



Logistics and Distribution Management

Analysis of Raw Material Inventory Control Based on the Economic Order Quantity Method at the Classic Donat Kendari Shop

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ABSTRACT

The company's main objective is to achieve profitability through an optimal production process, which is highly dependent on the availability and efficient management of raw materials. Although vital, raw material supplies must be managed optimally—not excessively—for cost efficiency, which requires careful calculation of the ideal purchase quantity and timing. Toko Classic Donat Kendari still implements an inefficient purchasing policy, which is based on estimates (purchasing small quantities when supplies are running low) to prevent spoilage. This study aims to evaluate the control of raw material inventory at Toko Classic Donat Kendari using the Economic Order Quantity (EOQ) method. This study uses a combined qualitative and quantitative approach, with data collection through interviews and documentation. The results of the study indicate that Toko Classic Donat Kendari can control raw material inventory more effectively through the application of the EOQ method. The implementation of EOQ has been proven to optimize ordering costs and storage costs, which overall contribute to a reduction in total inventory costs.

1. INTRODUCTION

In general, a company is established to generate profits and ensure that its production process runs smoothly. To achieve this goal, one crucial aspect to consider is how to maintain a continuous and efficient production process. Reaching these objectives can be challenging, as they depend on various factors. One of the most important factors is the procurement and management of raw material stocks, which are often referred to as the basic materials for production [1].

The availability of raw materials is crucial to ensure the implementation of planned production activities. However, this does not mean that the company should stockpile excessive inventory. The quantity of inventory needs to be properly managed to align with production needs while maintaining cost efficiency.

When purchasing raw materials, it is very important to calculate the optimal amount of inventory. Planning the quantity of raw materials to be purchased and determining the right time to make those purchases are necessary to create an ideal inventory level so that production is not disrupted due to a shortage of raw materials [2].

Classic Donut Kendari does not apply an efficient method of raw material purchasing to meet its inventory needs. The business relies only on estimation in procuring raw materials—

when the inventory is considered nearly depleted, they immediately make another purchase in a relatively small quantity. This policy is implemented as a preventive measure in case of damage to raw material stock during the production process.

2. LITERATURE REVIEW

2.1. Empirical Review

A previous study conducted by Bayu Fikri Rizaldhi, Fara Damayanti, Julia Anisa Nur Octavia, Kamalia Fitriani, and Ujang Suherman (2024) at the Legendaris Tofu Factory showed that the management of soybean raw material inventory in the factory was not yet optimal [3]. In the ordering process, the factory relied solely on estimation without applying any specific method to manage raw material inventory. The Economic Order Quantity (EOQ) method revealed figures significantly higher than the policy implemented by the Legendaris Tofu Factory, even though total expenses could actually be minimized. Therefore, it can be concluded that the EOQ method is highly beneficial for companies in managing raw material inventory, particularly in reducing costs. Based on the explanation above, this study presents the theme "Analysis of Raw Material Stock

Management Using the Economic Order Quantity (EOQ) Method."

2.2. Theoretical Review

2.2.1. Inventory

Rangkuti (2018) defines inventory as assets that include various goods owned by a business with the purpose of being marketed within a certain period, along with products that are still in the manufacturing process or raw materials ready to be used in production [4]. The term "raw material inventory" refers to all materials stored in anticipation of fluctuating demand that needs to be fulfilled. Raw materials, work-in-process products, and finished goods are all parts of inventory, which collectively serve as essential resources to support production or specifically to meet customer needs.

According to Herjanto (2020), inventory refers to goods or raw materials stored in warehouses for specific uses, such as resale, spare parts for machines or equipment, or use in production or assembly processes [5]. Inventory can also be defined as assets consisting of products owned by a company and intended for sale during normal operating hours, products that are still in the production process, or raw material stocks waiting to be used in production. The explanation above emphasizes that inventory plays a vital role in the production process because it ensures operational efficiency so that finished products can be delivered to customers in an orderly manner.

