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Design of a Raw Material Inventory Control Information System Using the EOQ Method with Supplier Integration : A Case Study of CV. Troy Metal

Faizal Armansyah[1], Mohammad Fajar Nurwildani[2], Siswiyanti[3]
[1,2,3]Department of Industrial Engineering, Faculty of Engineering and Computer Science, Pancasakti University, Indonesia
[1]arsfaizal589@gmail.com, [2]nurwildani20172@gmail.com, [3]Siswieyanti@gmail.com

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ABSTRACT

Troy Metal is a manufacturing company that produces stove tops and still uses conventional methods to manage raw material inventory, which can potentially lead to overstock and stockout situations. This study aims to implement the Economic Order Quantity (EOQ) and Reorder Point (ROP) methods in a web application-based raw material inventory control information system integrated with supplier management. This is an applied study using a quantitative approach. Data were collected through observation, interviews, and documentation, including data on raw material demand, ordering costs, holding costs, *lead time*, *safety stock*, and supplier information. The EOQ and ROP methods were used to determine the economic order quantity and reorder point, while the system's functionality was tested using Black Box Testing. The developed system is capable of managing raw material data, supplier data, and inventory transactions; automatically calculating EOQ and ROP; providing reorder notifications; and generating and sending *Purchase Orders* (POs) to suppliers via email. The implementation results showed an EOQ value of 1,387 kg and an ROP value of 599.54 kg, providing the company with a more systematic basis for determining reorder quantities and timing. The results of Black Box Testing showed that all system functions operate in accordance with functional requirements. Thus, the developed system is capable of supporting more effective control of raw material inventory and improving the efficiency of the procurement process through the integration of supplier management into a single information system.

A. INTRODUCTION

The development of the manufacturing sector in Indonesia has shown rapid growth and plays a significant role in supporting national economic growth (Prabowo, 2025). Data from the Central Statistics Agency show that the manufacturing industry contributed approximately 18–19% to the national Gross Domestic Product (GDP) during the 2022–2024 period (Harahap et al., 2026). As industrial competition intensifies, companies are required to improve operational efficiency, one way being through raw material inventory control (Navarro et al., 2022). Inventory control is a critical aspect of operations management as it is directly linked to the smooth flow of production processes and cost efficiency (Burhan et al., 2019). Suboptimal inventory management can lead to overstock, which increases storage costs, or stockouts, which hinder the production process (Arani et al., 2021.). These conditions are generally influenced by fluctuations in demand and suboptimal inventory control systems implemented by companies (Afrizal et al., 2025).

Advances in information technology have encouraged manufacturing companies to implement information systems that support inventory control more effectively. Manual inventory management has limitations, including recording errors, delays in information availability, and difficulties in monitoring stock accurately. Technology-based systems can integrate inventory data, provide real-time information, and support raw material procurement decisions (Lukiman & Richard, 2020)(Trianto et al., 2025) . Research by Bassey & Zelibe, (2022) shows that the integration of inventory management systems and coordination across inventory levels can improve operational efficiency. Information systems also facilitate inventory monitoring and data management, improving the efficiency of decision-making processes (Agustin et al., 2026) (Luthfianto et al., 2025).

This problem occurs at CV. Troy Metal, a manufacturing company that produces stove grates. The company still experiences overstock and stockout conditions due to reactive raw material procurement. Raw material order data for June 2025–May 2026 shows inconsistent quantities, with the highest order of 3,748 kg in April and the lowest of 262.2 kg in March. Inventory recording and monitoring are also performed manually using Microsoft Excel, making reorder quantity and timing less systematic. These conditions increase the risk of inventory buildup or raw material shortages caused by demand changes and supplier delivery delays.

Previous studies have shown that EOQ can improve inventory management efficiency and support web-based inventory decision-making (Jahroni & Muksin, 2023) (Thiara et al., 2024). Other studies have developed web-based inventory systems using various technologies, but generally focus on internal inventory management (Sodiqin et al., 2026)(Putri et al., 2025). ROP can determine reorder timing and help maintain raw material availability (Milewski & Wiśniewski, 2022), can improve the effectiveness of inventory control and reduce the risk *of overstock* and *stockouts*. developing a web-based inventory information system capable of improving the accuracy of inventory management and supporting the decision-making process through the integration of inventory calculations into the system (Marzuqi et al., 2026). On the other hand, the Reorder Point (ROP) method can be used to determine the reorder timing so that the availability of raw materials is maintained (Syamsi et al., 2026). The development of an inventory system can improve data management efficiency and accelerate inventory administration processes. However, previous studies generally have not integrated EOQ and ROP with supplier data and lead time information in a single system to connect inventory planning with procurement execution.

