Research Article

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Inventory System Design at Rajawali Motor Workshop Using Zachman Framework

Sulis Setyo Ningtyas[1]*, Diah Nur Alif[2], and Fachrudin Pakaja[3]

1,2,3 Faculty of Engineering and Informatics, Gajayana University, Malang, Indonesia,
Email: sulisstyn2@gmail.com[1], diah0303@gmail.com[2], fachrudinpakaja@unigamalang.ac.id[3]

*Corresponding Author Email: sulisstyn2@gmail.com

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Abstract

This research aims to design an inventory system at Rajawali Motor Workshop using the Zachman Framework as an enterprise architecture approach. This research uses qualitative methods with observation, interview, and documentation techniques. The results of the research are in the form of mapping system components based on six perspectives and six components in the Zachman Framework. Each perspective of the actors involved-such as the owner, warehouse admin, chief mechanic, mechanic, cashier, helper, and supplier-has a contribution in designing the system, starting from determining business needs, operational process flow, managing goods data, to distributing information between related parties. The implication of this design is to help the inventory process of goods such as oil, spare parts, and service equipment to be more systematic and integrated. This research is also the basis for implementing an information system that supports the business needs of the workshop.

Keyword: Inventory system, Zachman Framework, Enterprise Architecture, Rajawali Motor Workshop.

1. Introduction

In the era of digitalization that continues to grow rapidly, organizations and companies are required to be able to manage information quickly, accurately, and efficiently. The utilization of information technology is one of the key factors in improving operational efficiency, productivity, and service quality. In this context, information systems play an important role as a tool in decision making and in ensuring the continuity and optimization of complex business processes. Moreover, the integration of information across functions and departments is an essential requirement in modern data-driven management.

Rajawali Motor Workshop is a business engaged in motorcycle maintenance and repair services and the sale of accessories. With a daily service volume of 50 to 100 vehicles, inventory management is a crucial aspect in ensuring smooth operations. However, this workshop still faces various problems in terms of recording and managing stock, such as delays in the distribution of spare parts, data discrepancies, and undetected stock-outs. This is due to the unavailability of a structured and integrated information system that is able to record the flow of goods in real time and accurately. Currently, the inventory process is still carried out manually by warehouse admins and cashiers, which is prone to human error and slows down the reporting and decision-making process.

To overcome these problems, an inventory information system is needed that is not only able to record incoming and outgoing goods, but also integrate the needs of various parties such as mechanics, helpers, and suppliers. The design of the information system needs to use a systematic and comprehensive approach, one of which is by utilizing the Zachman Framework. This framework allows system designers to understand and model business needs from various stakeholder perspectives, ranging from business owners to technical users. With a matrix structure that considers the dimensions of data, process, actors, location, time, and motivation, the Zachman Framework provides clear guidance in designing an information system architecture that matches the real conditions in the field.

Previous research has shown that manual- based inventory systems contain many weaknesses. Research by Renggi, F. O., Tute, K. J., & Mando, L. B. F. (2022) revealed that the use of manual systems makes it difficult to monitor the process and accuracy of inventory data in workshops. Meanwhile, Bahri (2021) emphasized the importance of the right system architecture approach, such as the Zachman Framework, in designing information systems that are relevant and can meet user needs. Wildan, Riswandi, F., Sembiring, K. J., & Aditya, E. (2021) also support the use of the Zachman Framework because it can produce a neat system design that is in accordance with organizational conditions. Although it has proven effective, this approach is still rarely applied in the small and medium business sector, including workshops.

Seeing this condition, this research aims to design an inventory information system that suits the operational needs of the Rajawali Motor Workshop using the Zachman Framework approach. This research also aims to identify the roles of each stakeholder, the ongoing business processes, and the information needs that need to be modeled systematically in order to support optimal stock management and distribution of goods. The structure of the discussion in this research starts from theoretical studies and previous research, followed by data collection and analysis methods, system design results based on the Zachman framework, as well as conclusions and suggestions for future system development

2. The Art of Research

In developing an effective and structured information system, an understanding of key concepts such as inventory information systems, system design, and architectural frameworks is very important. The following literature review provides the conceptual basis for this research.

Inventory information systems are a crucial part of logistics management and distribution of goods in an organization, including in the context of motorcycle repair shops. This system has the main function to record data on incoming and outgoing goods, monitor stock availability, and facilitate the process of requesting goods from various internal parties. Jogiyanto (2005) explains that an information system is a set of interconnected procedures that function to process data into useful information to support decision making. In workshop operations, the inventory information system is a vital tool in ensuring the real-time and accurate availability of spare parts, lubricants, and other equipment, so as to minimize recording errors and service delays that can have an impact on customer satisfaction.

