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Optimizing Inventory Management To Address Delivery Delays And Cost Inefficiencies: A Case Study Of Pt Genta Trikarya

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Abstrak

This study examines how inventory management can help reduce delivery delays and cost inefficiencies in the musical instrument manufacturing industry, focusing on PT Genta Trikarya. Managing the right amount of stock is essential to avoid shortages that slow down production and excess inventory that increases storage costs. To solve this, the Economic Order Quantity (EOQ) method is used to determine the best order size, and the Reorder Point (ROP) method helps decide when to restock materials. These strategies ensure that inventory levels stay balanced, costs are minimized, and deliveries are on time. The study also uses Total Inventory Cost Analysis to measure cost savings and Demand Forecasting to predict future stock needs. The results show that EOQ reduces total inventory costs from IDR 107,194,708 to IDR 34,928,610, while lowering the number of orders from 45 to 9 per year, improving cost efficiency. However, challenges like manual inventory tracking, outdated technology, and unreliable suppliers still affect performance. The study suggests solutions such as automated inventory tracking, ERP systems, and stronger supplier partnerships to improve efficiency. This research uses a mixed-method approach, combining numerical data analysis with business insights to understand the best inventory management strategies. The findings suggest that a data-driven inventory system can significantly lower costs, reduce stock problems, and improve supply chain performance, ensuring smoother operations in the musical instrument manufacturing industry.

Keywords: Optimization, Inventory Management, Delivery Delays, Cost Inefficiencies, Economic Order Quantity (EOQ.

Introduction

Studies on inventory management optimization are still very limited when compared to the urgency of the problem and the impacts that will be caused. The high price of primary commodities due to scarcity is suspected to be one of the causes of production delays. Inventory management is very important because it is useful in ensuring the availability of the right goods at the right time. With good inventory management, companies can anticipate stock shortages, ensure inventory orders

are according to needs, ensure smooth production processes and avoid high storage costs.

This study will examine the optimization of inventory management to handle late deliveries and cost inefficiencies in one of the manufacturing companies engaged in the musical instrument industry. The complexity of the musical instrument industry requires the implementation of good stock inventory management in the hope of handling late deliveries and inefficient cost expenditures. This chapter will be the opening of the description of the business situation in the musical instrument industry in general and PT Genta Trikarya in particular.

The musical instrument manufacturing industry faces fluctuating demands and supply chain challenges, particularly in managing the availability of wood, a key raw material that is becoming increasingly scarce and expensive (Susanti, et al., 2022). Inefficient inventory control can lead to production delays and cost inefficiencies, affecting companies' ability to meet consumer demand (Annisa, et al., 2023; Kansil, et al., 2019). Effective inventory management, including raw materials, work-in-process, and spare parts, is crucial for ensuring smooth operations and minimizing disruptions (Santosa, et al., 2018). Despite the music industry's rapid growth—Indonesia's musical instrument exports reached $585 million in 2018, growing by 5.4% from 2017 (Kemenperin, 2019)—domestic manufacturers must optimize inventory management to maintain competitiveness and profitability.

PT Genta Trikarya faces significant cost inefficiencies due to high setup costs for ordering spare parts from international suppliers, which require import documentation, customs duties, and clearance fees. Frequent small-batch orders further increase expenses. To address these challenges, this study applies the Economic Order Quantity (EOQ) method to determine the optimal order quantity, reducing inventory costs while maintaining adequate stock levels. Additionally, implementing safety stock is crucial for mitigating supply chain disruptions, while establishing a proper reorder point ensures timely replenishment of raw materials (Adzaky, et al., 2024; Wati & Sulaiman, 2022). By improving inventory control, PT Genta Trikarya can minimize delays, reduce costs, and enhance production efficiency.

