



Implementation of the Economic Order Interval (EOI) and Just in Time (JIT) Method in Bread Material Inventory Control

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ARTICLE INFO	ABSTRACT
Published Online: 26 May 2026	The competition of the bakery industry demands efficient management of raw material inventories to reduce costs and maintain smooth production. The Bukit Bintang Roti factory does not have a good inventory control system, so it often experiences excess and shortage of stock. This study aims to compare EOI and JIT methods in inventory control. The results of the study show that the EOI method produces a total cost of IDR 1,563,435 with an optimal quantity of 6,577 kg and an order frequency of 44 times per year. Meanwhile, the JIT method produces a lower cost of IDR 438,060 with a quantity of 3,937 kg and a frequency of 117 times per year.
Corresponding Author: Muhammad Marizal	Thus, the JIT method is more optimal because it is able to save costs of IDR 1,125,375 and reduce the risk of accumulation and damage to raw materials.
KEYWORDS: EOI method, JIT method, Bukit Bintang Roti Factory, Inventory Control.	

1. INTRODUCTION

Competition in the industrial sector is getting tighter along with the development of globalization, both from domestic and international business actors [1]. Indonesia also feels this pressure, marked by increasing competition between companies in the local and global markets. Therefore, companies need to design the right strategy to maintain business continuity [2]. In addition, companies must also be able to anticipate fluctuations in demand and raw material prices through effective production planning to meet consumer needs.

Production planning is the process of determining the amount of output in a certain period that has a direct effect on the company's profits. One of the determining factors is the management of raw material inventory, where inventory control is carried out to maintain the availability of raw materials so that production remains smooth and minimizes the risk of stock shortages [4]. If there is *overstock*, storage and maintenance costs in the warehouse will increase, causing inefficiency. On the other hand, if the inventory is too low (stockout), the production process can be hampered, causing distribution delays, and risking losing customers who switch to competitors [5].

Raw material inventory management is necessary to maintain the continuity of raw material availability so that the company is able to fulfill orders optimally [6]. Raw materials are an important element in the company's operations because they function as the main support for the production process. Therefore, efficient inventory management is indispensable to ensure the sustainability of production, both in small and large industries [7]. One of them happened to the Bukit Bintang Bakery. Based on the survey results, the Bukit Bintang Roti factory does not have an effective inventory control system, making it difficult to maintain the availability of raw materials. This leads to excess stock that leads to expiration and increased storage costs, as well as stock shortages due to savings that make consumer demand unmet. Some of the methods used in inventory control are EOI method and JIT method.

EOI method is an inventory management technique that adjusts the frequency of orders and order quantities based on inventory conditions [9]. Meanwhile, JIT method is a production system that adjusts the number and time of delivery to needs, with the aim of eliminating waste in the work process [10].

Several studies related to EOI method and JIT method are studies conducted by [9] with the research results of the

EOI method being more optimal than the Lagrange Multiplier method. Furthermore, the research [11] with the results of the research the *Economic Order Quantity* (EOQ) method is more effectively applied by companies because it produces a minimum total cost compared to the EOI method. Another study was also conducted by [13] with the results of the research on the application of the JIT method resulting in a more optimal total inventory cost compared to the *Economic Production Quantity* (EPQ) method. Furthermore, the research conducted by [14] with the results of the JIT method research is more optimal than the EOQ method. This can be seen from the minimum total cost of raw material inventory.

Based on research [9] and [13], researchers are interested in conducting research comparing the EOI method with the JIT method. The purpose of this study is to find out the results of controlling the inventory of bread raw materials using the EOI method and the JIT method and to find out the comparison of the total cost results of the two methods.

2. RESEARCH METHODS

The steps of this research are as follows:

1. Data collection

The data used in this study is primary data by conducting interviews with the owner of the Bukit Bintang Roti factory located on Jalan Gaya Baru, Mandau District, Bengkalis Regency, Duri, Riau Province and secondary data namely the amount of raw material needs and the purchase price, storage costs, and ordering costs for each type of raw material in the period from January 2024 to December 2024.

