Analysis of Burger Main Raw Material Inventory Control Using the Economic Order Quantity (EOQ) Method and the Just in Time (JIT) Method

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ARTICLE INFORMATION

ABSTRACT

Burger Fandawa is an MSME in Pekanbaru that faces problems in managing the inventory of the main raw materials, namely bread, meat, and sauce. The main problem is the uncertainty of demand and inventory irregularities that cause shortages or excess stock, thus disrupting smooth production and cost efficiency. This study aims to analyze the main raw material inventory management method using the Economic Order Quantity (EOQ) and Just In Time (JIT) approaches to determine the most optimal method. The research method used is quantitative analysis based on demand data, ordering costs, storage costs, and lead time of the main raw materials during 2023. The results of the analysis show that the optimal purchase quantity according to EOQ is 236.505 packs of bread, 93.510 kg of meat, and 118.866 kg of sauce, with a total inventory cost of IDR. 2,763,809,416. Meanwhile, the JIT method results in a lower total inventory cost of IDR. 1,142,030,936, with a savings difference of IDR. 1,621,778.48. Based on these results, the JIT method is considered more optimal for managing raw material inventory at Burger Fandawa. The JIT method is more efficient in reducing inventory costs and increasing the effectiveness of managing the main raw material stocks.

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1. INTRODUCTION

Indonesian cuisine continues to evolve, as demonstrated by tourism activities focused on sampling diverse dishes in major cities, commonly referred to as culinary tourism (Ruspitasari & Anselah, 2023). The culinary industry is known as one of the largest industrial sectors in Indonesia economically because it contributes 41.4% to the gross domestic product or around 922 trillion with an increase of between 8-10% each year (Nurhayati et al., 2022). In the business world, some challenges faced by culinary industry is are food safety, food authenticity and food fraud, fair trade, environmental impact, animal welfare, and ineffecient process. The sustainability of business operations heavily relies on the availability of adequate raw materials, yet

inefficiencies in risk management and inventory control can disrupt the smooth flow of business processes (Katsikouli et al., 2021). Effective management of raw material inventory can boost profits by minimizing costs related to proper storage and handling. Inventory management plays a crucial role across various business functions, particularly in operations, marketing, accounting, and finance. Since inventory constitutes a significant portion of a company's assets, maintaining efficient control not only improves operational performance but also strengthens the company's competitive edge in a highly competitive market (Olusuyi et al., 2021). Previous studies have explored methods to optimize inventory management. Inventory management costs can be minimized, and overstocking avoided, by utilizing the Economic Order Quantity (EOQ) method, which accurately determines the levels of safety stock and reorder points (K. Hidayat et al., 2020). This research is relevant for small and medium enteIDR.rises that face limitations in raw material storage capacity.

In other studies, the Just In Time (JIT) method has become a popular approach to reducing waste in inventory management (Sakti et al., 2023). The comparison of the EOQ and JIT methods in food sector shows that JIT is more effective in reducing total inventory costs because this approach adjusts ordering to actual demand (Utami & Setyariningsih, 2019). This study emphasizes the importance of flexibility in inventory management to address demand fluctuations.

Burger Fandawa, a small business in the fast food sector, faces significant challenges in managing key ingredients such as bread, meat, and sauces. Based on data from 2023, discrepancies between demand and inventory levels have led to major issues, including stock shortages that disrupt production and waste due to unused ingredients. This highlights the need for a more strategic approach to efficiently manage inventory. This study aims to answer the question, "How can the control of key ingredient inventory for burgers be optimized using the EOQ and JIT methods at Burger Fandawa?" This research will not only compare the two methods but also provide strategic

insights for small businesses in managing raw material inventories, ultimately improving operational efficiency and market competitiveness. The phenomenon occurring at Burger Fandawa that makes this research necessary is the significant challenges the business faces in managing the inventory of main raw materials, such as bread, meat, and sauce. These challenges stem from irregular demand patterns and inefficiencies in inventory management, leading to either shortages that disrupt production or overstocking that results in financial losses. As a result, there is a pressing need to develop strategic inventory control methods that can optimize costs and ensure a seamless production process.

2. LITERATURE REVIEW
Inventory
Inventories are assets that consist of items owned by a company, which are meant to be sold during the regular business cycle, or goods that are still in the production process, or raw materials intended for use in manufacturing (Tuffahati & Pulansari, 2023). The inventory function plays a crucial role in enhancing company operations, both internally and externally, ensuring the company maintains a strong position. The inventory and purchasing function is responsible for managing stock levels and overseeing the procurement of raw materials from suppliers (Ramadhan & Saifuddin, 2024). In general, there are several elements of inventory: (1) Demand, which refers to the number of units of goods taken from inventory. (2) Reordering (Replenishment), which varies based on size, pattern, and lead time. (3) Limits or Constraints, which are the factors that limit the existing inventory system (Al Fitroni & Pulansari, 2024).

