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Design Of A Web-Based Inventory Information System Using The Agile Scrum Method Case Study: PT Omega Karyatama Elektronindo

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Abstract

Inventory management at PT Omega Karyatama Elektronindo is still carried out manually using written records and spreadsheets, resulting in inaccurate stock data, delayed information, and the absence of a structured procurement workflow. This study aims to design and develop a web-based inventory information system capable of supporting integrated, accurate, and real-time inventory management in accordance with the company's operational needs. The development method used was Agile Scrum, implemented through three sprints: Sprint 1 (Product & Stock Management), Sprint 2 (PR/PO Procurement), and Sprint 3 (Reports & Dashboard). The system was built using the Laravel 12 framework and Filament v5 with a role-based multi-panel architecture that divides access into three panels: Admin, Management, and Supplier. System testing was carried out using the Black Box Testing method on 33 test scenarios across eight functional modules. The results show that the developed web-based inventory information system successfully replaced the manual process and met all the established functional and non-functional requirements, with a testing success rate of 100%.

Keywords: Inventory Information System, Agile Scrum, Laravel, Filament, Multi-Panel

INTRODUCTION

The rapid development of information technology has brought significant changes to various fields, including information system management in the industrial sector. Companies are required to manage data quickly, precisely, and accurately to support effective decision-making. One important aspect of company operations is inventory management. Without adequate information system support, inventory management has the potential to create various problems. The use of web-based information systems is considered capable of providing broader and more flexible access, making inventory management more integrated and controlled.

PT Omega Karyatama Elektronindo is a company engaged in electric motor service and maintenance, and therefore has fairly complex warehousing activities. The process of recording incoming and outgoing goods, which is still carried out manually or semi-manually, has the potential to cause recording errors, delayed information, and difficulties in compiling reports. Non-integrated inventory data can also cause discrepancies between physical stock and recorded data, thereby disrupting the company's operational processes.

The Agile Scrum method has been widely applied in the development of web-based information systems because it is able to support a development process that is flexible and adaptive to changing user requirements. Ramdhani et al. developed a website-based logistics inventory application using the Scrum method, which was shown to help manage goods data and compile reports more effectively. Fadillah et al. applied Agile Scrum to a culinary management information system and demonstrated that the product backlog, sprint planning, and sprint review stages were able to support structured system development. Other studies have applied Scrum to a monitoring dashboard, an online thesis-supervision application, and a sales website, consistently showing the effectiveness of this method across various domains. Nevertheless, research specifically addressing the design of a web-based inventory information system using the Agile Scrum method within an electric motor service and maintenance company remains relatively limited.

The novelty of this study lies in the design of a web-based inventory information system developed using the Agile Scrum method within an electric motor service and maintenance company, which not only provides integrated management of incoming and outgoing goods data but also

supports real-time stock monitoring through an Observer Model mechanism, as well as a structured procurement workflow through Purchase Requests and Purchase Orders. Therefore, this study aims to (1) analyze the current warehouse inventory management process at PT Omega Karyatama Elektronindo, (2) design a web-based inventory information system using the Agile Scrum method, and (3) test the developed system to ensure it meets user requirements.

RESEARCH METHODS

This study is applied research using a Research and Development (R&D) system-development approach aimed at producing a software product to solve a real problem within an organization. Data were collected through direct observation and unstructured interviews with warehouse staff and the on-site supervisor at PT Omega Karyatama Elektronindo, Bogor, West Java, complemented by a literature review and a documentation study. The research was conducted over approximately four months (March-June 2026). The overall research stages are shown in Figure 1.

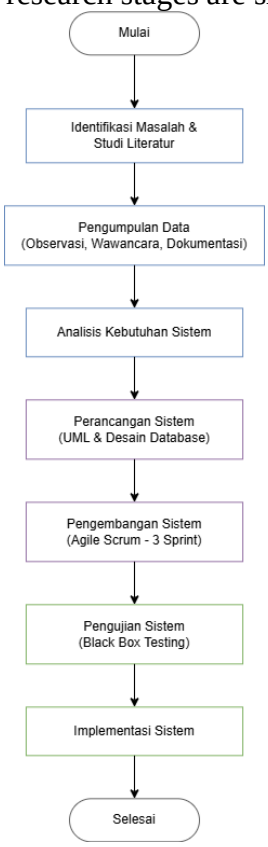

Figure 1. Research Stages

The resulting product is a web-based inventory information system built using the Laravel 12 framework and Filament v5, with PHP 8.4 as the programming language and MySQL 8.0 as the database management system. The system structure was designed using an Entity Relationship Diagram (ERD), a Use Case Diagram, an Activity Diagram, a Class Diagram, and a Sequence Diagram.

