JSM: Jurnal Sains Manajemen
Vol. 12, No. 1, May 2023 / ISSN 2302-1411 (print)
pp: 31 - 36

Evaluation of the implementation of a Just-in-Time System for raw material inventory to satisfy production requirements

Alvin Agus Prasetio[1], Hansly Tunjang[2], Achmad Syamsudin[3]
[1,2,3] *Faculty of Economics and Business, Palangka Raya University*

Corresponding Author:
Address : Faculty of Economics and Business, Palangka Raya University, Central Kalimantan
E-mail : alvinagus.p17@gmail.com

Abstract

This study aimed to investigate the adoption of the Just In Time (JIT) system at Indu Kuh Coffee Palangka Raya. This study employs a descriptive research design with a quantitative approach, specifically utilizing a case study methodology. Data is collected from the organization's research and analyzed using the Just In Time system method. Conclusions can be derived from the research results, which will then be utilized as a basis for decision-making to address a problem inside the firm. The research findings indicate that the company will suffer a total inventory cost of Rp. 3,072,847 if it adopts the Just In Time (JIT) strategy. This expense is significantly more cost-effective than the inventory expenses incurred by the company, totaling Rp. 4,640,000. Indu Kuh Coffee can save costs and reduce raw material inventory expenses by up to Rp1,567,847 by implementing the Just In Time (JIT) method.

Keywords: cost, inventory, Just In Time, raw materials

Article history:
Received March 10th, 2023
Revised April 5th, 2023
Accepted April 28th, 2023

1. INTRODUCTION

Operational management is intricately linked to the company's technology. Businesses equipped with fundamental contemporary technologies will undoubtedly have a distinct advantage in terms of competition and longevity (Grant, 2021). Conversely, companies that abstain from utilizing technology may encounter challenges in their development. One instance is using software in operational management to aid the production process. However, there are currently only a few available sources on this topic. The rapid advancements in technology significantly impact the progress of firms, particularly those working in the industrial sector (Ellitan, 2020). This leads to intense competition among industrial companies to accomplish their different goals.

To acquire a competitive edge in the market, corporations will strive to surpass their competitors, sometimes even resorting to undermining each other, all to maximize profits (Knudsen et al., 2021). To maximize revenues, firms endeavor to enhance their products' quality while minimizing costs (Dewantara & Giovanni, 2023). Economic actors can optimize utilizing all available resources to respond effectively and efficiently to this rivalry. The Just In Time (JIT) system is a current strategy in the development of manufacturing technologies. Just In Time (JIT) is a business philosophy that focuses on minimizing production time in both manufacturing and non-manufacturing processes (Terdpaopong et al., 2021).

A firm called "Indu Kuh Coffee" now manufactures coffee locally in the Central Kalimantan Region. This company can be a suitable candidate for implementing the Just In Time (JIT) System. The study was conducted in Palangka Raya City, specifically at Indu Kuh Coffee Palangka Raya, on Jl. Pinus No.39. The establishment was established in 2022. The term "Indu Kuh" originates from the Dayak language, where "Indu" translates to "mother" and "Kuh" translates to "me/I". Indu Kuh is my biological

mother. Indu Kuh specializes in producing Spice Ground Coffee Products using locally sourced raw materials such as Robusta and Liberica Coffee, cinnamon, coconut, rice, anise, and coriander, which are unique to Central Kalimantan. These ingredients are mixed with traditional methods passed down through generations. The coffee processing method, which preserves the ancient practice of roasting in a frying pan over a hardwood fire and manual grinding, is a means of protecting the heritage of our ancestors to ensure the preservation of its unique flavor and authenticity.

The traditional coffee processing or roasting procedure significantly impacts the flavor of the coffee produced by Indu Kuh Coffee. The coffee undergoes roasting with different spices and is heated over a wood fire in the pan. It is then manually ground, following a traditional method passed down through generations to retain its distinct flavor and authenticity. The conventional process of brewing Main Kuh Coffee is susceptible to scorching the coffee if the coffee is not evenly rotated and the size of the fire is not regulated using firewood, as the temperature distribution in the pan is highly erratic.

