CHAPTER 2
LITERATURE REVIEW AND BASIC THEORY

2.1. Literature Review

The literature review contains a theoretical basis that will be discussed and help solve the problem discussed in this thesis. This section will also explain some of the studies that several previous researchers have conducted in more depth and detail. This is done to become a benchmark in the implementation of this study.

2.1.1. Previous Research

This subchapter will explain previous studies that previous researchers have conducted. It is hoped that the research that has been carried out will later become a reference and benchmark to assist in resolving current research problems. Several earlier researchers with different objectives have researched inventory control in the company believed will reduce the cost that can be avoided, such as storage costs, maintenance costs, and other costs.

Based on the internet browsing results, there are ten journals for consideration for figuring out this further research. All of the subsequent studies have succeeded in solving the company's and businesses problems in the inventory problem stated. The objectives of each of the previous studies also differ depending on their needs.

Rahmayanti & Fauzan (2016) and Candra (2019) conducted research about inventory problems resulting in overstocks on some goods and shortage of stock in other goods. They used the method which is done by doing forecasts calculations. The purpose of their research is to find available inventory space and to determine the maximum usable inventory.

Other research was also carried out by Budiharjo & Hadikurniawati (2020) and Kartikasari & Suhartono (2013) who used historical data to process data to be processed further. Both studies have similarities with the previous reference, which using the forecasting method in their research. This research aims to forecast future order demand. This method is also believed to be an indicator to measure success in selling and offering the products that the companies researched.

Other studies by Al-Husaini et al. (2018) and Okwara (2013) used sales data for data processing. Both studies are the same as other studies that used the forecasting method to solve company problems carefully. However, the final output

produced by these two studies is an information system that will make it easier for companies to apply the forecast data.

Other research conducted by Stephyna (2000), Jappi & Koan (2014) and Alfredo (2015) focused more on the EOQ, ROP method and also the determination of safety stock. They use the three objectives of this study to implement a new and good inventory system in the object research company. With this implementation, it is believed that it will increase the company's inventory performance, sales productivity, and cost-efficiency.

Another research from Nisa (2019) studied hospitals that had problems with expired drugs. Data processing requires several data such as demands, order cost, and storage cost in this study. She uses analyses of the ABC, EOQ, and ROP methods for data processing. This research aims to identify and analyze drug grouping based on the ABC method, the optimum amount of drug ordering using the EOQ method, and the time of reordering medicine using the ROP method.

All of the previous research has been reviewed and provided a lot of knowledge and information to become a benchmark and reference for further research in this thesis. The following is a summary of ten previous studies that will be used as a reference in the work of this paper:

Table 2.1. Previous Research

No	Author	Research Object	Problem Identification	Required Data	Research Method	Research Objective
1	Rahmayanti & Fauzan (2016)	PT. Abaisat Raya (Rubber Crumb Manuf)	The company has done some planning activities in the warehouse inventory of raw materials firms irregular, thus causing excess stock at a time and shortage of stock (stock out)	Demand forecasting production planning, costs needed, lead time, and safety stock	Analysis of historical data, forecasting results, safety stock, calculation of lot size, respective costs, and also reorder point	To get the number of requests is for 12 periods ahead, the size of each reservation period, the total price required, and how much available space inventory in the warehouse.
2	Candra (2019)	PT. ABC (Construction Company)	The inventory of raw materials from 2015 to 2016 has annually decreased raw material inventories	The cost of purchasing raw materials, the use of raw materials, the cost of the order, the ordering of storage costs, the level of raw material requirements	Forecasting of exponential refinement and calculation of the EOQ method,	To get the number of EOQ value, safety stock, reorder point and to determine the maximum inventory
3	Budiharjo & Hadikurniawati (2020)	Ciputra (CitraGrand Real Estate)	The uncertain sales each of the month make it difficult for the company to determine sales targets at the beginning of the year and also in deciding the top product for the year	Historical data and the amount of significant paramount error	Forecasting (double exponential smoothing), and simple additive weighting (SAW)	To get the number of forecast sales in the coming year, and to determine what type of house could be the top product to the fewest sales
4	Kartikasari & Suhartono (2013)	Amigo Group (Retail Company)	Amigo Group does not have a standardized forecasting model to get an accurate sales forecast.	The data used is secondary data, namely sales data from January 2002 to September 2012	Hierarchical time series forecasting is carried out using three approaches, namely bottom-up, top-down historical proportion, and top-down forecast proportion.	Forecasting product sales in seven stores using the hierarchical time series forecasting method
5	Al-Husaini et al. (2018)	Berkah Swalayan (SME Market)	The company have difficulty in predicting sales, planning purchases, and managing inventory.	Sales data	Forecasting uses the single exponential smoothing method and trend analysis method, economic order quantity (EOQ) method, reorder point (ROP) method, and safety stock calculation and analysis	Information system of business forecasting at the Berkah Swalayan, and forecasting on sales, low-cost purchases, and minimize inventory

