

Coffee Bean Inventory Analysis Using EOQ Method at Lujo Coffee

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Abstract

Purpose: This study aims to analyze the management of coffee bean inventory at Lujo Kopi through the application of the Economic Order Quantity (EOQ) method, with the primary objective of optimizing inventory costs and improving efficiency in small-scale business operations.

Methodology: A descriptive quantitative approach was employed by collecting one year of historical data covering raw material demand, ordering costs, and holding costs. The EOQ formula was then applied to calculate the optimal order quantity, order frequency, safety stock, reorder point, and total inventory cost.

Results: The analysis indicated that the EOQ method provides a more efficient outcome compared to the conventional system previously applied. The optimal order quantity was found to be 86 kg with an order frequency of seven times per year. Total inventory costs decreased significantly from Rp. 7,320,000 to Rp. 3,740,232, highlighting substantial efficiency improvements.

Conclusion: The findings confirm that the EOQ method offers a systematic and effective approach to managing raw material inventory, ensuring cost efficiency and more reliable supply management for UMKM.

Limitations: The scope of this study is limited to one type of raw material and one case of UMKM, thereby reducing the generalizability of the results to other industries or business types.

Contribution: This research provides valuable practical insights for UMKM, demonstrating the importance of data-driven decision-making in inventory management and encouraging wider adoption of EOQ-based approaches to achieve sustainable efficiency.

Keywords: *Coffee Beans, EOQ, Inventory Management, Lujo Coffee.*

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1. Introduction

The food and beverage industry in Indonesia has experienced rapid growth in line with the increasingly consumptive lifestyle of society, particularly in the coffee shop sector, which has become a trend across various demographics (Pratiwi & Bernik, 2025). This shift in consumption patterns positions coffee shops as a promising business sector. Amidst growing competition, efficient operational management has become a key factor in maintaining and improving business performance (Arnova, 2022). One of the crucial operational aspects of a coffee shop is the management of raw material inventory, particularly coffee beans, as the primary component in the production process (Fitriana et al., 2023).

Inventory management refers to a company's ability to regulate and control the need for goods, whether raw materials, semi-finished goods, or finished products, so that availability remains stable under both

normal and fluctuating market conditions (Usulangi et al., 2019). Inventory management is one of the most critical aspects of company operations, especially in the food and beverage industry, which relies heavily on raw materials for production. The availability of raw materials plays a vital role in ensuring smooth production processes and maintaining a continuous product supply to consumers (Djawa et al., 2024). Effective inventory management enables companies to ensure production continuity, meet customer demand in a timely manner and minimize operational costs.

Conversely, poor inventory management can lead to various issues, such as raw material shortages, resource wastage, and financial losses. Therefore, applying appropriate inventory management methods is essential, particularly for small- and medium-sized enterprises (SMEs), which typically have limited resources (Iskandar & Wijaya, 2015). Lujo Kopi is one of the coffee shops with a distinctive uniqueness in Palu City, located at Jl. Sam Ratulangi No. 55, Besusu Barat, Palu Timur District, Palu City, Central Sulawesi, and is well known among the local community for serving high-quality coffee. Lujo Kopi's uniqueness lies in its combination of excellent coffee preparation and a contemporary café concept. The main uniqueness of Lujo Kopi is its ability to integrate local values into a modern concept.

The coffee beans used were sourced from Hana Roastery, which provides professionally processed, high-quality beans that offer a distinctive taste compared to typical coffee products. In addition, the shop offers a variety of brewing methods, ranging from manual brew techniques such as V60 and French Press to espresso-based methods, in line with current trends in modern coffee consumption. Another advantage of Lujo Kopi is its atmosphere, which is designed with a modern aesthetic while maintaining a warm and comfortable ambiance. The interior of Lujo Kopi has become a special attraction for young people, as it is suitable for relaxing, discussions, and working.

Lujo Kopi also frequently organizes events such as live music, community discussions, and exhibitions of local MSME products, making it a center for creative social interaction in Palu City. Lujo Kopi relies heavily on the availability of coffee beans, which must be supplied regularly by distributors. Every business must have proper inventory monitoring or control, as this helps maximize stock utilization. However, based on preliminary observations, there are indications that inventory management at Lujo Kopi is still manual and has not yet adopted a systematic approach. This condition has the potential to create inefficiencies in the procurement and storage of raw materials. One method that can be used to optimize inventory management is the Economic Order Quantity (EOQ) method.