The development method used was Agile Scrum, implemented iteratively through three sprints, each lasting four weeks:

Sprint 1 - Product & Stock Management (April 1-30, 2026): development of the CRUD modules for Product, Product Category, and Supplier, as well as the Stock In and Stock Out modules together with the automatic stock-update logic implemented through the Model Observer.

Sprint 2 - PR/PO Procurement (May 1-31, 2026): development of the Purchase Request (PR) submission workflow by the warehouse, its approval and conversion into a Purchase Order (PO) by

Management, a Supplier panel for invoice upload, and the marking of received goods, which triggers automatic stock updates.

Sprint 3 - Reports & Dashboard (June 1-30, 2026): development of the (read-only) Management panel, a PDF report-export feature, a statistics dashboard based on date-range filtering, comprehensive system testing, and bug fixing.

It should be noted that the system was developed by a single developer, so the application of Scrum represents an adaptation of Solo Scrum / Agile for a Single Developer: the roles of Scrum Master and Development Team were carried out by the same researcher, the formal daily-scrum element was replaced with a daily self-evaluation, while the sprint review and sprint retrospective were still conducted together with the supervising lecturer acting as facilitator and the company acting as Product Owner.

System testing was carried out using the Black Box Testing method, which focuses on system functionality without considering the internal code structure, conducted directly in the local development environment (Laragon) together with PT Omega Karyatama Elektronindo as the direct user of the system.

RESULTS AND DISCUSSION

Analysis of the Current System

The results of the observations and interviews show that inventory management at PT Omega Karyatama Elektronindo is currently still carried out manually using notebooks and Microsoft Excel, without automatic validation of stock quantities. Purchase requests are submitted verbally or via short messages without a structured submission document, making the status of requests difficult to monitor, while management reports are compiled manually, a process that is time-consuming and prone to error.

System Design

The database design is depicted through an ERD with nine main entities: Admin, Manager, Supplier, Product Category, Product, Purchase Request, Purchase Order, Stock In, and Stock Out, as shown in Figure 2.

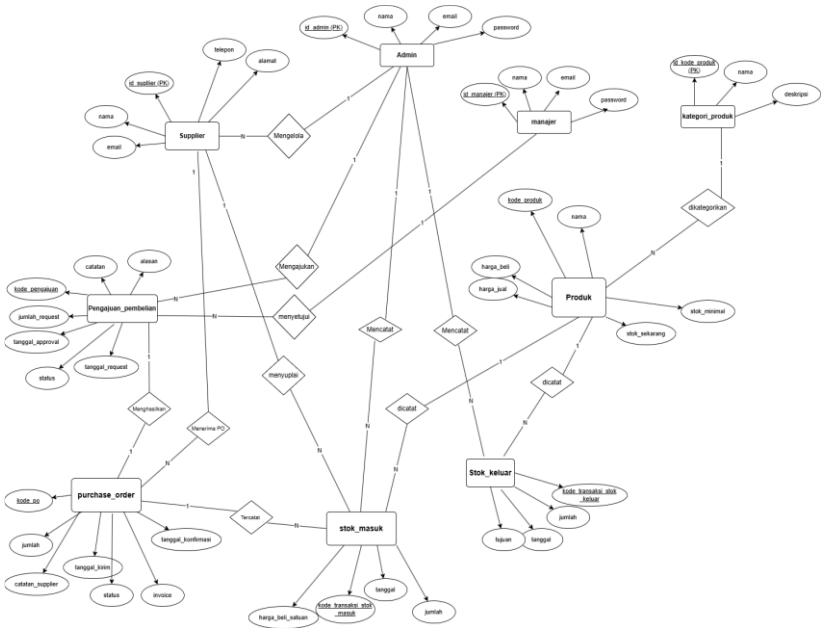

Figure 2. Entity Relationship Diagram (ERD)

The Use Case Diagram in Figure 3 identifies three main actors: Admin, with full access to product, stock, and procurement management; Management, with PR/PO approval access and read-only reporting; and Supplier, whose role is to confirm POs and upload invoices.