Table 2.1. Previous Research (Cont.)

No	Author	Research Object	Problem Identification	Required Data	Research Method	Research Objective
6	Okwara (2013)	Rumah Sakit Paru Dr. M. Goenawan Partowidigdo / RSPG (Hospital)	The hospital face difficulties in determining the amount of medicine that must be provided, which results in frequent shortages of drug stocks so that consumers do not get the drugs they need. Apart from a lack of drug stock, there was also an excess of drug stock, resulting in a buildup of drugs in the warehouse, which affected the quality of drug storage and a waste of money.	Sales data	Forecasting and monitoring system for drug supplies using single exponential smoothing and reorder point methods.	Creating a system that can determine the amount of medicine that must be provided for sales for the next month, and can monitor drug stock inventory in the warehouse
7	Handoko (2000)	PT. United Tractors, TBK at Semarang Branch (Spare Part Company)	The company faces the total cost needed is quite large because the company was only inventory goods at a low price so that reacting the ordering costs increase.	Inventory average value, inventory cost, and total inventory cost	EOQ method, calculation of safety stock, reorder point, average inventory that must be stored, and the number of inventory turn over	To improve the inventory system performance
8	Jappi & Koan (2014)	Toko X Kupang (Textile Company)	The company not yet implementing inventory management optimally, so it is resulting in over stock, less productive sales, and constraints on operational activities.	The number of capacity over-ordering and frequency data of the supply, stockpiling data, and the turnover inventory classification	EOQ and ROP method, and also safety stock	To get more organized inventory management, increase sales productivity and streamline inventory costs
9	Alfredo (2014)	Distributor Batik Kencana Ungu Surabaya	The company experiencing stockout costs, risk of losing goods due to lack of supervision in the warehouse, and loss of profit	The total cost of ordering and cost of storage, and safety stock	Reorder point, economic order quantity, and safety stock	To implement inventory management so that it will lead to the increasing of cost efficiency, especially in purchasing costs and also to increase the company's revenue
10	Nisa (2019)	Gudang Farmasi Rumah Sakit Muhammadiyah Gresik (Warehouse)	In the supply of medicines in the pharmacy warehouse of Muhammadiyah Gresik Hospital, there have been drug void and expired date.	Number of demands, order cost, storage cost	Analysis of ABC, EOQ AND ROP methods	To know and to be able analyzing drug grouping based on the ABC method, the optimum amount of drug ordering using the EOQ method to know the see of reordering medicine using the ROP method

2.1.2. Current Research

In an inventory control study, especially material management, it is obvious the company is compulsory to maintain reasonable inventory stock control. It is necessary to check and control supplies to be quickly taken from the warehouse when the goods are needed. On the other hand, the stock of goods in the warehouse should not be too much, because this might cause the flow of money hampered, and the risk of goods being damaged or lost might be very large.

To ensure the goods are stored to flow in a controllable amount there must be an appropriate method to control it. This is where reorder points, and safety stock plays an essential role in a company. The research that will be carried out at this time of writing aims to determine when and how much Curhat sweetened condensed milk needs to be reordered to prevent out of stock at Adhum Cafe.

