

INVENTORY PLANNING AND CONTROL OF RAW MATERIALS USING THE ECONOMIC ORDER QUANTITY (EOQ) METHOD (CASE STUDY: HOOLU BURGER CAFÉ)

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Abstract

Hoolu Burger Cafe is a food and beverage business that uses chicken and beef as the main raw materials in burger production. The inventory system implemented by the company is still based on historical purchasing data, and replenishment is generally conducted when stock levels are nearly depleted, which may lead to inventory imbalance and increased inventory costs. This study aims to analyze raw material inventory planning and control using the Economic Order Quantity (EOQ) method at Hoolu Burger Cafe. The data used include raw material usage, ordering costs, holding costs, and purchasing data. The research stages consisted of demand forecasting, Economic Order Quantity (EOQ) calculation, Reorder Point (ROP) determination, and Total Inventory Cost (TIC) analysis. The results show that the optimal order quantity is 60 packs for chicken and 80 packs for beef. The recommended ordering frequencies are 28 orders for chicken and 38 orders for beef during a six-month period. The Total Inventory Cost (TIC) analysis indicates that the EOQ method reduces chicken inventory costs from IDR 229,970 to IDR 113,156, resulting in a cost reduction of 50.79%, while beef inventory costs decrease from IDR 217,259 to IDR 152,970, resulting in a reduction of 28.61%. Therefore, the EOQ method can be applied as an alternative approach to improve inventory management effectiveness and minimize total inventory costs at Hoolu Burger Cafe..

Keywords: EOQ, Forecasting, Inventory, Inventory Management.

1. INTRODUCTION

According to Stephen and Jaideep as cited in Durohman et al. (2023), inventory refers to a list of goods that includes the quantity of items available in stock or products provided by a company for use or sale. Raw material control is one of the most important factors in ensuring smooth business operations so that the company can continue producing finished products. If the availability of raw material inventory does not meet operational requirements, it may negatively affect the company's profitability. When a company experiences shortages of raw materials, it may lose the opportunity to generate profit due to its inability to fulfill customer demand. Conversely, excessive raw material inventory may result in additional holding costs, such as increased electricity expenses, losses caused by materials becoming unusable after being stored for an extended period, and potential negative impacts on other goods or materials stored in the warehouse (Laoli et al., 2022).

Hoolu Burger is a Small and Medium Enterprise (SME) operating in the food and beverage industry sector. Its main product is burgers; however, the business also provides other food menu items as well as beverages. Hoolu Burger is located at Jalan Angklung No. 18, Dadi Mulya Subdistrict, Samarinda Ulu District, Samarinda City, East Kalimantan. Hoolu Burger experiences problems in inventory management due to the lack of inventory control over the raw materials used in burger production, particularly beef and chicken. As a result of these issues, the business frequently encounters situations where customer demand cannot be fulfilled or production activities for several menu variants must be temporarily halted.

To date, Hoolu Burger has managed its raw material inventory using a system that relies solely on previous purchasing history and occasionally restocks raw materials only when the inventory has been completely depleted. Based on these problems, proper inventory planning and control are required for the raw materials used in burger production.

By using the Economic Order Quantity (EOQ) method, companies can minimize order quantity as well as the ordering and holding costs associated with procuring raw materials that have continuous and stable demand. One of the requirements for implementing this method is that customer demand and raw material lead time remain constant during a certain period, which is consistent with the conditions experienced by Hoolu Burger. The implementation of the EOQ method in the company's inventory management is expected to improve the effectiveness and efficiency of raw material procurement activities (Satria and Sinta, 2024).

The Economic Order Quantity (EOQ) method aims to achieve the minimum possible inventory level while maintaining lower costs and better quality. Planning inventory using this method can minimize the occurrence of stockouts so that business operations are not disrupted or halted, while also reducing the inventory costs incurred by the company. In addition, the implementation of this method enables companies to reduce storage costs and optimize space utilization, both for warehouse areas and working spaces.

2. METHOD

This study was conducted to determine the optimal raw material order quantity for burger production inventory, specifically for chicken and beef as the main raw materials. The research was carried out at Hoolu Burger in Samarinda City. The study was conducted during the period from October to November 2025 using historical data from six periods, namely data collected from April to September 2025, with a lead time of less than one day ($\text{Lead Time} < 1 \text{ day} \approx 0$).