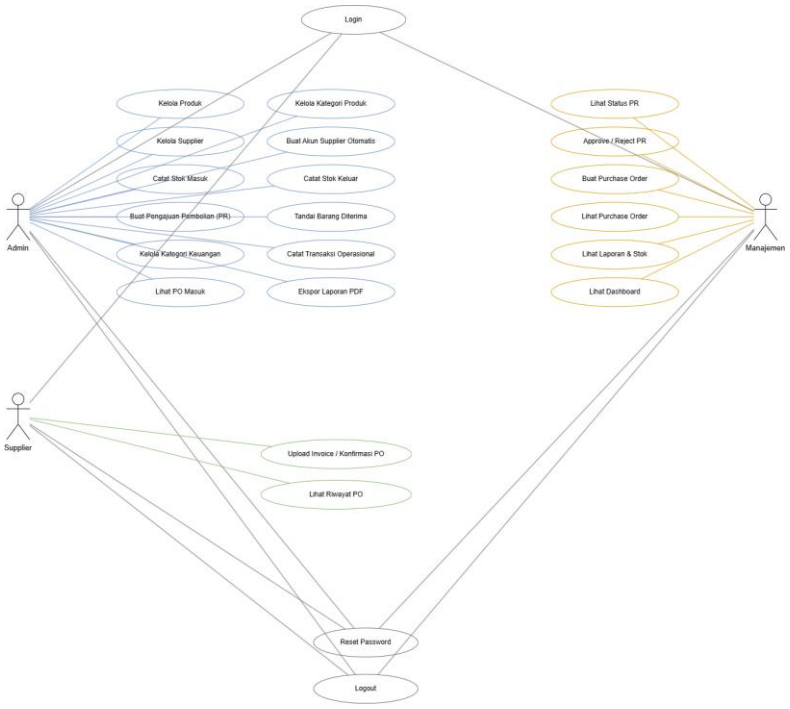

Figure 3. Use Case Diagram

The automatic stock-update mechanism is one of the system's main contributions. Figure 4 shows the Sequence Diagram for recording a Stock Out transaction: when the Admin submits the transaction form, the system first validates the requested quantity against the current_stock field in the Product Model. If valid, the StockOutObserver automatically triggers a reduction of current_stock and recalculates the stock_status (Available/Low/Out of Stock) without requiring any additional manual input from the user; if the requested quantity exceeds the available stock, the system displays an error message and the transaction is cancelled. An equivalent mechanism is also applied to the recording of Stock In transactions.

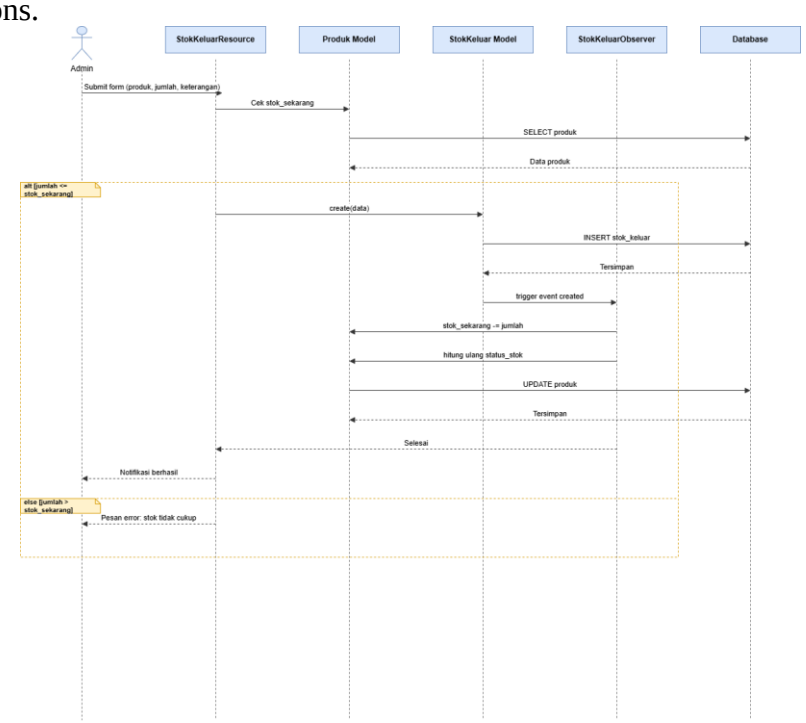

Figure 4. Sequence Diagram for Recording a Stock Out Transaction

System Testing Results

Black Box Testing was carried out on eight functional modules, with the results shown in Table 1.