In inventory management, the terms inventory control and inventory cost are commonly used. Inventory control refers to the process of managing inventory levels to ensure they remain optimal, neither too high nor too low. It involves maintaining the right quantity and type of goods to support other processes that rely on inventory. Inventory costs can be categorized into several types. (1) Holding/Carrying costs include expenses for managing inventory to prevent damage, loss, or deterioration, such as

storage facility costs (lighting, cooling, heating), capital opportunity costs, obsolescence and wear costs, inventory insurance, physical inventory count costs, and handling costs. (2) Order/Procurement costs arise during the ordering process until goods are delivered to the logistics stage and include transportation, wages, communication, correspondence, and raw material inspection fees. (3) Set-up costs involve preparing machinery and equipment for production, covering idle machine costs, labor setup costs, scheduling fees, and transportation. (4) Out-of-Stock costs are incurred when stockouts occur due to errors, leading to lost sales, customer loss, special booking fees, and additional shipping costs (Pratama & Ernawati, 2023).

Economic Order Quantity

Economic Order Quanity is a technique used to calculate the ideal quantity of products or goods to order per purchase in order to minimize costs. The primary variable costs associated with this method are storage and ordering costs. Storage costs encompass expenses like warehouse rental, utility bills, taxes, insurance, and other related charges. Ordering costs, on the other hand, cover the costs of transporting goods from the supplier to the warehouse, inspection, material handling, and other associated fees. The benefits of applying the EOQ method are: (1) the ability to calculate the optimal inventory quantity to order, such as soybeans, and determine the appropriate time to place the order, (2) it helps address demand variability by maintaining safety stock, and (3) it is simple to apply in mass production settings (R. Hidayat et al., 2024).

Forecasting

Forecasting is the process of predicting future outcomes based on historical data that has been gathered. It is essential because there is often a delay between the identification of the need for a new policy and its implementation. The longer this time gap, the more important forecasting becomes (Putrianti & Sitania, 2024). There are several data patterns in forecasting, including trend, seasonality, cycles, and horizontal patterns. Trend (T) occurs when data gradually increases or decreases over a long period. Seasonality (S) appears when data repeats at specific intervals, such as daily, weekly,

monthly, quarterly, or annually. Cycles (C) refer to data patterns that occur over several years, typically influenced by long-term economic fluctuations related to business cycles. Meanwhile, the Horizontal (H) / Stationary pattern occurs when data fluctuates around a stable average, making it stationary (Lusiana & Yuliarty, 2020). Forecasting uses various methods, each with distinct techniques. The Moving Average method involves averaging actual data over a set period and updating it as new data becomes available. The Weighted Moving Average emphasizes more recent data, making it more adaptable to changes. Single Exponential Smoothing applies exponential weighting to data for forecasting puIDR.oses. Linear Regression fits a trend line to historical data and extends it to predict future outcomes. Each of these methods provides specific benefits depending on the data characteristics and forecasting requirements (Rizki et al., 2021).

Just In Time

Just In Time (JIT) method is a system where products are produced only when there is demand from customers, with no waste in the production process and executed with high efficiency (Meilani & Azizah, 2023). By implementing the Just In Time (JIT) system, it is expected that companies will achieve low production costs, affordable selling prices, high-quality products, and timely delivery to customers. One of the best ways for companies to eliminate non-value-added activities and achieve an efficient process is by adopting a production system with raw material storage using the JIT method. The modern application of the Just In Time system began in Japan in the 1970. JIT focuses on simple and efficient operations that maximize the optimal use of available resources in the industry, such as capital, equipment, and labor (Annaafi et al., 2024). The literature review identifies gaps in studies on SMEs in the culinary sector using EOQ and JIT methods. While EOQ aids safety stock and reorder points, JIT is more cost-efficient. However, their comparative effectiveness under fluctuating demand and storage constraints, as faced by SMEs like Burger Fandawa, remains underexplored, which this study aims to address.