Delays in product delivery at PT Genta Trikarya are primarily caused by the unavailability of raw materials that are sourced from inefficient inventory management practices. The company currently relies on manual inventory management which causes various problems such as running out of new orders, disrupting the production process, and extending delivery times for consumers. These inefficiencies not only affect customer satisfaction but also pose risks to the company's reputation and potential customer retention. In addition, the high costs associated with this suboptimal inventory management, including significant ordering and storage costs, exacerbate the financial pressure on the business. Meanwhile, PT Genta Trikarya's raw material and spare part components tend to have high ordering lead times. Meanwhile, the company still sets the number of component orders as a rough estimate only. The description of the lead time data

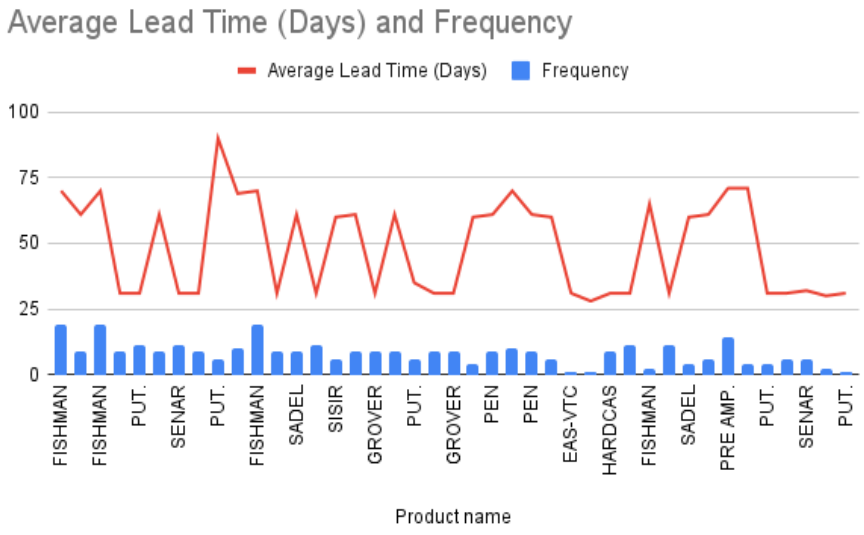
carried out manually by PT Genta Trikarya which also affects delays in delivery and cost inefficiencies is presented in the following table.

Total Inventory Cost PT Genta Trikarya		
1	Annual Holding Cost	IDR 17,194,708.24
2	Annual Setup Cost	IDR 90,000,000.00
Total Inventory Cost		**IDR 107,194,708.24**

The total inventory cost of PT Genta Trikarya, amounting to IDR 107,194,708.24, highlights a significant issue in inventory management, particularly in ordering and holding expenses. The Annual Setup Cost (IDR 90,000,000), which accounts for the largest portion (over 84% of the total inventory cost), suggests that the company places orders too frequently, leading to excessive administrative and procurement expenses. This means that rather than optimizing order quantities, PT Genta Trikarya may be making many small purchases, increasing operational inefficiencies.

Meanwhile, the Annual Holding Cost (IDR 17,194,708.24) indicates that the company keeps excess inventory, which results in additional costs for storage, insurance, and risk of obsolescence. High holding costs typically suggest overstocking issues, where materials remain unused for long periods, tying up company funds that could be better invested elsewhere.

This situation presents a major cost inefficiency that could impact profitability. By optimizing inventory management with Economic Order Quantity (EOQ) and better order planning, PT Genta Trikarya could reduce setup costs, order less frequently but in more efficient quantities, and minimize excess inventory storage costs. Without addressing these issues, the company risks continuing to lose profit margins due to poor stock control and inefficient procurement practices.



No	Product name	Frequency	Average Lead Time (Days)	Average Lead Time (Months)
1	FISHMAN OEM INK-300-KITE	19	70	2.333333333
2	PEN SENAR EBONY TANPA RING - E3 - KITE	9	61	2.033333333
3	FISHMAN OEM ISY-501CR-KITE	19	70	2.333333333
4	FV CASE BROWN-KITE	9	31	1.033333333
5	PUT.GH302GD (L3+R3) -KITE	11	31	1.033333333
6	PEN SENAR EBONY PAKE RING - E5 - KITE	9	61	2.033333333
7	SENAR D'ADDARIO EXP11 NO.1-KITE	11	31	1.033333333
8	FN CASE BROWN-KITE	9	31	1.033333333
9	PUT.DJ333C-D4(3R+3L)-KITE	6	90	3
10	FISHMAN OEM FLX-DAB-AAA (FLEX BLEND)-KITE	10	69	2.3
11	FISHMAN OEM ISY-501BK-KITE	19	70	2.333333333
12	PUT. GROVER GOLD H97-18GAM-KITE	9	31	1.033333333
13	SADEL UKULELE (TULANG)DJ-41(56X3X11)-KITE	9	61	2.033333333
14	PUT.GH302CR(L3+R3)-KITE	11	31	1.033333333
15	SISIR UKULELE (TULANG)DJ-42(36X3X9,5)-KITE	6	60	2
16	SADEL TUS Q N 12 SENAR BQ-9110-00-KITE	9	61	2.033333333
17	GROVER 9GB(2+2)-KITE	9	31	1.033333333
18	SISIR TUS Q 43MM BQ-6116-00-KITE	9	61	2.033333333
19	PUT.DJ333BK-D4(3R+3L)-KITE	6	35	1.166666667
20	SENAR YB-EJ87T NO.1-KITE	9	31	1.033333333
21	GROVER 9NB (2+2)-KITE	9	31	1.033333333
22	SADEL NUBONE BC-9110-00-KITE	4	60	2
23	PEN SENAR N21-KITE	9	61	2.033333333
24	FISHMAN OEM ISY-601BK-KITE	10	70	2.333333333
25	PEN SENAR EBONY POLOS - E1-KITE	9	61	2.033333333
26	SISIR NUBONE 43MM BC-6116-	6	60	2