Based on this gap, this study proposes the development of a web-based raw material inventory control information system that integrates the Economic Order Quantity (EOQ) and Reorder Point (ROP) methods with supplier management. The system includes supplier registration, storage of supplier lead time information, and the generation and sending of purchase orders via email. The main contribution of this study lies in integrating inventory decision-making with the raw material procurement process within a single information system. The EOQ and ROP methods provide recommendations for the quantity and timing of raw material replenishment, while supplier information and lead time data support supplier selection and procurement execution. This integration enables inventory control recommendations to be directly connected to the procurement process, reducing the separation between inventory planning and purchasing activities.

B. METHODS

1. Research Type and Data Collection

This study is an applied research project using a quantitative approach to develop a raw material inventory control information system using the Economic Order Quantity (EOQ) and Reorder Point (ROP) methods at CV. Troy Metal. Data were collected through observation, interviews, and documentation, including raw material demand for June 2025–May 2026, ordering costs, storage costs, lead times, safety stock, and supplier data. Observations identified the existing inventory control process, while interviews with inventory personnel provided information on procurement processes, inventory costs, lead times, and safety stock policies. Documentation provided historical demand, supplier data, and supporting documents.

The research process consisted of problem identification, data collection, data processing, EOQ calculation to determine the optimal order quantity, and ROP calculation to determine reorder timing. The results were then implemented in a web-based information system developed using the Laravel framework and MySQL database. The research workflow is shown in Figure 1.

Figure 1. research flow

2. Economic Order Quantity (EOQ)

The *Economic Order Quantity* (EOQ) method is used to determine the most economical order quantity for raw materials by balancing ordering costs and holding costs so that total inventory costs can be minimized (Milewski & Wiśniewski, 2022)(Gümüş & Gümüş, 2026)

$$\mathrm{EOQ} = \sqrt{\frac{2 \times \mathrm{D} \times \mathrm{S}}{\mathrm{H}}} \tag{1}$$

where:
D = raw material requirement for one period (kg);
S = ordering cost per order (Rp/order);
H = storage cost per unit per year (Rp/kg/year).

3. Reorder Point (ROP)

The *Reorder Point* (ROP) method is used to determine the reorder timing based on the average demand during *the lead time* and *the safety stock* (Herawati et al., 2024). In this study, the *safety stock* value follows the company's policy of 300 kg, while *the lead time* is derived from the company's raw material procurement data. Applying the ROP method helps the company determine the optimal reorder timing, thereby minimizing the risks *of overstock* and *stockouts* (Drent & Arts, 2022)(Wojtasik & Bruzda, 2025)

$$\mathrm{ROP} = (\mathrm{d} \times \mathrm{L}) + \mathrm{SS} \tag{2}$$

where:
d = average daily raw material requirement (kg/day);
L = lead time (days);
SS = safety stock (kg).

4. System Development

The EOQ and ROP calculation results were implemented in a web-based raw material inventory control information system developed using the Laravel framework and MySQL database. The system manages raw material and supplier data, stock movements, EOQ and ROP calculations, reorder notifications, and Purchase Order generation to support raw material procurement decisions. (Khakbaz et al., 2024) (Achkar et al., 2023.)

5. System Testing

After the implementation process was completed, the system was tested using the *Black Box Testing* method to ensure that each function operated in accordance with the functional requirements (Humaidah & Saifudin, 2023). Testing was conducted on the login feature, raw material data management, *supplier* data, inventory transactions, EOQ and ROP calculations, reorder notifications, and *purchase order* generation. The system was deemed to be functioning properly if the output matched the expected results in each test scenario (Sitio et al., 2023).

