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Application of Supply Chain Management Information System of Inventory at Computer Shop in Jambi City

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Abstract. This study discusses the inventory system in requires good inventory management in order to manage the procurement for customers. Based on the purpose of the study the make observations on the research by one of the method approach that can be used in the management of the inventory is a method of Supply Chain Management (SCM) concept for the inventory control process. In inventory managing, the store needs a system that can ensure the supply of products in guaranteed quality, on time delivery, and the right amount in accordance with the reservation. By application of the supply chain management in calculate reorder point with safety stock can help control inventory in maintaining stock stability in improving customer service. Following the total reorder with safety stock, provides the effect to improve business performance because it can improve the services to customers, sell new products, and increase sales. Therefore, the XYZ Store can be estimated and predicted capital that must be spent every year estimated revenue for the store and is able to maintain stability from stock out.

1. Introduction

Competition between companies lately does not only occur in domestic companies but also occurs globally as a result of the era of globalization and ASEAN free trade on Indonesia. The competition requires companies to provide the best service to consumers by ensuring the product distribution process up to the hands of consumers goes well. Various activities in production include activities to obtain raw materials, process them with various transformation processes become final products, and distributed it to consumers. Companies compete to meet the desires of consumers with “customer-oriented” services, covering three main points namely price, quality, and service (speed, comfort, etc.) [1].

XYZ Store is a computer store that sells computer hardware and accessories in Jambi. This company has to improve the quality of services to customers, by implementing appropriate strategies to win the competitions. The interview and observation data show this company often occurs out of stock every month. High demand for goods, causing frequently out of stock and became unfulfilled orders. The Current web-based Transaction Processing system has been operated but did not have a stock management feature, and they cannot estimate the number of goods should be purchased in the next month. Estimates for inventory are usually predicted based on product items and the number of units sold. This technique is less effective, it is proven that there is a build-up of goods because it is not in accordance with the needs of the customer, plus the delay in the supply of goods causes a vacuum of goods which results in customer disappointment and turns to the competitor’s company. The product circulation is not running well and has an impact on customer service quality. To overcome this problem, the authors designed the application to support XYZ Store business growth with features that can ensure that orders can be fulfilled, using the Supply Chain Management (SCM) method. The supply chain consists of all stages involved, directly or indirectly, in meeting customer demand. The supply chain includes not only producers and suppliers but also transporters, warehouses, retailers, and customers themselves [2].

The SCM is needed for organizations to compete in dynamic international markets. The purpose of SCM is to combine internal activities and cross-organizational activities to provide customers value [3]. Supply Chain Management is a form of competitive excellence, which is applied in every industrial system [4]. All these problems can be solved by the Supply Chain Management (SCM) approach which is an integrative method or approach that manages the flow of products, information, and money in an integrated manner involving parties ranging from upstream to downstream consisting of suppliers, factories, distribution networks, and logistics services [5].

2. Method

2.1. Data Collection Methodology and Data Analysis

Data collection techniques began with observing business processes, interviews with owners and literature studies. Literature study is done by digging more information from similar research.

The data analysis was performed with qualitative and quantitative descriptive analysis. The qualitative descriptive analysis describes the relationship between supply chain management from the purchase and sale of products to customers. Quantitative descriptive analysis is performed to calculate the stock in the database from the initial inventory and ending inventory.

2.2. Supply Chain Management Concept

Supply Chain Management Professionals is Supply chain management encompasses the planning and management of all activities involved in sourcing, procurement, conversion, and all logistics management activities [6]. Encompasses the planning on business process management to be important to stores for capitals management. It also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers.

Guided by an integrated production plan as well as supported by various technologies, especially based on Internet/Intranet, and is implemented around supply, production operations, logistics (mainly manufacturing processes), and meeting demand which is Supply Chain Management [7]. Stated that the supply chain is the network of companies that work hand-in-hand to create and deliver the product to the hands of end users [4]. W. Edwards Deming, author, and consultant on quality says that "The consumer is the most important part of the production line. Quality should be aimed at the needs of the consumer, present, and future" [8].

2.3. Evolution of Supply Chain Management

The supply chain literature review was conducted to study the past researches. The emergence and evolution of SCM may be depicted as a timeline shown in Figure 1 [3].

