CHAPTER 2
LITERATURE REVIEW AND BASIC THEHORY

2.1. Literature Review

An explanation of theory, previous research, and current research will be discussed in this chapter. Apart from that, the differences and similarities between previous research and current research are also explained.

2.1.1. Previous Research

Previous research is used to compare research that will be carried out now. The research was conducted by Riyani Sulistyasari, M. Ardhya Bisma, and Ekra Sanggala (2023) regarding the inventory control analysis for Oshinbeauty product needs using the silver meal heuristic at PT XYZ. This research was conducted to overcome problems at PT XYZ, namely shortages (stockouts) of goods caused by fluctuating demand resulting in high inventory costs. To control this problem, researchers used the silver meal heuristic method. Using this method, the researchers obtained the results that the total cost of product inventory previously incurred by PT was 2,437,101,820, or the equivalent of 66% so that companies can improve control over the procurement of goods.

Michael Pang, Lily Puspa Dewi, and Yulia (2022) conducted research regarding implementing administration and inventory control systems in UD warehouses. X. This research was conducted because stockouts are prone to occur at UD. X, as well as inaccurate transaction recording. In solving this problem, Economic Order Quantity and Reorder Point calculations are used so that researchers can know the quantity and when to procure goods for each type of goods available. The results of this research are in the form of an application that can assist the warehouse in recording transactions correctly, and the existing application can provide reminders for inventory control on the dashboard so that stock can be managed better and minimize the possibility of stockouts occurring.

Research conducted by Nur Layli Rachmawati and Mutiara Lentari (2022) regarding the application of the min-max method to minimize stockout and overstocking of raw material inventory. This research aims to improve inventory control performance in Liquefied Petroleum Gas (LPG) spare parts manufacturing companies based in Indonesia. The min-max method is implemented in two types of products, namely O-rings and Diaphragm Retainers, so an effective inventory

policy can be determined by determining the amount of safety stock, maximum stock, order quantity, and reorder level. The research results showed that using the min-max method could reduce the final inventory of O-rings by 33.9 times the existing condition. In contrast, the final inventory of Diaphragm Retainers experienced an improvement in the stockout ratio compared to safety stock by 56.85%.

Research conducted by Saka Masdani (2022) regarding raw material inventory planning always uses better control (ABC) analysis, min-max method, Q model (continuous review), and P model (periodic review) at PT Eastwind Mandiri. This research was carried out because of a problem, namely the increase in total inventory costs. PT Eastwind Mandiri does not yet have an optimal raw material inventory planning system and does not have a basis for determining the quantity and time when orders should be made. In this research, a determination was made to minimize high total inventory costs to be more optimal and determine optimal lot inventory planning for each raw material order. Based on the research that has been carried out, it was concluded that by using ABC analysis, there are eight types (44.4%) of raw materials that fall into group A, namely with a budget of 75% or IDR 2,232,518 of raw material investment at PT Eastwind Independent. PT Eastwind Mandiri can obtain the alternative minimum, and maximum order limits according to the budget requirements spent ordering raw materials when using the min-max method. Using the Q model (continuous review model) and P model (periodic review) in this research obtained optimal planning results, total inventory costs, and inventory policies for each raw material. Then, for the results of the P model approach (periodic review), the total cost difference for each order made using the conventional method issued by the company is IDR 206,383,201, so applying the P model for each raw material order can provide savings. A budget of IDR 206,383,201 and cash flow becomes more efficient.

This research was conducted by Lestiana Sandrawati (2021) regarding the analysis of the economic order quantity (EOQ) method in controlling raw material supplies at CV Kampung Kaos Kidung in Prajegan Village, Sukorejo District, Ponorogo Regency. This research was conducted with the aim of inventory management, namely, providing the raw materials needed in the production process so that it can run smoothly without shortages or excess inventory so that inventory costs can be reduced to a minimum. CV Kampung Kaos Kidung has problems controlling the supply of raw materials for fabric and yarn, where the

company still often experiences shortages and excess supplies of raw materials. Companies must be able to estimate how much raw materials they need for fabric and yarn in the future. This research was carried out using a qualitative approach with data collection techniques in the form of interviews, observation, and documentation. As well as data analysis techniques using economic order quantity (EOQ), safety stock, reorder point, and total cost methods. The results of this research indicate that controlling the supply of raw materials using the Economic Order Quantity (EOQ) method is more efficient in controlling the supply of raw materials for fabric and yarn at CV Kampung Kaos Kidung. Companies can optimize the supply of raw materials for fabric and yarn and save costs for supplying raw materials for fabric and yarn. By establishing safety stock and reorder points, companies can anticipate excesses or shortages of raw fabric and yarn materials, thereby minimizing inventory costs.