From the experts' perspectives mentioned above, it can be concluded that inventory generally refers to products intended for sale, regardless of whether the business is a manufacturing or trading company. Inventory is then used to produce goods for sale. The term "inventory" is widely used in the business world to describe the stock of goods owned by a company, particularly in manufacturing or trading industries. Inventory is typically maintained to protect the company from various risks that may disrupt its ability to acquire the necessary raw materials or finished goods. The total amount of products owned by a business—whether raw materials, semi-finished goods, or finished goods—is referred to as inventory.

2.2.2. Inventory Control

Raw material suppliers are essential for any business that produces goods or plans a production process. Such businesses require a steady supply of raw materials to support production activities, whether intentionally or unintentionally. However, each business adopts a different approach to inventory management, both in terms of the number of units and the handling of raw material stocks. Asyhari (1986:150) defines a company's inventory management procedures as *inventory control* [6]. One way to explain the specific objectives of inventory control is as an effort to [7]:

1. Prevent the company from running out of inventory, which could result in production stoppages.
2. Prevent the business from holding excessive inventory.
3. Avoid unnecessary small-scale purchases that could lead to excessive ordering costs.

Based on the explanation above, the goal of inventory control is to ensure that an organization benefits from having the appropriate quantity and quality of resources or goods available when needed, at the lowest possible cost.

2.2.3. Bahan Baku

Sinurya (2020:57) emphasizes that one of the most vital elements in the production process is raw material. Without raw materials, a company's production activities cannot take place. The term "raw material" or "direct material" refers to the basic

stock used in a company's production process, which is essential for creating the final product [8].

Indrajit (2020:57) states that raw materials can also be understood as natural resources that will later be processed into finished products, which become the company's main output [9]. Raw materials are materials that are still in an unprocessed or raw state and serve as the basis for producing goods.

From the perspectives of several experts, it can be concluded that raw materials are a crucial input. A shortage of raw materials will hinder the production process if the supply is insufficient. However, if raw materials are available in excessive quantities, this can lead to high inventory levels, potentially causing problems for the company and increasing the costs that the business must bear.

The quantity of raw materials to be purchased can be determined if company management understands the volume required for the production process over a specific period. Production needs are calculated to determine the amount of raw material to be acquired, taking into account existing inventory data. The quantity of raw materials the company must purchase will be equal to the raw material requirements for the production process minus the initial stock available [10].

2.2.4. Economic Order Quantity (EOQ) Method

In 1915, F.W. Harris was the first to introduce the concept of EOQ. Procurement costs and holding costs are the two main types of expenses associated with inventory. One of the earliest and most well-known methods of inventory management is the Economic Order Quantity (EOQ), which addresses two crucial questions: when to order and how much to order [11]. The economic order quantity model is an inventory management method that aims to minimize the total costs of procurement and storage. In calculating the Economic Order Quantity method, several key elements serve as indicators, including purchase frequency, safety stock, reorder point, and total inventory cost [11].

3. METHODOLOGY

3.1. Conceptual Framework

Every business generally has its own goals and aspirations, which may vary from one to another. However, all businesses share a common objective — to achieve maximum profit. A company must have clear and appropriate inventory policies to ensure the continuous availability of raw materials for production. By maintaining sufficient raw material inventory, the company can reduce the risk of production disruptions caused by limited supply. Through the implementation of the Economic Order Quantity (EOQ) approach, the company can minimize the likelihood of stockouts, ensuring smooth business operations while simultaneously reducing inventory-related expenses.

