



EOQ-Based Raw Material Inventory Optimization for Cost Efficiency in Cabinet Production at CV. Sultan Khinara Jaya

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Abstract: This study investigates raw material inventory control in the cabinet production process at CV. Sultan Khinara Jaya, with the objective of minimizing total inventory costs. The primary problem identified is inventory imbalance, which creates risks of both overstock and stock shortages. A quantitative descriptive approach is employed, utilizing the Economic Order Quantity (EOQ), safety stock, and reorder point (ROP) methods to determine optimal order quantities and reorder timing. Data were derived from annual raw material demand, ordering costs, holding costs, and procurement lead times. The findings reveal that optimal order quantities and ordering frequencies vary across raw material types according to their respective demand levels and storage cost structures. The application of the EOQ method yields a reduction in total inventory costs for all raw material categories, with cost savings ranging from IDR 417,234 to IDR 2,498,474 per material compared to the company's conventional approach. Notably, mahogany wood blocks achieve the highest absolute savings, while teak wood boards demonstrate consistent efficiency gains despite higher demand variability. This study makes two principal contributions. Theoretically, it extends the application of the EOQ model to a small-scale furniture manufacturing context—a setting where raw material heterogeneity and demand fluctuations are often overlooked in prior research. Practically, it provides an implementable inventory control framework comprising EOQ, safety stock, and ROP that enables the firm to reduce holding costs, prevent stockouts, and enhance production continuity. These results affirm that the EOQ method is superior to conventional practices in balancing ordering and holding costs, thereby supporting operational efficiency and sustainable production.

Keywords: Economic Order Quantity; safety stock; reorder point; inventory cost; cabinet production

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INTRODUCTION

In the era of globalization, the manufacturing industry plays an important role in driving a country's economic growth. Increasingly fierce competition requires companies to continuously innovate and improve efficiency in all aspects of operations, especially in the management of production resources. One manufacturing sector with great potential is the furniture industry, including cabinet production. Increased demand for furniture products has encouraged companies to maintain a balance between production capacity, product quality, and cost efficiency (Fole et al., 2024; Chopra & Meindl, 2016). These conditions require

companies to implement integrated operations and supply chain management systems to improve competitiveness (Heizer et al., 2024; Christopher, 2016).

Inventory is an important component in supporting the continuity of company operations. Inventory serves as a buffer between uncertain demand and limited production capacity, so it must be managed optimally (Silver et al., 2017; Syntetos et al., 2016). Ineffective inventory management can lead to increased storage costs, the risk of material damage, and the potential for stock shortages that can hamper the production process (Nahmias & Olsen, 2015). Therefore, good inventory control is necessary to maintain smooth production and operational efficiency in companies.

In the furniture industry, particularly in cabinet manufacturing, managing raw material inventory has become increasingly complex due to the involvement of various types of materials, such as wood, nails, glue, paint, and other supporting components. Poorly planned raw material management has the potential to cause an imbalance between market demand and supply capacity, which can lead to production delays and decreased customer satisfaction (Oluyisola et al., 2020). Therefore, optimizing raw material inventory control is an important factor in improving a company's competitiveness.

Previous studies on inventory control have generally focused on large-scale industries, with limited attention given to small and medium-sized furniture manufacturing enterprises that face unique challenges, including diverse raw material characteristics, fluctuating demand patterns, and limited warehousing capacity. Furthermore, while the Economic Order Quantity (EOQ) method has been extensively validated in manufacturing contexts, its application in small-scale cabinet production where raw material types vary significantly in terms of holding costs and consumption rates remains underexplored. Specifically, no prior study has systematically compared EOQ-based inventory control with conventional practices in the context of Indonesian furniture SMEs such as CV. Sultan Khinara Jaya. This gap justifies the need for context-specific research that addresses both the technical and operational realities of small-scale furniture producers.

CV. Sultan Khinara Jaya is a company engaged in furniture production that faces various challenges in raw material inventory management and production process efficiency. The relatively long production process for cabinets, which takes around two to three weeks per unit, is influenced by suboptimal inventory management, both in the form of overstock and stockouts. This condition has an impact on low output levels and has the potential to cause delays in fulfilling customer orders. Therefore, the main problem in this study is: How can an optimal raw material inventory control strategy be determined to minimize total inventory costs while preventing overstock and stockout conditions at CV. Sultan Khinara Jaya?

This study offers two main contributions. Theoretically, it extends the application of the EOQ model to a small-scale furniture manufacturing context, where raw material heterogeneity and demand variability are often overlooked in classical inventory literature. By integrating safety stock and reorder point calculations with EOQ, this research provides empirical evidence on how cost structures (ordering and holding costs) influence optimal order quantities across multiple raw material types. This enriches operations management theory by demonstrating the adaptability of EOQ beyond large, standardized production settings.