Information system design itself is an important stage that connects business needs and technical solutions. According to Whitten and Bentley (2004), system design aims to transform user requirements into structured technical specifications. In the context of workshop inventory, this process includes identifying the flow of goods transactions, reporting needs, and stock control by various stakeholders such as warehouse admins, cashiers, and mechanics. Therefore, the system design must be able to represent the real needs in the field and provide features that can reduce dependence on manual processes.

To produce a comprehensive system design that meets the needs of the organization, the Zachman Framework approach is used. This framework was first introduced by John A. Zachman in 1987 as a tool in the development of enterprise architecture. The Zachman Framework maps the system design process into a 6x6 matrix, which combines six perspectives (Planner, Owner, Designer, Builder, Subcontractor, and System in Operation) with six fundamental questions (What, How, Where, Who, When, and Why). Each cell in the matrix represents a specific architectural artifact that must be developed to ensure the completeness and consistency of the information system.

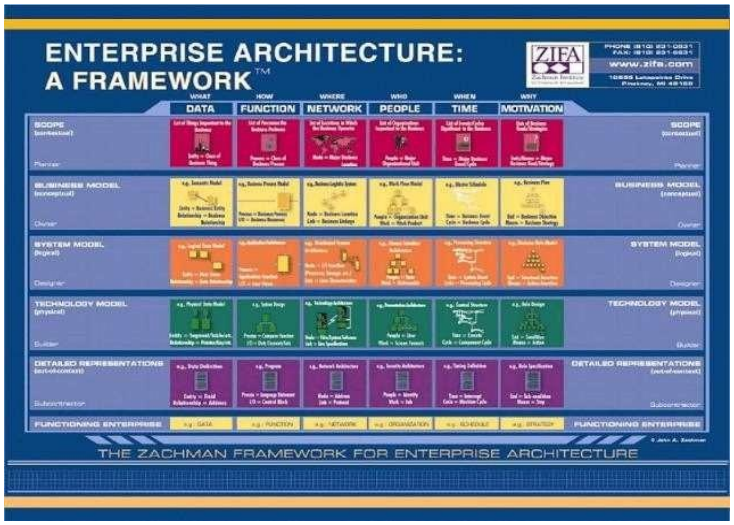

Figure 1. Zachman Framework

The use of the Zachman Framework in this research aims to accommodate the point of view of all stakeholders in the Rajawali Motor Workshop, ranging from business owners, warehouse admins, to suppliers. With this approach, the information system designed is expected to answer the actual business needs and minimize the gap between users and system developers. A more detailed explanation of the implementation of this framework in the research will be discussed in the methods section.

3. Method

1) Type of Research

This research is a descriptive qualitative research that aims to describe and design an inventory system at Rajawali Motor Workshop based on the enterprise architecture approach. The focus of this research is to identify system requirements from various stakeholder perspectives and map them into the Zachman Framework. This research does not produce ready-to-use software, but in the form of conceptual designs that are ready for further development.

2) Data Collection Technique

In this research, the data collection techniques used are as follows:

a. Observation

Researchers made direct observations of operational activities at Rajawali Motor Workshop to understand the workflow and inventory activities in depth. This method is used to obtain accurate data related to the running business process, so that it can be the basis for designing an application system that is suitable and supports the implementation of research.

b. Interview

Interviews were conducted with key stakeholders such as the owner, warehouse admin, chief mechanic, and cashier to find out the needs of the system, the obstacles faced, and the flow of goods management.

3. Development Framework

This system development framework uses the Zachman Framework, which is an approach that divides the system design process into six perspectives: Planner, Owner, Designer, Builder, Subcontractor, and System in Operation. Each perspective sees the system from a different point of view, starting from the initial planning until the system is actually used. In addition, this framework also considers six important aspects: what is needed (What), how it works (How), where the system is used (Where), who is involved (Who), when the activity is carried out (When), and why the system is needed (Why).

In the context of Rajawali Motor Workshop, this framework is used to describe the needs and workflows in inventory management in a step-by-step and structured manner:

- In the Planner perspective, the direction and purpose of the system is determined, namely to make stock management more organized and efficient.
- The Owner perspective describes the needs of the workshop owner, such as stock reports and approval of requests for goods.
- In the Designer perspective, the system begins to be designed through data and process diagrams, such as ERD and activity diagrams.
- The Builder perspective discusses the technology used, such as PHP, MySQL, and LAN/Wi-Fi networks.
- The Subcontractor focuses on technical implementation such as program code generation and system testing.
- Finally, System in Operation evaluates whether the system runs as needed through direct trials by users (warehouse admin, cashier, and owner).

With this framework, all processes can be explained neatly and easily understood by business owners. This approach also helps ensure that the system created is truly in accordance with the needs in the field and supports the real process of digitizing the workshop.