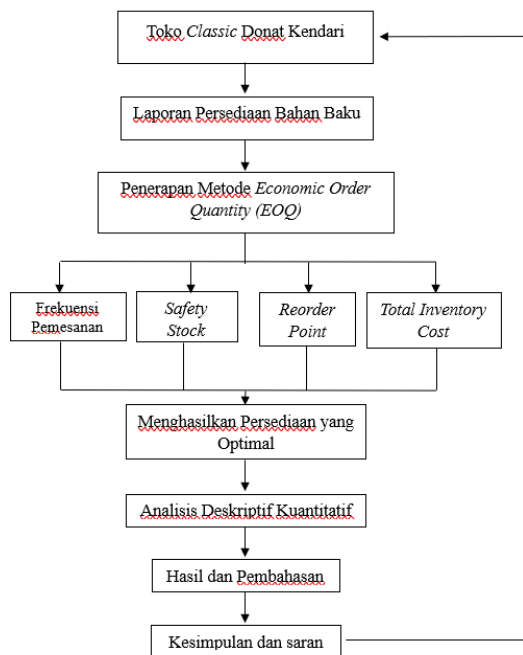


Figure 1. Conceptual Framework

3.2. Research Design

This research was conducted at Classic Donut Store No. 30 in Kendari, Southeast Sulawesi, with the aim of analyzing raw material inventory management using the Economic Order Quantity (EOQ) method. To ensure that the results obtained are accurately measurable based on the collected data, this study employs a descriptive method with a quantitative approach. The descriptive method is a contemporary research technique used to study a group of people, objects, specific situations, patterns of thought, or categories within a given context. The goal of descriptive research is to develop a systematic, factual, and accurate description of the facts, characteristics, and interrelationships among the phenomena being studied [12].

3.3. Research Object

The object of study refers to a condition that reflects the situation of the subject being analyzed in order to obtain a clear understanding of the research. In this study, the object under investigation is the application of the Economic Order Quantity (EOQ) method in evaluating inventory management at Classic Donut Store.

3.4. Types and Sources of Data

3.4.1. Types of Data

Both qualitative and quantitative data are applied in this study. Qualitative information consists of verbal statements and is not presented in numerical form. This type of data often reflects specific characteristics or attributes. Descriptions of the company and the background of Classic Donut's establishment are used as qualitative data in this research. Meanwhile, quantitative data consist of information that has been counted or measured and is presented in numerical form. Examples of quantitative data used in this study include the cost of raw materials, the amount of raw material usage, and the expenses related to Classic Donut's production process in 2023.

3.4.2. Sources of Data

The data source used in this research is secondary information. Secondary data refer to types of information sources that do not directly provide data to the collector, such as those obtained through third parties or various documents [13]. In this study, the secondary information sources were derived from data obtained from Classic Donut Store, located in Kendari City.

3.5. Data Collection Techniques

The data collected to support this study employed the following information-gathering methods:

1. Documentation

Data and information collected through books, archives, records, figures, and photographs—as well as other relevant materials for analysis—are referred to as documentation [13]. The researcher gathered data by accessing documentation from observations and interviews as secondary data related to raw material inventory at Classic Donut Store.

2. Interview

An interview is a research technique that involves conversation or interaction between the researcher and the informant to obtain information. To collect objective data that could serve as a basis or guideline for subsequent stages, the researcher conducted in-depth interviews with informants by visiting them directly at Classic Donut Store.

3.6. Data Analysis Techniques

In this study, the main raw material inventory was analyzed using the Economic Order Quantity (EOQ) method, with data obtained from the raw material usage reports at Classic Donut Store Kendari. The following are the data analysis methods applied in this research:

1. Raw Material Purchasing Analysis

The ideal quantity to order or purchase on each occasion can be determined using the Economic Order Quantity (EOQ) method, which is calculated using the following formula:

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

Where:

Q = Optimal (economic) order quantity

S = Ordering cost per order

D = Estimated usage/demand per time period

H = Holding cost per unit per year

2. Order Frequency

Refers to purchasing in uniform quantities each time an order is placed. It is expressed as follows:

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

Where:

F = Order frequency in one year

D = Annual demand

EOQ = Optimal (economic) order quantity

3. Safety Stock

The method for determining safety stock can be formulated as follows:

$$SS = LT \times (Max - Average Usage)$$

Where:

SS = Safety stock
L = Lead time (waiting time)
Max = Maximum usage
Average Usage = Average usage

4. Reorder Point

The reorder point is the moment when action must be taken to replenish stock that is running low.