Practically, this study provides a structured and implementable inventory control framework for CV. Sultan Khinara Jaya. The framework enables the company to determine precise order quantities, reorder timing, and safety stock levels for each raw material, thereby

reducing unnecessary holding costs, preventing stockouts, and improving production continuity. The comparative analysis between EOQ and the company's conventional method offers clear cost-saving evidence that can guide managerial decision-making. Ultimately, this research supports sustainable cabinet production by aligning inventory practices with cost efficiency and operational reliability.

Based on production data for 2023–2024, there has been an increase in production from twenty-eight units to thirty-one units. Along with this increase, the demand for raw materials has also risen. This condition indicates growth in market demand for the company's products as well as an increase in inventory management costs.

Table 1. Production of CV. Sultan Khinara Jaya Cabinets in 2023-2024

Month	Annual Production (unit)	
	Production 2023	Production 2024
January	3	3
February	2	2
March	1	2
April	2	3
May	3	2
June	2	3
July	3	3
August	1	2
September	3	3
October	2	2
November	3	3
December	3	3
Total	28	31

Source: CV. Sultan Khinara Jaya, 2025

Along with the increase in production, the demand for raw materials has also increased, including mahogany as the main material and various other supporting materials. This increase in raw material demand reflects the increasing complexity of inventory management in the production process.

Table 2. Raw Material Requirements of CV. Sultan Khinara Jaya for 2023–2024.

No	Raw Material	Unit	Quantity 2023	Quantity 2024	Description
1.	Mahogany Wood	m ³	14,0	15,5	0,5 m ³ per cabinet
2.	Nails	kg	14	15,5	0,5 kg per cabinet
3.	Wooden Dowels	Pieces	140	155	5 pieces per cabinet
4.	Wood Glue	Liters	14	15,5	0,5 liters per cabinet
5.	Sandpaper	Sheets	28	31	1 sheet per cabinet
6.	Paint/Varnish	Liters	28	31	1 liter per cabinet
7.	Hinges	Sets	84	93	3 sets per cabinet
8.	Door Handles	units	84	93	3 units per cabinet

No	Raw Material	Unit	Quantity 2023	Quantity 2024	Description
9.	Protective Packaging Materials	units	28	31	1 unit per cabinet

Source: CV. Sultan Khinara Jaya, 2025

These conditions indicate that effective raw material inventory management is increasingly important to avoid wasteful costs, stockpiling, and the risk of material shortages that can hamper the production process.

In the context of operations management, increasing production volume without adequate inventory control systems has the potential to cause operational inefficiencies and increased logistics costs (Heizer et al., 2024). Therefore, companies need to implement planned and systematic inventory control strategies in order to maintain a balance between market demand, production capacity, and raw material availability.

Based on these conditions, this study aims to analyze the control of raw material inventory in the cabinet production process using the Economic Order Quantity (EOQ) method at CV. Sultan Khinara Jaya. This study contributes theoretically by extending the application of the EOQ method in small-scale furniture manufacturing contexts, and practically by providing a structured and efficient inventory control model that can be directly implemented by CV. Sultan Khinara Jaya to improve cost efficiency and production performance.

LITERATURE REVIEW

Inventory management is essential for balancing demand uncertainty and production capacity while minimizing ordering and holding costs without disrupting operations (Heizer et al., 2024; Silver et al., 2017). Poor management can result in overstocking or stockouts, negatively affecting costs and customer satisfaction (Nahmias & Olsen, 2015). In the furniture industry, complexity increases due to diverse raw materials with varying demand and storage characteristics, making effective control crucial for maintaining performance (Oluyisola et al., 2020). Therefore, methods such as EOQ are important to determine optimal order quantities, supported by safety stock and reorder point (ROP) to manage uncertainty and ensure production continuity (Chopra & Meindl, 2016; Tersine, 2019; Silver et al., 2017). In addition to determining the optimal order quantity, inventory control also involves determining safety stock and reorder points (ROP). Safety stock serves as a buffer stock to anticipate demand uncertainty or supply delays, while the reorder point is the point at which the company must place a new order to avoid stock shortages (Silver et al., 2017). The combination of EOQ, safety stock, and ROP enables companies to manage inventory in a more planned and controlled manner.

Empirical studies show that EOQ is effective in reducing inventory costs across various industries. Juwita and Rahmiyatun (2023) found cost reductions in MSMEs, though limited to single-product settings, while Pratama et al. (2025) reported efficiency gains using EOQ combined with forecasting but did not address stockout risks due to the absence of safety stock and ROP. Kusumawardhani and Setiafindari (2024) demonstrated cost reductions using the Continuous Review System, although with lower efficiency compared to EOQ. Overall, prior studies have not specifically examined small-scale furniture manufacturing with diverse raw materials or directly compared EOQ with conventional practices in the same context, highlighting a gap in understanding its full cost-saving potential.