C. RESULT AND DISCUSSION

1. Data Analysis

This study used data on the demand for 1.2 mm SPCC sheet raw materials during the period from June 2025 to May 2026 as the basis for applying the Economic Order Quantity (EOQ) and Reorder Point (ROP) methods. The total raw material demand for one year was 46,727.65 kg, with an average daily demand of 149.77 kg/day and 312 company working days. The demand data is as follows

Table 1. Demand Data for 1,2 mm SPCC Steel Sheet June 2025-May 2026

Month	Demand (kg)
June 2025	3.448,59
July 2025	3.434,38
August 2025	3.673,56
September 2025	3.387,03
October 2025	3.327,01
November 2025	3.514,08
December 2025	4.620,67
January 2026	4.833,65
February 2026	3.732,65
March 2026	3.360,38
April 2026	4.654,78
May 2026	4.740,87
Total	**46.727,65**

In addition to demand data, the study also utilized raw material purchase data during the research period. Total purchases amounted to 67,173.80 kg with a purchase value of Rp716,300,374 across 58 transactions. The variation in purchase quantities indicates that the company does not yet have a fixed order quantity, making the EOQ method necessary to determine a more economical order quantity

Ordering costs were derived from administrative and transportation costs totaling Rp1,272,699.22 per year. With an ordering frequency of 58 times, the ordering cost per order was calculated at Rp21,943.09. The average price of raw materials was calculated using the *weighted average* method at Rp10,663.39/kg. Based on company policy, the storage cost is set at 10% of the raw material price (Wiyatno et al., 2026), resulting in a storage cost of Rp1,066.34/kg/year. The lead time used is 2 days, while the safety stock follows company policy at 300 kg

2. Implementation of the EOQ and ROP Methods in the System

Based on the parameters obtained, an EOQ calculation was performed to determine the economic order quantity. The calculation results show an EOQ value of 1,386.77 kg, rounded to 1,387 kg. Next, the ROP was calculated using a daily demand of 149.77 kg, a lead time of 2 days, and a safety stock of 300 kg, resulting in an ROP value of 599.54 kg.

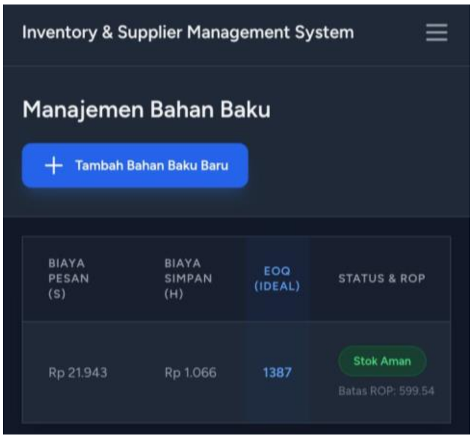

Figure 2. EOQ dan ROP Results

The EOQ and ROP values are then implemented into the inventory control information system. The administrator enters the parameters for annual demand, ordering costs, holding costs, lead time, and safety stock via the data input page. Based on these parameters, the system automatically generates a recommended order quantity of 1,387 kg and a reorder point of 599.54 kg. When inventory levels reach or fall below the ROP value, the system notifies the administrator to place a reorder immediately.

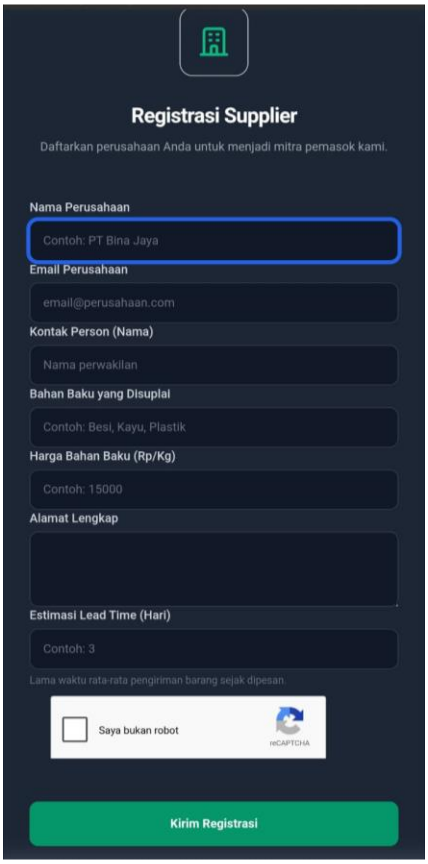

Figure 2. Supplier Registration Page

The supplier registration page allows prospective suppliers to submit company information, including company name, email, contact person, raw materials supplied, price per kilogram, address, and estimated lead time. The submitted data are verified by the administrator before being used in the procurement process.