3. RESEARCH METHOD

This study employs a descriptive quantitative design to analyze the management of main raw material inventory at Burger Fandawa. Data collection was conducted through two primary sources: primary data and secondary data. Primary data were obtained through direct observation of the production process in the company and interviews with the business owner to understand operational challenges and
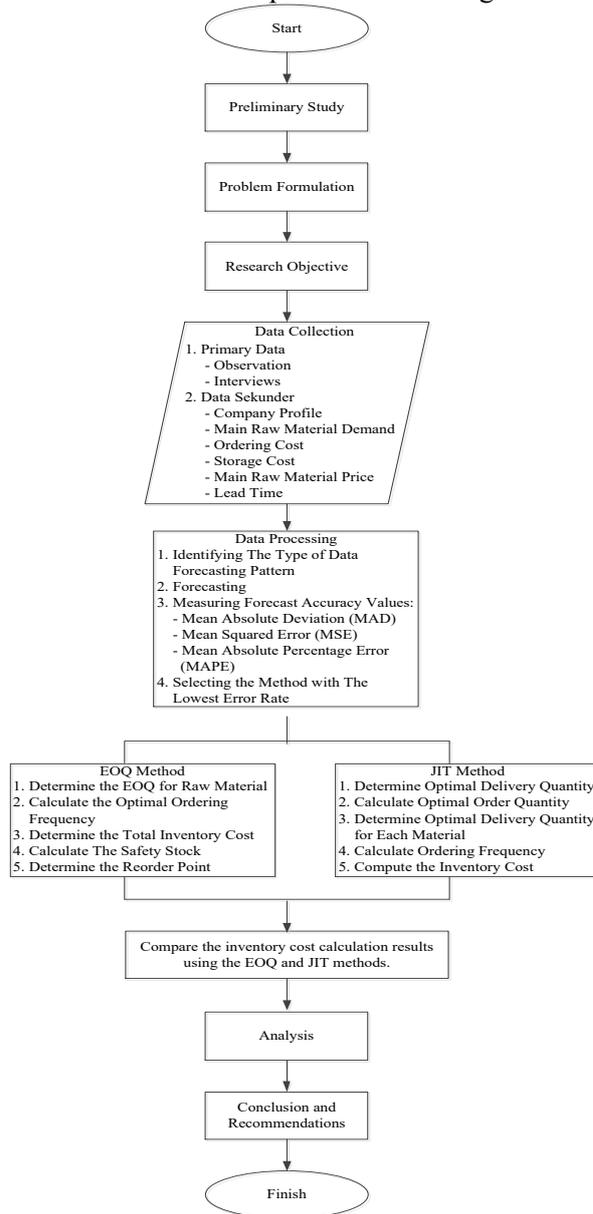

Figure 1. Research framework

policies related to raw material management. Secondary data were gathered from company documents, including the company profile, raw material demand data, ordering costs, storage costs, and lead time. Data processing in this study was conducted using forecasting, Economic Order Quantity (EOQ), and Just In Time (JIT).

4. RESULT AND DISCUSSION

A. Identification of Demand Data Patterns

In the first stage of data processing, namely identifying demand data patterns, then the forecasting method is carried out on the demand for the main raw materials.

Bread Demand Pattern

Figure 2. Bread demand chart

Based on Figure 2, graph of the main raw material demand data for bread in 2023, the demand is of the Seasonal data pattern type where each month's main raw material demand data value experiences an irregular increase and decrease.

Meat Demand Pattern

Figure 3. Meat demand chart

Based on Figure 3, graph of the main meat raw material demand data in 2023, the demand is of

the Seasonal data pattern type where each main raw material demand data value each month experiences an irregular increase and decrease.
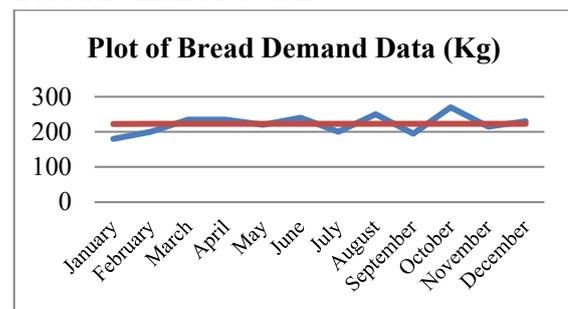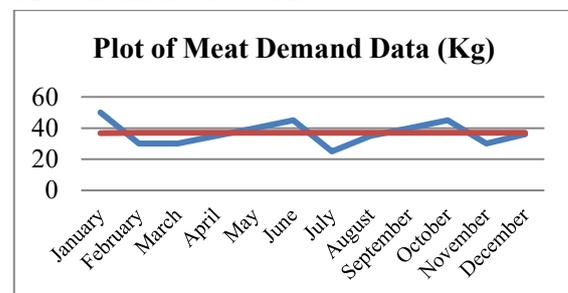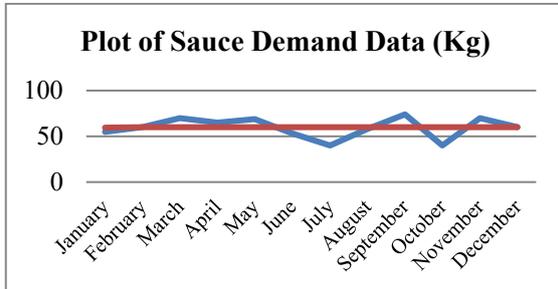
Sauce Demand Pattern

Figure 4. Sauce demand chart

Based on Figure 4, graph of the main raw material demand data for sauce in 2023, the

demand is of the Seasonal data pattern type where each month's main raw material demand data value experiences an irregular increase and decrease.