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

Where:

ROP = Reorder Point
d = Daily raw material requirement
L = Lead time (in days/weeks)
SS = Safety Stock

5. Total Inventory Cost

The total inventory cost is the accumulation of all expenses incurred in managing inventory, including ordering costs and holding (storage) costs.

$$TIC = \sqrt{2 \cdot D \cdot S \cdot H}$$

Where:

TIC = Total Inventory Cost
D = Total raw material requirement
S = Cost per order (ordering cost per purchase)
H = Holding cost (annual storage cost)

3.7. Operational Definition

Below is the operational explanation of the variables applied in this study:

1. Economic Order Quantity (EOQ) refers to the volume of goods that can be obtained with the lowest possible cost, often referred to as the ideal purchase quantity. It is used to determine the most efficient inventory level by analyzing ordering and holding cost elements. At Classic Donut Store, this method is applied to determine the most economical order size in order to minimize inventory expenses.
2. Raw material stock refers to materials that have not yet undergone processing and are prepared by the company for use in the production process. Raw materials play a crucial role in a company. Any shortage or excess of raw material stock may cause operational problems and inefficiencies within the company.

4. RESULTS AND DISCUSSION

4.1. Data Analysis Results

- a. Cost Analysis Using the Economic Order Quantity (EOQ) Method

The optimal order or purchase quantity for each procurement cycle is determined using the EOQ formula.

Table 1. Calculation of Raw Material Inventory Using the Economic Order Quantity (EOQ) Method

Materials	Formula	Result
Wheat	$Q = \frac{\sqrt{2 \cdot D \cdot S}}{H}$	$Q = \frac{\sqrt{2 \times 4025 \text{ Kg} \times \text{Rp } 5.031.250}}{\text{Rp } 1.006.250}$
Flour		$Q = 200 \text{ kg}$
Sugar	$Q = \frac{\sqrt{2 \cdot D \cdot S}}{H}$	$Q = \frac{\sqrt{2 \times 402,5 \text{ Kg} \times \text{Rp } 855.313}}{\text{Rp } 171.063}$
		$Q = 63 \text{ kg}$
Butter	$Q = \frac{\sqrt{2 \cdot D \cdot S}}{H}$	$Q = \frac{\sqrt{2 \times 805 \text{ Kg} \times \text{Rp } 2.515.625}}{\text{Rp } 503.125}$
		$Q = 89 \text{ kg}$
Yeast	$Q = \frac{\sqrt{2 \cdot D \cdot S}}{H}$	$Q = \frac{\sqrt{2 \times 80,5 \text{ Kg} \times \text{Rp } 805.000}}{\text{Rp } 161.000}$
		$Q = 28 \text{ kg}$

Source: Data processed by the Author 2025

Based on Table 1 mentioned earlier, it appears that the calculation of raw material stock usage for Classic Donat Shop in 2023 for efficient wheat flour purchases using the Economic Order Quantity method is 200 kg per order. Furthermore, for efficient sugar purchases as raw material using the Economic Order Quantity method, the quantity is 63 kg per order. Then, for affordable butter raw material using the Economic Order Quantity method, the quantity used is 89 kg per order. In addition, economical yeast purchases by applying the Economic Order Quantity method reach 28 kg per order.

- b. Analysis of Raw Material Ordering Frequency Calculation

Referring to purchases with consistent volume on each ordering occasion.

Table 2. Raw Material Ordering Frequency Calculation

Materials	Formula	Result
Wheat Flour	$F = \frac{D}{EOQ}$	$F = \frac{4025 \text{ Kg}}{200 \text{ Kg}}$ $F = 20 \text{ kali}$
Sugar	$F = \frac{D}{EOQ}$	$F = \frac{402,5 \text{ Kg}}{63 \text{ Kg}}$ $F = 7 \text{ kali}$
Butter	$F = \frac{D}{EOQ}$	$F = \frac{805 \text{ Kg}}{89 \text{ Kg}}$ $F = 9 \text{ kali}$
Yeast	$F = \frac{D}{EOQ}$	$F = \frac{80,5 \text{ Kg}}{28 \text{ Kg}}$ $F = 3 \text{ kali}$

Source: Data processed by the Author 2025

From Table 2 above, it can be seen that the calculation of raw material ordering frequency for the Classic Donat shop in 2023 shows that the use of the Economic Order Quantity method results in a wheat flour ordering frequency of 20 times in one year. Then, for ordering sugar raw material, the Economic Order Quantity method indicates a frequency of 7 times in a year. Furthermore, the ordering frequency of butter raw material with the same method is 9 times in a year. In addition, the Economic Order Quantity method shows that the ordering frequency of yeast raw material is 3 times in a year.

c. Analysis of Safety Stock Calculation

The concept of safety stock is an additional supply that provides support to meet inconsistent demand and serves as a reserve.

