

Improving Inventory Management Policy: Case Study 999 Stationery

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Abstract. Inventory management is important part in an organization or company because it can indirectly affect organization or company profitability. For store such as stationery store that has major activity to sell and buy product, inventory take an important part, because the amount of product that they keep can affect cost that they need to bear. Currently, 999 Stationery face problem in their inventory management, their problem mostly about the high level inventory and product shortage which result in high cost that they need to bear. The cost they need to bear include holding cost and shortage cost. If the store keep many products in their warehouse it can give impact to high holding cost. But, if there is a lack of product stock it will impact to unsatisfied customer that can lead to the loss opportunity to get the profit from the customer, since the customer probably will buy the product from different store. Those problem can happen because the responsible person in store did not have an appropriate method to determine when to order and how much to order. The methodology used are qualitative such as interview, and quantitative to calculate the method/tools chosen and see the impact of the metode/tools, there will be comparison between the current inventory policy and proposed inventory policy. The result of this research are probabilistic model is the most suitable method to determine when to order, and economic order quantity is the most suitable method to determine how much to order. With the using of those method 999 Stationery can generate lower cost compared to the current strategy.

Keywords: Stationery, Inventory Management Policy, Reorder Point, Safety Stock, Economic Order Quantity

1. INTRODUCTION

The Ministry of Education and Culture (Kemendikbud) of Indonesia always try to improve achievements in government priority programs in the fields of education and culture. Various programs have been taken in order to increase quality of education and also the education access, including through providing or rehabilitate physical infrastructure for classrooms and school buildings. The result of the programs showed, In 2019 APK for secondary education reached 80.78% and for higher education the APK reached 33.39%¹.

¹Kemendikbud. "Kemendikbud Terus Tingkatkan Pencapaian Program Prioritas Pemerintah". Access July 11th, 2019. <https://www.kemendikbud.go.id/main/blog/2016/10/kemendikbud-terus-tingkatkan-pencapaian-program-prioritas-pemerintah>

The development in education has a high correlation with the needs of stationery. Because, stationery resources or supplies is the main core that will always be required for the daily activities of any school². The stationery store usually provides so many kinds of products such as book, pen, pencil, it can diversify from the brand, color and others aspect. In order to maintain the product the store need good inventory management. Inventory management is one of important part for company, because it can indirectly affect profitability of a company, since stock can be significant financial assets³. For store such as stationery store, that have major activity to sell the product to customer and buy the product from distributor/supplier, inventory management take a crucial

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part. Because, the store or the responsible person need to be able to decide when to order the products and how much to order. Currently, 999 Stationery is facing difficulties related to their inventory management. Their problems in Inventory management, mostly related to high cost that they need to bear because the high level of inventory that they keep in the warehouse and also cost from the product shortage. The shortage or overstock happened in 999 Stationery, mostly happen because the store or the responsible person in 999 Stationery does not have method to determine order quantity and reorder point while they placing an order to supplier. Usually the responsible person or the store manager uses qualitative approach or intuition to determine reorder point and order quantity. Because of that, this study is conducted to help them by proposing a new inventory management system that include how much to order and when to order for 5 bestselling product in 999 Stationery by considering about reorder point, order quantity and safety stock. The objective of the new inventory management policy is to lower the total cost incurred in 999 Stationery.

2. THEORITICAL REVIEW

2.1 Inventory Management

Inventory Management can be define as stock of anykind of item or resources used in a company or organization in order to running their activities⁴. The benefit of inventory management are : Get discount price for big order size, help the company to take an action in the future, increase the profitability of company also safe time and increase the efficiency.

2.2 Inventory Cost

There are some cost that needs to be considered if the company need to make a decision that related to inventory size such as: Holding or Carrying Costs that includes the cost for storage, operation cost, insurance, taxes, warehouse depreciation, obsolescence. Setup Costs includes cost that involves to get certain materials, set up the changes of equipment, preparing the material or move the stock of previous material. Ordering Costs that include cost to prepare the order, cost of the labor inspects the products etc it also means all the activities that related to place an order to the supplier. Shortage Costs, it can be defined as the loss opportunity from customer who go to another store to make purchases also cost that incurre while the product stock is zero⁵

2.3 Inventory Model

Demand of inventory can be dependent or independent towards another item demand.