5. Forecasting

Forecasting is done using quantitative calculations in order to obtain future policies, namely from Moving Average, Weighted Moving Average, Exponential Smoothing, and Linear Regression. From this method, the smallest error value will be obtained for the selected method. After recapitulating the calculation of these methods, the selection of the best method identifies the smallest Mean Absolute Percentage Error (MAPE) value in the 4 forecasting methods carried out.

Selection of the Best Method for Bread Main Ingredient

The selection of the best method on the main raw material of bread, as follows:

Table 1. Recapitulation of bread error value

Method	Period/Alpha	MAD	MSE	MAPE	Rating
Moving Average	Period 2	25,75	813,125	11217%	16
	Period 3	24,63	857,716	10767%	11
	Period 4	22,656	716,992	9957%	7
	Period 5	25,571	822,429	11171%	14
	Period 6	24,028	790,857	10508%	9
	Period 7	25,571	875,408	10,87%	12
	Period 8	22,656	797,168	9682%	6
	Period 9	22,037	978,704	8572%	3
	Period 10	**5,75**	**36,125**	**2614%**	**1**
Weight Moving Average	Period 2	28,167	1,036,945	12315%	19
	Period 3	25,278	890,509	11079%	13
	Period 4	23,813	837,531	10455%	8
	Period 5	26,238	902,492	11499%	17
	Period 6	26,548	931,208	11675%	18
	Period 7	26,25	944,891	11207%	15
	Period 8	24,757	919,401	10728%	10
	Period 9	22,333	904,613	8808%	4
	Period 10	8,182	106,289	3777%	2
Exponential Smoothing	Alpha 0.1	44,23	2,438,967	18784%	28
	Alpha 0.2	42,215	2,264,868	17889%	27
	Alpha 0.3	40,312	2,111,198	17044%	26
	Alpha 0.4	38,515	1,975,475	16246%	25
	Alpha 0.5	36,817	1,855,508	15492%	24
	Alpha 0.6	35,456	1,749,385	14903%	23
	Alpha 0.7	34,346	1,655,434	14436%	22
	Alpha 0.8	33,297	1572,19	13995%	21
	Alpha 0.9	32,305	1,498,376	13578%	20
Linear Regression	-	20,53	521,78	9332%	5

The results of the recapitulation of the error value of the main bread raw material, then get the results of the smallest error value based on the smallest MAPE value, namely the Moving Average method with a value of 2.614% with a period of n = 10. After the method is selected, it is continued with forecasting to determine future demand, the following is the calculation of the moving average method (n = 10), namely:

Table 2. Calculation of selected moving average method (n=10) bread

Month	Demand	n = 10
January	180	-
February	200	-
March	235	1
April	235	2
May	220	3
June	240	4
July	200	5
August	250	6
September	195	7
October	270	8
November	215	9
December	230	10

Table 3. Recapitulation of bread needs in 2023

Period (Month)	Bread Requirement (Pack)
January 2023	229
February 2023	228,4
Maret 2023	227,74
April 2023	228,51
May 2023	227,36
June 2023	230,10
July 2023	228,11
Agustus 2023	231,42
September 2023	277,56
October 2023	233,82
November 2023	234,20
December 2023	234,72
Total	**2810,94**

Based on the Table 3, the average demand for the main raw material needs of bread and its standard deviation is as follows:

1. Average Bread Requirement

$$\bar{x} = \frac{\text{Bread quantity needed}}{\text{Periode}}$$
$$= \frac{2810,94}{12}$$
$$= 234,24 \text{ Pack}$$

2. Standard Deviation of Bread main raw material requirements

$$\sigma_{(D)} = \sqrt{\frac{\Sigma(x_i-\bar{x})^2}{n}}$$
$$= \sqrt{\frac{\Sigma(229-234,24)^2 + (228,4-234,24)^2 + \ldots + (234,72-234,24)^2}{12}}$$
$$= \sqrt{\frac{2123,68}{12}}$$
$$= \sqrt{176,973}$$
$$= 13,303 \approx 13 \text{ pack}$$

After calculating the main raw material requirements, then calculate the main raw material requirements for bread during the lead time and standard deviation. The demand for the main raw materials of bread during the lead time standard deviation is as follows:

1. Bread main raw material requirements during lead time (D_L)

$$D_L = D \times L$$
$$= 2810,94 \times 0,002$$
$$= 5,62 \approx 6 \text{ pack}$$

2. Standard deviation of Bread's main raw material requirements during lead time ($\sigma_{(DL)}$)

$$S_L = S\sqrt{L}$$
$$= 13,303 \sqrt{0,083}$$
$$= 3,832 \approx 4 \text{ pack}$$

Selection of the Best Method for Meat Main Raw Materials

The selection of the best method on the main raw material of meat, as follows:

<div align="center">Table 4. Recapitulation of meat error value</div>

Method	Period/Alpha	MAD	MSE	MAPE	Rating
Moving Average	Period 2	7,9	85,85	24054%	19
	Period 3	7,296	74,062	21202%	17
	Period 4	6,125	53,797	17721%	11
	Period 5	**5,714**	**47,143**	**17%**	**1**
	Period 6	6,038	57,134	19394%	12
	Period 7	5,086	36,792	13673%	6
	Period 8	5,375	40,523	14236%	7
	Period 9	4,852	35,601	13066%	3
	Period 10	4	28,25	13194%	4
Weight Moving Average	Period 2	7,6	79,822	23372%	18
	Period 3	7,019	74,664	20984%	16
	Period 4	6,938	69,219	20538%	15
	Period 5	6,524	64,143	19622%	14
	Period 6	6,103	60,084	19512%	13
	Period 7	4,657	35,45	12632%	2
	Period 8	5,687	43,181	15345%	8
	Period 9	5,741	46,605	15741%	9
	Period 10	4,045	29,921	13384%	5
Exponential Smoothing	Alpha 0.1	13,71	228,239	43074%	28
	Alpha 0.2	13,012	211,626	41113%	27
	Alpha 0.3	12,358	197,183	39274%	26
	Alpha 0.4	11,743	184,612	37,55%	25
	Alpha 0.5	11,167	173,66	35933%	24
	Alpha 0.6	10,764	164,106	34722%	23
	Alpha 0.7	10,387	155,762	33591%	22
	Alpha 0.8	10,032	148,465	32525%	21
	Alpha 0.9	9,698	142,075	31,52%	20
Linear Regression	-	6,054	50,68	17266%	10

The results of the recapitulation of the error value of the main meat raw material, then get the results of the smallest error value based on the smallest MAPE value, namely the Moving Average method with a value of 17% with a period of n = 5. After the method is selected, it is continued with forecasting to determine future demand, the following is the calculation of the moving average method (n = 5) (Table 5).

Table 5. Calculation of selected method moving average (n=5) meat

Month	Demand	n = 5
January	50	-
February	30	-
March	30	-
April	35	-
May	40	-
June	45	-
July	25	-
August	35	1
September	40	2
October	45	3
November	30	4
December	36	5

Table 6. Recapitulation of meat requirements in 2023

Period (Month)	Meat Needs
January 2023	37,2
February 2023	37,64
Maret 2023	36,96
April 2023	35,36
May 2023	36,43
June 2023	36,71
July 2023	36,62
Agustus 2023	36,41
September 2023	36,30
October 2023	36,49
November 2023	36,50
December 2023	36,46
Total	**439,08**

Based on the table above, the average demand for the main raw material needs of meat and its standard deviation is as follows:

1. Average Meat Requirement

$$\bar{x} = \frac{\text{Jumlah Total meat requirement}}{\text{Period}}$$
$$= \frac{439{,}08}{12}$$
$$= 36{,}59 \text{ Pack}$$

2. Standard Deviation Main raw material requirements Meat

$$\sigma_{(D)} = \sqrt{\frac{\Sigma(x_i-\bar{x})^2}{n}}$$
$$= \sqrt{\frac{\Sigma(37{,}2-36{,}59)^2+(37{,}64-36{,}59)^2+\ldots+(36{,}46-36{,}59)^2}{12}}$$
$$= \sqrt{\frac{3{,}316}{12}}$$
$$= \sqrt{0{,}276}$$
$$= 0{,}525 \approx 1 \text{ Kg}$$

Selection of the Best Method for the Main Raw Material of Sauce

After calculating the main raw material requirements, then calculate the need for the main meat raw materials during the lead time and standard deviation. The demand for the main meat raw materials during the lead time standard deviation is as follows:

1. Main meat raw material requirements during lead time (D_L)
   $$D_L = D \times L$$
   $$= 439{,}08 \times 0$$
   $$= 0$$

2. Standard deviation of meat main raw material requirements during lead time ($\sigma_{(DL)}$)
   $$S_L = S\sqrt{L}$$
   $$= 0{,}525 \ \sqrt{0}$$
   $$= 0$$

As for the selection of the best method on the main raw material of the sauce, as follows (Table 7)

