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INVENTORY MANAGEMENT IN NON-FOOD CONVENIENCE STORE

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Abstract. Retail is one of the promising business sectors to run in Indonesia. Nowadays, small size retail stores such as minimarkets is counted as largely growing business in Indonesia. Along with its rapid growth, retail businesses face many problems. One of the most complicated problems in this business sector is overstocking and under stocking of inventory that may happen at the same period. PT. Idola Jaya Semesta, a growing non-food convenience store, faces this inventory problem. This research aims to get the best inventory policy for PT. Idola Jaya Semesta. The sample data to be analyzed is limited to the best-selling category which is stationary, and focused on the top ten most overstocked items by percentage in a random retail store, which is the retail store in Bintaro. The data of the inventory report in the central store and distribution center is employed as a basis data of the research. The researchers used probabilistic method and economic order quantity model to analyze the inventory practices and to propose a solution. The result of this research is an inventory policy (maximum inventory level and reorder point) that avoid those problems and maximize profit. The research founds that using EOQ results in the lowest total inventory cost for the company, it is around IDR 4 million rupiahs cheaper than the current policy in a course of a year. However the current existing "TSM" policy of the company results in the lowest under stocking cost by IDR 68,308, not a very significant amount. In the long term the EOQ policy results in better to be used as it rises, the profitability ratio in the next 5 years using Monte Carlo Simulation for the items that have a yearly demand of over 100, but with the TSM policy it is better to use with items that have a yearly demand below 100. Ultimately, the best solution is to use the EOQ policy because it has the lowest total inventory cost and the profitability ratio of items with a yearly demand below 100 is not very significant for the company's total profit. By using the sensitivity analysis, it is also more reliable to use the EOQ policy, when compared to the current existing TSM policy, as it is less sensitive to a change in demand compared to the current policy. The implementation plan for the company is very simple, the company employed a software engineer to create the software used to determine how much to order and the point of reorder, the company's software engineer needs to simply change the formula of the current policy to the EOQ policy within the software program codes. Since the software is a form of digital media, it can be applied fast and at a low cost.

Keywords: Inventory Management; Economic Order Quantity; Re-order Point; Non-Food; Convenience Store;Retail

Introduction

Inventory management is a key issue faced by every retail business. The inventory turnover defines the company's revenue and shareholder's earnings (Dharmaraj, 2014). The failure of managing inventory results in high cost of operations. Inventory management is of critical strategic importance in two key areas, customer service and cash flow (Augustine, Huff, Lockman, & MacLean, 2004). Inaccuracies in an inventory creates a range of problems, including loss of productivity, the manufacturing of unwanted items, a reduction in the levels of customer commitment, the accumulation of costly physical inventories and frustration(Meyer, 1991). The failure of managing inventory results in high cost of operations. Inventory management is of critical strategic importance in two key areas, customer service and cash flow (Augustine, Huff, Lockman, & MacLean, 2004). Inaccuracies in an inventory creates a range of problems, including loss of

productivity, the manufacturing of unwanted items, a reduction in the levels of customer commitment, the accumulation of costly physical inventories and frustration(Meyer, 1991). The non-food minimarket that the author analyzed is PT Idola Cahaya Semesta. PT Idola Cahaya Semesta is a growing non-food convenience store, established in 2007 by the name of Toysmart, where they originally only sell toys. Its humble beginnings originated in Taman Galaxy, Bekasi. As they expand they started to sell text books, office supplies, and other general goods, transforming into a non-food convenience store in 2010. This expansion gives the company the revenue growth, as the number of stores grow however, more problems occur for the company, one of the problems is overstocking and under stocking inventory levels, this research analyzes the inventory management of the company, and gives a suggestion of a better inventory management policy. The problem exists because of the uncertainty of demand, especially in everyday goods, the standard deviation of the demand is relatively high, unlike food minimarket which is mostly stagnant. Items like blank textbooks are very low in some months, but in the start of school, demand roses high, while other goods like toys and coffee mugs are very fluctuating and hard to forecast.