2. Calculate the cost of ordering all raw materials for a single order with the formula:

$$Biaya\ Pesan_{SBB} = \frac{Total\ biaya\ pemesanan}{Total\ frekuensi\ pemesanan} \quad (1)$$

and the order fee per raw material with the formula:

$$Biaya\ Pesan_{BB} = \frac{biaya\ pemesanan\ untuk\ sekali\ pesan}{banyak\ bahan\ baku} \quad (2)$$

3. Calculate storage costs with the formula:

$$Biaya\ simpan = \frac{Total\ biaya\ penyimpanan}{total\ kebutuhan\ bahan\ baku} \quad (3)$$

4. Completion using the EOI method with the following steps:

a. Calculate the booking time interval (T) with the formula:

$$T = \sqrt{\frac{2S}{HD}} \quad (4)$$

b. Calculate the optimal order quantity for each bread ingredient with the formula:

$$Q^* = D \times T \quad (5)$$

c. Calculate the frequency of bookings with the formula:

$$m = \frac{D}{Q^*} \quad (6)$$

d. Calculate the amount of inventory cost with the formula:

$$TC = \frac{S}{T} + \left(\frac{Q^*H}{2}\right) \quad (7)$$

Description:

T : Time interval of order;

S : Booking fee per order (Rp.);

H : Storage fee per product (Rp.);

D : Number of needs (products);

Q^* : Optimal order quantity (product);

m : Frequency of orders in the EOI method;

TC : Total cost using the EOI method (Rp.)

5. Completion using the JIT method with the following steps:

a. Calculate the value Q^* with the formula:

$$Q^* = \sqrt{\frac{2DS}{H}} \quad (8)$$

b. Calculate the optimal number of shipments with the formula:

$$n = \frac{D}{2a} \quad (9)$$

c. Calculate the optimal order quantity with the formula:

$$Q_n = \sqrt{n} \times Q^* \quad (10)$$

d. Calculate the frequency of bookings with the formula:

$$N = \frac{D}{Q_n} \quad (11)$$

e. Calculate the total initial storage cost with the formula:

$$T^* = \frac{DS}{Q^*} + \frac{Q^*H}{2} \quad (12)$$

f. Calculate the total minimum inventory cost with the formula:

$$T_{JIT} = \frac{1}{\sqrt{N}}(T^*) \quad (13)$$

Description:

Q^* : Order quantity (product);

S : Booking fee per order (Rp.);

D : Number of needs (products);

H : Storage fee per unit (Rp.);

n : Optimal delivery quantity;

N : Frequency of ordering;

a : Average production (product);

Q_n : Optimal order quantity;

T^* : Total storage cost;

T_{JIT} : Total minimum storage cost by using the JIT method;

6. Conduct a thorough comparative evaluation of the output generated by the EOI method and the JIT method to identify the optimal total cost of inventory.

7. Results and Conclusions.

3. RESULTS AND DISCUSSION

The research data was obtained through interviews with the owner of the Bukit Bintang Roti factory. The production process takes place 24 times a month and raw

materials are supplied directly with a *lead time* of one day at most.

The following is presented data on raw material needs, prices and all costs incurred by the Bukit Bintang Roti factory:

Table 1 Raw Material Demand Data in 2024

Moon	Raw Material(kg)									Production Quantity/ pcs
	Wheat Flour	Butter	Sugar	Butter	Salt	Developer	Softener	Oil	Eggs	
January	2.300	630	325	47	40	52	47	590	123	12.590
February	1.950	390	260	26	33	39	26	520	104	10.000
March	2.050	542	289	34	39	41	34	579	120	11.300
April	2.000	497	277	30	35	39	30	565	117	10.880
May	2.252	600	292	45	39	50	45	587	121	12.215
June	2.395	637	330	50	41	54	50	597	125	12.970
July	2.400	637	332	50	41	54	50	597	125	12.990
August	2.600	780	390	52	45	65	52	650	130	15.000
September	2.548	754	387	51	43	63	51	647	128	14.160
October	2.500	750	386	50	43	62	50	645	126	13.975
November	2.499	747	377	48	42	60	48	600	125	13.775
December	2.597	760	388	52	44	64	52	649	129	14.350
Total	28.091	7.724	4.033	535	485	643	535	6.926	1.473	154.205
Average	2.341	644	336	45	40	54	45	577	123	12.850

Source: Bukit Bintang Roti Factory

Furthermore, the price of each raw material taken from the supplier can be seen in Table 2, namely:

Table 2 Prices of each raw material

Raw Material Price/kg (Rp)								
Wheat Flour	Butter	Sugar	Butter	Salt	Developer	Softener	Oil	Eggs
11.000	18.000	18.000	33.000	10.000	70.000	90.000	19.000	30.000

In addition to incurring costs for the purchase of each raw material, the bakery also incurs costs for ordering each raw material, which can be seen in Table 3, namely:

Table 3 Raw Material Order Fee

Fee Type	Cost /month (Rp)	Cost/ year (Rp)
Telephone and internet	400.000	4.800.000
Loading and unloading	150.000	1.800.000
Total		6.600.000

Table 4 shows the storage costs at the Bukit Bintang Roti factory, which are as follows:

Table 4 Raw Material Storage Costs

Fee Type	Cost /month (Rp)	Cost/ year (Rp)
Electricity	750.000	9.000.000
Hygiene	250.000	3.000.000
Total		12.000.000

Source: Bukit Bintang Roti Factory

The ordering and storage costs for a single order are then determined as the first stage in determining the overall cost of bread raw material inventory by:

Calculate the ordering cost for a single order of all raw materials.