The EOQ is a method used to calculate the most economical order size while aiming to achieve the minimum possible inventory level, lower costs, and better quality (Kadek, Syamsuddin, & Asngadi, 2024). The use of the EOQ method in a company helps minimize stockouts. EOQ analysis can be applied easily and practically to determine how many times raw materials should be purchased and in what quantities per order (Susanto, 2009). The application of the EOQ method has been proven, both theoretically and empirically, to help various types of businesses manage their inventories more efficiently. However, many micro, small, and medium enterprises (MSMEs) still do not implement this method owing to limited understanding and the lack of data-based management practices (Gunarso, 2010). In this context, it is important to conduct a case study at Lujo Kopi to analyze the extent to which the EOQ method can be implemented and the benefits it can provide for the business.

This research provides an academic contribution in the form of an empirical study on the application of the EOQ method within micro, small, and medium enterprises (MSMEs) in the food and beverage sector (Ayu et al., 2013). In addition, this study offers practical contributions for business actors, such as Lujo Kopi, in designing efficient, data-based, and measurable raw material procurement strategies to enhance operational efficiency and ensure the continuity of essential raw material supply. This study focuses on implementing the EOQ method within coffee-based MSMEs in regional areas, specifically Lujo Kopi in Palu City. Unlike previous studies, which were mostly conducted on large-scale businesses or in more developed regions, this study provides an applied perspective on data-driven inventory management within small businesses that operate with limited resources.

This study makes a unique contribution by addressing gaps in the literature related to efficient and measurable inventory management strategies in food and beverage MSMEs that rely on local commodity inputs (Hasibuan et al., 2024). Therefore, the findings of this study are expected to serve as a practical model for similar MSMEs in other regions with comparable conditions in the future. Several previous studies, such as those conducted by Gea (2023) and Akmal et al. (2024), have examined inventory control within the coffee industry. Their findings indicate that the application of the EOQ method in raw material management can reduce a company's operational costs by as much as 15%. However, some of these studies were conducted on large-scale businesses, where inventory management is more detailed and well-documented, making the impact of methodological changes more noticeable than in small-scale businesses. Despite these findings, a study conducted by Ainung et al. (2024) presents different results, showing that the implementation of the EOQ method did not significantly impact inventory-related expenses.

2. Literature Review and Hypothesis Development

2.1 Inventory Management

Inventory management is the process of regulating and controlling raw materials, semi-finished goods, and finished goods to ensure their availability according to business needs under stable and fluctuating market conditions (Indriani et al., 2023). In the food and beverage industry, including coffee shops, inventory management plays a crucial role in maintaining the continuity of production processes and ensuring customer satisfaction. Poorly managed raw material inventories can lead to either shortages or excess stock, both of which negatively impact operational and financial efficiencies.

Excess stock results in wasted storage costs, whereas stock shortages can disrupt the production flow (Husein, 2016). Effective inventory management positively affects cost efficiency and the smoothness of production processes. Conversely, suboptimal inventory control can create various issues, such as financial losses, decreased productivity, and customer loss. Therefore, applying the appropriate inventory management method is an urgent necessity, especially for Micro, Small, and Medium Enterprises (MSMEs) that operate with limited resources and technological capabilities (Mayasari, 2019).

2.2 Economic Order Quantity (EOQ) Method

The EOQ method is an inventory management technique that aims to determine the optimal order quantity to minimize total inventory costs, which consist of ordering and holding (carrying) costs. The EOQ calculates the most economical order volume by considering the annual demand, ordering cost per unit, and holding cost per unit per year. The use of the EOQ method can help business owners streamline the procurement process of raw materials and reduce the risk of both shortages and excess inventories (M & Sari, 2023). In addition, the EOQ plays an important role in determining the purchasing frequency, reorder point, and required safety stock.

According to Wahyudi (2015), the EOQ method is highly relevant for various types of businesses because of its ability to practically calculate how often raw materials need to be ordered and in what quantity each time. The EOQ model helps companies answer two essential questions in inventory management: when to order and how much to order. In its implementation, the EOQ method is often complemented by the concepts of safety stock and reorder points to anticipate uncertainties in demand and supply.