Table 3. Safety Stock Calculation.

Materials	Formula	Result
Wheat	$LT x (Max-Average Usage)$	$2 x (400-335,417)$ $= 129,167$ $= 130 \text{ kg}$
Flour		
Sugar	$LT x (Max-Average Usage)$	$2 x (40-33,5417)$ $= 12,9167$ $= 13 \text{ kg}$
Butter	$LT x (Max-Average Usage)$	$2 x (80-67,0833)$ $= 25,8333$ $= 26 \text{ kg}$
Yeast	$LT x (Max-Average Usage)$	$2 x (8-6,70833)$ $= 2,58333$ $= 3 \text{ kg}$

Source: Data processed by the Author 2025

Based on Table 3, the amount of safety stock of flour raw material that the company needs to provide is 130 kg each month. Furthermore, the required stock of sugar raw material is 13 kg. In addition, for butter raw material, the company must prepare 26 kg, and for yeast raw material, 3 kg is required.

d. Analysis of Reorder Point

Reorder point merupakan momen (titik) persediaan yang menandakan perlunya dilakukan langkah untuk memenuhi kekurangan stok pada barang tersebut [14].

Table 4. Raw Material Reorder Point Calculation

Month	Wheat Flour	Sugar	Butter	Yeast
Januari	159	15,857	31,714	3,571
Februari	156	15,593	31,185	3,518
Maret	152	15,241	30,483	3,448
April	152	15,174	30,348	3,434
May	149	14,897	29,793	3,379
Juni	153	15,308	30,615	3,461
July	153	15,321	30,643	3,464
Augustus	154	15,414	30,828	3,482
September	155	15,5	31	3,5
October	155	15,5	31	3,5
November	154	15,414	30,828	3,482
Desember	157	15,679	31,357	3,535

Source: Data processed by the Author 2025

Based on the data in Table 4, Classic Donat Shop can determine the reorder point for the existing flour raw material, with reference to raw material consumption during a month, the number of working days, and daily usage. From the table, it can be seen that the reorder point varies each month. For January, with a total of 28 working days, wheat flour consumption reaches 14 kg, which means there will be a reorder requirement of 159 kg. Furthermore, for sugar, the use of 1.43 kg will result in a reorder point of 15.857 kg. Similarly, for butter used as much as 2.86 kg with the same number of working days, the reorder point is 31.714 kg. Finally, for yeast, the highest daily use of 0.29 kg indicates that the required reorder point is 3.571 kg.

e. Analysis of Total Inventory Cost

Total inventory cost is the accumulation of all expenses incurred when managing inventory, including ordering costs and storage costs.

Table 5. Calculation of Total Storage Costs

Raw Material Inventory	Flour (kg)	Sugar (kg)	Butter (kg)	Yeast (kg)
Total/year (D)	4,025	402.5	805	80.5
S	Rp 5,031,250	Rp 855,313	Rp 2,515,625	Rp 805,000
H	Rp 1,006,250	Rp 171,063	Rp 503,125	Rp 161,000
TIC	Rp 201,877,927	Rp 10,852,699	Rp 45,141,277	Rp 4,567,976

Based on Table 5 above, it can be seen that the total Inventory Cost of Classic Donat shop for wheat flour raw material in 1 year is Rp 201,877,927, then the Total Inventory Cost of Classic Donat shop for sugar raw material in 1 year is Rp 10,852,699, then the total Inventory Cost of Classic Donat shop for butter raw material in 1 year is Rp 45,141,277. Also, the total Inventory Cost of Classic Donat shop for yeast raw material in 1 year is Rp 4,567,976.

4.2. Discussion

Measurement of raw material inventory control based on the Economic Order Quantity (EOQ) method.