	00-KITE			
27	EAS-VTC OEM ELEMENT LR BAGGS-KITE	1	31	1.033333333
28	HARDCASE FCLEGN NEPTUNE-KITE	1	28	0.9333333333
29	HARDCASE FCLEGH LINVILE-KITE	9	31	1.033333333
30	PUT.NIKEL (GEAR RATIO 18:1) GH102-NI-KITE	11	31	1.033333333
31	FISHMAN SON-GT2BK-KITE	2	65	2.166666667
32	PUTARAN U97-18GA-KITE	11	31	1.033333333
33	SADEL BLACK NU BONE (74X3MM) BLB-9110-C0-KITE	4	60	2
34	SISIR BLACK NU BONE (43X5MM) BLB-6116-00-KITE	6	61	2.033333333
35	PRE AMP. UKU ELK PP-404U-KITE	14	71	2.366666667
36	FISHMAN SON-GT2-KITE	4	71	2.366666667
37	PUT.GH309-G (GOLD)-KITE	4	31	1.033333333
38	SENAR YB-EJ87B NO.1-KITE	6	31	1.033333333
39	SENAR YB-EJ87C NO.1-KITE	6	32	1.066666667
40	PUT.DJ333C-D7 (3R+3L)-KITE	2	30	1
41	PUT.GROVER I50GM IMPERIAL-KITE	1	31	1.033333333
Average Lead Time			48.65853659	1.62195122
Max Lead Time			90	3

PT Genta Trikarya faces serious supply issues due to long and unpredictable lead times for guitar components, with an average wait of 48.66 days and some parts taking up to 90 days to arrive. This creates major production delays, stock shortages, and higher storage costs. For example, FISHMAN OEM INK-300-KITE and PUT.DJ333C-D4 (3R+3L)-KITE take months to arrive, making it difficult to keep production running smoothly. Since deliveries are so inconsistent, the company either has to order large amounts in advance (which increases warehouse costs) or risk running out of stock, which can delay customer orders. To fix this, the company needs better supplier coordination, smarter reorder timing, and improved demand forecasting to avoid costly delays and keep production on track.

1. RESEARCH METHOD

Data Collection Method

Given that this study uses a mixed-method research design, the data collection method uses several instruments, including: interviews, observations and literature reviews. Therefore, this study uses two data sources, namely primary data and

secondary data. Primary data is collected directly from research informants based on interview techniques. While secondary data is information collected from the results of a literature review, including company reports.

Data Analysis Method

Data analysis method is the process of studying and processing data to find patterns, relationships, and important information contained therein. The goal is to gain a deeper understanding of the data and make decisions based on the information found. Considering that the method used in this study is a mix-method, the entire research process is described using a flowchart to show the process that will be carried out during the study. This includes the tools/frameworks used and the outputs of certain steps of the process.

This research starts with company observations, including site visits and interviews with internal management. The goal is to understand the company's inventory system, identify problems, and find ways to improve stock management. One of the biggest issues the company faces is delivery delays, which cause production slowdowns and increase costs.

To solve these problems, the research follows three main steps:

1.Predicting demand using Demand Forecasting – This step helps estimate how much inventory is needed based on past sales and production trends. By knowing future demand, the company can avoid overstocking or running out of materials.