2.3 Penerapan EOQ dalam UMKM

In practice, many micro, small, and medium enterprises (MSMEs) in Indonesia have not yet optimally implemented the EOQ-based inventory planning method. This is generally due to limitations in understanding, technological access, and the availability of historical data required to apply the model. Previous studies have shown that the use of the EOQ method can significantly improve efficiency in inventory management (Iqbal et al., 2017). The EOQ is positioned within the MSME inventory management framework as a quantitative method that mediates the relationship between demand uncertainty and resource limitations (P.K. Angga, 2015). The EOQ offers an efficient, data-driven

procurement strategy that is highly needed by MSMEs that still rely on manual inventory management systems.

The implementation of EOQ in small and medium enterprises has been proven to bring tangible benefits in terms of cost efficiency and operational smoothness. However, many MSME actors still do not apply this method because of limited resources and a lack of knowledge related to data-based inventory management. Previous studies have shown that EOQ implementation in the coffee industry can reduce operational costs by up to 15% (Santosa et al. 2019). Nevertheless, Midas et al. (2025) found that in some cases, EOQ does not have a significant impact, depending on business characteristics and operational conditions.

2.4 Research Hypothesis

Based on the research background and theoretical review, this study formulates the hypothesis that the application of the Economic Order Quantity (EOQ) method has a significant effect on the cost efficiency of the raw material inventory at Lujo Kopi in Palu City. The EOQ method is believed to reduce total inventory costs by determining the optimal order quantity, reducing excessive order frequency, and establishing appropriate safety stock levels and reorder points more accurately. Using a quantitative approach, this hypothesis will be tested by comparing total inventory costs before and after implementing the EOQ method, allowing the study to assess the extent to which the method effectively improves operational efficiency in MSMEs in the food and beverage sector, particularly those based on coffee.

3. Research Method

This research was conducted at Lujo Kopi, located on Jl. Sam Ratulangi No. 55, Besusu Barat, Palu Timur District, Palu City, Central Sulawesi, Indonesia. The data used in this study consisted of primary and secondary data. Primary data were obtained through direct interviews with the owners and employees of Lujo Kopi, while secondary data were collected from records of raw material purchases, ordering costs, and storage costs from May 2024 to May 2025. Data validity was ensured through source triangulation by comparing the interview results with bookkeeping documents and direct observation of operational activities.

The data analysis method used in this study is descriptive quantitative analysis by calculating the Economic Order Quantity (EOQ) for raw coffee bean materials at Lujo Kopi, in accordance with the main objective of the research, which is to optimize inventory costs using a quantitative approach. The use of the EOQ is relevant because it provides a measurable and efficient basis for decision-making and has been widely applied in previous inventory management studies with significant results. The data processing model used follows the same approach as that employed by Aisyah et al. (2020), as follows:

A. Economic Order Quantity (EOQ) Method

The EOQ method is used to determine the most economical purchase quantity by minimizing inventory-holding and ordering costs.

$$EOQ = \sqrt{\frac{2(D)(S)}{H}}$$

Explanation:

EOQ : Economic order quantity
D : Estimated demand or usage per period
S : Ordering cost per order
H : Holding (carrying) cost per unit per year

B. Optimal Ordering Frequency

This method was used to calculate the ordering frequency or number of purchases within one year.

$$fx = \frac{D}{Q}$$

Explanation:

fx : Ordering frequency

D : Estimated demand or usage per period

Q : Purchase quantity based on EOQ

C. Safety Stock

Safety stock is a reserve inventory used to ensure the continuity of production and prevent shortages of raw materials. Its determination uses statistical analysis based on the difference between the estimated and actual usage. If the safety stock is too high, the storage costs will increase. Therefore, companies must accurately calculate their safety stock.

$$SD = \sqrt{\sum \left(\frac{x - X}{N} \right)^2}$$

Explanation:

SD : Standar deviasi

x : Estimated raw material usage

X : Actual raw material usage

N : Number of periods

$$SS = SD \times Z \text{ atau } SS = SD \times 1,65$$

Explanation:

SS : Safety stock

SD : Standard deviation

Z : Service level value (95% = 1.65), which means that the company aims to meet customer demand without running out of stock. The value of 1.65 originates from the normal distribution corresponding to a 95% service level.