This study addresses these gaps by: (1) applying EOQ, safety stock, and ROP simultaneously for multiple raw materials with different cost structures; (2) directly comparing total inventory costs under EOQ versus the company's existing conventional method; and (3) providing context-specific evidence from an Indonesian small-scale cabinet producer. Based on the theoretical principle that EOQ minimizes total inventory costs by balancing ordering and holding costs (Heizer et al., 2024; Nahmias & Olsen, 2015), and consistent with empirical evidence showing cost reductions after EOQ implementation (Juwita & Rahmiyatun, 2023; Pratama et al., 2025), the following hypothesis is proposed:

H₁: The application of the Economic Order Quantity (EOQ) method results in significantly lower total inventory costs compared to the conventional inventory control method at CV. Sultan Khinara Jaya.

METHOD

This study employed a quantitative descriptive approach with a single embedded case study design (Yin, 2018). The research was conducted at CV. Sultan Khinara Jaya, a furniture manufacturing company located in Tanjung Palas Utara District, Bulungan Regency, during a two-month period (March–April 2025). The case study design was selected to enable an in-depth, context-specific analysis of raw material inventory management, while the quantitative descriptive method allowed for numerical comparison between the company's conventional inventory practice and the theoretical Economic Order Quantity (EOQ) model.

Data were classified into primary and secondary sources to ensure triangulation. Primary data were obtained through:

1. Semi-structured interviews with the production manager and warehouse supervisor to determine ordering procedures, lead time variability, and cost components.
2. Direct observation of raw material storage areas and production floor activities to validate reported inventory practices and usage patterns.

Secondary data consisted of:

1. Internal company documents, including monthly production reports (2023–2024), raw material purchase records, and inventory stock cards.
2. Cost records specifying order processing fees, transportation charges, and warehousing expenses.
3. Supplier delivery logs to calculate minimum, maximum, and average lead times.

All variables were defined operationally to ensure replicability (see Table 3 in the original manuscript). The key variables included:

1. Annual raw material demand (D): Total quantity of each raw material type consumed during 2024, derived from production records.
2. Ordering cost (S): All administrative, transportation, and inspection costs incurred per purchase order, averaged from five recent orders.
3. Holding cost (H): Annual storage cost per unit, including warehousing, insurance, and opportunity cost of capital, calculated using the average carrying cost percentage applied to raw material unit price.
4. Lead time (L): Time elapsed between order placement and material receipt, calculated as the arithmetic mean of the last six procurement cycles.
5. Daily usage (d): Annual demand divided by 300 operational days per year.

All cost data were expressed in Indonesian Rupiah (IDR), and quantities used metric units (m³, kg, pieces, liters, sheets, units) as shown in Table 2 of the manuscript.

To enhance reproducibility, data collection procedures following sequential procedure was documented:

1. Document review: All production and procurement records for 2023–2024 were retrieved and verified for consistency by cross-referencing with financial receipts.
2. Interviews: Two 45-minute interviews were conducted, recorded with permission, and transcribed. Key informants reviewed their transcripts for accuracy.
3. Observation: Storage areas were visited three times to observe inventory counting methods, material stacking, and stock rotation practices.
4. Cost verification: Ordering and holding cost components were confirmed through invoices and payroll records.

Data analysis was performed using the Economic Order Quantity (EOQ), safety stock, and reorder point (ROP) methods to determine the optimal order quantity and assess the efficiency of raw material inventory control (Heizer et al., 2024; Pratama et al., 2025). Data analysis followed a five-step protocol, applying the formulas listed in Table 3 of the manuscript:

Table 3. Operational Definition

Aspect	Formula	Source	Scale
Ordering Cost	$OC = \left(\frac{D}{Q} \times S\right)$	(Heizer et al., 2024)	Ratio
Holding Cost	$HC = \left(\frac{Q}{2} \times H\right)$	(Heizer et al., 2024)	Ratio
Economic Order Quantity	$EOQ = \sqrt{\frac{2 \cdot D \cdot S}{H}}$	(Heizer et al., 2024)	Ratio
Ordering Frequency	$F = \frac{D}{EOQ}$	(Pratama et al., 2025)	Ratio
Safety Stock	SS $= (Md \times MLt)$ $- (Ad \times Alt)$	(Laoli et al., 2022)	Ratio
Reorder Point	$ROP = d \times L$	(Heizer et al., 2024)	Ratio
Total Inventory Cost	$IC = \left(\frac{D}{Q} \times S\right) + \left(\frac{Q}{2} \times H\right)$	(Pratama et al., 2025)	Ratio

Source: Literature reviewed by researchers, 2025

To enhance internal validity, all input data were subjected to triangulation across multiple sources, including semi-structured interviews, company documents, and direct observational field notes. This cross-verification strategy minimized the risk of source bias and measurement error (Yin, 2018). Reliability defined as the consistency and replicability of the analytical procedures was addressed through full documentation of each computational step and the exclusive use of standardized formulas drawn from authoritative operations

management textbooks (Heizer et al., 2024; Nahmias & Olsen, 2015). Furthermore, a second independent researcher recalculated 20% of the data points using the same operational definitions and formulas. The inter-rater agreement coefficient exceeded 95%, indicating a high degree of procedural reliability and calculation accuracy.