2.Managing inventory with Economic Order Quantity (EOQ) – EOQ is used to find the best order size that reduces storage costs while keeping enough stock available for production.

3.Improving stock replenishment with Reorder Point (ROP) – ROP is used to determine when to reorder materials, ensuring that stock arrives on time before it runs out. This helps prevent production stoppages due to missing materials.

After analyzing the data, the research develops solutions to reduce inventory costs and prevent delivery delays. Demand forecasting helps identify stock needs, while EOQ ensures that orders are placed in the most cost-effective way. ROP is then used to make sure materials are reordered on time, preventing production delays caused by stock shortages.

In the final stage, the study suggests business improvements based on previous successful cases and practical solutions that fit PT Genta Trikarya's situation. These solutions focus on keeping the right amount of stock, reducing unnecessary costs, and improving supplier coordination to avoid late deliveries.

2. ANALYSIS

PT Genta Trikarya's inventory management faces inefficiencies that lead to high costs and delivery delays. The company relies on frequent small-batch orders, resulting in excessive setup costs, especially for imported spare parts requiring import documentation and customs clearance. The study implemented the Economic Order Quantity (EOQ) model to optimize order size and frequency, effectively reducing total inventory costs by 67%.

Comparison of Inventory Costs

A comparison between the company's current inventory management and the EOQ Multi-Item method highlights significant cost savings.

No.		Current Method	EOQ Multi Item Method
1	Order Frequency (Times)	45	9
2	Annual Setup Cost	90,000,000	18,000,000
3	Annual Holding Cost	17,194,708	16,928,610
4	Total Annual Inventory	107,194,708	34,928,610

The EOQ method reduces setup costs by 80%, lowering them from IDR 90 million to IDR 18 million per year, as fewer orders are needed. Holding costs remain similar but slightly improve due to better inventory balancing.

Reorder Point (ROP) and Safety Stock Optimization

To address delivery delays and stock shortages, Reorder Point (ROP) and Safety Stock calculations were introduced. The ROP calculation ensures timely material replenishment, mitigating risks of stockouts.

No.	Name of Goods	Daily Demand (d) (Unit)	Lead Time (LT) (Daily)	Safety Stock (SS) (Daily)	Reorder Point (ROP) (Unit)
1	FISHMAN OEM INK-300-KITE	5.66	71	123	522
2	PEN SENAR EBONY TANPA RING - E3 - KITE	54.99	61	870	4,218
3	FISHMAN OEM ISY-501CR-KITE	3.72	71	103	365
4	FV CASE BROWN-KITE	2.72	31	97	181
5	PUT.GH302GD (L3+R3) - KITE	4.60	31	103	245
6	PEN SENAR EBONY PAKE RING - E5 - KITE	24.89	61	632	2,148
7	SENAR D' ADDARIO EXP11 NO.1-KITE	13.90	31	147	577
8	FN CASE BROWN-KITE	1.76	31	60	115
9	PUT.DJ333C-D4(3R+3L)-KITE	4.16	90	103	479
10	FISHMAN OEM FLX-DAB-AAA (FLEX BLEND)-KITE	0.62	70	35	79

11	FISHMAN OEM ISY-501BK-KITE	1.18	71	59	142
12	PUT. GROVER GOLD H97-18GAM-KITE	1.47	31	36	81
13	SADEL UKULELE (TULANG)DJ-41(56X3X11)-KITE	9.54	61	290	870
14	PUT.GH302CR(L3+R3)-KITE	2.33	31	44	116
15	SISIR UKULELE (TULANG)DJ-42(36X3X9,5)-KITE	9.24	60	275	831
16	SADEL TUS Q N 12 SENAR BQ-9110-00-KITE	6.90	61	124	543
17	GROVER 9GB(2+2)-KITE	4.33	31	66	200
18	SISIR TUS Q 43MM BQ-6116-00-KITE	5.66	61	87	432
19	PUT.DJ333BK-D4(3R+3L)-KITE	2.11	35	52	125
20	SENAR YB-EJ87T NO.1-KITE	5.38	31	106	273
21	GROVER 9NB (2+2)-KITE	3.06	31	54	149
22	SADEL NUBONE BC-9110-00-KITE	4.41	60	134	399
23	PEN SENAR N21-KITE	3.62	61	122	342
24	FISHMAN OEM ISY-601BK-KITE	0.47	70	22	54
25	PEN SENAR EBONY POLOS - E1-KITE	5.08	61	163	472
26	SISIR NUBONE 43MM BC-6116-00-KITE	4.07	60	146	390
27	EAS-VTC OEM ELEMENT LR BAGGS-KITE	0.17	31	10	15
28	HARDCASE FCLEGN NEPTUNE-KITE	0.22	28	14	20
29	HARDCASE FCLEGH LINVILE-KITE	0.19	31	19	25
30	PUT.NIKEL (GEAR RATIO 18:1) GH102-NI-KITE	0.60	31	17	36
31	FISHMAN SON-GT2BK-KITE	0.33	66	17	38
32	PUTARAN U97-18GA-KITE	0.50	31	17	33
33	SADEL BLACK NU BONE (74X3MM) BLB-9110-C0-KITE	2.17	60	89	219