The research stages include:

1. Collection of raw material demand data
2. Analysis of demand patterns
3. Demand forecasting using the Moving Average, Weighted Moving Average, and Single Exponential Smoothing methods
4. Selection of the best forecasting method using MAD, MSE, and MAPE
5. Calculation of the Economic Order Quantity (EOQ)
6. Calculation of total inventory costs
7. Comparison between the results of the EOQ method and the company's existing policy

2.1 Data Collection

The data used in this study consist of primary data and secondary data. The primary data were obtained through interviews with Muhammad Sahrul as the Head of the Purchasing Department. The primary data include storage capacity measurements, raw material size data, and raw material composition data. The secondary data used in this study consist of the company profile, organizational structure, raw material usage data, raw material purchasing data, ordering costs, and holding costs, as well as literature used as references in this research.

Tabel 1. Raw Material Usage Data for Chicken and Beef

No	Period	Chicken Raw Material Usage (Kg/Pack)	Beef Raw Material Usage (1 Kg/Pack)
1	May	181,445	437
2	June	203,586	582
3	July	122,886	490
4	Agust	263,914	518
5	September	200,408	469
6	October	471,388	506
TOTAL		1443,627	3002

After obtaining the raw material usage data, additional data regarding purchasing costs, holding costs, and lead time were subsequently required.

Table 2. Purchase Cost, Ordering Cost, Holding Cost, and Lead Time Data

Data	Unit	Chicken	Beef
Purchased Cost	Kg/pack	Rp52.000	Rp90.000
Ordering Cost	per Order	Rp2.000	Rp2.000
Holding Cost	per 6 months	Rp1.872,425	Rp1.872,425
Lead Time	Days	0	0

2.2 Economic Order Quantity (EOQ)

According to Pratama and Arif (2021) as cited in Apriyanti et al. (2024), Economic Order Quantity (EOQ) is a method that aims to achieve the minimum possible inventory level with the lowest possible cost while maintaining better quality. The EOQ method can minimize the occurrence of stockouts, thereby preventing disruptions in company operations and reducing raw material inventory costs within the company.

According to Satria and Sinta (2024), the Economic Order Quantity (EOQ) method considers two main types of costs related to inventory:

1. Ordering Cost
Costs associated with placing orders or purchasing new inventory. These costs tend to decrease as the order quantity increases.
2. Holding Cost
Costs associated with storing inventory. These include physical storage costs, insurance costs, and opportunity costs related to the capital tied up in inventory.

According to Kadriani (2018) as cited in Hilman and Farhan Aini Budiarty (2022), the following formula is used to calculate the Economic Order Quantity (EOQ).

$$EOQ = \sqrt{\frac{2DS}{h}} \dots\dots\dots (1)$$

with:

- Q = EOQ
 D = Total raw material demand in units during a certain period
 S = Ordering cost for each order placed
 H = Holding cost per unit

According to Safitri et al. (2024), the following formula is used to determine the Total Inventory Cost (TIC):

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

dengan:

- TIC = Total Cost Inventory
 D = Total raw material demand in units during a certain period
 S = Ordering cost for each order placed
 H = Holding cost per unit

2.3 Forecasting

According to Jay Heyzer (2004) as cited in Hasriyanti and Aryo Prawoto Wibowo (2020), forecasting is a method used to estimate future events. Forecasting is carried out using historical data which are then projected into future conditions through mathematical models. In this study, three forecasting methods are employed, namely Moving Average, Weighted Moving Average, and Single Exponential Smoothing. After obtaining the results from these three methods, the most accurate forecasting method will be selected by comparing the error values generated by each forecasting method.

According to Putri et al. (2021), mathematical calculations of forecasting error measurements are required to determine the accuracy level of a forecasting system. There are various calculation methods that can be used to measure forecasting error levels.

According to Harini and Lilia (2021), there are three formulas that can be used to determine the level of forecasting error measurement in this study:

1. Mean Absolute Deviation (MAD)

Mean Absolute Deviation (MAD) is the average absolute error over a certain period, without considering whether the forecasting result is higher or lower than the actual value.

$$MAD = \sum \left| \frac{A_t - F_t}{n} \right| \dots \dots \dots (3)$$

with:

A_t = Actual Data

F_t = Forecasting Result

n = Total number of periods for the actual and forecast data

2. Mean Square Error (MSE)

Mean Square Error (MSE) is calculated by summing the squared forecasting errors for each period and dividing the result by the total number of forecasting periods.

$$MSE = \sum \frac{(A_t - F_t)^2}{n} \dots \dots \dots (4)$$

3. Mean Absolute Percentage Error (MAPE)

MAPE is the average absolute error over a certain period, then multiplied by 100% to obtain the result in percentage form.

$$MAPE = \left(\frac{100}{n} \right) \sum \left| A_t - \frac{F_t}{A_t} \right| \dots \dots \dots (5)$$

3. Result and Discussion

Based on the results obtained from the data processing stage, an analysis and discussion were subsequently conducted to serve as the basis for proposing raw material inventory control planning at Hoolu Burger in Samarinda City. Based on the previous data processing results, the demand pattern for beef was identified as static, with a variability value of $0,008064799 < 0.25$, while the demand pattern for chicken was also classified as static, with a variability value of $0,213471824 < 0.25$.