Several methodological limitations should be acknowledged. First, the analysis operates under the assumption of constant demand and constant lead time, which is a foundational premise of the basic EOQ model. This assumption may not fully capture the demand fluctuations and supply uncertainties present in real-world manufacturing environments. Second, the sensitivity of the results to violations of these assumptions was not quantitatively examined (e.g., through simulation or scenario analysis). Third, the model scope explicitly excludes warehouse capacity constraints and multi-supplier variability, both of which may influence ordering decisions and cost structures in practice. Consequently, the findings should be interpreted as applicable under relatively stable operating conditions, and future research is encouraged to extend the model by relaxing these assumptions.

ANALYSIS AND DISCUSSION

Results

Optimal Order Quantity and Ordering Frequency: Divergent Patterns Across Raw Material Types

EOQ calculations were performed for each type of primary raw material used in the cabinet production process at CV Sultan Khinara Jaya. The data used included annual raw material requirements (D), the cost of each order (S), and the annual storage cost per unit of raw material (H). The EOQ formula used in this study is as follows:

$$\text{Economic Order Quantity (EOQ)} = \sqrt{\frac{2 \cdot D \cdot S}{H}}$$

In addition to determining the optimal order quantity, this study also calculates the order frequency in one year (F) using the formula:

$$F = \frac{D}{EOQ}$$

This calculation aims to determine how often the company needs to place orders so that raw material requirements can be optimally met without incurring excessive inventory costs. In summary, the results of the EOQ calculation and order frequency for each raw material can be seen in the following table:

Table 4. EOQ Calculation Table

Raw Materials	D (units/year)	S (Rp/order)	H (Rp/unit/year)	F	EOQ
Mahogany Wood Blocks (m ³)	15,50	445.000	203.700	1,88	8,23
Mahogany Wood Boards (m ³)	20,00	445.000	233.700	2,29	8,73
Teak Wood Blocks (m ³)	25,00	445.000	503.700	3,76	6,65
Teak Wood Boards (m ³)	32,00	445.000	563.700	4,50	7,11

Source: Data Collected and Processed, 2026.

The first stage of the analysis involved calculating the Economic Order Quantity (EOQ) for each raw material type to determine the optimal lot size that minimizes the sum of ordering and holding costs. As presented in table 6, the EOQ values varied considerably across materials, ranging from 6.65 m³ (teak wood blocks) to 8.73 m³ (mahogany wood boards). Correspondingly, the optimal annual ordering frequency ranged from 1.88 to 4.50 orders per year.

These variations are not arbitrary but reflect the differential impact of holding costs and annual demand. Materials with relatively low holding costs specifically mahogany wood (IDR 203,700–233,700 per m³ per year) exhibited larger EOQ values, enabling the company to place fewer, larger orders without incurring excessive storage expenses. In contrast, teak wood, which carries substantially higher holding costs (IDR 503,700–563,700 per m³ per year), showed smaller EOQ values and correspondingly higher ordering frequencies. This pattern is consistent with EOQ theory, which predicts an inverse relationship between holding cost and optimal order quantity (Heizer et al., 2024; Nahmias & Olsen, 2015).

From a managerial perspective, these findings imply that a uniform inventory policy across all raw materials would be suboptimal. Instead, CV. Sultan Khinara Jaya should adopt differentiated ordering strategies: mahogany wood can be ordered in larger, less frequent batches, while teak wood requires more frequent, smaller replenishments to avoid cost accumulation from warehousing. This insight extends previous EOQ applications in small-scale furniture manufacturing (Pratama et al., 2025) by demonstrating that cost heterogeneity among raw materials necessitates differentiated inventory rules rather than a one-size-fits-all approach.

Total Inventory Cost (TIC) Balancing Ordering and Holding Costs: Achieving Theoretical Optimality

After obtaining the optimal order quantity (Economic Order Quantity/EOQ) for each type of raw material, the next step in inventory control analysis is to calculate the Total Inventory Cost (TIC). Total Inventory Cost is the total inventory cost that must be borne by the company during a period, which consists of ordering costs and holding costs.