4. Result

This chapter describes the results of the inventory information system design process at Rajawali Motor Workshop using the Zachman Framework approach. The main focus of this research is to develop a systematic system that is relevant to the real conditions of the workshop which still uses manual recording in inventory activities. All data, processes, and system structures are organized based on six perspectives and six components in the Zachman Framework.

1. Characteristics of the Research Object

Rajawali Motor Workshop is an automotive workshop in Malang City that provides motorcycle service and sells spare parts and oil. With an average of 50 to 100 motorcycles serviced per day, the need for accurate and efficient inventory management is very high. However, currently the recording of incoming and outgoing goods is done manually, both by the warehouse admin and the cashier. Problems that arise include:

- Unsynchronized stock data
- Delays in decision-making because there is no up-to-date stock report
- High risk of human error

Therefore, an information system is needed that can integrate all inventory activities and speed up the daily workflow.

2. Design Results Based on Zachman Framework

The scope of the system includes recording and management:

Tabel 1. Zachman Perspective

Zachman Perspective	Focus Area	Description
Planner (Scope)	System Scope	Inventory data management (items, suppliers, stock in/out, sales, and item requests).
Owner (Enterprise Model)	Business Needs	Stock visibility, request verification, reporting dashboard, low stock alerts.
Designer (System Model)	Logical Design	ERD, Activity Diagram, role-based access, LAN/Wi-Fi network for internal access.
Builder (Technology Model)	Technical Specs	PHP (CodeIgniter/Laravel), MySQL/MariaDB, HTML/CSS/JS frontend, structured modules.
Implementer (Detailed Representations)	Implementation Environment	XAMPP/local/cloud server, internal testing, password encryption, role- based access.
Participant (User View)	User Simulation	Admin inputs data, cashier handles transactions, owner verifies and monitors reports

5. Discussion

The system development framework in this research uses the Zachman Framework, which presents an enterprise architecture approach in the form of a two-dimensional matrix. This framework consists of:

A. Planner's Perspective

1. What (Data)

The data that is the main focus at this stage relates to the main entities in the inventory process, including:

- Item Data: Information about goods such as item code, item name, type, stock quantity, and unit.
- Goods Receipt: Records of incoming goods from suppliers, including date, quantity, and related suppliers.
- Goods Expenditure: Data on goods used or sold, including usage by mechanics and sales transactions.
- Goods Request: Internal requests from cashiers or chief mechanics for vehicle repair needs.

2. How (Process)

Conceptually, the main processes designed include:

- Input of goods data by the warehouse admin.
- Recording incoming goods after they are received from the supplier.
- The process of requesting goods by mechanics approved by the chief mechanic.
- Release of goods based on requests and recording of their use.
- Periodic monitoring of stock items.
- All of these processes are still taking place manually and require information systems to improve efficiency and accuracy.

3. Where (Network/Location)

The main location of the system is Rajawali Motor Workshop which is located at Jl. Metojoyo Selatan No. 4, Merjosari, Lowokwaru sub-district, Malang City. All inventory activities take place in the warehouse area and cashier section. The system will be designed web-based so that it can be accessed through computer devices at the workshop location.

4. Who (People)

The parties involved in the inventory process are:

- Workshop Owner/Head Mechanic: Monitor stock availability and make purchasing decisions, approve requests for goods.
- Warehouse Admin: In charge of inputting data on incoming and outgoing goods.
- Cashier: Perform sales transactions and record goods sold.

5. When (Time)

Inventory activities are dynamic, depending on the daily conditions of workshop operations:

- Incoming goods usually occur every week or according to procurement needs.
- Outgoing goods occur every day, depending on the volume of vehicle services.
- Requests for goods may occur several times a day.
- Recording is done on a daily basis by the warehouse admin.

6. Why (Motivation)

The main objectives of designing this inventory system are:

- Reducing errors in recording goods due to manual processes.
- Increase speed and accuracy in stock management.
- Facilitate the owner in making decisions based on accurate stock reports.
- Ensure the availability of goods when needed by mechanics.
- Improve service to customers by speeding up the service process

B. Owner's Perspective

The Owner's Perspective in the Zachman Framework describes how the proposed information system will be run from the point of view of management or business owners. At this stage, the focus is directed at the information structure and system requirements that support the inventory process, in accordance with the expectations and interests of the workshop manager.

1. What (Data)

From the owner's point of view, the data of primary concern are:

- Item Master Data: Information on items available in the workshop, including code, item name, type, quantity, and price.
- Goods Receipt Transaction Data: Recording every incoming item from the supplier, which is important to know the new stock available.
- Goods Dispensing Transaction Data: Recording of goods used in service or sold to customers, as a basis for inventory control and financial reports.
- Goods Request Data: A history of requests from cashiers or workshop heads showing actual operational needs.
- These data are used by the owner to determine stock conditions, analyze the use of goods, and make procurement decisions.