The stored supplier information, particularly price, email, and lead time, supports supplier selection and PO creation. Administrators can select a verified supplier based on price and lead time, after which the system generates a PO in PDF format and sends it via email. Thus, supplier management and procurement execution are integrated with the inventory control process.

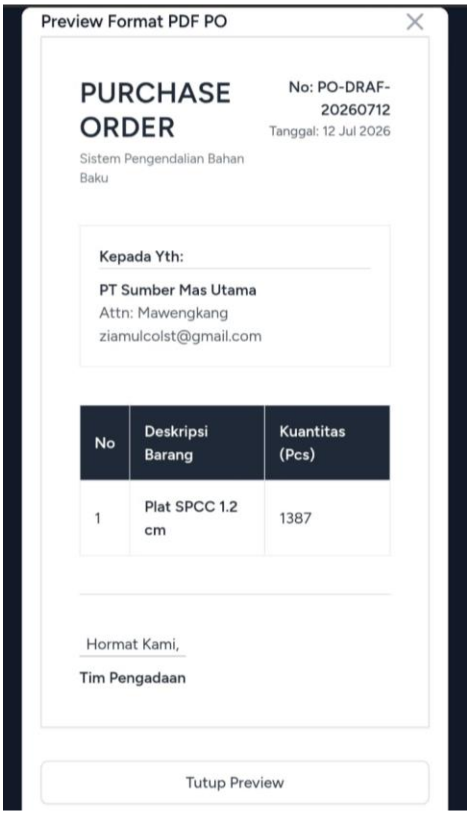

Figure 3. Preview of the PO Document

3. Validation of Calculation Results

Validation was conducted by comparing manual EOQ and ROP calculations with the results generated by the system. The comparison is presented in Table 2.

Table 2. Comparison of Manual and System Results

Parameter	Manual	System
EOQ	1.387 kg	1.387 kg
ROP	599,54 kg	599,54 kg

The system produced the same results as the manual calculations, with an EOQ of 1,387 kg and an ROP of 599.54 kg. This confirms that the calculation algorithm was implemented correctly and that the system can accurately generate reorder quantity and timing recommendations.

4. System Testing

System testing was conducted using the Black Box Testing method to ensure that each function operates in accordance with functional requirements. Testing was performed on the administrator login feature, raw material data management, supplier data management, inventory transactions, EOQ and ROP calculations, minimum stock notifications, and Purchase Order creation.

Table 3. Black-box Testing Results

	Features Tested	Test Scenario	Results Obtained	Status
1	Admin Login	Admin enters valid username and password, then clicks Login.	System verifies credentials and displays the dashboard.	✓
2	EOQ and ROP Calculation Results	Admin enters demand, ordering cost, holding cost, lead time, and other parameters.	System displays the recommended EOQ and ROP.	✓
3	Inventory Recording	Admin records incoming and outgoing raw materials.	System stores the transaction and updates stock automatically.	✓
4	Minimum Stock Notification	Stock reaches or falls below the ROP.	System displays a reorder notification.	✓
5	Supplier Registration	Supplier enters and submits company information.	System displays the supplier data in the supplier list.	✓
6	Manage Supplier Data	Admin edits or deletes supplier data.	System updates or deletes the data accordingly.	✓
7	Creating a Draft Purchase Order (PO)	Admin selects a supplier and raw material, then creates a draft PO	System generates a draft PO containing supplier, material, quantity, and order date.	✓

Based on the test results, all system functions were successfully executed according to the predetermined scenarios. The system is capable of managing inventory data, automatically calculating EOQ and ROP, sending notifications when stock reaches the reorder point, and generating Purchase Order documents ready to be sent to suppliers. These results indicate that the system has met the functional requirements and can be used to support raw material inventory control at CV. Troy Metal.

D. CONCLUSION AND SUGGESTIONS

This study successfully implemented the EOQ and ROP methods in a raw material inventory control information system at CV. Troy Metal. The system manages raw material and supplier data, inventory movements, EOQ and ROP calculations, reorder notifications, and PO generation via email. The implementation resulted in an EOQ of 1,387 kg and an ROP of 599.54 kg. Black Box Testing confirmed that all system functions operated according to their requirements. The system therefore supports more systematic inventory control and integrates inventory planning with the procurement process. Future research could enhance the system by adding features such as *Purchase Order* confirmation by suppliers, monitoring the delivery status of raw materials, or integration with an Enterprise Resource Planning (ERP) system to support a more comprehensive procurement process.

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