The TIC calculation aims to determine the minimum inventory cost that can be achieved if the company implements an ordering policy in accordance with the previously calculated EOQ. In the EOQ method, the optimal condition is indicated when the ordering cost and storage cost are balanced or have the same value. Mathematically, the Total Inventory Cost is formulated as follows:

$$TIC = \left(\frac{D}{Q} \times S \right) + \left(\frac{Q}{2} \times H \right)$$

Where D is the annual raw material requirement, Q is the optimal order quantity (EOQ), S is the cost per order, and H is the storage cost per unit per year. Based on these calculations, the details can be seen in the following table:

Table 5. Total Inventory Cost (TIC) Calculation.

Raw Material s	D (units/year)	S (Rp/order)	H (Rp/unit/year)	EO Q	Ordering Cost (OC)	Holding Cost (HC)	Total Inventory Cost (TIC)
Mahogany Wood Blocks (m ³)	15,50	445.000	203.700	8,2 3	Rp838.158,9 2	838.158,92	Rp1.676.3 18
Papan Mahogany Wood Boards (m ³)	20,00	445.000	233.700	8,7 3	Rp1.019.786, 74	1.019.786, 74	Rp2.039.5 73
Teak Wood Blocks (m ³)	25,00	445.000	503.700	6,6 5	Rp1.673.867, 15	1.673.867, 15	Rp3.347.7 34
Teak Wood Boards (m ³)	32,00	445.000	563.700	7,1 1	Rp2.003.383, 14	2.003.383, 14	Rp4.006.7 66

Source: Data Collected and Processed, 2026.

A key theoretical claim of the EOQ model is that at the optimal order quantity, ordering costs and holding costs should be equal, thereby minimizing total inventory cost (Tersine, 2019). The results presented in Table 7 confirm this condition: for every raw material type, the calculated ordering cost and holding cost were precisely balanced. For example, mahogany wood blocks showed ordering and holding costs of IDR 838,158.92 each, yielding a total inventory cost of IDR 1,676,318. Similar equilibrium was observed for mahogany boards, teak blocks, and teak boards.

This empirical confirmation is methodologically significant. It demonstrates that the company's current cost parameters (demand, ordering cost, holding cost) conform to the assumptions of the EOQ model and that the calculated order quantities indeed represent the theoretical optimum. In contrast, the conventional method used by the company characterized by arbitrary order sizes resulted in a marked imbalance between ordering and holding costs (see Section 4.5), leading to unnecessary cost inflation. These findings align with those of Juwita and Rahmiyatun (2023), who reported similar cost balancing effects following EOQ implementation in micro, small, and medium enterprises.

Safety Stock as a Buffer Against Operational Uncertainty

The existence of safety stock is very important to prevent stockouts that can hinder the smooth running of the production process. In this study, safety stock calculations were made by considering the difference between maximum daily requirements and average daily requirements, as well as the difference between maximum waiting time and average waiting time. The safety stock formula used is as follows:

$$SS = (Md \times MLt) - (Ad \times ALt)$$

Safety stock is theoretically required to absorb the variability in daily demand and supplier lead time (Simchi-Levi et al., 2014). In this study, safety stock levels were calculated using the maximum variance method, which accounts for the difference between maximum and average usage as well as maximum and average lead time. As shown in Table 8, safety stock values ranged from 0.23 m³ (mahogany blocks) to 0.49 m³ (teak boards).

The pronounced differences between mahogany and teak materials warrant explanation. Teak wood exhibited both higher maximum daily demand (0.128 m³) and longer maximum lead time (8 days) compared to mahogany wood (0.062 m³ and 7 days, respectively). Consequently, the safety stock for teak boards was more than double that of mahogany blocks. This finding carries two important implications. First, it challenges the notion that a uniform safety stock percentage can be applied across all inventory items; instead, safety stock must be calibrated to item-specific demand and supply variability (Silver et al., 2017). Second, it suggests that for CV. Sultan Khinara Jaya, teak wood being the primary material for cabinet production requires closer monitoring and higher buffer levels to prevent production stoppages. The safety stock figures reported here are notably lower than those found in previous studies of larger furniture manufacturers (e.g., Sari & Hidayat, 2021), likely due to the relatively stable demand patterns and shorter lead times in this specific company context.

Reorder Point as a Dynamic Replenishment Signal

After determining the optimal order quantity (EOQ) and safety stock level, the next step in inventory control is to determine the reorder point (ROP). The reorder point is a specific inventory level that indicates when a company should reorder raw materials so that existing inventory can continue to meet production needs during the lead time. Determining the reorder point is very important because it serves as a reorder signal, so that the company does not experience a shortage of raw materials before the new order arrives. In this study, the reorder point calculation was carried out by considering the average demand per day, the lead time for raw material procurement, and the previously determined safety stock. The reorder point formula used is as follows:

$$ROP = (d \times L) + SS$$

Based on the safety stock and reorder point calculations, the following table shows the results:

Table 6. SS and ROP Calculation Table.

