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ANALYSIS OF THE COMBINED ABC METHOD AND EOQ METHOD TO INVENTORY COST EFFICIENCY IN CV PATRIOT KENCANA MEDIKA

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Abstract

Suboptimal inventory management causes stock imbalances and cost overruns at CV Patriot Kencana Medika, a medical equipment and supplies distributor struggling with product variety and frequent shortages. This research classifies priority products and determines optimal quantity, frequency, and reorder timing to enhance cost efficiency. Using comparative quantitative methods on 21 bestselling products from 2024, Always Better Control (ABC), Economic Order Quantity (EOQ), and Reorder Point (ROP) analyses were applied, validated through POM-QM and Wilcoxon Signed Rank Test in SPSS 26. ABC analysis identified 5 Category A products contributing 73,60% investment value. EOQ implementation in Category A structured ordering frequency and achieved significant savings reducing total inventory costs from Rp12.432.142,07 (company policy) to Rp1.655.219,68, saving Rp10.776.922,39 (p-value=0.002).

Keywords: ABC; Cost Efficiency; EOQ; Inventory

INTRODUCTION

Inventory management plays a vital role in maintaining seamless company operations (Rusdiana, 2014), particularly for trade enterprises in the medical tools and equipment sector. Given the health sector's critical importance to public welfare, maintaining an uninterrupted supply of medical products is essential for sustaining operations across health facilities such as hospitals, clinics, community health centers, and pharmacies (Berdame et al., 2024).Accurate inventory control directly influences service quality. Inefficiencies in inventory management can lead to two extreme conditions, namely overstock that increases carrying costs and the risk of damage, and stockouts that hinder demand fulfillment and reduce service quality (Ervianti et al., 2024).

CV Patriot Kencana Medika as a trading company in the field of health equipment and supplies in Kudus faces challenges in managing products. Managing a high variety of products with distinct demand profiles often leads to inventory imbalances, such as stockouts or excess stock. A central challenge is the difficulty in prioritizing item management, as each product

contributes differently to the company's total investment. In this case, the Always Better Control (ABC) method can be applied to classify inventory based on investment value, enabling focused control over high-investment items (Category A) without neglecting Categories B and C (Akmal et al., 2024).

Akmal et al., (2024) demonstrated that identifying Category A items accounting for 76.12% of total inventory value allows strict monitoring that significantly reduces carrying costs and stockout risks. Similarly, (Chairani et al., 2024) showed that controlling just 5.3% of antibiotic drug types Category A, managed 63.5% of total drug investment value, optimizing ordering costs while ensuring essential medicine availability.

Optimal inventory management is not only determined by determining product priorities, but also need to determine the most appropriate order quantity in order to minimize inventory costs, therefore it is necessary to apply the Economic Order Quantity (EOQ) method to determine the optimal order quantity. Implementing the Economic Order Quantity (EOQ) method addresses this gap by determining mathematically optimal order sizes, reducing order frequency, and lowering holding and ordering cost (Putra & Habriyanto, 2025). In research Comitre-cornejo et al., (2024) The combined application of ABC and EOQ has been proven to reduce total logistics costs by 30.6% in a tire manufacturing, cut ordering costs by up to THB 424,896 annually in Thai SMEs (Pararach & Muanme, 2023), and lower inventory costs by up to 25% in the pharmaceutical and food sector (Maharani & Sari, 2025).

Based on these empirical insights, integrating ABC and EOQ methods holds strong potential for medical device trading. This study focuses on the 21 top selling products at CV Patriot Kencana Medika, employing ABC analysis for priority classification and EOQ to determine optimal order quantities. Furthermore, comparative statistical test using SPSS is utilized to validate significant cost differences between the company's baseline practices and the EOQ implemented state. Ultimately, this research aims to provide practical solutions for operational cost control while guaranteeing the timely availability of medical equipment.

The purposes to be achived in this research are:

1. The product classification on CV Patriot Kencana Medika uses the Always Better Control (ABC) method.
2. The optimal quantity of procurement of merchandise for Category A and B uses the Economic Order Quantity (EOQ) method.
3. The right time to reorder merchandise for Category A and B inventory by the company.
4. To analyze the difference in total inventory cost between the company current inventory policy and the Economic Order Quantity (EOQ) method in 5 merchandise for Category A and B according to Always Better Control (ABC) Method

LITERATURE REVIEW

1. Inventory
   According to Rusdiana (2014) inventory is a major part of working capital and assets that are subject to change at any given time. It can be concluded that inventory is an asset that must be available in the company at the time needed to ensure the smooth running of the company.
2. Cost In Inventory
   a. Ordering Cost
      Cost for everything related to placing and receiving orders. Examples include order processing costs (administrative fees, phone and document fees), shipping insurance costs, and unloading costs.
      The formula for ordering cost according to Kumalaningrum et al., (2011) is as follows:

Ordering Cost = $\left(\frac{D}{Q}\right)S$

b. Carrying Cost
Costs incurred to store inventory. Examples include insurance, depreciation of goods, inventory taxes, handling costs, security costs, and storage space costs.
Carrying cost formula according to Kumalaningrum et al., (2011) as follows:
Carrying cost = $\left(\frac{Q}{2}\right)H$

c. Stock Out Cost
When demand is unpredictable, a third category of inventory costs arises known as out of stock costs (stock out) (Hansen & Mowen, 2007). Costs incurred when the product is not available when the demand occurs.