This research was conducted by Juliyana Puspa Sari (2020) regarding efforts to reduce stagnation and stockout of category A drug supplies using a model (study at the Surabaya Mutual Cooperation Hospital). The research was motivated by the problem of stagnation and stockout of drug supplies at the Gotong Royong Hospital. If sales of drug supplies this year increase compared to the previous year, the hospital will experience an inventory shortage (stockout). Conversely, if sales experience a decrease, drug supplies will experience an excess (stagnant), causing an increase in storage costs and increasing total inventory costs. So, in the procurement planning process, a lead time is needed, calculated from planning, procurement, receipt, and distribution. Safety stock is also required, which does not yet exist at the Gotong Royong Hospital. This research was conducted using the Perpetual Purchasing Inventory Control Model. Implementation of inventory control with perpetual inventory, namely recording inventory continuously so that the inventory value and quantity can be known at the end of the period (month) and at any time. Inventory recording uses a computerized system via SIM-RS and manually via reserve stock cards. Calculation of stock quantities using stock counting. The Perpetual Purchasing Inventory Control Model is influenced by the stock position point where certain remaining stock must be reordered (in this research using Reorder Point) with a predetermined or variable order quantity (in this research using Economic Order Quantity).

Research conducted by Euro Noor Fernaldy (2018), regarding planning the supply of raw materials for bus seat production using the probabilistic EOQ method and Monte Carlo simulation. This research was carried out because of problems in the form of stock shortages of raw materials for plastic pellets and plastic dyes which have occurred several times. In addition, the lead time required for raw materials to arrive at the company often changes. When there is a stock shortage, the company needs to spend more to order raw materials from the nearest supplier or wait until the raw materials arrive, resulting in the production process being hampered and the company at risk of experiencing losses because it cannot fulfill customer orders on time. Researchers solve the problem by calculating the number of requests during lead time; determine distribution for use of raw materials, quantity requested during lead time and raw material lead time; calculate order quantity, reorder point, and safety stock with Probabilistic Economic Order Quantity (EOQ) of both raw materials; generating random numbers which is then continued by validating the data resulting from the random number generation; carry out simulations using Monte Carlo Simulation to determine the total value of inventory costs; and validate the results obtained from the probabilistic EOQ with the results obtained from the Monte Carlo simulation by calculating the confident interval value. Based on this research, calculation results were obtained in determining the quantity order for plastic pellet raw materials of 7701 kg and plastic dye raw materials of 104 kg which were then simulated using Monte Carlo Simulation to overcome the company's problems in the form of several stockouts. The safety stock required is 2868 kg for plastic pellets and 39 kg for plastic dyes. Other results obtained from the EOQ method in the form of average stock, order frequency, number of purchases, and total costs are all within the confidence interval calculated based on the results of 5 replications of Monte Carlo simulations.

This research was conducted by Melly Aguslita Ho (2014), regarding the evaluation of the implementation of inventory management to reduce stockout costs at UD Diva Sukses Bersama. This research was conducted to resolve problems that occurred regarding the inventory management of UD Diva Sukses Bersama. Based on the research results, it is known that stockouts can be caused by several things, including delays in the production process carried out by suppliers, lack of attention given by the warehouse/admin section to the current inventory, thereby reducing coordination for placing orders made by the owner, thus causing delays.

orders that result in insufficient stock when demand exists. This research is needed as a review of inventory procurement which will be carried out by considering demand and lead time. The results of this research are the application of inventory management in the form of calculating economic order quantities, reorder points, and safety stock, so that stockout costs that have occurred so far can be minimized.