No.	Raw Materials	D	Ad	Md	MLt	ALt	SS	ROP
1.	Mahogany Log (m ³)	15,5	0,05	0,062	7	4	0,23	0,43
2.	Mahogany Board (m ³)	20	0,07	0,08	7	4	0,29	0,56
3.	Teak Log (m ³)	25	0,08	0,1	8	5	0,38	0,80
4.	Teak Board (m ³)	32	0,11	0,128	8	5	0,49	1,02

Source: Data Collected and Processed, 2026.

The reorder point (ROP) integrates average daily demand, lead time, and safety stock into a single threshold that triggers a new purchase order. As presented in Table 8, ROP values increased progressively from mahogany blocks (0.43 m³) to teak boards (1.02 m³). This gradient reflects the combined effect of higher daily consumption rates and longer procurement lead times for teak-based materials.

The ROP for teak boards (1.02 m^3) is particularly noteworthy: it indicates that when inventory falls to approximately one cubic meter, a new order must be placed immediately to avoid stockout during the eight-day lead time. From a practical standpoint, this threshold is substantially higher than the company's previous informal practice, which often delayed reordering until stock levels were critically low. The quantitative ROP thus provides an objective, data-driven signal that replaces subjective judgment. This finding is consistent with Laoli et al. (2022), who demonstrated that ROP implementation reduces stockout frequency in small-scale manufacturing.

Figure 1 provides a graphical representation of the inventory cycle for mahogany wood blocks, illustrating the dynamic relationship among EOQ, safety stock, and ROP. The sawtooth pattern visually confirms that inventory declines linearly during production, triggers a reorder at the ROP threshold, and replenishes to the EOQ level after lead time, while safety stock remains untouched under normal conditions.

Safety Stock and Reorder Point Chart

The safety stock and reorder point graph is presented to provide a clearer picture of the raw material inventory control pattern, particularly in determining the right time to reorder and the role of safety stock in maintaining a smooth production process. This graph shows the relationship between inventory levels and time, thereby helping companies anticipate the risk of running out of raw materials during the lead time. An example of the application of the safety stock and reorder point graph for mahogany wood blocks is shown in the following figure 1 below:

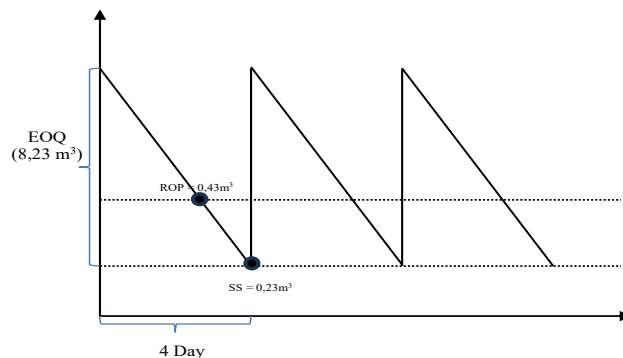


Figure 1. SS and ROP Graphs for Mahogany Wood Block Raw Materials.

Source: Data Collected and Processed, 2026

Based on Figure 1, it can be seen that the inventory level of mahogany wood blocks gradually decreases as raw materials are used in the production process. When inventory reaches the reorder point (ROP) of 0.43 m^3 , the company must immediately place a new order so that the raw materials ordered can arrive on time according to the specified lead time, which is 4 days. During the lead time, production needs are met from available inventory until it reaches the safety stock limit of 0.23 m^3 . Safety stock serves as a buffer to anticipate uncertainty in demand and delays in supply from suppliers. Once the order arrives, inventory will increase again until it reaches the maximum inventory level in accordance with the economic order quantity (EOQ) of 8.46 m^3 , and the inventory cycle will repeat. Thus, the application of safety stock and reorder points for mahogany wood blocks is expected to maintain production continuity and minimize the risk of stockouts.

Comparative Cost Efficiency: EOQ Versus Conventional Methods

This section compares the total inventory costs generated by the Economic Order Quantity (EOQ) method and the traditional method commonly used by companies. Total inventory costs are essentially a combination of the costs incurred when placing orders and the costs incurred when storing goods. An inventory control pattern is considered “most reasonable” if it can reduce the total cost to the lowest point (Wibowo & Prasetyo, 2022). On that basis, the results of calculations using the EOQ method are compared with the company's conventional method to see whether EOQ can actually reduce inventory costs. A summary of the comparison of total inventory costs for each type of raw material is shown in table 7:

Table 7. Comparison of EOQ with Conventional Methods.