Based on all references to previous research, the chosen method uses the EOQ and ROP methods. This is because the purpose of the study that will be developed is to determine the reorder point, the quantity, and the time for Curhat sweetened condensed milk. It is believed that the two methods are very suitable for the objectives required for the research. This is also supported by previous research that uses both ways and can formulate problems and solve these problems well.

Therefore, the application of the two methods is expected to provide sound output for this research. Based on this research, it will also create the research results in a simple table of Microsoft Excel form, which Adhum Café can implement in the future.

2.2. Basic Theory

2.2.1. Café

According to Merriam-Webster (1828), it is stated that a café is usually a small and informal establishment serving various refreshments, such as coffee. The café today has high popularity because the target marker cafe is primarily teenagers. Usually, cafe visitors will spend time at the cafe discussing together with friends, spending time with friends, and enjoying café dishes and beverages.

The cafe is considered acceptable not only from its comfortable atmosphere, but the atmosphere is judged by how good the café can fulfil the customer's orders. Therefore, having sufficient stock ingredients to be processed and be sold to

customers is very important. It is possible that customers who come to order experienced disappointment if they requested certain dishes on the menu not available due to the out of stock of the raw material. This will surely and will be a big problem that caused café to suffer profit and complaints.

2.2.2. Inventory Control

a. Inventory Definition

Inventory is materials, parts provided, and materials in the process that are contained in the company for the production process and finished goods or products provided to meet demands from consumers or customers every time they are stored and maintained. It is considered a specific rule in the Inventory so that it is always ready to use and recorded in the form of company books.

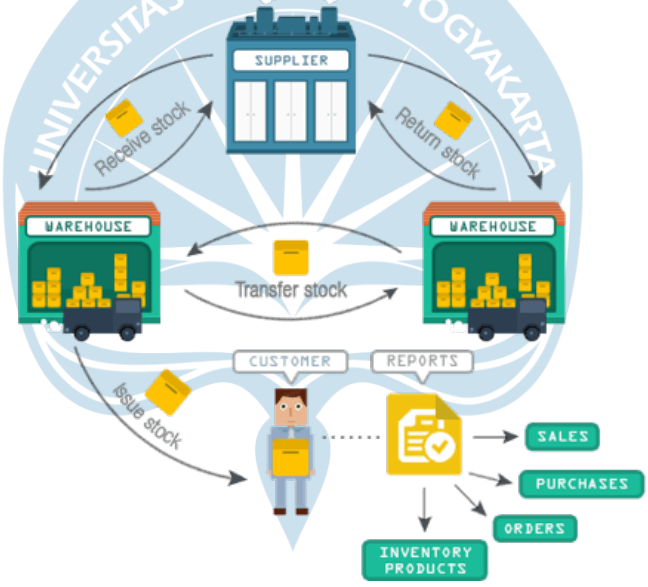

Figure 2.1. Illustration of Inventory Control

(Source: https://www.fascor.com/what-is-inventory-control/, November 2020)

Inventory control usually also refers to stock control, and it is aimed to monitor the stock at any given point in time. Besides, it also deals with maintaining stores and keeping track of any excess or deficit. Inventory control can be performed by employing one of the many methods used by companies (Barwa, 2015). Stock keeping and storage, such as an inventory system, is vital for various companies and businesses. This is because a steady flow of raw material is required for the smoother running of the business.

Inventory management is essential because it is a factor that also determines service levels to customers (Alfredo, 2014). If Inventory management faces a problematic situation, the customer will not be served well. With customer dissatisfaction, the company will certainly get a harmful effect, namely lost sales and complaints. If this situation keeps continues, the company progress will not run smoothly. It will result in a higher problem such as jamming the business and, the most fatal, bankruptcy.

b. Control Definition

Inventory control is often defined as inventory management in the inventory control system at retail companies in Indonesia. Management itself is also known as planning, organizing, directing, and supervising the efforts of organizational members and the use of other corporate resources to achieve the organization's stated goals.

