Data updates in DB	Successful	Valid
6	Product Mgmt	Add/Edit/Delete Product	Catalog updates real-time	Successful	Valid
7	Product Mgmt	(Negative) Add product without uploading an image	System triggers validation error and prevents saving	Successful	Valid
8	Shipping	Set shipping costs	Cost added to checkout	Successful	Valid
9	Order Processing	Update order status	Status changes for buyer	Successful	Valid
10	Rating System	Input review & rating	Review appears on product	Successful	Valid
11	Coupon System	Apply valid coupon code	Total price decreases	Successful	Valid
12	User Mgmt	Admin manages users	Roles assigned correctly	Successful	Valid
13	User Mgmt	(Negative) Add a new user with an invalid email format	System displays "The email must be a valid email address"	Successful	Valid
14	Site Settings	Update site info/logo	Frontend updates	Successful	Valid

IV. CONCLUSION

This research successfully developed a web-based e-marketplace for the 'Berkah Tani' community using the Laravel framework. Functional validation through Black Box testing, including negative test scenarios, confirmed that all core modules operate with 100% validity. The platform provides a reliable digital infrastructure for managing agricultural products and transactions, effectively replacing manual processes.

For the prospect of future development, several improvements are recommended based on the current system's limitations. First, the integration of an automated payment gateway, such as Midtrans, is highly suggested to replace the manual payment verification process, thereby providing various secure payment methods (e-wallets, virtual accounts) and increasing user trust. Second, considering the mobility of farmers in the field, developing a dedicated mobile application with offline capabilities is necessary to overcome connectivity issues in rural areas. Finally, continuous digital literacy training for the farming community is essential to ensure the sustainable adoption of this technology.

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