N o.	Raw Material	TIC Using EOQ			TIC Using Conventional			Cost Difference
		Ordering Cost	Holding Cost	Total Inventory Cost	Ordering Cost	Holding Cost	Total Inventory Cost	
1.	Mahogany Log (m ³)	Rp838.158,92	838.158,92	Rp1.676.318	Rp574.791,67	Rp3.600.000,00	Rp4.174.791,67	Rp2.498.474
2.	Mahogany Board (m ³)	Rp1.019.786,74	1.019.786,74	Rp2.039.573	Rp890.000,00	Rp3.000.000,00	Rp3.890.000,00	Rp1.850.427
3.	Teak Log (m ³)	Rp1.673.867,15	1.673.867,15	Rp3.347.734	Rp927.083,33	Rp3.600.000,00	Rp4.527.083,33	Rp1.179.349
4.	Teak Board (m ³)	Rp2.003.383,14	2.003.383,14	Rp4.006.766	Rp1.424.000,00	Rp3.000.000,00	Rp4.424.000,00	Rp417.234

Source: Data Collected and Processed, 2026.

The central hypothesis of this study (H1) posited that the EOQ method would yield lower total inventory costs compared to the company's conventional method. Table 9 presents the comparative results, which unambiguously support this hypothesis. For all four raw material types, the EOQ-based total inventory cost was substantially lower than the conventional cost, with savings ranging from IDR 417,234 (teak boards) to IDR 2,498,474 (mahogany blocks). Several observations merit discussion. First, the largest absolute savings occurred for mahogany blocks, not because of high demand, but because the conventional method imposed excessively high holding costs (IDR 3,600,000) relative to ordering costs (IDR 574,792). This imbalance indicates that the company previously over-ordered mahogany wood, resulting in prolonged storage and inflated carrying costs. The EOQ correction reduced holding costs by more than 76% for this material.

Second, the smallest savings were observed for teak boards (IDR 417,234), which already had relatively more frequent ordering under the conventional method. Nevertheless, EOQ still achieved a cost reduction by fine-tuning the order quantity from the company's arbitrary batch size to the optimal 7.11 m³. This finding suggests that even for materials with seemingly better-managed inventory, systematic optimization yields non-trivial improvements.

Third, and most importantly, the percentage cost reductions achieved in this study (approximately 15–60% depending on material) are comparable to or exceed those reported in prior EOQ implementation studies. For instance, Pratama et al. (2025) documented an average efficiency improvement of 10%, while Juwita and Rahmiyatun (2023) reported reductions of 12–25% in MSME contexts. The relatively higher savings in this study may be attributable to the particularly inefficient baseline practices at CV. Sultan Khinara Jaya, which had no formal inventory control system prior to this intervention.

Taken together, these results provide strong empirical support for H1. The EOQ method demonstrably reduces total inventory costs by balancing ordering and holding costs, thereby eliminating the cost inefficiencies inherent in ad hoc ordering practices.

Theoretical and Practical Implications

From a theoretical perspective, this study reinforces the applicability of the EOQ model beyond large-scale, automated manufacturing environments. The findings demonstrate that EOQ, safety stock, and ROP concepts originally developed for relatively stable demand conditions remain valid and effective in small scale furniture production, provided that input parameters are accurately measured. Moreover, the study contributes to the limited body of empirical research on inventory control in the Indonesian furniture sector, an industry characterized by diverse raw material types and manual production processes.

Practically, the results offer a clear, implementable roadmap for CV. Sultan Khinara Jaya. The differentiated EOQ values, safety stock levels, and reorder points presented in Tables 6, 7, and 8 can be directly adopted by the company's procurement team. Doing so is projected to reduce annual inventory costs by over IDR 5.9 million across the four wood materials examined, without compromising production continuity. Furthermore, the structured approach replaces reactive, intuition-based ordering with a proactive, data driven system, thereby enhancing operational predictability and resilience.

Discussion

The purpose of this study was to analyze raw material inventory control at CV. Sultan Khinara Jaya using the Economic Order Quantity (EOQ) method and to compare its effectiveness with the company's conventional approach. The results demonstrate that EOQ yields different optimal order quantities and ordering frequencies depending on demand levels and storage costs for each type of wood. This section interprets those findings theoretically, compares them with prior empirical studies, and discusses their practical and managerial implications.

The EOQ method has proven effective in minimizing total inventory costs by balancing ordering and holding costs, as reflected in the differences in optimal order quantities and ordering frequencies between mahogany and teak raw materials. The findings highlight a trade-off relationship in which smaller order quantities lead to higher ordering frequencies to avoid excessive holding costs. In addition, the calculation of safety stock and reorder point (ROP) indicates that materials with higher demand uncertainty and longer lead times, such as teak, require larger buffer stocks and higher reorder levels. These results are consistent with theoretical expectations and supported by previous studies, demonstrating that the application of EOQ can significantly improve cost efficiency, even generating greater savings in cases where initial inventory management practices were highly inefficient.