2.3.1 Independent Demand

Independent demand is the demand that not related to other demand request, it means that the demand is independent. In independent demand, there are 3 types of inventory model:

Economic Order Quantity Model

Economic Quantity Model (EOQ) can be used when the product have constant demand, constant price, constant setup and holding cost for 1 year period of time, lead time constant and the last is quantity discounted model is impossible to be mplemented.

Production Order Quantity

There are 2 situation that this model can be implemented, the situations are: 1). After the order is placed, the inventory continues to accumulate over a certain period of time, 2). When the unit is produced and sold simultaneously.

Quantity Discount Model

Supplier usually provide discount or lower proce to customer who buy the product in large quantities. The discount given can generate cheaper price for the products. But, in order to use this model the company need to consider the cost of purchase and the cost of storage, where there are more amounts product ordered, the cost of ordering product per unit will decrease, but on the the cost of storage will increase⁶

2.3.2 Dependent Demand

Dependent demand can be defined as the demand that relates to the request for another demand product. Given an amount of the end thing, the request for all parts and components can be calculated

2.4 Material Requirement Planning

Material Requirement Planning (MRP) is one of the methods that usually use for dependent product to determine the detail to produce a product such as the amount material, part and component. MRP also provides a schedule of ordering product and amount to be ordered

2.5 Probabilistic Model and Safety Stock

Probabilistic model is inventory model that can be used to decide level of inventory that the company need to keep, or to find the optimal amount of inventory for company also for decide order schedule. This model objective is to get the high service level and avoid stock out by provide or consider safety stock. There is also special conditions when the data on demand during lead time is not known, the conditions are: 1) when the demand constant and lead time variable. 2) when the demand variable and the lead time constant. 3) when the demand and lead time are variable

3. RESEARCH METHODOLOGY

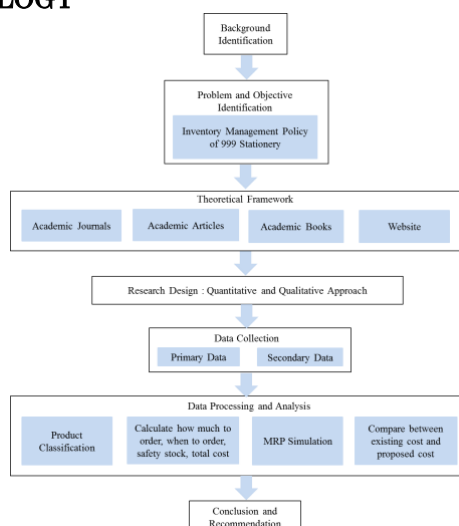


Figure 1 Research Flow

The research methodology start from background identification to know the potential problem occurred in 999 Stationery, this step done by doing interview to store manager and also the store owner. The next step is problem and objective identification, this step identify the main problem occur in 999 Stationery. Then, there is theoretical foundation that include all theories that related to this research that can be the analysis of this research. Next step is data collection, in this step there are 2 types of data used that are primary and secondary data. The primary data gathered from the interview and secondary data gathered from the company historical data from November 2018 until April 2019, those period of time chosen because in mid of September the company faces loss of data because of the system error. The secondary data include the product demand, lead time, inventory on hand, order quantity, and cost for each product. The next step is data processing and analysis, the data that already collected will be analyzed start from the product classification. In product classification, since 999 Stationery want focus on 5 best selling product, then the product will be classified as fast and slow moving product. Then the bestselling product can be found in fast moving product because it is generate high number of product sold. After the product classification then there is inventory model selection that based on product characteristic. There characteristic of product are : 1) Independent and variable demand . 2) Lead time known and consistent. 3) Inventory from supplier arrives in one batch at one time. 4) Quantity discount is not possible to be implemented in 999 Stationery management, because 999 stationery cannot afford