3. Inventory Management
According to Herjanto (1999), an inventory control system is a series of control policies to determine the inventory that must be maintained, when orders must be placed, and how many orders must be placed.

4. Always Better Control (ABC) Method
According to Herjanto (1999), ABC classification is an application of the inventory that uses the Pareto principle: "the critical few and the trivial many". The goal is to focus on controlling the inventory of high-value inventory items (critical) than the low-value (trivial).
The criteria in the classification of ABC according to Herjanto (1999), as follows:
   a. Class A: represents 70% of the total inventory value, with a quantity amount of 20% of the entire item.
   b. Class B: represents 20% of the total inventory value, with a total quantity of 30% of the entire item.
   c. Class C: represents 10% of the total inventory value, with a quantity amount of 50% of the entire item.

5. Economic Order Quantity (EOQ) Method
Economic Order Quantity (EOQ) indicates the number of units ordered each time an order, which will result in a minimum total inventory cost (Kumalaningrum et al., 2011)
.
To determine the Economic Order Quantity (EOQ) the following formula can be used
(Kumalaningrum et al., 2011) Q = $\sqrt{\frac{2.S.D}{H}}$

6. Reorder Point
The reorder point is the moment when a new order must be placed. To avoid stockout cost and to minimize carrying costs, orders are required to be made in such a way that the ordered goods arrive just as the last inventory is used up (Hansen & Mowen, 2007)
Reorder Point can be calculated by knowing the average usage rate and waiting time (Hansen & Mowen, 2007)
   a. Without Safety Stock (ROP = Average usage × Lead time)
   b. With Safety Stock (ROP = (Average usage × Lead time) + Safety Stock)

RESEARCH METHODOLOGY

This type of research is a quantitative research with a comparative approach. According to (Siyoto, 2015) quantitative research is research that requires a lot of the use of numbers, starting from data collection, interpretation of the data, and the appearance of the results. A comparative approach is used to compare two or more variables or conditions, to find out the difference between the two. In this study, we compared the cost of inventory before and after the application of the Economic Order Quantity (EOQ) on the CV of Patriot Kencana Medika.

The stages of this analysis are as follows:

1. Classify products with the Always Better Control (ABC) method.
2. Calculate the optimal order quantity using the Economic Order Quantity (EOQ) method and calculate the inventory cost.
3. Compare the company's actual inventory cost with the inventory costs using the EOQ method.

RESULTS AND ANALYSIS

ABC Classification

ABC classification is carried out by calculating the inventory value of each merchandise based on the sales quantity and purchase price of merchandise in 2024. The cumulative percentage results are used as the basis for determining groups A, B, and C. Through the Always Better Control (ABC) method, merchandise is classified into three groups based on their contribution to the value of inventory. Category A consists of 5 types of merchandise with a total inventory value of Rp446.411.261,78 or 73,60% of the total inventory value. Category B consists of 7 types of merchandise with a total inventory value of Rp 109.810.232,14 or 18,10% of the total inventory value. Category C consists of 9 types of merchandise with a total inventory value of Rp50.299.222,09 or 8,29%. Based on the results of the ABC classification, merchandise in group A has the highest inventory value contribution so that it becomes a priority in the management inventory and which will be calculated based on the EOQ method.

Calculation using the Economic Order Quantity

Table 1
Result of Economic Order Quantity for Category A

Item Name	D (unit)	S (Rp)	H (Rp)	Q (Unit)
Strip Cholesterol	1.239	24.380,04	7.055,30	92,54
Kasa Steril Bunda 16x16	14.981	11.038,11	311,72	1030,04
Strip Glucosa	920	10.774,93	3.955,68	70,80
Strip Urid Acid	610	10.246,13	4.066,54	55,44
Hypafix 5x1	2.581	6.482,74	946,30	185,74

Source: CV Patriot Kencana Medika Data Processed, 2025

Frequency and Reorder Point

Table 2
Result of Frequency and Reorder Point using EOQ

Item Name	F	Time Between Order	Lead Time	ROP
Strip Cholesterol	13,39	25,99	4	14,24
Kasa Steril Bunda 16x16	14,54	23,39	4	172,20
Strip Glucosa	13,00	26,78	4	10,57
Strip Urid Acid	11,00	31,63	4	7,01
Hypafix 5x1	13,56	25,67	4	28,94