No	Module Tested	Number of Scenarios	Passed	Failed
1	Login	6	6	0
2	Product Management	5	5	0
3	Stock In	3	3	0
4	Stock Out	3	3	0
5	Purchase Request (PR)	5	5	0
6	Purchase Order (PO)	4	4	0
7	PDF Report Export	4	4	0
8	Dashboard	3	3	0
	Total	**33**	**33**	**0**

Table 1. Summary of Black Box Testing Results

The test results show a 100% success rate across 33 scenarios. It should be noted that this result reflects the final condition after iterative bug fixing during each sprint review and sprint retrospective, particularly related to Filament v5 compatibility issues, and does not imply that no failures occurred at all during the development process.

System Implementation

Figure 5 shows the Admin panel dashboard, which displays a real-time summary of inventory statistics, including the total number of products, the number of products with low or out-of-stock status, the total number of stock-in and stock-out transactions, a financial summary, and a recap of Purchase Requests by status. The dashboard is equipped with a date-range filter that allows users to view statistics for a specific period.

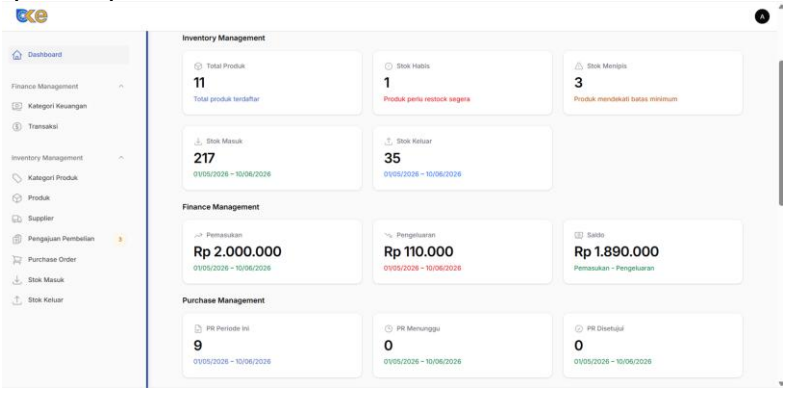

Figure 5. Admin Panel Dashboard

Discussion

All the research problems formulated in this study were successfully addressed. The problem of real-time stock monitoring was resolved through a dynamic stock-status badge (Available/Low/Out of Stock) automatically updated via the Model Observer, as illustrated in Figure 4. The problem of unstructured purchase requests was resolved through an integrated Purchase Request-Purchase Order workflow spanning multiple panels, with automatic notifications to Management. The risk of recording errors was reduced through input validation and a PDF report-export feature that replaced manual recapitulation. The system, built with a role-based multi-panel architecture using Spatie Laravel Permission, ensures that each user can only access features relevant to their responsibilities, as shown in Figure 3.

Several limitations should nonetheless be noted: the system has only been tested in a local development environment (not yet on a production server under real user load), the test data used was still simulated, the application of Scrum represents an adaptation for a single developer, and testing has thus far focused on happy-path scenarios, so edge cases such as concurrent stock transactions (which could potentially cause a race condition in the Model Observer) have not been specifically tested.

CONCLUSION

The design and development of a web-based inventory information system for PT Omega Karyatama Elektronindo has been successfully carried out using the Agile Scrum method through three development sprints. The system, built with Laravel 12 and Filament v5, successfully replaced manual record-keeping with integrated digital record-keeping, automatic stock updates via the Model Observer, a structured procurement workflow through Purchase Requests and Purchase Orders, and role-based access control across three panels (Admin, Management, Supplier). The results of Black Box Testing on 33 scenarios across eight functional modules show a 100% success rate, demonstrating that the system has met the functional and non-functional requirements established during the analysis stage, at the level of design and limited-scale functional testing. Validation at production scale and in a real operational environment can be pursued in future research, including the addition of a database-transaction mechanism to the Model Observer, external notification features, and stock forecasting.

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