2. How (Process)

The inventory process from the owner's perspective includes:

- Viewing daily, weekly, or monthly stock reports.
- Monitoring the number of outgoing and incoming items on a regular basis.
- Approving the purchase of new items if the stock is low or there is a request from the warehouse.
- Analyzing the efficient use of goods based on demand and expenditure data.

The inventory system must be able to present clear, easy-to-understand, and real-time reports so that the owner can make decisions quickly.

3. Where (Network/Location)

From the owner's perspective, the inventory system must have a network that is easily accessible, integrated, and supports all workshop operational activities. The system is designed to be web-based so that it can be used by devices connected via local network (LAN) or wireless (Wi-Fi), with a simple yet functional network architecture.

Table 2. The Inventory System Design and Development Activities

No.	Activity Name	Target	June			
			M1	M2	M3	M4
1.	System requirement identification	Knowing user needs and problems				
2.	Stakeholder interview	Extracting information from owners and users				
3.	Formulation of scope and objectives	Determine the scope & objectives of the system				
4.	Review of existing business processes	Mapping the current process for the new system				
5.	Preliminary design approval	Owner approval of the initial system scheme				

4. Who (People)

The parties involved and interacting with the system from the owner's perspective are:

- Workshop Owner/Head Mechanic: The main decision maker regarding the procurement of goods, stock evaluation, and expenditure budget, approves requests for goods from mechanics, and ensures that goods are used as needed.
- Warehouse Admin: The party in charge of recording incoming and outgoing goods.
- Cashier: In charge of recording customer service transactions, submitting requests for goods to the warehouse admin based on service needs from mechanics, and ensuring that the goods used are in accordance with the type of service provided.

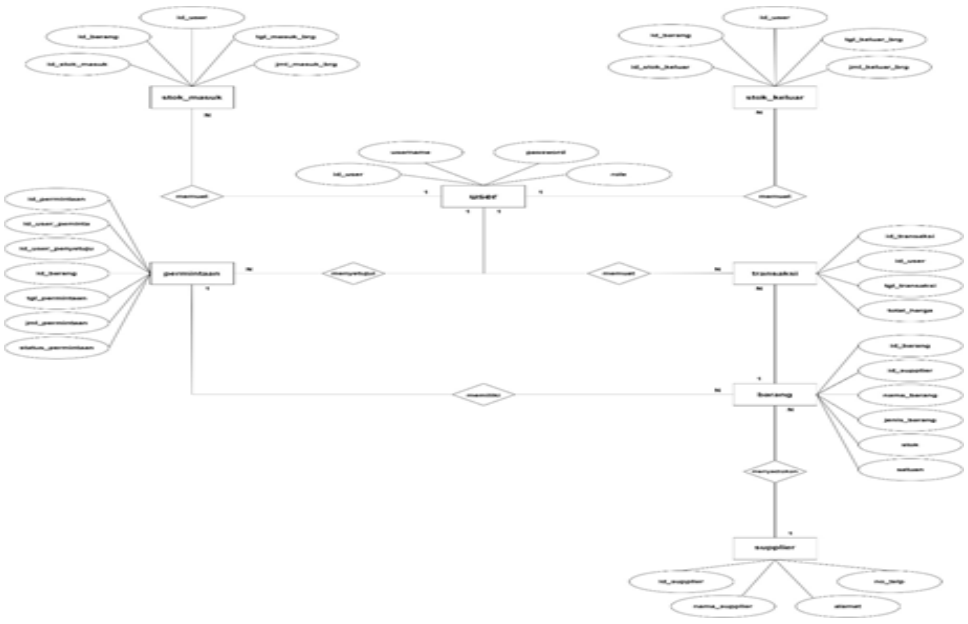

Figure 2. Entity Relationship Diagram (ERD)

5. When (Time)

This column describes the time of the inventory system design and development activities (see tabel 2).

6. Why (Motivation)

The owner's goals and expectations for this inventory system include:

- Improve efficiency in managing goods.
- Ensure stock availability so that the service process is not hampered.
- Reduce the risk of running out of goods and losses due to recording errors.
- Support more accurate decision making based on real-time data.
- Improve supervision and control of warehouse activities and employee use of goods.

C. Designer Perspective

The Designer Perspective in the Zachman Framework describes the system in a logical form that underlies the technical development of the system. At this stage, the design of the Rajawali Motor Workshop inventory system is compiled based on the functional requirements previously identified by the system owner and users. The purpose of this perspective is to compile the data structure, process flow, network configuration, user actors, design schedule, and logic rules that will be applied to the inventory system.

1. What (Data)

On the data side, a relational model between entities is designed that describes the structure of information in the system. The main entities determined include:

- Item: includes item data such as item code, item name, type, and stock quantity.
- Supplier: provider of goods or spare parts used by the workshop.
- In-Stock: records details of goods received from suppliers.
- Out of Stock: records items issued for service needs.
- Goods Request: contains data on requests for goods by the head mechanic based on service needs.
- System Users: including Warehouse Admin, Chief Mechanic (Owner), and Cashier.