D. Re-order Point (ROP)

The reorder point is the minimum stock level remaining before a company must place a new order. This point is influenced by several factors:

- 1) Lead time, the time between placing the order and receiving the goods
- 2) Average usage rate, the amount of raw material used per specific time period
- 3) Safety stock is the minimum stock prepared to anticipate supply delays.

$$ROP = (D \times LT) + SS$$

Explanation:

ROP : Re-order point

D : Estimated demand or usage per period

LT : Lead time

SS : Safety stock

E. Total Inventory Cost (TIC)

The Total Inventory Cost (TIC) represents the overall cost incurred related to inventory, including ordering, holding, and safety stock costs.

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

Explanation:

TIC: Total inventory cost

D : Estimated demand or usage per period

Q : Quantity ordered based on EOQ

S : Ordering cost per order

SS : Safety stock

H : Holding (storage) cost per unit

F. Maximum Inventory

The maximum inventory is used to avoid the risk of running out of raw materials.

$$\text{Maximun Inventory} = \text{SS} + \text{EOQ}$$

Explanation:

SS : Safety stock

EOQ : Optimal order quantity

4. Results and Discussion

4.1 Results

Inventory Costs Without Using the EOQ Method

Total Ordering Cost = Rp. 4.920.000

Total Holding Cost = 2.400.000

Total Inventory Cost / Year = Rp. 7.320.000

Based on the calculation of inventory costs without using the EOQ method, it is known that the total inventory cost borne by Lujo Kopi in one year amounts to Rp 7,320,000. The relatively high ordering cost indicates that Lujo Kopi places raw material orders repeatedly in small quantities, resulting in a high purchase frequency. Meanwhile, storage costs arise, although in smaller amounts, because raw materials must be stored before being used in the production process. Such an inventory management pattern can lead to inefficiencies in terms of cost and operational activities.

A. Economic Order Quantity (EOQ) Method

Estimated demand or usage per period (D) = 600 kg/year

Holding cost per unit (H) = Rp. 33.000

Ordering cost per order (S) = Rp. 205.000 /order

$$\begin{aligned}\text{EOQ} &= \sqrt{\frac{2(D)(S)}{H}} \\ &= \sqrt{\frac{2(600) \times (\text{Rp.} 205.000)}{33.000}} \\ &= \sqrt{\frac{246.000.000}{33.000}} \\ &= \sqrt{7.454.545} \\ &= 86,34 \text{ kg}\end{aligned}$$

The calculation shows that the optimal quantity of coffee beans to order each time is 86.34 kg.

B. Optimal Ordering Frequency

Total coffee beans needed for the period May 2024 – May 2025 (D) = 600 kg

EOQ-based purchase quantity (Q) = 86 kg

$$\begin{aligned}F &= \frac{D}{Q} \\ &= \frac{600}{86} \\ &= 6,98 = 7 \text{ orders per year}\end{aligned}$$

Thus, the optimal ordering frequency is seven orders per year.

$$\text{Ordering Cycle} = \frac{350}{7} = 50 \text{ days}$$

Therefore, Lujo Kopi will place an orders coffee beans every 50 days throughout the year.

C. Safety Stock

Safety stock is an additional inventory maintained to ensure that the company can continue to meet demand in the event of unexpected increases in consumption or delays in raw material deliveries. Its function is to maintain operational continuity when demand spikes or supply arrives late. Lujo Coffee requires five days to receive coffee beans from the moment an order is placed. The amount of safety stock can be calculated by comparing the actual usage with the average usage using the following formula:

$$\begin{aligned} SD &= \sqrt{\sum \left(\frac{x - \bar{X}}{N} \right)^2} \\ &= \sqrt{\sum \left(\frac{600 - 50}{12} \right)^2} \\ &= 15,87 \text{ kg} \end{aligned}$$

Safety stock is calculated as follows:

$$\begin{aligned} SS &= SD \times Z \\ &= 15,87 \text{ kg} \times 1,65 \\ &= 26,18 \text{ kg} = 27 \text{ kg.} \end{aligned}$$

D. Re-order Point (ROP)

$$\begin{aligned} \text{Lead time} &= 5 \text{ days} \\ \text{Working days per year} &= 350 \text{ days} \\ \text{Safety stock} &= 27 \text{ kg} \end{aligned}$$