This research was conducted by Sri Hartini, Haryo Santoso, and Retno Susanti (2009), regarding alternative methods of forecasting and determining safety stock levels to reduce the risk of stockouts (case study of PT Sari Husada II, Tbk Kemudo Klaten). This research was conducted on problems that occurred in the company, namely that there were orders from customers that could not be fulfilled according to the specified quantity and time because the goods ordered showed that the company had a low service level. From the company it is known that there are still errors in forecasts which are the difference between the PO from PT Tiga Raksa Satria and the company's sales target and it turns out that for finished products sometimes the existing inventory is insufficient, resulting in lost sales. To help overcome this problem, a new forecasting method is proposed that uses trend analysis to reduce errors in forecasting. Apart from that, the inventory determines the amount of safety stock to reduce lost sales that occur within the company. This research produces an overview of the use of forecasting methods with trend analysis and a reduction in error is obtained, and by determining safety stock, lost sales will be reduced.

Research conducted by Rike Indrayati (2007), at a furniture company, PT Tipota Furnishings Jepara, aimed at controlling raw material supplies. This goal can be achieved by applying the EOQ (Economic Order Quantity) method. The research carried out shows the results of the calculations carried out and obtains cost savings.

This research was conducted by Nadya Fabiani, Parwwadi Moengin, and Sucipto Adisuwiryo (2019), regarding PT Braja Mukti Cakra, an Indonesian manufacturer of precision automotive parts, faced challenges due to disorganized raw material storage in their warehouse, causing production delays. A research initiative sought to enhance the warehouse layout, assessing the current setup, simulation improvement, and proposing three layout changes. Using the Benferonni method, the third proposal emerged as the most effective, cutting down material retrieval times from 122.23 hours to 71.18 hours, marking a 41.76% improvement.

Research conducted by Trio Kusuma and Muhammad Firdaus (2019) show UD. Wangdi W Engineering, a manufacturing firm specializing in innovative machine production, employs 49 individuals, with 34 in production and 15 in administration and marketing. Despite an annual demand of 176 machine units, they only managed to complete 136 due to challenges posed by increasingly complex machine orders, which elongate production times. To address this, a calculation method categorized machines into four complexity levels and determined optimal staffing based on standard manufacturing times. The findings revealed a need for 49 employees, whereas the company currently has 34, an indication of a shortfall of 15 workers. By recruiting these additional personnel, UD. Wangdi W Engineering aims to enhance productivity and meet order demands more effectively.

Research conducted by Revi Famelia (2022) shows Waras Pharmacy, a medicinal service provider, struggles with manual recording, leading to inventory management challenges. This research aims to develop an application aiding waras pharmacy in efficiently recording and managing drug inventory using the FIFO perpetual system. Data was collected via observation, interview, and literature reviews. The Prototype method, with DFD as an analytical tool, facilitated system design. Using Laravel, Composer, and Visual Studio Code, the system was developed, encompassing flowcharts, DFDs, ERDs, and databased designs. Black box testing confirmed the system's capability in managing drug data, suppliers, inventory and generating accurate reports.

Research conducted by Ade Qaddafi and Agung Wahyudi (2020) regarding Rika 86, founded in 1986, operates in the convection sector with limited data management, relying on manual record for sales, purchases, and returns. Lacking a centralized system, inventory data is scattered across books, leading to inefficiencies and potential order delays. To address this, an application was designed using the UML method, coded in PHP with MySQL as the database. Testing indicated high software quality. The web-based buffer stock method was employed, enabling Rika 86 to accurately assess current inventory and determine reorder quantities, enhancing operation efficiency.

Table 2.1. Previous Research

No	Author	Problem	Research Method	Research Result
1	Sulistyasari, R, et al. (2023)	Shortage (stockout) of Oshinbeauty products at PT XYZ caused by fluctuating demand resulting in high inventory costs	*Heuristic Silver Meal*	Through determining the optimal lot size by PT XYZ, cots are minimized 66%.
2	Pang, M, et al. (2022)	Prone to stockouts at UD X as well as inaccurate transaction recording	*Economic Order Quantity, Reorder Point*	An application that can help the warehouse record transactions correctly, and the existing application can provide reminders for inventory control on the dashboard so that stock can be managed better and minimize the possibility of stockouts.
3	Rachmawati, and Lentari, M. (2022)	There are frequent stockouts and overstocks of raw material supplies at Liquefied Petroleum Gas (LPG) spare parts manufacturing companies based in Indonesia.	*Min-Max*	The min-max method can reduce the ending inventory of O-rings by 33.9 times from existing conditions, while the ending inventory of Diaphragm Retainers has improved the stockout ratio compared to safety stock by 56.85%.