c. Types of Inventory Control

The inventory type setup has its characteristics and different ways of being managed. Supplies can be divided into several types:

i. Raw material inventory which means Inventory of tangible goods and unprocessed material, such as iron, wood, and other components used in the production process.
ii. Purchased parts/components, an inventory of goods consisting of details obtained from other companies that can be directly assembled into a product.
iii. Supplies of auxiliary or auxiliary materials, which are supplies of goods needed in the production process, are not parts or components of finished goods.
iv. Work-in-process inventory, which means Inventory of goods that are output from each part of the production process or processed into a form but still needs further processing into finished goods.

d. Function of Inventory Control

Inventory aims to maintain the continuity of the existence of a company by looking for profits that can be achieved. The trick is to provide services that satisfy customers by providing the requested items. The inventory function is as follows:

i. Batch stock or lot size inventory function

   They were storing large quantities of inventories considering discounted purchase prices, production efficiency due to long production processes, and savings in transportation costs.

ii. Decoupling function

It is the function of the company to hold decouple inventories by having separate operational groupings.

iii. Anticipation function

It is a storage of material Inventory that functions are to save in the event of a delay in the arrival of an order for materials from a supplier or supplier. The main goal is to keep the conversion process running efficiently and effectively.

e. Purpose of Inventory Control

An inventory control that a company carries out has specific objectives. The purpose of inventory control is as follows:

i. Help to maintain and to avoid the company from running out of inventory stock which might result in the cessation of production activities

ii. help to maintain and keep the company's inventory stock management so that it will not become excessive to avoid the costs arising from Inventory

Inventory planning is related to determining inventory composition, timing or scheduling, and location to meet company needs. Inventory control includes controlling quantity within planned limits and protecting physical Inventory. For this reason, it is necessary to evaluate whether the company's inventory system is as expected. Good inventory management requires skill and experience in creating an inventory system.

From the explanation, it can be assumed that inventory control aims to obtain the right quality and quantity of materials available at the time required with minimum costs for the benefit or benefit of the company. In other words, inventory control ensures the availability of Inventory at an optimal level so that production can run smoothly and keeping the inventory costs minimal.

f. Inventory Control Method

There are two methods used in inventory control in companies to control the inventory, namely:

i. Continuous Review Method

Continuous review method is a method in which the position of the goods available in the warehouse is considered the same as the position of the inventory in a deterministic system (a system where the demand for goods is known with certainty) with the addition of a small safety stock. Ordering goods based on the continuous review method is carried out in quantities per lot with orders that are

always the same. The ordering period in this method is not fixed. This method requires a lot of administration because it must always monitor the existing inventory so that there are no delays in ordering goods. The things that must be considered in using the continuous review method are the holding cost per unit of goods is fixed, the cost of reordering goods by the company is fixed, there is no delay in the arrival of raw materials because the waiting time for the arrival of raw materials is fixed.

The characteristic of the Continuous Review inventory system is that the number of items ordered at the time of ordering is not fixed. Orders will continue to be made until the amount of inventory reaches the maximum inventory point. The value of S is obtained from the addition of order points and order quantity. The advantage of this system is that inventory will always be available so that demand will always be met (Nurrahma, 2016).

ii. Periodic Review Method

Periodic Review Method is a method where the time gap between two orders in inventory control is fixed. In this method, safety stock is needed because it is possible that the stock runs out before the order period comes. Safety stock is used to reduce demand fluctuations during the lead time process and is used to reduce all existing inventory consumption.

The number of orders for goods ordered in the periodic review method is very dependent on the remaining inventory in the warehouse at the end of the order period. Therefore, the lot size of the ordered goods will always be different every time an order is placed. In this method, the ordering period is carried out periodically so that the administration required is relatively light.

2.3. Order Quantity with Shortages

According to Waters (2003), the analysis of order quantity with shortages differs significantly in that the EOQ assumes continuous demand while the shortage model assumes a discrete market. To simplify things, it is needed to use discrete requests, but constant requests only require a minor tweak. It is believed that demand is variable and discrete and that there are a few shortfalls that are all met by the return order.