Table 7. Recapitulation of sauce error value

Method	Period/Alpha	MAD	MSE	MAPE	Rating
Moving Average	Period 2	12,95	242,275	24446%	22
	Period 3	11,519	198,852	21954%	15
	Period 4	12,219	214,398	23519%	18
	Period 5	13,143	230,08	25936%	26
	Period 6	12,778	220,407	25773%	25
	Period 7	10,429	168,91	19391%	13
	Period 8	12,281	202,527	22991%	17
	Period 9	10,593	181,309	22443%	16
	Period 10	**5,85**	**67,285**	**8, 369%**	**1**
Weight Moving Average	Period 2	13,167	253,656	24775%	23
	Period 3	12,241	224,275	23,53%	19
	Period 4	13,088	232,611	25194%	24
	Period 5	13,676	248,691	26799%	28
	Period 6	13,357	247,873	26,53%	27
	Period 7	11,2	189,593	20,22%	14
	Period 8	13,368	228,129	24336%	21
	Period 9	11,844	201,877	24321%	20
	Period 10	7,255	89,286	10506%	2
Exponential Smoothing	Alpha 0.1	10,677	146,281	18635%	4
	Alpha 0.2	10,636	145,625	18658%	5
	Alpha 0.3	10,602	145,25	18688%	6
	Alpha 0.4	10,576	145,113	18724%	7
	Alpha 0.5	10,556	145,178	18766%	8
	Alpha 0.6	10,541	145,413	18813%	9
	Alpha 0.7	10,532	145,79	18864%	10
	Alpha 0.8	10,528	146,29	18918%	11
	Alpha 0.9	10,528	146,892	18976%	12
Linear Regression	-	8,692	114,115	16295%	3

The results of the recapitulation of the error value of the main raw material for the sauce, then get the results of the smallest error value based on the smallest MAPE value, namely the Moving Average method with a value of 8.369% with a period of n = 10. After the method is selected, it is continued with forecasting to determine future demand, the following is the calculation of the moving average method (n = 10) (Table 8, 9).

Table 8. Calculation of Selected Moving Average Method (n=10) Sauce

Month	Demand	n = 10
January	55	-
February	60	-
March	70	1
April	65	2
May	69	3
June	53	4
July	40	5
August	58	6
September	74	7
October	40	8
November	70	9
December	60	10

Table 9. Recapitulation of Sauce Needs in 2023

Period (Month)	Sauce needs
January 2023	59,9
February 2023	58,89
Maret 2023	58,27
April 2023	57,20
May 2023	57,62
June 2023	59,38
July 2023	59,52
Agustus 2023	58,07
September 2023	59,88
October 2023	58,87
November 2023	58,76
December 2023	58,64
Total	**705,23**

Based on the table above, the average demand for the main raw material needs of the sauce and its standard deviation is as follows:

1. Average Sauce Requirement

$$\bar{x} = \frac{\text{Amount of sauce needed}}{\text{Period}}$$
$$= \frac{705,23}{12}$$
$$= 58,76$$

2. Deviation Main raw material requirements Sauce

$$\sigma_{(D)} = \sqrt{\frac{\Sigma(x_i-\bar{x})^2}{n}}$$

$$= \sqrt{\frac{\Sigma(59,9-58,76)^2+(58,89-58,76)^2+...+(58,64-58,76)^2}{12}}$$
$$= \sqrt{\frac{5116770}{12}}$$
$$= \sqrt{417639,7}$$
$$= 646,250$$

After calculating the main raw material requirements, then calculate the main raw material requirements for the sauce during the lead time and standard deviation. The demand for the main raw materials of the sauce during the lead time standard deviation is as follows:

1. Sauce main raw material requirements during lead time (D_L)
$$D_L = D \times L$$
$$= 705,23 \times 0,002$$
$$= 1,41 \approx 1 \text{ Kg}$$

2. Standard deviation of Sauce main raw material requirements during lead time ($\sigma_{(DL)}$)
$$S_L = S\sqrt{L}$$
$$= 646,250 \sqrt{0,083}$$
$$= 186,182 \approx 186 \text{ Kg}$$

Table 10. Recapitulation of main raw material needs in 2023

Month	Bread (Pack)	Meat (Kg)	Sauce (Kg)
January	229	37,2	59,9
February	228,4	37,64	58,89
March	227,74	36,96	58,27
April	228,51	35,36	57,20
May	227,36	36,43	57,62
June	230,10	36,71	59,38
July	228,11	36,62	59,52
August	231,42	36,41	58,07
September	277,56	36,30	59,88
October	233,82	36,49	58,87
November	234,20	36,50	58,76
December	234,72	36,46	58,64
Total	**2810,94**	**439,08**	**705,23**

A. Inventory Costs Using the EOQ Method
After the forecasting calculation is carried out, it is continued with the calculation of the Economic Order Quantity (EOQ) method. This method is used to determine the amount of each inventory order that minimizes ordering and storage costs so that the total inventory cost is efficient. Recapitulation of EOQ calculations for the main raw materials for burgers, as follows:

Table 11. Recapitulation of EOQ

Item	Bread	Meat	Sauce
EOQ	103,808	41,018	51,982
I	27,078	10,704	13,566
TC	1.949.674,985	770.728,584	976.802,098
SS	21,949	0,866	1.066
ROP	155,949	441,866	1.780

B. Inventory Costs Using the Just In Time (JIT) Method

The following are the recapitulation results of the calculation of total inventory costs using the Just In Time (JIT) method as follows (Table 11).