Indu Kuh Coffee sources its raw materials from suppliers in Pangkoh Village. The collection and delivery process takes one day to transport the raw materials to Palangka Raya City. The monthly capacity for robusta and liberica coffee raw materials is 100 kg, producing approximately 40 kg to 80 kg. Upon the arrival of the raw materials, the production process can commence immediately, resulting in the sale of 200 packs of finished Indu Kuh Coffee products every month, following market demand. The given description shows that the issue with Indu Kuh Coffee is its reliance on coffee suppliers from Pangkoh Village. This is due to the company's insufficient coffee land or plantation to fulfill its production requirements.

Consequently, this significantly impacts the cost of raw materials, as the company aims to reduce production expenses—coffee from cows. Hence, employing the Just In Time (JIT) method is highly suitable as it seeks to enhance labor efficiency and minimize costs associated with holding raw materials throughout production (Stojkanović et al., 2021). The fundamental concept of Just In Time (JIT) is straightforward: manufacturing goods or services only when there is a specific need, meaning that production is based on customer requests and limited to the exact quantity needed (Görmen, 2022). Just-In-Time (JIT) as a comprehensive system for managing manufacturing and inventory (Iwasokun et al., 2023). It involves purchasing and producing raw materials and spare parts only when they are needed at each stage of the production process.

2. LITERATURE REVIEW

Inventory is a broad phrase that encompasses all an organization's resources that are stored in preparation for meeting demand (Langenwalter, 2020). Based on this hypothesis, the author concludes that inventory can be utilized as a resource to stockpile and prepare for increased consumer demand. Inventory refers to the corporation's assortment or accumulation of items (Barman & Mahata, 2022). Ordering costs incurred when ordering an item. The message cost includes:

a) Fees during the order process
   Costs during the order process are costs for carrying out the required orders, which go through various methods, such as transportation costs for sending goods.
b) Request shipping costs
   Request shipping costs are for materials/goods sent until they arrive at the inventory storage warehouse.
c) Cost of receiving materials
   Material reception costs are incurred when the materials/goods have arrived at the warehouse, so these costs must be paid along with wages or compensation for the service.
d) Cost of placing materials into the warehouse
   The company incurs placement costs in storing goods/materials in the warehouse to maintain inventory.

Analysis of the application of Just In Time in increasing production cost efficiency. Just In Time is a business philosophy that specifically discusses reducing production time in manufacturing and non-manufacturing processes (Lyu et al., 2020). Apart from that Just In Time (JIT) is a highly coordinated processing system where goods move through the system, and services are carried out exactly when they are needed (Biswas & Sarker, 2020). There are eight primary keys to implementing Just In Time in industrial activities (Simkins & Maier, 2023), namely:

a) Produce products according to consumer demand.
b) We are producing in small quantities.

c) Eliminate waste.
d) Improve production flow.
e) We are improving product quality.
f) Responsive people.
g) Eliminate uncertainty.
h) Emphasis on long-term maintenance.

Many advantages can be enjoyed when implementing the Just In Time system (Simkins & Maier, 2023), including the following:

a) A low inventory level saves storage space and related costs such as rental and insurance costs.
b) Production materials are only obtained when needed, so they only require low working capital.
c) Low inventory levels mean the possibility of waste due to products that are out of date, past expiration, damaged, or obsolete will be lower.
d) Avoid collecting unsold finished products due to sudden changes in demand.
e) It requires emphasis on the quality of production materials supplied by suppliers to reduce inspection and rework time.