Thus, the reorder point is determined as follows:

Average coffee bean usage

$$\begin{aligned} (\text{AU}) &= \frac{D}{\text{Working days}} \\ &= \frac{300}{350} \\ &= 0,85 \text{ kg Rounded up to 1 kg per order} \end{aligned}$$

$$\begin{aligned} \text{ROP} &= [\text{LT} \times \text{AU}] + \text{SS} \\ &= [5 \times 1 \text{ kg/order}] + 27 \text{ kg} \\ &= 32 \text{ kg} \end{aligned}$$

Thus, when the inventory reaches 32 kg, Lujo Coffee must place a new order.

E. Total Inventory Cost (TIC)

$$\begin{aligned} \text{Estimated demand per year (D)} &= 600 \text{ kg /1 year} \\ \text{Holding cost per unit (H)} &= \text{Rp. } 33.000 \\ \text{Ordering cost per order (S)} &= \text{Rp. } 205.000 \text{ /order} \\ \text{EOQ purchase quantity (Q)} &= 86 \text{ kg /order} \\ \text{Safety stock} &= 27 \text{ kg} \end{aligned}$$

$$\begin{aligned} \text{TIC} &= \left[\frac{Q}{2} \times H \right] + \left[\frac{D}{Q} \times S \right] + (H \times \text{SS}) \\ &= \left[\frac{86}{2} \times 33.000 \right] + \left[\frac{600}{86} \times 205.000 \right] + (33.000 \times 27) \\ &= \text{Rp. } 1.419.000 + \text{Rp. } 1.430.232 + \text{Rp. } 891.000 \\ &= \text{Rp. } 3.740.232 \end{aligned}$$

The difference in the total inventory costs before and after using the EOQ method is as follows:

$$\begin{aligned} &\text{Total inventory cost without EOQ} - \text{Total inventory cost using EOQ} \\ &= \text{Rp. } 7.320.000 - \text{Rp. } 3.740.232 = \text{Rp. } 3.579.768 \end{aligned}$$

- F. Maximum Inventory
 SS = 27 kg
 EOQ = 86 kg

$$\begin{aligned}\text{Maximum Inventory} &= \text{SS} + \text{EOQ} \\ &= 27 \text{ kg} + 86 \text{ kg} \\ &= 113 \text{ kg}\end{aligned}$$

Thus, the maximum inventory available in storage after orders arrive (before usage begins) is 113 kg, including 27 kg of safety stock.

4.2 Discussion

No	Description	Without Method	EOQ Method	Difference
1	Purchase Frequency (times/year)	24 times	7 times	17 times
2	Ordering Cost (Rp)	Rp. 4,920,000	Rp. 1,430,232	Rp. 3,489,768
3	Holding Cost (Rp)	Rp. 2,400,000	Rp. 1,419,000	Rp. 981,000
4	Safety Stock (kg)	0 kg	27 kg	27 kg
5	Reorder Point / ROP (kg)	0 kg	32 kg	32 kg
6	Total Inventory Cost (Rp)	Rp. 7,320,000	Rp. 3,740,232	Rp. 3,579,768
8	Maximum Inventory (kg)	0 kg	113 kg	113 kg

Table 1. Comparison of Inventory Management Results Before and After Applying the EOQ Method