Table 2.1. Previous Research

No	Author	Problem	Research Method	Research Result
4	Masdani, S. (2022)	The total inventory costs are increasing because PT Eastwind Mandiri does not yet have an optimal raw material inventory planning system and does not have a bases for determining the quantity and time when orders should be placed.	*Always Better Control* (ABC), *Min-Max*, Q (*continuous review*), P (*periodic review*)	ABC analysis shows that eight types (44.4%) of raw materials fall into group A, with a budget of 75% or IDR 2,232,518 of raw material investment at PT Eastwind Mandiri. PT Eastwind Mandiri can obtain alternative minimum and maximum order limits according to the budget requirements for ordering raw materials when using the min-max method. Using the Q model (continuous review model) and P model (periodic review) in this research obtained optimal planning results, total inventory costs, and inventory policies for each raw material. Then, for the results of the P model approach (periodic review), the total cost difference for each order made using the conventional method issued by the company is IDR 206,383,201, so applying the P model for each raw material order can provide savings. A budget of IDR 206,383,201 and cash flow becomes more efficient.

Table 2.1. Previous Research

No	Author	Problem	Research Method	Research Result
5	Sandrawati, L. (2021)	Reducing inventory costs without shortages or excesses of raw materials needed in the production process at CV Kampung Kaos Kidung in Prajegan Village, Sukorejo District, Ponorogo Regency	*Economic Order Quantity (EOQ), Safety Stock, Reorder Point, Total Cost*	Companies can optimize the supply of raw materials for fabric and yarn and save costs for supplying raw materials for cloth and yarn. By establishing safety stock and reorder points, companies can anticipate excesses or shortages of raw fabric and yarn materials, thereby minimizing inventory costs.
6	Sari, J. P. (2020)	The problem of stagnant and stockout of drug supplies at the Gotong Royong Hospital	*Economic Order Quantity, Perpetual Purchasing Inventory Control Mode*	Implementation of inventory control with perpetual inventory, namely recording inventory continuously so that the inventory value and quantity can be known at the end of the period (month) and at any time. Inventory recording uses a computerized system via SIM-RS and manually via reserve stock cards.

Table 2.1. Previous Research

No	Author	Problem	Research Method	Research Result
7	Fernaldy, E. N. (2018)	Stock shortages of raw materials for plastic pellets and dyes have occurred several times. In addition, the lead time required for raw materials to arrive at the company often changes.	*Economic Order Quantity* (EOQ)	The order quantity for raw materials for plastic pellets was 7701 kg, and raw materials for plastic dyes was 104 kg, which was then simulated using Monte Carlo Simulation to overcome the company's problems in the form of several stockouts. The safety stock required is 2868 kg for plastic pellets and 39 kilograms of plastic dyes. Other results obtained from the EOQ method in the form of average stock, order frequency, number of purchases, and total costs are all within the confidence interval calculated based on the results of 5 replications of Monte Carlo simulations.
8	Ho, M. A. (2014)	Stockouts can be caused by several things, including delays in the production process carried out by suppliers and lack of attention given to the inventory by the warehouse/admin section.	*Inventory Management*	Implementation of inventory management takes the form of calculating economic order quantities, reorder points, and safety stock so that stockout costs that have occurred so far can be minimized.