Even though there are many advantages to be had, the Just In Time production system still has weaknesses (Simkins & Maier, 2023), namely:

a) The Just In Time production system has no error tolerance, so it will be complicated to repair or rework production materials or finished products that experience defects. This is because the inventory level of production materials and finished products is minimal.
b) Very high dependence on suppliers in terms of quality and delivery provisions, which are generally outside the scope of the manufacturing company concerned.
c) Delays in delivery by one supplier will result in delays in all planned production schedules. Transaction costs will be relatively high due to high frequency.
d) The manufacturing company concerned will find it challenging to meet suddenly high demand when there are no more finished products.
e) Limited multifunctional human resources, whereas in implementing Just In Time, multifunctional human resources are needed to support smooth production due to suddenly high demand.

The potential benefits of Just In Time are numerous, such as reducing inventory levels, which means lower investment in inventory (Jiang et al., 2021). Because the system only requires the smallest amount of materials needed immediately, it will substantially reduce overall inventory levels so that waste in terms of inventory does not occur, purchases under Just In Time require much shorter delivery times, and lead-time constraints are significantly increased (Dey et al., 2021), Other benefits of Just In Time are:

a) Reduce investment in factories for inventory and production processes,
b) Reduce risk in inventory,
c) Reducing space or warehouses for storing goods,
d) Reduce waste of damaged goods and defective goods by detecting errors at the source,
e) Reducing direct material costs through purchasing goods.

The Just In Time production system shows a production system where operational activities occur only when necessary (Helmold, 2020). Apart from that, it is positioned as an approach tool for balancing production, a tool for controlling product quality, and a mechanism for motivation and involvement of the workforce. Just-in-time production means producing minimal quantities purchased at the right Time. Just In Time, production is based on the logic that it will create a product until there is demand. Just In Time products require producing the units needed in quantity and Time (Palange & Dhatrak, 2021). In reality, anything above the minimum required amount is considered a waste since the effort and raw materials expended on something unnecessary now cannot be utilized. Targets in Just In Time include (Novak, 2011):

a) Zero Defects
   In the Just In Time approach, production activities are directed to achieve output without defects, completed on Time, and in the right quantities according to demand.
b) Zero Inventory
   In the Just In Time view, inventory is considered waste because it is inappropriate in procurement planning and a mismatch between supply and the planned need to provide. In Just In Time, production is carried out according to existing demand so that the production volume is always the same as the demand volume.
c) Zero setup time and lot size of one

Setup time and setup cost are equal to or near zero, so the lot size is called lot size one. Components (materials) are submitted individually according to the Time required. The required components and subcomponents must always be available and delivered to the assembly unit in the required quantities.

d) Zero lead time
Suppliers must deliver materials on Time, resulting in minimal lead Time.

e) Zero Part Handling
Part Handling is moving parts or components from one workstation to another. The moving cost depends on the distance the component is moved. In Just In Time, the process layout is changed to a hybrid design, where all the tools or machines needed to complete one type of product are combined in the same room so that the distance to move components is close together. Therefore, moving Time and costs are minimal.

3. METHOD

This research uses descriptive research using a quantitative approach and a case study with a quantitative approach. It collects data from the results of the company research and analyzes it using the Just In Time system method. So, from the research results, conclusions can be drawn which will be used as consideration in making decisions to solve a problem within the company. Descriptive research is research conducted to determine the value of independent variables, either one or more (independent), without comparing or connecting them with other variables (Sugiyono, 2007). The data analysis technique used in this research is as follows:

a) Collect information regarding the amount of raw material in the inventory for one month.

b) Process this data to determine the optimization of raw material inventory control based on company policy. In this way:

(1) Calculating the average purchase of raw materials (Q)

$$Q = \frac{\text{Total Raw Material Requirements}}{\text{Order Frequency}}$$

(2) Calculating total inventory cost (TIC)

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

Information:
D = Monthly demand for inventory in units
Q = Number of items per order
S = Ordering costs for each order

c) Analyze the data that has been processed using the Just In Time method. The following method is used to calculate the optimal order quantity and total inventory costs using the Just In Time method (Almadany, 2022):

(1) Determining the Optimal Delivery Quantity of Raw Materials JIT Method.

$$n\alpha = \frac{Q}{2a}$$

Information :
Q = Total Raw Material Requirements
a = Average inventory of raw materials