The relationship structure between these entities is outlined in the form of an Entity Relationship Diagram (ERD) which serves as the basis for relational database design. This data model is designed to support detailed and accurate tracking of stock history.

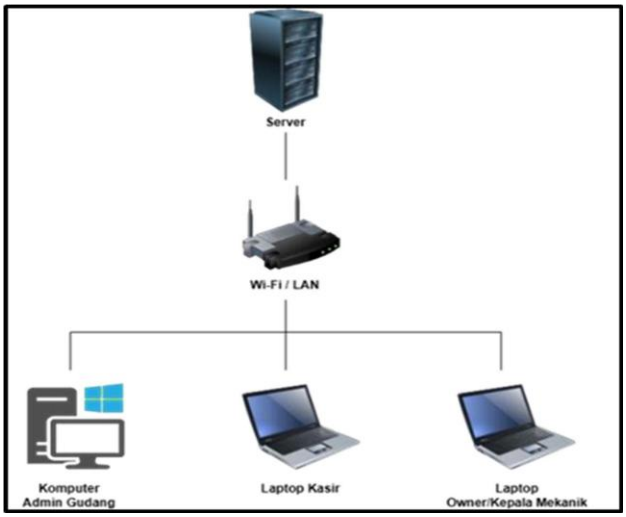

Figure 3. The Network

2. How (Process)

The business processes that occur in the system are described using Activity Diagrams to illustrate the logical workflow of various features. The main activities include:

- System Login: All users must login to access the system according to their respective access rights.
- Incoming Goods Entry: Warehouse admin records goods coming from suppliers.
- Goods Request: The head mechanic makes requests based on operational needs.
- Request Verification: The owner verifies each requisition before it is approved.
- Goods Release: Once approved, the admin issues the goods as requested.
- Transaction Recording: The cashier records the items used in the customer service transaction.

This activity diagram helps developers understand the sequence and dependencies between existing processes.

3. Where (Network/Location)

The network design in the Rajawali Motor Workshop inventory system uses a simple topology based on a local network (LAN) with the possibility of developing to a web-based network in the future. The network components consist of:

- Local server as a database storage center and system application.
- Warehouse Admin computer for stock management
- Head Mechanic's computer for managing item requests.
- Cashier's computer for recording transactions
- Routers and Switches as a link between devices.

The network is designed to ensure data security and efficient access between users who are in the same location.

4. Who (People)

This system design involves three main stakeholders:

- Warehouse Admin: responsible for recording incoming and outgoing goods, and monitoring stock availability.
- Owner/Head Mechanic: organizes and verifies requests for goods based on vehicle repair and service needs.
- Cashier: records customer service transactions related to the use of goods or spare parts.
- This role division determines system access restrictions based on the authority and responsibilities of each user. Each role is given specific access rights to ensure data accuracy and security.

5. When (Time)

The system design is carried out based on the stages planned in stages as follows:

Table 3. The System Design

No.	Activity Name	August			
		M1	M2	M3	M4
1.	Identify entities and attributes				
2.	Preparation of ERD and database schema				
3.	Design of use cases and activities				
4.	Network design and system access				
5.	Review and validation of initial design				

This schedule is designed to ensure that each component of the system can be developed in a structured and sustainable manner.

6. Why (Motivation)

The motivation for the Designer perspective is to develop a system that is logical, structured, and can be translated into technical form. Some of the logic rules applied in the design include:

- Item code standard: each item has a unique code to prevent duplication.
- Access restrictions: the system is built with authentication and access rights based on job titles.
- Input validation: each data entry is validated to ensure consistency and accuracy.
- Historical tracking: each incoming and outgoing transaction is recorded with a timestamp for auditing and reporting purposes.
- With a robust logical structure, the system is expected to improve inventory management efficiency and reduce the risk of errors caused by manual recording.

D. Builder Perspective

The Builder perspective is the fourth line in the Zachman Framework. At this stage, the focus shifts from the logic of system design (designer level) to the physical and technical form of system implementation. The builder is in charge of translating design specifications into real software and hardware components that can be used directly by end-users.