Table 2.1. Previous Research

No	Author	Problem	Research Method	Research Result
9	Hartini, S, et al. (2009)	Risk of stockout (case study PT Sari Husada II, Tbk Kemudo Klaten)	Forecasting, Safety Stock	Produce an overview of the use of forecasting methods with trend analysis and obtain a reduction in error, and by determining safety stock, lost sales will be reduced.
10	Indrayati, R. (2007)	Uncontrolled supply of raw materials at PT Tipota Furnishings Jepara	Economic Order Quantity (EOQ)	Shows the results of calculations carried out and obtains cost savings.
11	Nadya, F, et al. (2019)	Design of a Raw Material Warehouse Layout Simulation Model Using The Shared Storage Method at PT. Braja Mukti Cakra	Shared Storage	Third proposal emerged as the most effective, cutting down material retrieval times from 122.23 hours to 71.18 hours, making a 41.76% improvement.
12	Trio, K, and Muhammad, F, (2019)	Determining The Optimal Number of Workforce to Increase Work Productivity UD Rekayasa Wangdiw	Westinghouse Method	Research shows that company indicating short of workers by 15 personnel.
13	Revi, F, (2022)	Analysis and Design of Inventory Accounting Information Systems at Sane Pharmacy Using the FIFO Method	FIFO Method	The Prototype method, with DFD as an analytical tool, facilitated system design/
14	Ade, Q, and Agung, W, (2020)	Warehouse Inventory Information System Availability of Stock of Goods Using Buffer Stock Method	Buffer Stock	Buffer Stock method help Rika 86 to determine the quantity existing inventory and amount of inventory that must be orderd.

2.1.2. Current Research

Research is currently being carried out at CV Ajisata to find improvements that can be used to handle stockout problems, as well as determine the right time and order quantity based on the amount of stock available. This research focuses on processing data requests for cigarettes that vary in type and have fluctuating consumer demand data patterns. On the other hand, CV Ajisata has a consideration limit on the number of goods ordered from the supplier PT Indo Kretek Indonesia, namely 5,000 Gold cigarettes, 7,000 Habbat's cigarettes, 4,000 CK cigarettes, and 10,000 Tani Madjoe cigarettes. Based on observations and interviews conducted with CV Ajisata owners and employees, CV Ajisata has problems regarding stockout incidents, so they can be minimized and know the correct order time. Apart from that, researchers can create a plan for employees so that the remaining stock can easily be determined without having to check back and forth in the warehouse.

Based on the explanation above, there are several uniqueness in this current research, the uniqueness of this research is that there are four types of products that have their own enthusiast based on the taste and price of the product, and the use of the product as an alternative therapeutic ingredient for health by marketing through word of mouth and the therapeutic are free, there are free cigarettes whenever customer doing therapy in the store that the owner never record the amount of the free cigarettes.

2.2. Basic Theory

2.2.1. Stockout

Stockout is a situation where consumer demand cannot be met because supplies are exhausted/empty. In the short term, stockouts may cause backorders/lost sales, so the industry will lose revenue and profits. Lost sales/backorders are an incident where a sales opportunity is lost because the goods are not available, which causes sales to lose the chance to sell (Jarrett, 2015). Lost sales can drive less tangible costs in the long term. These costs are associated with the loss of customer upside intent. This means that a customer who experiences a stockout from a supplier may think twice before submitting another order to the same supplier or, even worse, may inform other customers about the treatment he received and how it affects them in the future.

2.2.2. Retail

According to Risch (1991:2), retail is selling a few commodities to consumers. Retail comes from the French word "retailer," which means "to cut into small pieces." Gilbert (2003:6) also confirms this opinion, which states that retail is all business ventures that directly direct their marketing capabilities to satisfy end consumers based on the organization selling goods and services as the core of distribution. Retail has several functions and characteristics; this was also stated by Berman and Evans (2001), namely:

a. Small Average Sale

The level of retail sales at the store is relatively small because the target is final consumers who buy in small quantities.

b. Impulse Purchase

Most of the purchases that occur in retail are unplanned purchases. Retailers must pay attention to this, namely, how to find the right strategy to maximize purchases and optimize income.

c. Popularity of Stores

Retail success depends on the popularity and image of the store or company. The more famous the shop or company, the higher the level of visits, ultimately impacting revenue.

Retail includes several activities, such as:

a. Providing goods needed by end consumers.

b. Selling at a fair price.

c. Deliver it to consumers.

d. Convince consumers that the goods sold by retailers can meet consumer needs.