(2) Determining the Optimal Order Quantity of Raw Materials JIT Method.

$$Qn = \sqrt{nQ^*}$$

Information :
n = Number of raw material deliveries
Q* = Optimal order quantity EOQ

(3) Determine the optimal delivery quantity for each delivery of raw materials using the JIT method.

$$q = \frac{Qn}{n}$$

Information :
Qn = Optimal raw material ordering quantity
n = Optimal Number of deliveries

(4) Determining the Frequency of Ordering Raw Materials JIT Method.

$$N = \frac{Qn}{n}$$

Information :
Q = Total raw material requirements
Qn = Optimal raw material ordering quantity
N = Optimal Number of deliveries during one period

(5) Calculating Raw Material Inventory Costs.

$$TJIT = \frac{1}{\sqrt{n}}(T)$$

Information :
T = Total cost of raw material inventory
n = Optimal Number of deliveries

4. RESULT AND DISCUSSION

Before conducting an analysis using the Just In Time (JIT) method, it is necessary first to know the technique used by the company, where this method will be compared with the Just In Time (JIT) method to determine the effectiveness of the technique when applied.

Table 1. Comparison Results of Raw Material Inventory Control Between Company Policy and JIT Methods

Description	Company Policy	JIT Method
Raw Material Requirements Per Month	80 kg	80 kg
Optimal Order Quantity	20 kg	9,2 kg
Order Frequency Per Month	4	8,6
Frequency of orders per month for raw materials divided by frequency of delivery per order for one week	(4:4) = 1 time	(8,6:4) = 2 times
Total Inventory Cost	Rp 4.640.000	Rp 3.072.847

Based on Table 1, it can be compared between the control of supplies of coffee raw materials between the policies implemented by the Indu Kuh Coffee company and the Just In Time (JIT) method. It can be seen that the need for raw materials is 80 kg. So, it can be calculated that the average purchase of raw materials based on the company's policy is 20 kg. In contrast, if you use the Just In Time (JIT) method, the optimal order quantity is 9.2 kg. To meet Indu Kuh Coffee's raw material needs with an optimal order quantity, 8.6 orders of raw materials can be made. This amount is more than using the company's policy of 4 orders. Then, the total cost of raw material inventory that the company will incur will be calculated at Rp. 4,640,000. By using the Just In Time (JIT) method, the total cost of raw material inventory is smaller by IDR. 3,072,847. Compared to the company's policy, it can save IDR raw material inventory costs. 1,567,153. The total cost of raw material inventory for Indu Kuh Coffee using the Just In Time (JIT) method can produce much more efficient purchasing costs for raw material inventory. It can reduce raw material storage costs even more.

5. CONCLUSION

Based on a comparison of coffee raw material inventory control between the policies used by Indu Kuh Coffee using the Just In Time (JIT) method, it is known that the raw material requirement is 80 kg. The average purchase of raw materials based on company policy is 20 kg, whereas if using the Just In Time (JIT) method, the optimal order quantity is 9.2 kg.

a) The company orders optimal raw materials using the Just In Time (JIT) method, 8.6 times ordering raw materials, compared to using the company's policy at Indu Kuh Coffee, ordering smaller raw materials, namely four times ordering.
b) Total inventory costs incurred based on company policy are Rp. 4,640,000. Meanwhile, if you use the Just In Time (JIT) method, it can result in much-reduced inventory costs of IDR. 3,072,847. With these results, Indu Kuh Coffee can save Rp1,567,153, which is efficient for the company.
c) The cost of raw material inventory with company policy will be compared based on the results of the analysis before and after using the Just In Time (JIT) method. Then, a conclusion will be drawn about what is more appropriate for Indu Kuh Coffee in managing raw material inventory over a certain period so as not to harm the company.

d) Increasing the efficiency of raw material inventory costs at Indu Kuh Coffee by using the Just In Time (JIT) method can reduce excessive purchases of raw materials, as well as save production costs and eliminate costs for storing raw materials.