the supplier high limit of order size. 999 Stationery afraid that they cannot complete the payment for the ordered product. From the characteristic stated above it can be seen that the most suitable model for 999 Stationery is Economic Order Quantity. Meanwhile for determining the reorder point and safety stock, the most appropriate model is Probabilistic Model for certain conditions which are variable demand and constant lead time. After that the calculation resulted from the reorderpoint, safety stock and order quantity will be illustrated in Material Requirement Planning. The result from Material Requirement Planning simulation will be used to find the total cost for each product. The cost including holding cost, shortage cost and also ordering cost. After that there will be comparison between the existing inventory management and proposed inventory management. Then the most appropriate inventory management can be determined from the strategy that generates lower cost. The last step is conclusion and recommendation, this step consist of the summary of all result that can answer or solve the problem of 999 Stationery.

4. FINDINGS AND DATA ANALYSIS

4.1 Company Background

999 Stationery is a stationery located in Purbalingga, Central Java. This store is the branch store of one of stationery in Purbalingga, Central Java. The store is established in 2014, they provide stationery, office supplies, art supplies and many more. Their primary target market is school student, since the 999 stationery is surrounding by several middle school and high school. 999 Stationery has 1 store manager and 11 workers. The responsible person in 999 Stationery is the store manager, because the store owner give the store manager responsibility to manage the whole activities in 999 Stationery. The store owner give full responsibility to 999 Stationery because the store owner manage the main store. Because of the differences in management, the warehouse of both store also different, but both of the store use the same supplier.

4.2 Current Condition in 999 Stationery

The main problem of 999 Stationery is the store manager does not have appropriate method to determine how much to order and when to order. This problem occurred in ordering process. Figure below shows the ordering process that happened in 999 Stationery

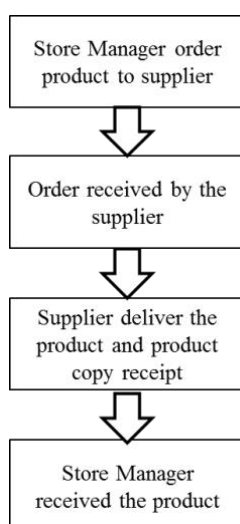


Figure 2 Ordering Proses

When the store manager contacted the supplier to place an order, the store manager only use her intuition to determine when to order and order quantity, because of that it is quite hard to control the inventory level in 999 Stationery, because they didnot know the optimal order quantity that need to be ordered.

4.3 Data Analysis

4.3.1 Product Classification

999 Stationery classified their product into several class, class means that they classified the product based on the product that have similar characteristic. The product classification will classified the fast moving and slow moving product because if 999 Stationery want to focus on bestselling product then the product can be found in fast moving product. The class that can sold 1500 product per month can be calssified as fast moving product. The judgement is based on 999 Stationery management. Table 1 show tha top 5 bestselling class in 999 Stationery.

Table 1 Top 5 Bestselling Class

Stationery Product	Demand						Average	Classification
	Nov	Des	Jan	Feb	Mar	Apr		
PEN	2508	4480	9890	7548	7906	6624	6493	FAST MOVING
NOTEBOOK	5075	5205	14545	7800	8240	7140	8001	FAST MOVING
GLUE	1677	2550	4004	4360	3192	3106	3148	FAST MOVING
PENCIL	1086	1922	3474	3678	3318	3494	2829	FAST MOVING
MARKER	1804	3704	4692	4136	4852	4104	3882	FAST MOVING

4.3.2 Product Selection

From the 5 bestselling class stated above, it will be chosen 1 bestselling product per class. So this is the list of product chosen for each class : Notebook SIDU 38 ,Pencil Staedtler 2B, Standard AE7 Pen, Glue Hanakol ,Snowman Boardmarker Black.

4.3.3 Material Requirement Needed

This point will give information in order to conduct the MRP simulation for the current inventory management policy. Table 2 shows the information needed.