Table 11. Recapitulation of JIT

Item	Bread	Meat	Sauce
na	0,286	6,026	6,075
Qn	29,689	247,174	315,790
q	103,807	41,017	51,981
N	4,513	1,784	2,260
T_{jit}	1.042.666,058	313.969,095	396.308,550

Table 12. Comparison of Total cost of both EOQ and JIT methods

Main Raw Materials	EOQ	JIT	Difference in Total Cost
Bread	1.949.674,985	1.042.666,058	907.008,927
Meat	770.728,584	313.969,095	456.759,489
Sauce	976.802,098	396.308,550	580.493,548

Based on the table above the difference from the total inventory cost results, it is concluded that the use of the Just In Time (JIT) method is more optimal and the total amount of inventory costs required is minimum compared to using the Economic Order Quantity (EOQ) method. So that in increasing the efficiency of the main raw material inventory costs the company can use the Just In Time (JIT) method, purchases are made in small quantities and deliveries on a scale, so as to reduce the cost of storing the main raw materials.

Discussion
Demand Forecasting for Bread Main Raw Materials

Error assessment of the forecasting method is done using the MAD, MSE, and MAPE values to determine the best method with the smallest error. Moving average forecasting is performed for periods N=2 to 10, by summing the previous month's data and dividing it by the number of periods. The weighted moving average method uses a greater weight on the nearest month, while exponendial smoothing uses an alpha constant (α) between 0.1-0.9 as recommended by the research. The linear regression method involves squaring time and demand. The analysis results show the moving average method with N=10 as the best, with MAD 5.75, MSE 36.125, and MAPE 2.614%. Calculations using this method resulted in a predicted demand for bread raw materials of 2810.94 packs in 2023. The average need for bread is 234.24 packs with a standard deviation of 13.303 packs, while during the lead time the average need is 5.62 packs with a standard deviation of 3.832 packs.

Demand Forecasting for Meat Main Raw Materials

The error assessment of the forecasting method is done by calculating the MAD (Mean Absolute Deviation), MSE (Mean Squared Error), and MAPE (Mean Absolute Percent Error) values to determine the method with the smallest error value. The methods used include moving average with periods N=2 to 10, weighted moving average with adjusted weights, exponential smoothing with constant α=0.1-0.9, and linear regression. From the calculations, the moving average method with a period of n=5 was chosen as the best for predicting demand for the main ingredient of meat, with a value of MAD=5.714, MSE=47.143, and MAPE 17%. Demand prediction in 2022 using moving average period n=5 resulted in a total demand of 439.08 kg, average demand of 36.59 kg, and standard deviation of 0.525 kg. During the lead time with an average of 0 months, the demand and standard deviation of the main meat ingredient is also 0 kg.

Sauce Main Raw Material Demand Forecasting

Error assessment of forecasting methods is carried out using the MAD, MSE, and MAPE values to determine the method with the smallest error of the four methods used. The moving average method with a period of N=2 to 10 was used by summing the previous month's data and dividing it by a certain period, resulting in the smallest error for the main raw material of sauce. Weighted moving average is applied with sequential weights, where the greatest weight is given to the month closest to the forecast month. The exponential smoothing method uses a constant α = 0.1-0.9, while the linear regression method is performed by squaring time and demand. From the analysis,

the moving average method with period N=10 gives the best results with MAD=5.85, MSE=67.285, and MAPE=8.369%. Using the N=10 period, the demand for sauce raw materials in 2022 is estimated at 705.23 kg, with an average requirement of 58.76 kg and a standard deviation of 646.25 kg. During a lead time of 0.083 months (0.002 years), the sauce requirement is 1.41 kg with a standard deviation of 186.182 kg.