1. What (Data)

The physical implementation of the data entity includes the creation of databases and tables according to the ERD scheme. The main components are:

- Database: db_inventory_rajawali
- DBMS used: MySQL/MariaDB
- Table structure and physical relationships:
  - tb_user→ Stores user data (admin, cashier, head mechanic).
  - tb_goods→ Item data (code, name, category, unit, price, stock).
  - tb_supplier→ Supplier name, address, and contact.
  - tb_stock_inbound→ Records of incoming goods (date, supplier, quantity, item).
  - tb_stock_out→ Records of outgoing goods based on requests/sales.
  - tb_request→ Request for goods from the cashier to the head mechanic.
  - tb_transaction→ Records of sales of goods to customers.
  - Relationship between tables (foreign key):
  - tbl_stock_in.id_goods→ tbl_goods.id_goods
  - tbl_stock_out.id_request→ tbl_request.id_request
  - tbl_transaction.item_id→ tbl_item.item_id
  - tb_supplier.id_supplier‧ tb_supplier.id_supplier
  - tb_goods id‧ tb_goods.item_id
  - tbl_user.id_user‧ tb_user.id_user

2. How (Process)

Business processes are translated into system modules (program code) developed with a modular approach. Components:

- Login & Authentication Module:
  - Username & password validation.
  - Redirect according to role (admin, cashier, owner).

- Item Management Module:
  - Add/edit/delete items.
  - Search for items by category/code.

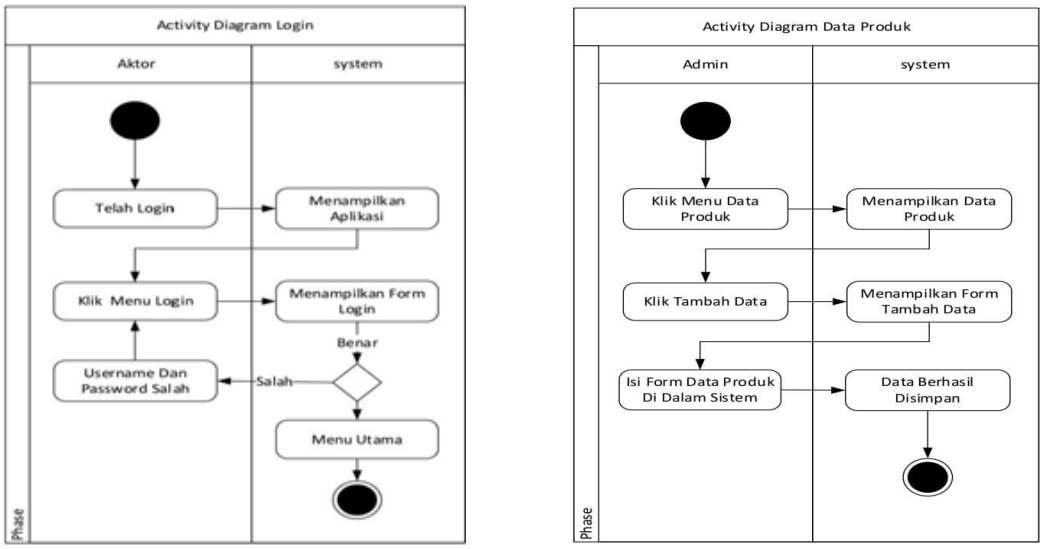

Figure 4. Diagram Activity Login (Left) & Data Activity Diagram (Right)

- Incoming Stock Module:
  - Input of incoming goods drom suppliers.
  - Automatically add stock in tbl_goods.

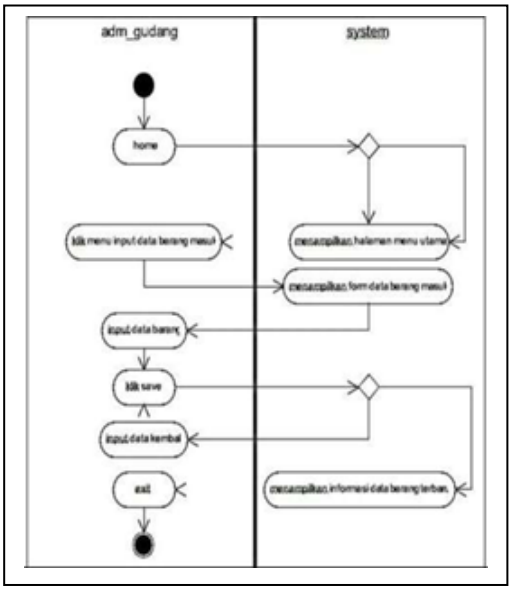

Figure 5. Incoming Stock Module

- Goods Request Module:
  - Cashier submits a request for goods.
  - Owner approves/rejects request.
- Out of Stock Module:

- Admin issues goods according to the approved request.
- Reduce stock in tbl_goods.

- Sales Transaction Module:
  - Input transaction by cashier.
  - Calculate total price.
  - Reduce stock automatically.
- Report Module:
  - Stock report (daily/weekly/monthly).
  - History of goods in/out.
  - Transactions and request history.
- Framework/Tools that can be used:
  - PHP + MySQL.
  - Laravel / CodeIgniter (if framework-based).
  - HTML/CSS/JS for front end.