Table 2 Information Needed for MRP Simulation

Products	SIDU 38	STANDARD AE 7	GLUE HANAKOL	PENCIL STAEDTLER 2B	SNOWMAN MARKER
Lead Time (weeks)	4	1	1	2	1
Inventory On Hand (pcs)	1910	1477	519	900	394
Holding Cost (15% price)	450	255	150	495	1275
Ordering Cost (IDR)	30000	30000	30000	30000	30000
Shortage Cost (IDR)	895	529	484	939	2610

The holding cost is set based on the percentage of holding cost component such as the housing cost, material handling cost, labor cost and obsolescence cost. The ordering cost is set based on the cost to contact the supplier and also labor cost. For the shortage cost is set based on the loss opportunity faced by 999 Sttaionery it also means that the loss profit because they cannot sell the prouct. After conducted the MRP simulation. Table 3 shows the summary from the MRP simulation

Table 3 Current Total Inventory, Shortage Amount and Ordering Times

No	Products	Inventory (6 months)	Shortage (6 months)	Ordering times (6 months)
1	Notebook SIDU 38	29068	557	3
2	Pen Standard AE 7	37444	94	2

3	Pencil Staedtler 2B	15297	62	2
4	Glue Hanakol Small	21617	32	2
5	Snowman Board Marker	9085	1	2

4.3.4 Cost Analysis for Current Inventory Management Policy

Data from the table. Can be used to calculate the cost incurred in 99 Stationery. Table 4 shows the cost calculation for 6 month period of time.

Table 4 Current Strategy Cost Calculation

No	Products	Holding Cost	Ordering Cost	Shortage Cost	Total Cost
1	Notebook SIDU 38	IDR 13,080,600.00	IDR 90,000.00	IDR 498,515.00	IDR 13,669,115.00
2	Pen Standard AE 7	IDR 9,548,220.00	IDR 60,000.00	IDR 49,726.00	IDR 9,657,946.00
3	Pencil Staedtler 2B	IDR 7,572,015.00	IDR 60,000.00	IDR 58,218.00	IDR 7,690,233.00
4	Glue Hanakol Small	IDR 3,242,550.00	IDR 60,000.00	IDR 15,488.00	IDR 3,318,038.00
5	Snowman Board Marker	IDR 11,583,375.00	IDR 60,000.00	IDR 2,610.00	IDR 11,645,985.00

From the table 4, it shows that 999 Stationery has high holding cost it means that they have high inventory level in their warehouse.

4.3.5 Proposed Inventory Management Policy

The proposed inventory management policy will calculate reorder point, safet stock and also order quantity. The result from the calculation will be implement in the propsed inventory management policy. The service level used in this study is 95%. Below is the result from the calculation

Reorder point and Safety Stock

The calculation of reorder point and safety stock is using the probabilistic model in special condition which is the demad variable and constant lead time. Table 5 shows the result of reorder point and safety stock claculation

Table 5 Proposed Reorder Point and Safety Stock

N o	Products	d (average weekly)	L (in week)	Z	Standard Deviation	Safet y Stock	Reorde r Point
1	Notebook SIDU 38	237	4	1.6 4	99	325	1273
2	Pen Standard AE 7	268	1	1.6 4	106	174	442
3	Pencil Staedtler 2B	98	2	1.6 4	20	47	243
4	Glue Hanakol Small	56	1	1.6 4	42	69	125
5	Snowman Board Marker	48	1	1.6 4	18	29	78

Order Quantity

The calculation of reorder point and safety stock is using the Economic Order Quantity formula, below is the result. S represents the shortage cost per product ,D represents the annual demand, and H represents the holding cost per product per year.

Table 6 EOQ Calculation

No	Products	D	S	H	EOQ
1	Notebook SIDU 38	12324	IDR 30,000.00	450	1282
2	Pen Standard AE 7	13936	IDR 30,000.00	255	1811
3	Pencil Staedtler 2B	5096	IDR 30,000.00	495	786
4	Glue Hanakol Small	2912	IDR 30,000.00	150	1079
5	Snowman Board Marker	2496	IDR 30,000.00	1275	343

4.3.6 Proposed MRP Simulation

The result of both calculation will be illustrated in MRP simulation to see the order schedule or when to order and also the shortage that may happen. Table 7 shows the summary from the MRP simulation that already conducted before.