REFERENCES

Almadany, K. (2022). Comparative Inventory Control Analysis With Economic Order Quantity (Eoq) And Just In Time Method To Minimize Inventory Costs At UD. Melati Jaya. *UNIMAS Review of Accounting and Finance*, *6*(1), 20–26.

Barman, D., & Mahata, G. C. (2022). Two-echelon production inventory model with imperfect quality items with ordering cost reduction depending on controllable lead time. *International Journal of System Assurance Engineering and Management*, *13*(5), 2656–2671.

Biswas, P., & Sarker, B. R. (2020). Operational planning of supply chains in a production and distribution center with just-in-time delivery. *Journal of Industrial Engineering and Management (JIEM)*, *13*(2), 332–351.

Dewantara, R., & Giovanni, J. (2023). Analisis Peramalan Item Penjualan dalam Optimalisasi Stok Menggunakan Metode Least Square. *Jurnal Krisnadana*, *3*(1), 59–66.

Dey, B. K., Bhuniya, S., & Sarkar, B. (2021). Involvement of controllable lead time and variable demand for a smart manufacturing system under a supply chain management. *Expert Systems with Applications*, *184*, 115464.

Ellitan, L. (2020). Competing in the era of industrial revolution 4.0 and society 5.0. *Jurnal Maksipreneur: Manajemen, Koperasi, Dan Entrepreneurship*, *10*(1), 1–12.

Görmen, M. (2022). Statistical Process Control (SPC) under the Quality Approach of Just In Time (JIT) Manufacturing Philosophie and an Application. *İşletme Araştırmaları Dergisi*, *14*(1), 646–670.

Grant, R. M. (2021). *Contemporary strategy analysis*. John Wiley & Sons.

Helmold, M. (2020). *Lean management and kaizen*. Springer.

Iwasokun, G. B., Ogunseye, M. O., & Adeleye, S. A. (2023). Development of a Stock Control and Management System based on Just-in-Time Technique. *International Journal of Innovative Computing*, *13*(2), 65–74.

Jiang, B., Rigobon, D. E., & Rigobon, R. (2021). *From Just in Time, to Just in Case, to Just in Worst-Case: Simple models of a Global Supply Chain under Uncertain Aggregate Shocks.* National Bureau of Economic Research.

Knudsen, E. S., Lien, L. B., Timmermans, B., Belik, I., & Pandey, S. (2021). Stability in turbulent times? The effect of digitalization on the sustainability of competitive advantage. *Journal of Business Research*, *128*, 360–369.

Langenwalter, G. A. (2020). *Enterprise resources planning and beyond: integrating your entire organization*. CRC Press.

Lyu, Z., Lin, P., Guo, D., & Huang, G. Q. (2020). Towards zero-warehousing smart manufacturing from zero-inventory just-in-time production. *Robotics and Computer-Integrated Manufacturing*, *64*, 101932.

Novak, G. M. (2011). Just-in-time teaching. *New Directions for Teaching and Learning*, *2011*(128), 63–73.

Palange, A., & Dhatrak, P. (2021). Lean manufacturing a vital tool to enhance productivity in manufacturing. *Materials Today: Proceedings*, *46*, 729–736.

Simkins, S., & Maier, M. (2023). *Just in Time Teaching: Across the Disciplines, and Across the Academy*. Taylor & Francis.

Stojkanović, D., Petković, Z., & Ivanov, L. (2021). Just in Time as a Modern Principle of Inventory Management. *KNOWLEDGE-International Journal*, *45*(1), 193–197.

Sugiyono. (2007). *Statistika Untuk Penelitian* (M. P. Dra. Endang Mulyatiningsih (ed.); 12th ed.). CV. ALFABETA.

Terdpaopong, K., Puapradit, A., & Malisuwan, U. (2021). The effect of lean on the operational performance of medium-sized Thai manufacturing companies. *Uncertain Supply Chain Management*, *9*(3), 647–658.