3. Where (Network/Location)

Realize the logical design of the network into real infrastructure:

- Servers:
  - Can be local (in the workshop) or cloud-based.
  - Running web server (Apache/Nginx), PHP, and MySQL.
- Client Devices:
  - Warehouse Admin Computer: for incoming & outgoing stock.
  - Cashier's Laptop: transactions and item requests.
  - Owner's Laptop: approve requests and monitor stock.
- Servers:
  - LAN and Wi-Fi connected to the server.
  - Router + switch as connector.
  - Static IP for local server if not using cloud.

4. Who (People)

Implementation of user roles in the system with separate interface development according to function:

Table 4. Implementation of User Roles

No.	Role	Main Access Rights	Displayed UI
1.	Owner/Head Mechanic	Verify requests, view reports, decision to purchase goods	Approval dashboard & transaction report
2.	Warehouse Admin	Input goods, stock in & out, view reports	Input form, stock table, report, type
3.	Cashier	Input transactions, submit requests for goods	Transaction form, request form

Notes:

- The application is web-based, responsive for laptop/PC devices.
- Access right are limited by session login and role (owner/head mechanic, warehouse admin, or cashier).

5. When (Time)

The schedule for the implementation system development is described on a weekly basis:

Table 5. The Schedule for The Implementation System Development

No.	Implementation Stages	September			
		M1	M2	M3	M4
1.	Setup environment (server, DB)				
2.	UI and login module development				
3.	Main module development (stock, transaction, request)				
4.	Report and dashboard development				
5.	System testing and debugging				

6. Why (Motivation)

The motivation at this stage is more technical, which is to ensure the system runs correctly through:

- Form Validation:
  - No blank input.
  - Appropriate data format (date, number, string).
- Authentication & Authorization:
  - Every login is checked against role.
  - Access restricted by role (cashier cannot delete items).
- Data Integrity:
  - Automatic stock updates when goods enter/exit.
  - All activities are recorded with timestamp.
- System Security:
  - Password encrypted (e.g. bcrypt).
  - SQL Injection protected database.
- Audit Trail:
  - User activity history can be traced.
  - Every important action (delete, update) is logged.

E. Builder Implementation Perspective

The Builder perspective describes how the system is built technically and physically. The main focus is to form a real database structure, write program code (modules), connect the system to the network, prepare user interfaces according to roles, develop a technical implementation schedule, and ensure the system runs properly through testing and validation.

1. What (Data)

The implementation of the physical data structure in the db_inventori_rajawali database uses MySQL/MariaDB, with the following relationships between tables:

- Tables and Relationship:

Table 6. The Implementation of The Physical Data Structure

No.	Table	Foreign Key	Relationship
1.	tb_goods	supplier_id	tb_supplier.id_supplier
2.	tb_stock_input	item_id, user_id	tb_items, tb_user
3.	tb_stock_out	item_id, user_id	tb_items, tb_user
4.	tb_request	requesting_user_id, approving_user_id, item_id	tb_user, tb_items
5.	tb_transaction	user_id	tb_user

- Technical:

- DBMS: MySQL 8.0.
- Security of sensitive data: password encrypted (bcrypt),
- Indexing: on key columns (item_id, transaction_date, etc.)

2. How (Process)

System modules are built using PHP and a framework (e.g. CodeIgniter or Laravel). Each process is divided into modules as follows:

Table 7. System Modules Using PHP and a Framework

No.	Module	Technical Function
1.	Login & Authentication	User verification based on role and session
2.	Item Data Management	CRUD item data, with input validation
3.	Incoming Stock Input	Incoming goods input form, automatic stock update
4.	Goods Request	Cashier fills out the form, owner approves / rejects the request
5.	Out of Stock	Goods out according to requests or transactions, reduce stock automatically
6.	Sales Transaction	Input goods to customers, automatically record outgoing stock
7.	Reports	Print and filter stock reports, transactions, requests

3. Where (Network/Location)

The physical implementation of the inventory system uses a local architecture (LAN), with the possibility of expanding to the cloud.

Table 8. The Physical Implementation of The Inventory System

No.	Component	Function
1.	Local Server	Stores database and program code, can be used XAMPP or VPS.
2.	Admin Computer	Input of goods data, stock in / out, access to the server via LAN
3.	Owner's Laptop	Verify requests, view reports via Wi-Fi
4.	Cashier Laptop	Input transactions and requests for goods
5.	Router + Switch	Connecting all devices, static IP for server

4. Who (People)

The interface design is differentiated based on user access rights, and is built responsive (HTML + CSS + JS). Access rights:

Table 9. The Interface Design

No.	Role	Accessed Module
1.	Warehouse Admin	Input of goods, stock in/out, stock report
2.	Cashier	Request for goods, sales transactions
3.	Owner	Request verification, report, stock history

5. When (Time)

System development schedule in 1 month, week by week:

Table 10. System Development Schedule

No.	Work Stage	M1	M2	M3	M4
1.	Server installation & DB setup				
2.	Table structure creation (SQL)				
3.	Login & authentication module coding				
4.	Coding of goods module, stock in/out				
5.	Transaction & request module				
6.	Report & dashboard module				

6. Why (Motivation)

Implementation of technical logic to ensure the system runs stable, and as needed:

Table 11. Implementation of Technical Logic

No.	Rule/ Feature	Technical Implementation
1.	Data Validation	All forms use frontend and backend validation
2.	Authentication	Session-based login, redirect by role
3.	Access Restriction	Middleware (Laravel) or filter (CI) for each role access
4.	Auto-update stock	Trigger the stock script when items enter/exit/sell
5.	Audit Trail	User activity log, especially for deletion/change of big data.
6.	Password Encryption	Use bcrypt or password_hash() (PHP native)
7.	Database Backup	Scheduled weekly (optional via cron job)

F. Participant Perspective (Sub-Contractor)

The Participant perspective is a representation of a system that has been running or tested in the form of a prototype or functional version. The main focus is testing, user training, function validation, and evaluation of system performance before full deployment.

1. What (Data)
   - The system is tested with real data such as:
     - New item input.
     - Stock in/out simulation.
     - Request for goods from the cashier.
     - Sales transcation by cashier.
     - Request approval by owner.
   - Tested:
     - Input validation (whether the data is not empty, according to the format).
     - Stock changes according to business logic.
     - Automated reports: stock, transaction, and requisition summary.
   - Sample Output:
     - Weekly stock report (incoming, outgoing, requisition).
     - Transaction history cashier.
     - Requests approved/rejected by owner.
2. How (Proses)
   - Testing is done with real scenario test cases, such as:
     - Login with different roles (cashier, admin, owner).
     - Admin input new items and incoming stock.
     - Cashier makes a request for goods.
     - Owner approves request.
     - Admin releases goods.
     - Cashier creates sales transactions.
   - Test Method:
   - Black-box testing · functions run without errors?
   - User Acceptance Test (UAT) · do users feel the system meets their needs?
3. Where (Network/Location)
   - The system is tested in the real operational environment, i.e:

- Location: Rajawali Motor Workshop
- Devices: Warehouse admin computer, cashier laptop, owner laptop.
- Network: LAN + Wi-Fi internal to the workshop

- Additional Activities:
  - Server IP adjustment (if using localhost).
  - Installation of supporting software: XAMPP, browser, PDF viewer.

4. Who (People)

Brief training is given to each role to understand the basic flow of using the system

Table 12. System Testing Activities by Role

No.	Role	Activity in Testing
1.	Warehouse Admin	Input data on goods, stock in, stock out
2.	Cashier	Simulation of goods requests, sales transactions
3.	Owner / Head Mechanic	Approve requests, view reports
4.	Developer/Test Team	Assist, record bugs and feedback

5. When (Time)

System tests were conducted during the last week of the implementation phase, including:

Table 13. Schedule System Tests

No.	Test Activity	Time (Day To)
1.	Item input simulation	Day 1
2.	Incoming & outgoing stock	Day 2
3.	Goods request & approval	Day 3
4.	Sales transaction	Day 4
5.	Report & output validation	Day 5
6.	User evaluation & revision	Day 6-7

Use flexible schedule according to user's free time (admin/cashier).

6. Why (Motivation)

- The main motivation from this perspective is to ensure the system:
  - Feasible for users to use (not just a prototype).
  - Meet the operational needs of the workshop.
  - There are no fatal errors in the input process, calculations, and reports.
  - Provide comfort and convenience for admin, cashier, and owner.
- The results of this stage are:
  - List of bugs/errors.
  - List of improvement the system can be fully deployed or needs revision

6. Conclusion

The application of the Zachman Framework in designing an inventory information system at Rajawali Motor Workshop has proven effective in overcoming stock management problems that were previously done manually. The system is able to translate stakeholder needs into functional features such as stock recording, sales transactions, reports, and management of access rights for warehouse admins, cashiers, and owners. Web-based, the system is easily accessible and improves operational efficiency and accuracy. Managerially, the system provides better visibility to the owner in monitoring the movement of goods, accelerating the service process, and building a professional and modern image of the workshop. However,

this system still has limitations, such as the scale of implementation is limited to one location, has not been integrated with other systems, and has not been tested under high transaction loads.
For future development, it is recommended that the system supports mobile access, is moved to the cloud, has an audit trail, and is able to handle multiple warehouse locations. User documentation and training should also be prepared, along with maintenance strategies such as regular backups and system migration planning. With this further development, the system is expected to be able to sustain the growth of workshops and meet the challenges of a larger scale in a sustainable manner.

Acknowledgments

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