2.3.1. Cost

According to Waters (2003), inventory models use Cost as a parameter in making decisions, costs in the inventory system can generally be classified as follows:

a. Reorder Cost

Reorder costs are costs incurred when reordering inventory items. Ordering costs consist of several things, namely costs incurred during the ordering process and shipping goods, packing and weighing costs and shipping costs to the warehouse.

$$Number\ of\ orders = \frac{D}{Q} \tag{2.1}$$

$$Reorder\ cost\ component = RC \times \frac{D}{Q} \tag{2.2}$$

b. Holding Cost

Holding costs are costs that consist of costs that vary directly with the quantity of Inventory. There are several costs included in the holding cost, namely facility costs, air conditioning costs, room lighting costs, electricity costs, inventory tax costs, and warehouse rental costs. This holding cost is calculated in the form of a certain percentage of the rental kiosk price.

$$Average\ stock = (ROL - LT\ X\ D + \frac{Q}{2}) \tag{2.3}$$

$$Holding\ cost\ component = HC \times (ROL - LT\ X\ D + \frac{Q}{2}) \tag{2.4}$$

c. Shortage Cost

Out-of-stock costs/shortage costs are incurred when supplies are insufficient or out of balance with material demand. Shortage costs include losing customers, Cost of lost goods or sales, and special-order fee.

$$Shortage\ cost\ component = Expected\ shortage\ per\ cycle \times \frac{D}{Q} \times \frac{SC \times D}{Q} \left[\sum_{D=ROL}^{\infty} (D - ROL) \times Prob(D) \right] \tag{2.5}$$

2.3.2. Variable Cost

Variable costs are company costs that can change proportionally depending on the production issued. Variable costs can go up or down depending on the company's production volume. Variable costs will increase when production increases and

decrease when production decreases. One example of variable Cost is the costs of raw materials and packaging.

$$Variable\ Cost = \frac{RC \times D}{Q} + HC \times \left(ROL - LT \times D + \frac{Q}{2}\right) + \frac{SC \times D}{Q} \times (D - ROL) \times Prob(D) \quad (2.6)$$

2.3.3. Economic Order Quantity

Economic order quantity (EOQ) is an inventory management method that determines the number of orders or purchases that must be made and how many quantities must be ordered to minimize total costs (the sum of ordering fees and storage costs). Thus, to calculate the number of economical orders, it is necessary to look at the increase in ordering costs and carrying costs and the average inventory size. The formula that can be used to calculate the economic order quantity is:

$$EOQ = \sqrt{2 \times RC \times \frac{D}{HC}} \quad (2.7)$$

According to Nugroho (2015) the EOQ model can be applied if the following assumptions are met:

a. The demand for the product is constant, uniform and known or means deterministic.
b. The price per unit of product is constant.
c. The holding cost per unit per year is constant.
d. The ordering cost per order is constant.
e. The time between the order being placed and the goods received means lead time is constant.

2.3.4. Reorder Point Theory

Reorder point or also well-known as reorder level, has the same intent and meaning. Reorder point is the stage where another order must be made in a way. This is done by the arrival or receipt of the ordered material precisely when the Inventory is above the safety stock. ROP model occurs when the amount of Inventory in supply continues to decrease. This is also very important because, for business continuity, product restocking will need to continue in a cycle. With no certainty about the quantity and time of material required to be ordered, shortages

or out of stock conditions will have occurred. This will hinder the company performance and resulting in loss of profit.

In material management applications, inventory control has a very significant and crucial role and importance. The inventory level required by the company will be the benchmark for determining the point of reordering amount and time. This is based on prevention in terms of deviations in demand & trend of lead times so that later in the hope of maintaining supplies' safety.

According to Gonzalez & González (2010) stated that when determining the reorder point, the following three factors need to be at hand:

i. demand, which means the amount of quantity inventory used or sold each day
ii. lead time, which means time (in days) of how long it takes for an order to arrive when an order is placed
iii. safety stock, which means the amount in Inventory is kept on hand if there is an unpredictable event like delays in lead time or unexpected demand.

a. Reorder Point (ROP) Definition

Reorder point (ROP) is a method for deciding when to submit a reorder point to create a balance between supply and demand (Nisa, 2019). The reorder point stage is when an item in the warehouse must be added to the Inventory before the stock is running out. This reorder point refers to the amount of stock in the warehouse and if the supply of goods has reached that amount. The warehouse must immediately ask for the items needed so that purchasing is purchased at the procurement department.