In his writing, Kotler (1997) classified retailers based on the product lines they sell. Store Retailing, which is included in this category, are:

i. Specialty Store (Special Store)

A specialty store is a unique store that sells a narrow product line with various goods contained in that line. In this case, retailers try to serve consumers from one or a small number of market segments by providing unique products. The volume is not too large; it is privately owned, and the legal entity is an individual business, firm, or CV. Specialty stores can be further classified according to the degree of specialty of their product lines. Clothing stores are single-line stores. For example,

specialty shops, namely AGIS (PT Artha Graha Investama Sentral), are retailers specializing in electronic goods, and the Holland Bakery bakery sells bread. Specialty stores can then be further classified based on product type, selection, quality, price, and the size and location of the store.

ii. Department Store

A department store is a retail institution that offers various product lines with selected qualities. Usually, shops like this have a large business volume, their financial condition is more robust, and their legal entity is a limited liability company or at least a CV. There are two types of retail department stores, namely line department stores and limited-line department stores. Line department stores are a type of retail department store that offers many kinds of merchandise. Limited-line department stores provide several categories of goods, generally soft goods, such as clothing, towels, and bed linen, with a model orientation and high prices.

iii. Daily Necessities Store (Convenience Store)

Daily necessities shops are relatively small shops located in residential areas or on high-traffic routes, have extended opening hours (24 hours) seven days a week, with a high turnover rate, and sell a limited line of convenience products, such as snacks, drinks, candy, cigarettes, etc. It has extended opening hours and operates at high prices because consumers buy at this store only as a "complementary."

iv. Supermarket

Supermarkets are stores with relatively large operations, low costs, low margins, and high volume. Supermarkets are designed to serve all consumer needs, such as grocery products, meat, fresh fish, vegetables, fruit, canned drinks, laundry, and household care products. Now, many supermarkets complete their offer with non-food items, such as detergent, bath soap, spoons, and forks.

v. Discount Store

Discount stores regularly sell standard goods at lower prices because they take lower margins and sell at higher volumes. Generally sell national brands, not low-quality goods. Today, discount retailers have moved from general merchandise to specialty.

vi. Off-Price Retailers

Discount retailers are retailers who buy at prices lower than wholesale prices and charge consumers prices lower than retail prices. They tend to sell a changing, unstable, and often residual, unsold, and defective merchandise inventory

obtained from other manufacturers or retailers at lower prices. Discount retailers have thrived in clothing, accessories, and footwear. There are three main types of discount retailers: factory outlets, independent off-price retailers, and warehouse clubs/wholesale clubs. Factory outlets are shops owned and operated by manufacturers, usually selling excess, no longer produced, and irregular goods. Independent off-price retailers are stores owned and used by entrepreneurs or divisions of large retail companies. Warehouse clubs/wholesale clubs are stores that sell a limited selection of branded food products, household goods, clothing, and other products at significant discounts to members who pay annual fees.

vii. Super Store (Superstore)

A superstore is a combination of a supermarket and a discount store. The average superstore has 35,000 square feet of selling space and aims to meet all consumer needs for routine food and non-food purchases. They usually offer laundry, cleaning, shoe repair, check cashing, bill payment, and cheap lunches.

viii. Catalog Showroom (Catalog Showroom)

A catalog showroom is a shop that sells quite a large selection of products with high margins, fast turnover, and branded products at discount prices. The products sold include jewelry, carpentry tools, small tools, toys, and sports equipment.

2.2.3. Inventory

According to Assauri (2008), inventory is an activity that includes company-owned goods intended to be sold within a certain period or an inventory of goods still in the production process. Meanwhile, according to Ristono (2009), inventory can be interpreted as goods that are stored and used for sale in the future. In his writing, Rangkuti (2004) explained that by having inventory, the activities of a company that must be carried out continuously will be made more accessible, and it will eventually produce goods and convey them to customers. According to Rangkuti (2004), there are several functions of inventory.

a. Decoupling

Decoupling is one of the functions of inventory, which is helpful in fulfilling customer requests without having to depend on suppliers. This means that a company can provide its supply of raw materials to carry out the production process without waiting for the arrival of raw materials from suppliers. With this function, a company is not entirely dependent on procuring raw materials from suppliers in terms of delivery time and raw material quantity factors.