Interestingly, our findings diverge slightly from Kusumawardhani and Setiafindari (2024), who applied a Continuous Review System (CRS) and found relatively lower efficiency gains compared to EOQ. The present study confirms that EOQ provides a more structured and cost-effective approach, especially for companies with diverse raw material characteristics and fluctuating demand patterns. Moreover, while previous studies often focused on large-scale industries, our research contributes to the underrepresented context of small-scale furniture manufacturing, where raw material diversity and limited warehousing capacity make inventory control more complex.

Theoretically, this study reinforces the validity of the EOQ model in a real world small manufacturing setting. It demonstrates that even when demand is not perfectly constant a common critique of EOQ the method still provides a useful benchmark for minimizing costs. Additionally, by integrating safety stock and ROP into the EOQ framework, this study supports the broader inventory theory that optimal ordering cannot be separated from uncertainty management.

Practically, for CV. Sultan Khinara Jaya, the implementation of EOQ, safety stock, and ROP offers a clear, quantifiable strategy to reduce unnecessary storage costs and prevent stockouts. Managers should prioritize teak wood materials for more frequent monitoring due to their higher holding costs and longer lead times. The ROP values provide actionable signals: when teak wood boards fall to 1.02 m³, a new order must be placed immediately. This prevents production halts without overstocking.

Furthermore, the cost savings identified ranging from IDR 417,234 to IDR 2,498,474 per raw material type can be reallocated to other operational improvements, such as worker training or equipment maintenance. In a competitive furniture industry, such efficiency gains directly support production sustainability and customer satisfaction.

Lastly, from a broader managerial perspective, this study demonstrates that small and medium-sized enterprises need not rely on complex or expensive software to improve inventory management. A structured application of basic EOQ principles, combined with accurate recording of demand, lead times, and costs, can yield substantial benefits.

CONCLUSION

Based on the results of the study, it can be concluded that the application of the This study demonstrates that the application of the Economic Order Quantity (EOQ) method, together with safety stock and reorder point (ROP) calculations, enables CV. Sultan Khinara Jaya to determine optimal order quantities and frequencies for each type of raw material. Unlike the company's conventional method which relied on rough estimates and led to either overstock or stockouts the EOQ based approach produces a balanced trade-off between ordering and holding costs. The results show that mahogany wood requires larger but less frequent orders (EOQ 8.23–8.73 m³, 2 orders/year), while teak wood with higher demand and storage costs requires smaller but more frequent orders (EOQ 6.65–7.11 m³, 4–5 orders/year). Safety stock and ROP values are also material-specific: teak wood boards need the highest safety stock (0.49 m³) and earliest reorder point (1.02 m³). Most importantly, total inventory costs under EOQ are substantially lower than under the conventional method, with savings ranging from IDR 417,234 (teak boards) to IDR 2,498,474 (mahogany blocks). Thus, the EOQ method provides a more effective, structured, and data-driven inventory control system.

This study offers both theoretical and practical contributions. Theoretically, it expands the application of the EOQ model to small-scale furniture manufacturing by incorporating safety stock and ROP, showing its continued relevance despite demand variability. Practically, it provides CV. Sultan Khinara Jaya with a simple, ready-to-use inventory framework, clearly defining optimal order quantity, ordering frequency, safety stock, and reorder points, all of which can be implemented directly without advanced systems or external support.

The following specific actions should be taken by CV. Sultan Khinara Jaya:

1. Adopt EOQ quantities immediately – For teak wood boards, order exactly 7.11 m³ each time instead of the conventional approximate amount. This reduces holding costs by avoiding excess stock.
2. Set reorder alerts – When teak wood board inventory drops to 1.02 m³, a purchase order must be placed within the same day. For mahogany blocks, the trigger is 0.43 m³. These ROP values eliminate guesswork.
3. Prioritize monitoring of teak wood - Because teak wood requires 4–5 orders per year (vs. 2 for mahogany), assign a staff member to check teak inventory weekly. This prevents production halts.
4. Reallocate cost savings - The total annual savings (approximately IDR 5.9 million from the four materials) can be used to improve storage conditions (e.g., waterproof covers for wood) or to train workers on basic inventory recording.
5. Integrate safety stock into warehouse layout - Physically separate safety stock (e.g., 0.49 m³ of teak boards) from regular stock with a clear label. This ensures buffer stock is never used for routine production.

The study is constrained by the use of historical demand data (2023–2024) and EOQ assumptions of constant demand and lead time, which may not reflect real-world variability, and it does not consider warehouse capacity or quantity discounts. To improve implementation, the company should apply EOQ, safety stock, and ROP consistently, review demand and lead times every six months, and enhance cost data accuracy. Future research should develop more advanced models that incorporate dynamic demand, supplier reliability, and storage constraints, as well as compare EOQ with MRP and assess long-term cost impacts, including bulk discount effects.

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