Calculation of Economic Order Quantity (EOQ) Method

Based on the results of the calculations that have been calculated, namely using the economic order quantity (EOQ) method, it can be seen that the comparison between the costs incurred by these MSMEs in controlling the inventory of the main raw materials, which include bread, meat, and sauce, in the cost of raw material inventory that was originally issued was IDR. 7.856,178, while using the economic order quantity (EOQ) method, the costs incurred for controlling raw materials are IDR. 3.697.205,667. (1) Main Bread Ingredients: Calculations using the EOQ method, the results of the economic inventory needs of bread are 103,808 kg. From the amount of inventory of the main raw material for bread in 2023 of 134 kg. In order to achieve minimum ordering costs, the number of ordering frequencies is sought where the frequency of ordering the main bread raw materials is 27,078 per year or 2 times/month from the economic inventory and optimal ordering frequency. The inventory costs incurred amounted to IDR. 5,150,772. Inventory costs calculated using EOQ calculations are issued in the amount of IDR. 1,949,674.985. If the company applies the EOQ method, the company can reduce inventory costs by IDR. 3,201,097,015. Costs can decrease significantly with reduced storage costs, ordering and the number of order frequencies each month. Based on the safety stock calculation, the safety stock that must be prepared is 21,949 packs. So, the main raw material stock should not be below safety stock. It is only allowed to use safety stock if the costs incurred for the main raw materials have increased and orders arrive late. Based on the calculations that have been carried out, the point of re-ordering the main raw material for bread is when the bread totals 155,949 kg. (2) Main Raw Material Meat: Calculations using the EOQ method, the results of the economic inventory needs of meat are 41,018 Kg. From the amount of meat main raw material inventory in 2023 of 441 Kg. In order to achieve minimum ordering costs, the number of ordering frequencies is sought where the frequency of ordering the main meat raw materials is 10,704/ year, from economic inventory and optimal ordering frequency. The cost of inventory issued is IDR. 1,050,532. Inventory costs calculated using EOQ calculations are issued in the amount of IDR. 770,728.584. If the company applies the EOQ method, the company can reduce inventory costs by IDR. 279,803,416. Costs can decrease significantly with reduced storage costs, ordering and the number of order frequencies each month. Based on the safety stock calculation that the safety stock that must be prepared is 0.0866 Kg. So, the main raw material stock should not be below safety stock. It is only allowed to use safety stock if the costs incurred for the main raw materials have increased and orders arrive late. Based on the calculations that have been carried out, the re-order point for the main meat raw material is 441.866 Kg. (3) Main Raw Materials of Sauce: Using the EOQ method, the results of the economic inventory needs of the sauce are 51,982 Kg. From the amount of meat main raw material inventory in 2023 of 714 Kg. In order to achieve minimum ordering costs, the number of ordering frequencies is sought where the frequency of ordering the main meat raw material is 13,566 /year, from the economic inventory and optimal ordering frequency. The inventory costs incurred amounted to IDR. 1,654,874. Inventory costs calculated using EOQ calculations are issued in the amount of Rp. 976,802,098. If the company applies the EOQ method, the company can reduce inventory costs by IDR. 678,071,902. Costs can decrease significantly with reduced storage costs, ordering and the number of order frequencies each month. Based on the safety stock calculation that the safety stock that must be prepared is 1,066 Kg. So, the main raw material stock should not be below safety stock. It is only allowed to use safety stock if the costs incurred for the main raw materials have increased and orders arrive late. Based on the calculations that have been carried out, the point of re-ordering the main raw material for bread is when the bread amounts to 1,780 Kg.

Calculation of Just In Time (JIT) Method

Based on the results of calculations that have been calculated, namely using the just in time (JIT) method, it can be seen that the comparison between the costs incurred by these MSMEs in controlling the main raw material inventory is in the cost of raw material inventory which was originally issued at IDR. 7.856,178, while using the just in time (JIT) method the costs incurred for controlling raw materials are IDR. 1.752.943,703. There is a minimum reduction by using the JIT method, this can be shown by calculating the order quantity that can minimize inventory, calculating the optimal number of shipments, quantifying the number of orders, and frequency of ordering raw materials. So that this can make raw material inventory effective and minimum compared to the costs incurred by MSMEs in carrying out raw material inventory. The total cost savings generated from using the just in time (JIT) method amounted to IDR. 6.103.234,297.

5. CONCLUSION

The results obtained from the identification of the type of forecast pattern, for research in burger fandawa, namely the horizintal pattern, and the selected forecasting method with the lowest error value is the moving average. then the calculation is carried out using the Economic Order Quantity (EOQ) method, the optimal purchase amount for the main raw material of bread is 103.808 Kg, the main raw material of meat is 41.018 Kg, the main raw material of sauce is 51.982 Kg. The safety stock required for bread is 21.949 kg, meat is 0.866 Kg, sauce is 1.066 Kg. The optimal inventory cost for the main raw material of bread is Rp. 1,949,674.985. Meat amounting to Rp. 770,728,584. Sauce amounting to Rp. 976,802,098. The results of the calculations that have been carried out using the economic order quantity (EOQ) method are with a total raw material inventory of Rp. 3,697,205,667, while using the just in time (JIT) method which is Rp. 1,752,943,703, with a difference of Rp. 1,944,261,964. From the results of the calculation between the two methods, it can be concluded that the just in time method is very optimal for use in carrying out raw material inventory at UMKM Burger Fandawa.

Future research should explore the integration of EOQ and JIT to develop a hybrid approach that maximizes the strengths of both methods. Additionally, studies could examine the broader implications of these inventory management systems on operational efficiency, production timelines, and customer satisfaction. This would provide a more comprehensive understanding of the optimal inventory strategies for SMEs in the culinary sector.

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