b. Economic Lot Sizing

Economic lot sizing is a function that a company can consider when purchasing discounts or discounts from suppliers. This is because the company will purchase inventory in larger quantities than usual, thereby getting cheaper costs and discounts on purchase prices and shipping costs, which will be more affordable due to purchasing in large quantities.

c. Anticipation

The anticipation function can be used when a company experiences unpredictable or unpatterned demand, which means it has fluctuating demand. The company can still estimate how much it needs based on historical data stored by the company. The anticipation function can also be applied when companies often face uncertainty regarding delivery and product demand during a specific period. When this situation occurs, the company needs sufficient inventory or what is often referred to as safety stock.

2.2.4. Important Factor in Inventory

According to Tersine (1994), several essential factors in inventory need to be considered as follows.

a. Charging Inventory

This factor is a type of inventory that can change over time when it reaches a certain point, and it will experience changes, which will result in a decrease in the value and function of the goods.
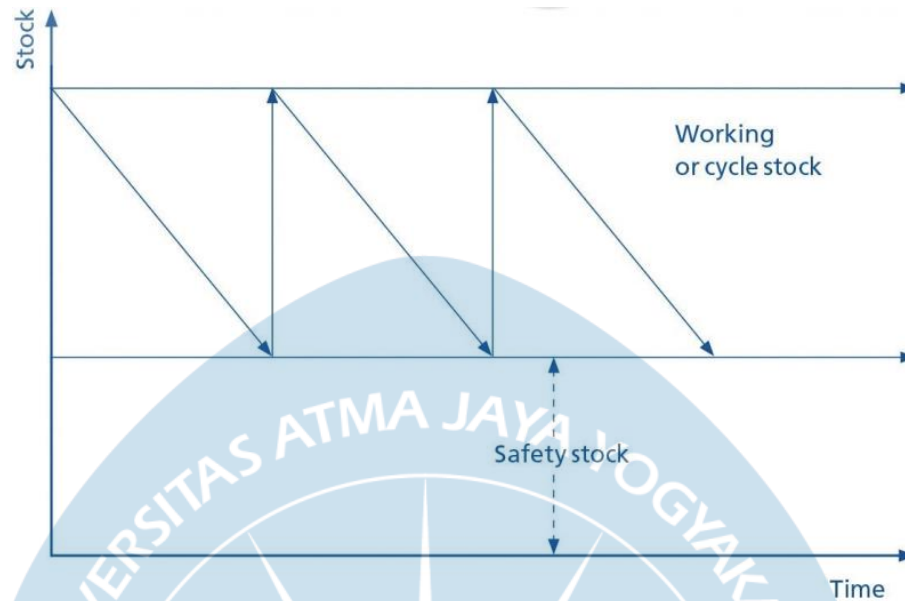
b. Safety Stock

Figure 2.1. Safety Stock

(Source: Ryando (2019))

In his research, Ryando (2019) revealed that safety stock is inventory that protects or prevents the possibility of shortages of goods, such as using more goods than estimated initially or delays in receiving ordered goods. According to Hardono (2020), safety stock is used to reduce the risk of stockouts. Safety stock is needed so that when there is a sudden increase in demand, the additional inventory can be used to meet that demand. Several factors influence companies to carry out safety stock, as follows:

i. High stockouts can cause significant costs or losses.

Suppose the materials needed for the production process are not available. In that case, the company's operation will stop, resulting in workers and factory facilities being idle, which can cause a decline in company sales.

ii. Varied or uncertain demand is increasing.

Safety stock is needed as a preventive measure when demand exceeds previously planned estimates.

iii. The stockout risk level increases.

Limited availability of inventory on the market and difficulties companies faces in fulfilling inventory in the company. This obstacle can cause stockouts in the company.

iv. Affordable safety stock storage costs.

If the company has adequate and feasible warehouse facilities, storage costs can ve managed efficiently to anticipate the possibility of stockouts.