- Purchase Frequency**
 Without using the EOQ method, the purchase frequency was 24 times per year. This indicates that Lujo Coffee frequently made purchases, resulting in high-ordering costs. After applying the EOQ method, the purchase frequency decreased significantly to only seven times per year. This reduction reflects the improved efficiency of the procurement process. The difference of 17 orders demonstrates substantial operational benefits from implementing the EOQ method.
- Ordering Cost**
 Without the EOQ method, the total ordering cost amounted to Rp 4,920,000, which is relatively high because of frequent ordering. After the EOQ method was applied, this cost decreased to Rp 1,430,232. This reduction occurred because purchases were made less frequently and in more optimal quantities. The savings of Rp 3,489,768 show that the EOQ method provides significant cost efficiency for raw material procurement.
- Holding Cost**
 Without the EOQ method, the holding costs reached Rp 2,400,000, likely due to insufficient control over the quantity of raw materials stored. Using the EOQ method, holding costs decreased to Rp 1,419,000. This reduction resulted in more accurate and appropriate order quantities. The cost savings of Rp 981,000 highlight the efficiency achieved through planned and systematic inventory management using the EOQ method.
- Safety Stock**
 Without the EOQ method, Lujo Coffee did not maintain any safety stock (0 kg), making it vulnerable to stockouts during demand surges and supply delays. Using the EOQ method, the safety stock was set at 27 kg, serving as an emergency buffer. This indicates that the EOQ method emphasizes cost efficiency and ensures supply stability. The difference of 27 kg reflects better preventive measures for inventory shortages in the latter period.
- Re-order Point (ROP)**
 Without the EOQ method, Lujo Coffee did not have a reorder point (0 kg), risking delays in raw material procurement. After implementing the EOQ method, the ROP was set at 32 kg, meaning that Lujo Coffee must place an order when the stock reaches this level. Establishing the ROP is crucial for maintaining production continuity and avoiding stockouts. The 32 kg difference indicates that the EOQ method provides a clear calculation basis for ordering decisions.
- Total Inventory Cost (TIC)**

Without the EOQ method, the total inventory cost was Rp 7,320,000. After applying the EOQ method, the total cost decreased significantly to Rp 2,849,232. This reduction resulted from decreases in both the ordering and holding costs. The substantial cost savings of Rp 4,470,768 strongly indicate that the EOQ method significantly improves operational efficiency in inventory management.

7. Maximum Inventory

Without EOQ calculations, Lujo Coffee did not determine any maximum inventory level (0 kg), making it difficult to assess the optimal storage capacity. Using the EOQ method, the maximum inventory level was calculated as 113 kg. This figure results from EOQ calculations that consider optimal ordering quantities and production requirements. The difference of 113 kg demonstrates improved warehouse capacity planning, enabling the company to minimize costs while meeting the production requirements.

Overall, this table illustrates that the application of the EOQ method in managing the coffee bean inventory is significantly more efficient and economical than conventional methods. The EOQ not only reduces the frequency of ordering but also lowers total inventory costs while improving stock readiness through the provision of safety stock. This allows Lujo Coffee to operate more effectively and avoid unnecessary expenses in the future. The findings of this study indicate that the implementation of the EOQ method at Lujo Coffee successfully reduced total inventory costs from Rp 7,320,000 to Rp 3,740,232 per year. This aligns with the results of the study by (Gea, 2023) which showed that the EOQ method in raw coffee material management can reduce costs by up to 15%. The cost reduction is largely attributed to the decrease in excessive order frequency and optimization of purchase quantities.

Furthermore, the results support the findings of Basyid et al. (2020), who concluded that the EOQ method is highly effective for MSMEs facing managerial and resource limitations. The EOQ not only reduces ordering and holding costs but also assists in better medium-term inventory planning. The inclusion of a 27 kg safety stock and determination of a 32 kg reorder point are essential components of a preventive strategy against raw material shortages. This is consistent with the findings of Widiawati et al. (2024), who emphasized the importance of integrating reorder points and safety stock in the EOQ system to anticipate demand fluctuations and supply uncertainty. Therefore, the findings of this study are not only valid based on quantitative calculations but are also supported by previous studies, strengthening the conclusion that the EOQ method can be effectively applied to coffee-based MSMEs, such as Lujo Coffee.

5. Conclusion

This study provides important managerial implications for MSMEs, particularly those in the food and beverage sector. The implementation of the EOQ method enables business owners to manage inventory more systematically, reduce unnecessary operational costs, and enhance raw material procurement effectiveness. Through this method, business owners no longer rely solely on intuition but adopt a quantitative approach to decision-making. This helps improve the accuracy of purchase planning and reduces the risk of stockouts or excessive inventory, which could lead to inefficiencies.

Based on the findings of this study, MSME actors should gradually adopt the EOQ method in their inventory management systems. Training and assistance from local governments, entrepreneurship institutions, and academic practitioners are necessary to support MSMEs in understanding the practical application of this method. Additionally, the use of simple tools, such as Excel spreadsheets or digital inventory applications, is encouraged to enable regular and efficient EOQ calculations and stock monitoring. Lujo Kopi and similar MSMEs are expected to integrate the EOQ method into their operational systems, not merely as a temporary solution but as a sustainable inventory management practice.

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