Table 7 Proposed System Inventories, Shortage Amount and Ordering Times

No	Products	Inventory (6 months)	Shortage (6 months)	Ordering times (6 months)
1	Notebook SIDU 38	23941	567	4
2	Pen Standard AE 7	28261	189	3
3	Pencil Staedtler 2B	12295	39	2
4	Glue Hanakol Small	11990	0	1
5	Snowman Board Marker	5235	25	2

4.3.7 Cost Analysis for Proposed Inventory Management Policy

The cost analysis include holding cost, ordering cost and also shortage cost. Table 8 shows the total cost for each products after the implementation of proposed inventory management policy.

Table 8 Cost Analysis for Proposed Inventory Management Policy

No	Products	Holding Cost	Ordering Cost	Shortage Cost	Total Cost
1	Notebook SIDU 38	IDR 10,773,450.00	IDR 120,000.00	IDR 507,465.00	IDR 11,400,915.00
2	Pen Standard AE 7	IDR 7,206,555.00	IDR 90,000.00	IDR 99,981.00	IDR 7,396,536.00
3	Pencil Staedtler 2B	IDR 6,086,025.00	IDR 60,000.00	IDR 36,621.00	IDR 6,182,646.00
4	Glue Hanakol Small	IDR 1,798,500.00	IDR 30,000.00	IDR -	IDR 1,828,500.00
5	Snowman Board Marker	IDR 6,674,625.00	IDR 60,000.00	IDR 65,250.00	IDR 6,799,875.00

4.4 Cost Comparison

As explained before that there will be cost comparison to see the total cost differences between the current inventory management policy and proposed inventory management policy. Table 9 the result of cost comparison.

Table 9 Cost Differences between Current Policy and Proposed Policy

No	Products	Total Cost of Current Strategy	Total Cost of Proposed Strategy	Cost Differences
1	Notebook SIDU 38	IDR 13,669,115.00	IDR 11,400,915.00	IDR 2,268,200.00

2	Pen Standard AE 7	IDR 9,657,946.00	IDR 7,396,536.00	IDR 2,261,410.00
3	Pencil Staedtler 2B	IDR 7,690,233.00	IDR 6,182,646.00	IDR 1,507,587.00
4	Glue Hanakol Small	IDR 3,318,038.00	IDR 1,828,500.00	IDR 1,489,538.00
5	Snowman Board Marker	IDR 11,645,985.00	IDR 6,799,875.00	IDR 4,846,110.00

It shows that the proposed inventory management policy generates more benefit which is the reduction of total cost.

5. CONCLUSION AND RECOMMENDATION

In conclusion the appropriate method for 999 Stationery in order to determine when to order or the reorder point is the using of probabilistic method. The probabilistic model become the most suitable method because the probabilistic model has 1 condition that suitable for product characteristic that is variable demand and constant lead time. Meanwhile, for the order quantity the most suitable product is the using of Economic Order Quantity Model because the condition that applicable for EOQ model is suitable with the product characteristic which is independent demand, constant lead time, one batch one time system while receiving the inventory, and impossible to implement quantity discount model. The implementation of the reorder point, safety stock and economic order quantity resulted in the reduction of total cost for each product. The reduction of the cost is different for each product it shows in table in point 4.4. Because the proposed inventory management generate lower cost compared to the previous inventory management policy, it means that the proposed inventory management policy can be a solution for 999 Stationery to decreasing their total cost that incurred from the overstock or shortage.

In order to implement the proposed inventory management policy, 999 Stationery need to consider other important aspects such as the loyalty of customer toward 999 Stationery, and also marketing strategy that can cover up the weakness of the proposed inventory management policy that which is there are still shortage happen in several product. 999 Stationery need to know how to persuade customer to buy other similar product if there is shortage happen for several product. Furthermore, since 999 Stationery has many products it can be difficult to use a simple excel table, because the manager should update the data manually. So it will be better if 999 Stationery can make a new computerized system that can help them calculate reorder point, safety stock and order amount based on the MRP simulation and also the cost analysis.

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