- Economic Order Quantity is the optimal purchase quantity needed to determine the optimum inventory by using the ordering and storage cost aspects generated by the Classic Donat Shop to determine the most economical order size that can minimize inventory costs can be presented in table 4.7. It can be seen that the use of raw materials fluctuates every month, but in the calculation of Economic Order Quantity, the optimal use of wheat flour raw material is 200 kg, sugar raw material is 63 kg, butter raw material is 89 kg, and yeast raw material is 28 kg per order in a period of 1 year.
- Raw material ordering frequency is a measure of how often raw material purchases are made in a certain period. By using the Economic Order Quantity method, the number of ordering frequencies can be calculated and presented in table 4.8, which states that the ordering frequency of wheat flour raw material is 20 times, in addition, the ordering frequency of sugar raw material is 7 times, then the ordering frequency of butter raw material is 9 times, and the ordering frequency of yeast raw material is 3 times in 1 year.
- Safety Stock is an additional inventory that aims to protect raw materials from material shortages and stockouts, safety stock functions to protect against demand fluctuations and uncertainty of raw materials used so that safety stock is important for companies that use raw material inventory. To calculate safety stock, the researcher takes the raw material inventory that is most widely used in 1 year. It can be seen in table 4.9 that the safety stock of flour raw material that must be provided by the company is 130 kg in one month, then the safety stock of sugar raw material is 13 kg, in addition, the safety stock of butter raw material is 26 kg and the safety stock of yeast raw material is 3 kg.
- The reorder point is when a company or business organization needs to order goods or materials to maintain inventory. Considering that the reordering process takes two days, Classic Donat Shop needs to maintain stock as shown in tables 4.10 to 4.13, where the company must determine the reorder point for flour raw material as much

as 159 kg, then for sugar raw material as much as 15.857 kg, then for butter raw material as much as 31.714 kg, and also for yeast raw material around 3.57 kg.

- e. Total inventory costs include all expenses for ordering and storage. Storage can be done more efficiently if the company is able to determine the right number of items to order from suppliers, so that the stock ordered is neither less nor more than what is needed for the production or distribution process. If the company can identify the ideal number of items to order, this will also contribute to savings in ordering costs. Expenses previously spent on ordering excess quantities of goods can be minimized by ordering as needed, as seen in table 4.14 above, where the total inventory cost of Classic Donat Shop for wheat flour raw material in a year is Rp 201,877,927, while for sugar raw material the total is Rp 10,852,699, and for butter raw material the total is Rp 45,141,277. In addition, the total inventory cost for yeast raw material in one year was recorded at Rp 4,567,976.

From the results of the analysis above, it is known the comparison of raw material inventory control of Classic Donat Kendari Shop, Before and after using the Economic Order Quantity (EOQ) method.

Before using the Economic Order Quantity (EOQ) method:

- a. Uncontrolled inventory levels, difficulty determining when and how much to order, leading to excessive or insufficient inventory, which increases costs.
- b. High inventory costs, lack of control over inventory can lead to excessive ordering costs and high storage costs due to excessive inventory on raw material usage.
- c. Inefficient, does not have enough information to make appropriate ordering decisions, which can lead to inefficiencies in inventory management.
- d. Risk of shortage, insufficient or out of stock during the production process results in delays that affect sales opportunities.

After using the Economic Order Quantity (EOQ) method:

- a. Optimal inventory level, Economic Order Quantity helps companies calculate the ideal order quantity, so that inventory can be managed more efficiently.
- b. Optimized inventory costs, with the right order quantity, ordering and storage costs can be minimized, thus reducing total inventory costs.
- c. Increased efficiency, can make more accurate and efficient ordering decisions, thus reducing the risk of shortage or excess inventory.
- d. Risk of shortage, better inventory management can prevent stock outs, thus reducing potential losses for the company.

5. CONCLUSION

Based on the problem identification, discussion, and evaluation results regarding raw material inventory management at the Classic Donat Kendari Shop using the Economic Order Quantity method. Classic Donat Shop still relies on traditional methods or just estimates in managing its raw materials. As a result, raw material inventory management has not achieved optimal efficiency, which leads to a high total inventory cost. With the application of the Economic Order Quantity method, the total inventory cost becomes much lower compared to the previous policy, so that a decrease in inventory costs can increase operational efficiency, minimize waste, increase profitability, and provide more flexibility for the business.

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