Based on Table 3 and Equation (1),

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1. Calculates the ordering cost for a single order of all raw materials.

Based on Table 3 and Equation (1), with a known ordering frequency of 84 times, the following is obtained:

$$Message\ Cost_{SBB} = \frac{total\ order\ cost}{total\ order\ frequency} = \frac{6.600.000}{84} = Rp. 78.571.-$$

Description:

$Message\ cost_{SBB}$: Cost of ordering all raw materials.

Thus, the order expense for one order of bread raw materials is IDR 78,571.

2. Calculates the cost of ordering the first raw materials (salt, softener, oil and sugar). Based on the results of the calculation of the ordering cost for one order of all bread raw materials and using Equation (2) with the first order of raw materials as many as 5 types of raw materials, it is obtained:

$$Message\ cost_{BB1} = \frac{one\ time\ ordering\ fee}{lots\ of\ raw\ materials} = \frac{78.571}{5} =$$

Rp. 15.714.-

Description:

$Message\ cost_{BB1}$: The cost of ordering the first raw material.

So that the cost of ordering raw materials for salt, developers, softeners, oil and sugar is each Rp.15.714.- for one order.

Based on the calculations obtained, the recapitulation is obtained as shown in Table 5 below:

3. Calculating the second raw material order (eggs, Wheat flour and butter) is calculated.

Based on the results of the calculation of the order cost for one order of all bread raw materials and using Equation (2) with the knowledge of the first order of raw materials as many as 4 types of raw materials, it is obtained:

$$Biaya\ Pesan_{BB2} = \frac{one\ time\ ordering\ fee}{lots\ of\ raw\ materials} = \frac{78.571}{4} = Rp.19.643.-$$

Description:

$Message\ cost_{BB2}$: Second raw material order fee.

So that the cost of ordering raw materials for wheat flour, butter, *butter* and eggs is each Rp.19.643.- for one order.

4. Calculates the storage cost for each unit of raw materials.

Based on Table 4 and using Equation (3), with the total need for raw materials as many as 50,445 in one year, it is obtained:

$$\begin{aligned} \text{holding Costs} &= \frac{total\ storage\ costs}{total\ raw\ material\ requirements} \\ &= \frac{12.000.000}{50.445} \\ &= Rp.238.- \end{aligned}$$

So that the storage cost incurred by the bakery is Rp.238/kg for each raw material.

Table 5 Recapitulation of Order Costs and Raw Material Storage Costs

Raw Materials	Order Fee (Rp/ kg)	Storage Fee (Rp/kg)
Wheat Flour	19.643	238
Butter	19.643	238
Sugar	15.714	238
<i>Butter</i>	19.643	238
Salt	15.714	238
Developer	15.714	238
Softener	15.714	238
Oil	15.714	238
Eggs	19.643	238

Furthermore, the calculation of the optimal inventory cost in each raw material will be calculated using the EOI method and JIT method as follows:

1. **Settlement using the Economic Order Interval (EOI) Method**

Raw Material of Wheat Flour

The process of applying the EOI approach to determine the total cost of wheat flour raw material inventory is as follows:

1. Calculate the ordering time interval (T) using Equation (4) to determine how long it takes to order wheat flour raw materials, namely:

$$T_{Wheat\ flour} = \sqrt{\frac{2S}{HD}} = \sqrt{\frac{2(19.643)}{(238)(28.091)}} 0,077\ year \approx 28,11\ day.$$

The calculation results show that one order of wheat flour raw materials is made every 28 days a year.

2. Calculate the optimal order quantity using Equation (5) for wheat flour raw materials:

$$Q^*_{Wheat\ flour} = D \times T = 28.091 \times 0,077 = 2.163,007 \approx 2.163\ kg.$$

So, the optimal order number for Wheat flour raw materials is 2,163 kg per order.

3. Calculating the frequency of orders using Equation (6), for wheat flour raw materials:

$$m_{Wheat\ flour} = \frac{D}{Q^*} = \frac{28.091}{2.163} = 12,987 \approx 13 \text{ times.}$$

So, the frequency of ordering raw materials for wheat flour is 13 times a year.