3.1 Forecasting Result

The following are the results of determining the demand forecasting method for chicken and beef using the Moving Average, Weighted Moving Average, and Single Exponential Smoothing methods.

Table 3. Results of Forecasting Method Determination for Chicken and Beef

Chicken				
Forecast		MAD	MSE	MAPE
Moving Average	2 months	104,135625	18.063,749	37,26%
Weighted Moving Average	2 months	113,4389167	20.269,704	41,03%
Single Exponential Smoothing	0,3	91,85196542	17.704,962	31,94%
Beef				
Forecast		MAD	MSE	MAPE
Moving Average	5 months	6,8	46,240	1,34%
Weighted Moving Average	3 months	24,556	955,389	5,11%
Single Exponential Smoothing	0,4	45,12	4.621,312	9,50%

After determining the most appropriate forecasting methods, demand forecasting for chicken and beef was subsequently conducted for the next six months based on the selected forecasting methods, as follows.

Table 4. Chicken Demand Forecasting Using the Weighted Moving Average Method

Months	Period	Chicken Demand Forecast for the Next Period	
		<i>Forecast</i>	$\approx$
November	7	280,102	281
December	8	280,102	281
January	9	280,102	281
Febuary	10	280,102	281
March	11	280,102	281
April	12	280,102	281
Total			1.686 (<i>pack</i>)

Table 5. Beef Demand Forecasting Using the Weighted Average Method

Months	Period	Beef Demand Forecast for the Next Period	
		<i>Forecast</i>	$\approx$
November	7	513,000	513
December	8	499,200	500
January	9	501,040	502
Febuary	10	497,648	498
March	11	503,378	504
April	12	502,8523	503
Total			3.020 (<i>pack</i>)

3.2 Economic Order Quantity

In the calculation of the Economic Order Quantity (EOQ), the demand forecasting data obtained from the previous stage were used. The results of the calculations using the EOQ method are presented in the following table..

Table 6. Result of Economic Order Quantity (EOQ)

Raw Material	Economic Order Quantity (EOQ) (<i>Pack</i>)	Order Frequently (6 months)
Chicken	60	28
Beef	80	38

3.3 Total Inventory Cost

In inventory planning, it is necessary to compare the total inventory costs calculated using the Economic Order Quantity (EOQ) method with the total inventory costs based on the company's existing policy, which considers ordering costs and holding costs. The results of the total inventory cost comparison can be seen as follows.

Table 7. Comparison Results of Total Inventory Costs

Method	Chicken	Beef
EOQ	Rp.113.156	Rp. 152.087
Company Policy	Rp. 229.970	Rp.217.259

Based on the results of the total inventory cost comparison, the total inventory cost calculated using the Economic Order Quantity (EOQ) method is lower than the total inventory cost based on the company's existing policy. The total inventory cost for chicken using the EOQ method is lower by 50.79%, while the total inventory cost for beef using the EOQ method is lower by 28.61%.

3.4 Limitation

This study has several limitations that should be acknowledged. First, chicken and beef are perishable raw materials with a limited shelf life, whereas the classical EOQ model assumes that inventory can be stored without any loss of quality or usable quantity over time. Consequently,

the order quantities and holding costs generated by this model may not fully capture potential losses caused by spoilage or quality deterioration during storage. Second, this study applies the classical EOQ model, which relies on several simplifying assumptions, including constant and deterministic demand, negligible lead time, no shortages or stockouts, and fixed ordering and holding costs per unit. These assumptions may not fully reflect the actual operating conditions of Hoolu Burger, where demand can fluctuate and supply conditions may vary. Future research is therefore recommended to consider EOQ models that explicitly account for perishability, such as the EOQ model for deteriorating items, in order to produce inventory planning recommendations that are more representative of real-world conditions.

4. CONCLUSION

Based on the results of this study, it can be concluded that the Economic Order Quantity (EOQ) method can determine the optimal raw material order quantity and reduce total inventory costs compared to the company's existing policy. The optimal order quantity for chicken is 60 packs, while the optimal order quantity for beef is 80 packs. The implementation of the EOQ method can serve as an alternative approach to improving inventory management efficiency in small-scale food businesses.

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