34	SISIR BLACK NU BONE (43X5MM) BLB-6116-00-KITE	2.05	60	87	210
35	PRE AMP. UKU ELK PP-404U-KITE	0.60	71	52	95
36	FISHMAN SON-GT2-KITE	0.28	71	20	40
37	PUT.GH309-G (GOLD)-KITE	0.18	31	8	13
38	SENAR YB-EJ87B NO.1-KITE	1.40	32	34	79
39	SENAR YB-EJ87C NO.1-KITE	1.68	32	38	91
40	PUT.DJ333C-D7 (3R+3L)-KITE	0.48	31	34	48
41	PUT.GROVER I50GM IMPERIAL-KITE	0.11	31	11	14

These figures indicate that high-demand products require larger reorder points, whereas lower-demand products maintain minimal safety stock.

By implementing EOQ, ROP, and safety stock strategies, PT Genta Trikarya successfully reduced order frequency, minimized costs, and optimized inventory levels. The findings suggest integrating ERP-based inventory systems to automate stock tracking and further enhance forecasting accuracy. This approach ensures greater efficiency, reduced operational costs, and improved competitiveness in the musical instrument manufacturing sector.

3. Conclusion

Effective inventory management is essential for enhancing operational efficiency, reducing costs, and ensuring smooth supply chain performance at PT Genta Trikarya. The following sections outline the key findings from this study, highlighting the impact of strategies such as the EOQ Multi-Item method, optimized stock levels, and efficient restocking practices on the company's ability to manage inventory effectively. These strategies provide valuable insights into improving inventory processes and achieving a balance between material availability and cost minimization.

Implementing the EOQ Multi-Item method at PT Genta Trikarya can significantly reduce costs, with setup costs dropping by 80%, from 90,000,000 IDR to 18,000,000 IDR annually, and total inventory costs decreasing by 67%. The reduction in order frequency from 45 orders per year to just 9 enhances operational efficiency by lowering setup and holding costs. This method optimizes inventory management, reducing overall operational expenses. Additionally, the calculation of safety stock and reorder points ensures product availability while minimizing stockouts. As a result, the EOQ method strikes a balance between maintaining sufficient inventory and minimizing excess stock.

PT Genta Trikarya faces significant challenges in inventory management, including reliance on a manual system, inaccurate demand forecasting, and high inventory costs. The manual system causes stock mismanagement and delays, making it difficult to maintain optimal stock levels. Inaccurate demand forecasting leads to either excess stock or shortages, disrupting production schedules. High inventory costs, driven by poor stock management, add unnecessary financial burden. Improving inventory practices through automation, better forecasting, and cost-efficient strategies would ensure smoother production, prevent stockouts, and reduce unnecessary costs, ultimately enhancing supply chain performance.

An efficient restocking strategy ensures timely material availability and minimizes storage costs by accurately determining reorder points based on daily demand, lead time, and historical sales data. This allows for the placement of orders before stock levels fall too low, preventing stockouts while avoiding excessive inventory that would incur high storage costs. Additionally, safety stock acts as a buffer against demand fluctuations and supply delays, ensuring continuous availability without overstocking. The use of advanced inventory management systems, such as ERP software, enhances this process by providing real-time tracking, data-driven decisions, and automation, which further optimizes restocking and reduces both operational and storage costs.

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