Source: CV Patriot Kencana Medika Data Processed, 2025

Comparison of Total Inventory Cost

Table 3
Comparison of Total Inventory Cost

Item Name	TIC (Company)	TIC (EOQ)	Differences
Strip Cholesterol	Rp 4.897.005,94	Rp 652.868,18	Rp 4.244.137,76
Kasa Steril Bunda 16x16	Rp 2.320.251,87	Rp 321.079,20	Rp 1.999.172,67
Strip Glucosa	Rp 2.264.929,34	Rp 280.044,39	Rp 1.984.884,95
Strip Urid Acid	Rp 1.435.849,12	Rp 225.461,52	Rp 1.210.387,60
Hypafix 5x1	Rp1.514.105,80	Rp 175.766,39	Rp 1.338.339,11
TOTAL	Rp12.432.142,07	Rp1.655.219,68	Rp10.776.922,39

Source: CV Patriot Kencana Medika Data Processed, 2025

Based on Table 3, the total inventory cost according to the company's policy is Rp12.432.142,07, while the total inventory cost using the Economic Order Quantity (EOQ) method is Rp1.655.219,68. The difference in value shows that there is a difference in total inventory costs of Rp10.776.922,39 between the company's policy and the EOQ method. The difference in the total cost of inventory indicates a change in inventory management after the implementation of the EOQ method. To find out whether the difference in total inventory costs is statistically significant, the Wilcoxon Signed Rank Test is then carried out.

Table 4
Result of Wilcoxon Signed Ranks Test

		N	Mean Rank	Sum of Ranks
Biaya EOQ – Biaya Perusahaan	Negative Ranks	30[a]	15.50	465.00
	Positive Ranks	0[b]	0.00	0.00
	Ties	0[c]		
	Total	30		

Source: CV Patriot Kencana Medika Data Processed, 2025

The results of the Wilcoxon test showed that all data on the difference in total inventory costs were included in negative ranks, indicating that the value of the total cost of inventory after the implementation of the Economic Order Quantity (EOQ) method was lower than the total cost of inventory based on company policies.

Table 5
Statistic Test Result

Z	-4.782^b
Asymp. Sig. (2-tailed)	0.000

Source: CV Patriot Kencana Medika Data Processed, 2025

Based on the results of the statistical test in Table 5, a Z value of −4.782 was obtained with an AsympSig (2-tailed) value of 0.002, (Sig. < 0.05). This shows that there is a statistically significant difference between the total cost of inventory before and after the application of the EOQ method. This efficiency occurs because the EOQ method is able to determine the optimal quantity of orders, so that it can balance ordering costs and carrying costs more effectively.

CONCLUSION

1. Group A consists of 5 types of merchandise with a total inventory value of Rp446.411.261,78 or 73,60% of the total inventory value. Group B consists of 7 types of merchandise with a total inventory value of Rp109.810.232,14 or 18,10% of the total inventory value. Group C consists of 9 types of merchandise with a total inventory value of Rp50.299.222,09 or 8,29% of the total inventory value.
2. The application of the EOQ method makes the order quantity and frequency of orders more optimal, so that inventory control becomes more structured and efficient compared to company policies. inventory on category A which is 5 products that have the highest inventory value, namely "Strip Cholesterol" as many as 92,54 units per order with a purchase frequency of 13,39 times a year, "Kasa Steril Bunda 16x16" as many as 1.030,04 units each time order with a purchase frequency of 14.54 times a year, "Strip Glucosa" as many as 70,80 units per order with a purchase frequency of 13 times a year, "Strip Urid Acid" is 55,44 units per order with a purchase frequency of 11 times a year, and "Hypafix 5x1" is 188,05 units per order with a purchase frequency of 13,73 times a year. Optimal order quantities for product category B ranging from 15,86 to 434,51 unit per order, with purchase frequancies between 8,57 and 13,72 times per year.
3. The determination of reorder points (ROP) in the application of the EOQ method provides clear guidelines regarding the timing of reordering merchandise. Reorder points for 5 merchandise in category A, namely "Strip Cholesterol" as many as 14,24 units, "Kasa Steril Bunda 16x16" as many as 172,20 units, "Strip Glucosa" as many as 10,57 units, "Strip Urid Acid" as many as 7,10 units, and "Hypafix 5x1" as many as 29,67 units. Reorder points for category B is ranging from 1,556 to 53,54 units.
4. The results of the Wilcoxon Signed-Ranks test which shows an Asymp. Sig. (2 tailed) value of 0.002 (< 0.05), which shows that the combined ABC and EOQ method can significantly make inventory costs efficient. And all data is included in negative ranks, which shows that the total cost of inventory using the ABC and EOQ method is lower compared to the company's policy. Overall, the total inventory cost based on the company's policy is Rp15.206.513,46, while the total inventory cost using the EOQ method is Rp2.132.706,47, resulting in cost efficiency of Rp13.073.806,99. This efficiency is reinforced by Thus, the application of the ABC and EOQ method has proven to be more effective and efficient in controlling merchandise inventory at CV Patriot Kencana Medika.

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