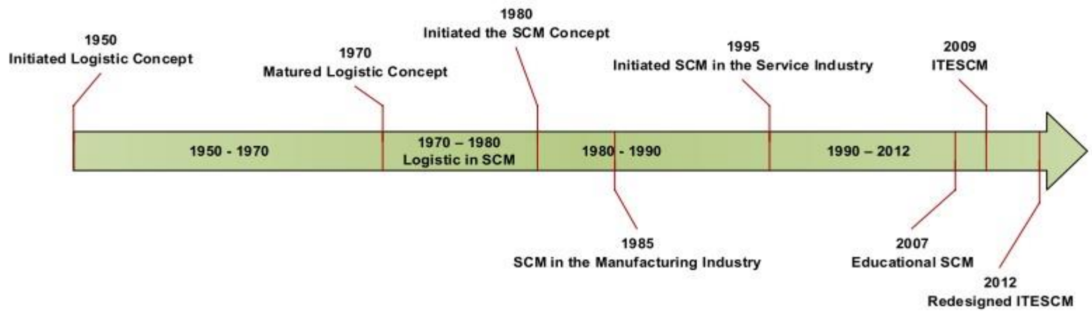

Figure 1. Evolutionary Timeline of Supply Chain Management.

2.4. Supply Chain Management Information System (SCM IS)

The difference between companies between other companies is how to manage management information systems. Hence, in this modern era, how companies manage their information will be the key to the success of a business failure [1]. Information systems are increasingly in supply chain management because of their ability to reduce costs and increase readiness in the supply chain [9]. Intensive information is needed in practice and innovative so that the information system support is needed in an effective SCM and business strategy. This study, therefore, is at the intersection of three important disciplines shown in Figure 2 [10, 9].

2.5. Lot Sizing Method

In the inventory control process, there are several methods lotting that use. The lotting process is a process to determine the size of individual order that optimal based on calculate result clean needs [11]. The use of the Lot Sizing technique is appropriate for use in determining the quantity of inventory orders in which in addition to minimizing the number of orders, it can also minimize the cost of direct inventory and inverse cost of inventory orders [12]. An inventory system controls the level of inventory by determining how much to order (the level of replenishment) and when to order. There are two basic types of inventory systems: a continuous (or fixed-order-quantity) system and a periodic (or fixed-time-period) [8].

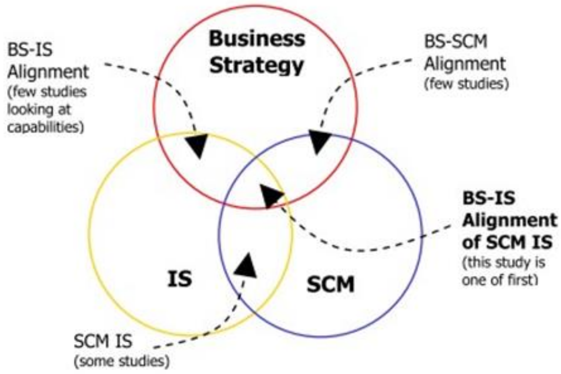

Figure 2. Scope of Study. SCM IS Concept and Business Strategy

2.6. Economic Order Quantity (EOQ)

A formula for determining the optimal order size that minimizes the sum of carrying costs and ordering costs is the basic EOQ model [8]. The XYZ Store has unsold inventory, therefore, the store has a carrying cost for the product.

Assumptions of case to model formula [8]:

- Demand is known with certainty and is constant over time.
- No shortages are allowed.
- Lead time for the receipt of orders is constant.
- The order quantity is received all at once.

This following is a formula of the basic EOQ, (1) :

$$Q_{opt} = \sqrt{\frac{2C_oD}{C_c}} \qquad (1)$$

Note:

- Q_{opt} = Quantity optimal (Economic Order Quantity)
- C_o = Ordering cost every order
- D = Demand rate
- C_c = Carrying cost/Holding cost

The total minimum cost is determined by substituting the value for the optimal order size, Q_{opt}, into the total cost equation (2) :

$$TC_{min} = \frac{CoD}{Qopt} + \frac{CcQopt}{2} \qquad (2)$$

2.7. Reorder Point (ROP)

Reorder point is a point which is a new order have to do (or preparations begin). This things influenced by lead time. Time to need for receive order quantity after the order to made. This following to getting reorder point, (3) [8]:

$$R = d \times L \qquad (3)$$

Where:

- d = demand rate per period (e.g., daily) - L = lead time

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2.8. Safety Stock

Safety stock an order is made when the inventory level reaches the reorder point. During the lead time the remaining inventory in stock will be depleted at a constant demand rate, such that the new order quantity will arrive at exactly the same moment as the inventory level reaches zero. While XYZ Store is met with uncertainty about demand so there will be a possibility of stock out. This following to getting reorder point with safety stock (4) [8]:

$$R = \bar{d}L + z\sigma_d\sqrt{L} \tag{4}$$

Where:

- $\bar{d}$ = average daily demand
- L = lead time
- σ_d = the standard deviation of daily demand
- z = number of standard deviation corresponding to the service level probability
- $z\sigma_d\sqrt{L}$ = safety stock

3. Results and Discussion

The results of the study were conducted experiments on data taken from sales applications.
This following data product in store Table 1 :

Table 1. Data transaction popular in 2019 years old at xyz store

Numb.	Code	Product Name	Annual Demand	Price
1	BRG037	Cart 810	103	Rp. 185.000,-
2	BRG234	Tinta alfa ink canon hitam 100 ML	53	Rp. 28.500,-
3	BRG038	Cart 811	35	Rp. 235.000,-

Base on Table 1 is the sales data obtained from the sales application in the XYZ store. Meanwhile, the number of sales per product can be seen in the following data:

Table 2. Data stock out, product: Cart 810 in 2019 years old at xyz store

Numb.	Month	In	Out
1	January	15	16
2	February	5	6
3	March	10	10
4	April	10	10
5	May	15	13
6	June	5	6
7	July	10	8
8	August	10	8
9	September	10	6
10	October	5	9
11	November	10	3
12	December	0	8
	Total	105	103

Based on the table 2 is sales and purchase data obtained from sales applications in XYZ stores based on Cartrige 810 products for a year.

Calculate EOQ Product: Cart (Cartrige) 810

(a) Demand (D) = The estimate demand order product cart 810 in 2019 years old = 103 Pcs
(b) Order Cost (C_o) = The order cost every order = Rp. 15.000,(c) Unit Cost = Price cart 810 = Rp. 185.000,-
(d) Lead Time (L) = The lead time while an order made = 2 day
(e) Carying Cost (C_c) = Holding cost per unit 10% from product price = (Heizer & Render) (Rp. 185.000 × 10%) = Rp. 18.500,-

So, the optimal order size is if use formula (1) :

$$Q_{opt} = \sqrt{\frac{2(Rp15.000)(103)}{Rp18.500}} = 13 \text{ Pcs}$$

The total annual inventory cost is determined by substituting Q_{opt} into the total cost formula (2):

$$TC_{min} = \frac{(Rp15.000)(103)}{13} + \frac{(Rp18.500)(103)}{2}$$

= Rp. 1.071.596,-

The number of orders per year is computed as follows:

Number of orders per year = $\frac{D}{Q_{opt}}$

$= \frac{103}{13}$

= 8 order per year

Calculate Reorder Point (ROP): Cart 810

The total reorder point by formula (3) this following:

(a) Lead Time (L) = 2 day
(b) The average using of product in a month = 103/12 = 8,5 (or 9) Pcs
(c) Estimate needed per day (d) = 9/20 (work day) = 0,45

R = 0,45 × 2

= 0,9 (or 1) Pcs

Therefore, the conclusion is when the product inventory reaches 1 Pcs, it must be ordered as many as 13 Pcs. For the possibility of shortages, this ROP model can be combined with Safety Stock, which is a stock reserve that must be held to avoid the shortage of goods, especially when waiting for goods that are being ordered. As a hedge against stock-outs when demand is uncertain, a safety stock of inventory is frequently added to the expected demand during the lead time [8]. The assumption demand during lead time follows a normal curve, just average and deviation standard that needed to describe inventory needed to increase service. The service level is the probability that the amount of inventory on hand during the lead time is sufficient to meet expected demand that is, the probability that stock out will not occur [8]. A service level of 90% means that there is a 0.90 probability that demand will be met during the lead time and the probability that stock out will occur is 10% [8].

Calculate Reorder Point with Safety Stock (ROPs): Cart 810

This following the total reorder with safety stock by use formula (4) :

(a) The average daily demand per day (d) = 1 Pcs per day
(b) Lead time (L) = 2 day
(c) standard deviation (z) = 3,44

Safety Stock = $z \sigma_d \sqrt{L}$

= (3,44)(1)($\sqrt{2}$)

= 1,41 Pcs

The reorder point is computed as follows base on formula 4 add safety stock:

R = 0,9 + 1,41

= 2,31 Pcs

Thus, if when stock to reach 2 or 3 pcs, it must be reorder as many as 13 Pcs. In accordance with previous EOQ calculations.

4. Conclusion

Using the EOQ model and supply chain management concept can help control inventory in maintaining stock stability in improving customer service. Then, be able to maintain expenditure on holding costs and capital can be managed properly. The XYZ Stores make an order every month from the results of this study can be seen how many times a year to make an order. Hence, The XYZ Stores can be estimated and predicted capital that must be spent every year estimated revenue for the store and is able to maintain stability from stock out.

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