Theoretical Foundation

a. Proposed Solution

Re-order Point

The re-order point in the probabilistic model is the minimum level of inventory existing at which a new order must be placed. The re-order point tells when to order (Heizer & Render, 2011). The formula for the re-order point is:

ROP = LT x d

Whereas:

- LT: Lead time, which is the time required for an order to be made and delivered to the company, unit is in days
- d : Daily demand, which is the amount of demands or sales per day faced by the company

Economic Order Quantity

$$Q = \sqrt{\frac{2DS}{H}}$$

Whereas:

Q: Economic order quantity

D: The number of demands

S: The amount of order setup cost

H: Holding cost

Safety Stock

The safety stock is the amount of inventory that the company should keep in order to avoid loss of sales from stock outs. Safety stock is also used to achieve a desired service level. The quantity formula is:

$$Safety\ Stock = z\ \sigma dLt$$

Whereas:

z: Index score of service level from the safety stock statistical table of desired service level

σ dLt: The standard deviation of demand during lead time

Based on the interview with the procurement manager, the desired service level is at least 95%, thus the z value is 1.65. So, the formula became:

$$Safety\ Stock = 1.65\ \sigma dLt$$

b. Existing Condition

TSM (Target Stock Minimum)

TSM or target stok minimum is one of the current inventory policies applied by PT Idola Cahaya Semesta. TSM is the maximum quantity target for each item in the retail stores of PT Idola Cahaya

Semesta. The formula used for determining the TSM is:

$$TSM = Spd\ x\ (Lt + SSid)$$

Whereas:
Spd: Sales per day
Lt: Lead time in days
SSid: Safety stock period

Safety Stock Period

The safety stock currently applied at PT Idola Cahaya Semesta is different from the safety stock in the textbooks. This safety stock unit is in days, this is the period of safety time for orders to anticipate late arrivals of orders. The formula given is:

$$SSid = \frac{28}{Om} + 7$$

Whereas:
SSid: PT Idola Cahaya Semesta's safety stock
Om: number of orders per month

Suggested Order Quantity (SGO)

The Suggested Order Quantity or SGO is used to determine the amount of items should be ordered, each item has its own order quantity based on the SGO, the given formula:

$$SGO: Spd\ x\ (2\ x\ Lt + SSid)$$

Whereas:
Spd: Sales per day
Lt: Lead time in days
SSid: Safety stock period

Data Analysis

The data collected from the company to analyse is shown in the table below:

Item Name	Demand per year	Net profit	Under stock Cost	Overstock Cost
Pen/ Pilot	768	IDR 583.00	583	417
PC Joyko P90	324	IDR 667.00	667	333
Pen/ Snowman V5	282	IDR 958.00	958	42
Pen/ SnowmanV1	643	IDR 4,583.00	4583	2917
Pen/ Snowman Bp-7	423	IDR 458.00	458	42
Paket FC Mantap	237	IDR 5,560.00	5560	2440
P/H Gribel B20	100	IDR 4,583.00	4583	417
PC Greebel 2B M/Set	54	IDR 2,060.00	2060	940
Refill S/N Whiteboard Hitam	21	IDR 3,110.00	3110	1890
Refill S/N Whiteboard Biru	23	IDR 3,110.00	3110	1890

a. Existing Conditions

Item Name	Min Understock	Max Understock	Min Overstock	Max Overstock	Average Under-stock	Average Overstock
Pen/ Pilot	0	43	0	353	8	114
PC Joyko P90	0	27	0	288	5	86
Pen/ Snowman V5	0	24	0	180	12	44
Pen/ SnowmanV1	0	165	0	219	27	57
Pen/ Snowman Bp-7	0	36	0	151	11	49
Paket FC Mantap	0	26	0	65	9	19
P/H Gribel B20	0	22	0	35	5	10
PC Greebel 2B M/Set	0	5	0	10	3	3
Refill S/N Whiteboard Hitam	0	2	0	9	1	3
Refill S/N Whiteboard Biru	0	2	0	13	1	5