According to Barwa (2015), when a company chooses the ROP inventory control method, it fixes a minimum quantity, reaching a point for the company to reorder and restock. As the minimum stock level signifies the minimum amount at which the company has to reorder, this method is also known as the reordering level.

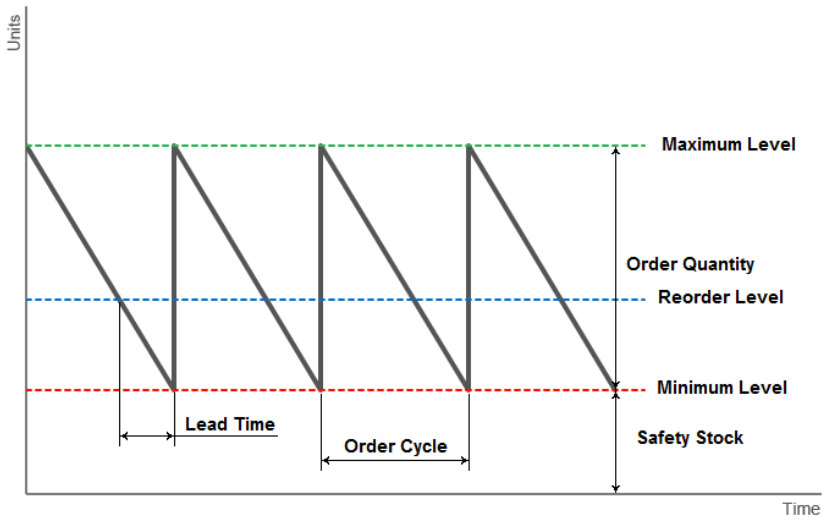

Figure 2.2. Reorder Point Graphic

(Source: http://financialmanagementpro.com/reorder-point/, November 2020)

b. Reorder Point (ROP) Formula

Bhavsar & Sinha (2019) stated that the reorder point in the inventory system is generally at a point where consumption in lead time is considered, plus safety stock is required. The reorder point in the probabilistic model is the minimum level of Inventory existing at which a new order must be placed (Harun & Mulyono, 2016). The formula for the reorder point is:

$$ROP = LT \times d \qquad (2.8)$$

Where:

L.T.: Lead time means the time required for an order to be made and delivered to the company. (unit is in days)

d: Daily demand, means the number of requests or sales per day faced by the company

c. Reorder Point (ROP) Function

Reorder point applied to make the purchase of materials that have been determined in the EOQ does not interfere with the smooth running of production activities. What is meant by ROP is the point where the amount of Inventory shows the time to reorder. According to Rafliana & Suteja (2018) stated that the reorder, or ROP, can be done in two ways, namely:

i. determine the number of materials or goods during the lead time plus a certain percentage.

ii. Determine the amount of material or goods used during the lead time plus the specified safety stock.

2.3.5. Finding the Value of Q

To get the results as expected, the calculation must be carried out by iteration. Iteration is so that the best optimal value can be found, namely by finding the convergent values point. The formula to get the Q value is:

$$Q = \sqrt{\frac{2 \times D}{HC} \times [RC + SC \times (D - ROL) \times Prob(D)]} \quad \frac{HC \times Q}{SC \times D} = \sum_{D=ROL}^{\infty} Prob(D) \quad (2.9)$$

The step that must be done is by:

a. Calculate the EOQ value that will be used as the initial value of Q

b. Substituting the Q value obtained in the previous step into the following equation, namely the second equation and solving this to find the ROL value.

c. Substituting the ROL value obtained in the previous step into the first equation to get the Q value for which the convergent value will be sought.

d. Repeat steps two and three in iterations until convergent values are found.