4. Calculate the total cost of raw materials for wheat flour raw materials using the EOI Method using Equation (7):

$$TC_{Wheat\ flour} = \frac{S}{T} + \left(\frac{Q^*H}{2} \right) = \frac{19.643}{0,077} + \left(\frac{(2.163)(238)}{2} \right) = 255.104 + 257.397 = \text{Rp. 512.501.}$$

So, the total cost of wheat flour inventory is IDR 512.501. For each raw material, the same calculation will be carried out.

2. Completion using the Just in Time Method (JIT) Raw Material of Wheat Flour

The following is the procedure for calculating the total cost of wheat flour raw material inventory using the JIT Method:

1. Calculate the order quantity using Equation (8) for wheat flour raw materials :

$$Q^*_{Wheat\ flour} = \sqrt{\frac{2DS}{H}} = \sqrt{\frac{2(28.091)(19.643)}{(238)}} = 2.153,347 \approx 2.153 \text{ kg.}$$

So, the raw material for wheat flour ordered per order is 2.153 kg.

2. Calculate the optimal shipment amount based on Equation (9) for wheat flour raw materials:

$$n_{Wheat\ flour} = \frac{D}{2a} = \frac{28.091}{2(12.850)} = 1,093 \approx 1 \text{ times.}$$

So, the optimal number of deliveries of wheat flour raw materials was obtained 1 time.

3. Calculate the optimal order quantity using Equation (10) for wheat flour raw materials:

$$Q_{n_{Wheat\ flour}} = \sqrt{n} \times Q^* = \sqrt{1,093} \times 2.153 = 2.250,889 \approx 2.251 \text{ kg.}$$

So, the optimal order quantity for wheat flour raw materials is 2.251 kg per order.

4. Calculating the order frequency (N) using Equation (11) for raw wheat flour:

$$N_{Wheat\ flour} = \frac{D}{Q_n} \text{ times.} = \frac{28.091}{2.251} = 12,479 \approx 12$$

So, the frequency of ordering wheat flour is 12 times a year.

5. Calculate the total cost of inventory (T*) using Equation (12), for the raw materials of wheat flour:

$$T^*_{Wheat\ flour} = \frac{DS}{Q^*} + \frac{Q^*H}{2} = \frac{(28.091)(19.643)}{(2.153)} + \frac{(2.153)(238)}{2} = 256.290 + 256.207 = \text{Rp. 512.497.}$$

So, the total cost of wheat flour inventory is IDR 512,497.

6. Calculate the total minimum inventory cost using the JIT method based on Equation (13) for wheat flour raw materials:

$$T_{JIT\ Wheat\ flour} = \frac{1}{\sqrt{N}} (T^*) = \frac{1}{\sqrt{12}} (512.497) = \text{Rp. 147.945.}$$

So, the minimum inventory cost using the JIT method is IDR 147.945 for wheat flour raw materials. For each other raw material, the same calculation will be made.

Table 6 presents a recapitulation of the calculation results using the EOI Method and the JIT Method:

Table 6 . Comparative Results of EOI Method and JIT Method Comparison

Raw Materials	Optimal Order Quantity (kg/one order)		Booking Frequency (times/year)		Total Cost of Inventory (Rs)	
	EOI	JIT	EOI	JIT	EOI	JIT
Wheat Flour	2.163	2.251	13	12	512.501	147.945
Butter	1.128	619	7	12	268.773	77.578
Sugar	730	289	6	14	173.688	46.419
Butter	297	43	2	12	70.736	20.417
Salt	253	36	2	13	60.210	16.705
Developer	291	46	2	14	69.318	18.535
Softener	266	39	2	14	63.272	16.907
Oil	956	496	7	14	227.634	60.831
Eggs	493	118	3	12	117.303	32.723
Total	6.577	3.937	44	117	1.563.435	438.060

4. CONCLUSION

Based on the calculation results, it can be concluded that using the EOI method produces an optimal order quantity of 6.577 kg of wheat flour with an order frequency of 44 times

per year, resulting in a total inventory cost of IDR 1.563.435. while using the JIT method, with a frequency of ordering 117 times per year, it produces an optimal quantity of 3.937 kg and a lower total inventory cost, which is IDR 438.060. Based

on the results of the total cost, it can be concluded that the JIT method is more optimal than the EOI method. This is because the JIT method determines the order quantity according to the needs of raw materials, so that it can reduce storage costs and reduce the risk of damage. In addition, the frequency of orders adjusted to needs also prevents accumulation and waste, so that the total inventory cost with the JIT method is lower than the EOI method.

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