b. Proposed Solution

Item Name	Min Understock	Max Understock	Min Overstock	Max Overstock	Average Understock	Average Overstock
Pen/ Pilot	0	27	0	66	4	20
PC Joyko P90	0	0	0	87	0	31
Pen/ Snowman V5	0	0	0	37	0	25
Pen/ SnowmanV1	0	31	0	95	3	21
Pen/ Snowman Bp-7	0	0	0	74	0	37
Paket FC Mantap	0	25	0	65	3	19
P/H Gribel B20	0	0	0	17	0	10
PC Greebel 2B M/Set	0	0	3	25	0	19
Refill S/N Whiteboard Hitam	0	0	6	24	0	17
Refill S/N Whiteboard Biru	0	0	6	21	0	16

c. Current Policy Fully Implemented

Item Name	Min Understock	Max Understock	Min Overstock	Max Overstock	Average Understock	Average Overstock
Pen/ Pilot	0	0	0	163	0	66
PC Joyko P90	0	0	0	87	0	34
Pen/ Snowman V5	0	0	0	42	0	29
Pen/ SnowmanV1	0	0	0	107	0	55
Pen/ Snowman Bp-7	0	0	0	96	0	55
Paket FC Mantap	0	25	0	65	3	34
P/H Gribel B20	0	0	9	58	0	39
PC Greebel 2B	0	0	9	54	0	41

M/Set						
Refill Whiteboard	S/N Hitam	0	0	9	48	0	39
Refill Whiteboard	S/N Biru	0	0	13	54	0	41

d. Overview

Method	Min Understock	Max Understock	Min Overstock	Max Overstock	Cost of Understocking	Cost of Overstocking	Total Cost
Existing	0	165	0	353	IDR 2,655,182	IDR 3,704,936	IDR 6,360,118
EOQ	0	31	0	95	IDR 307,308	IDR 2,508,049	IDR 2,815,357
TSM Implemented	0	25	0	163	IDR 139,000	IDR 5,819,571	IDR 5,958,571

Sensitivity Analysis

The sensitivity analysis is used to see the reliability of the methods used, which is the proposed EOQ and the current TSM method. The sensitivity analysis is used to a change in demand from 10% to 100% rise. The result of the sensitivity analysis shows the slope for each method, the existing method produced a slope value of -158,057, while the EOQ method produced a slope value of -61,539. The EOQ slope value is 96,518 less than the existing method, which means the EOQ method is less sensitive to a change in demand, which means it is more reliable.

Conclusion and Recommendation

Conclusion

After analyzing the data, here are the conclusions to answer the questions of this research:
1. PT Idola Cahaya Semesta had already developed a software program that help the company determine when to order (called Target Stok Minimum) and how much to order (called Suggested order Quantity) for each item of each category, though the company still face under-stock and overstock problems. The result of the software however is not always fully implemented because the company sometimes has to adapt to meet sudden rise or fall in demand. 2. After comparing the total cost for the year 2015 between the existing condition, TSM fully implemented, EOQ, and Hybrid policies, the proposed EOQ policy is the best policy to use because of the lowest total inventory cost and the insensitivity towards the change in demand. 3. The optimum parameter resulted from the projection of the EOQ method, with the yearly maximum under-stock quantity of 31, a maximum overstock quantity of 95, under-stock cost of IDR 307,308 overstock cost of IDR 2,508,049 and total cost of IDR 2,815,357. Compared to the existing condition, the current TSM policy fully implemented, and the Hybrid policy, the total cost was reduced by IDR 3,544,761 or a 55.7% improvement, IDR 3,143,214 or a 49.4% improvement and IDR 1,313,180 or a 20.6% improvement. 4. The proposed EOQ policy is less sensitive against the rise of demand, making it more reliable in the long term than using the existing TSM policy.

Recommendation

The company should use the EOQ policy for items with yearly demands of over 100, and keep use of their current TSM policy for items with yearly demand below 100, as it produced the lowest

inventory cost and deviation of quantity. The implementation plan is simple, because the company has its own third party developer for the inventory management software, the company should contact the software engineer to tweak the software's formula, without buying a new software, and it is very quickly can be implemented. This research aims to give an inventory solution for a retail company operating with non-food products, though this research is very limited to one particular store and one particular category of items which is stationary items. Some recommendations for future researches are to research on different categories of items, retail stores of a different location.

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