So, it can be concluded that the purpose of holding a safety stock is to cover possible shortages of raw materials due to usage exceeding the original estimate and delays in receiving the ordered raw materials. In research conducted by Mikhrani (2022), formula 2.1 can be used to calculate safety stock.

$$SS = (maximum\ demand - average\ daily\ demand) \times lead\ time \qquad (2.1)$$

Information:

SS : Safety Stock

Lead time : The delay between the time of ordering until the goods arrive.

c. *Demand*

Deman in a company is the primary consideration in determining the policies used to select the mathematical model that will be used.

d. *Reorder Level*

This factor is when the company must place back orders to prevent stockouts.

e. *Lead Time*

Lead time is the time it takes for a product to stat form being ordered until the item or product arrives at the company.

2.2.5. Inventory Control

Inventory control is an important thing that companies must consider to ensure that inventory is available according to needs at the right time. According to Assauri (2008), inventory control is an activity to determine the level and quantity required for the inventory of raw materials, components, and goods resulting from the production process so that the company can maintain a smooth production and sales process and other necessary needs. By the company efficiently. Apart from that, according to Ristono (2009), inventory control is an effort to monitor and determine the optimal level of material composition to support smooth, effective, and efficient company activities.

According to Rangkuti (2004), inventory control carried out by a company, from raw materials to finished goods stored in the warehouse, has several objectives.

a. Anticipate and prevent the risk of possible delays in the arrival of goods or products ordered from suppliers.

b. Anticipate and prevent the risk of damaged goods or products during delivery.

c. Maintaining the stability of the company's operations so that it continues to run well.

d. To optimize the use of machines owned by the company so that these machines do not become idle.

e. So that the company is always able to provide the best possible service to customers by fulfilling customer requests well.

2.2.6. Min – Max Method

According to Hertanto (2020), the min-max method is a primary method where inventory is at two levels: the maximum and the minimum. The maximum inventory level is the amount that can be stored. Meanwhile, the minimum inventory level is the amount of usage during the time of the purchase order. Once both levels have been established, when inventory reaches the minimum level, an order must be placed to place inventory at the maximum level. In her research, Rachmawati (2020) revealed that the min-max method is an inventory control method for determining maximum and minimum inventory so that companies can minimize stock shortages and excess stock. There are several stages in calculating the min-max method, namely:

a. Minimum Inventory

Minimum inventory calculates the minimum inventory amount to know the stock amount at which a product can reordered. To find out the minimum inventory, it is necessary to calculate using formula 2.2.

$$Min = \ (average\ daily\ demand \times lead\ time) + safety\ stock \qquad (2.2)$$

Information:

Min : Minimum inventory

Lead time : The delay between the time of ordering until the goods arrive.

Safety stock : Safety stock

b. Maximum Inventory

Maximum Inventory is a calculation to determine the maximum amount of inventory to determine how much of a product can be available in the warehouse. To find out the maximum inventory, it is necessary to calculate using formula 2.3.

$$Max = 2(lead\ time \times average\ daily\ demand) + safety\ stock \qquad (2.3)$$

Information:

Max : Maximum Inventory

Lead time : The delay between the time of ordering until the goods arrive.

Safety stock : Safety stock

c. *Quantity Order*

Quantity order is a calculation used to determine the quantity ordered when replenishing goods. To find out the order quantity, if is necessary to calculate using formula 2.4.

$$Q = Max - Min \qquad (2.4)$$

Information:

Q : *Order quantity*

Max : Maximum Inventory

Min : Minimum Inventory

So, it can be concluded that the min-max method is a method for determining the maximum and minimum inventory amounts. Minimum inventory determines how much inventory must be left in the warehouse to prevent problems, such as delays in delivery and so on. Minimum inventory can also choose how to avoid stockouts and how much a product will be reordered. Meanwhile, maximum inventory can be used to determine the maximum amount allowed to be kept in inventory. The min-max method includes maximum inventory calculations, minimum inventory, order quantity, and safety stock calculations.

2.2.7. Economic Order Quantity (EOQ) Method

The Economic Order Quantity (EOQ) method is a classic and straightforward inventory management method. The first formulation of the EOQ method was discovered by FW Harris in 1915, but this method is often called EOQ Wilson because it was developed by a researcher named Wilson in 1934. According to Divianto (2011), this method calculates the minimization of total inventory costs based on the equation level or equilibrium point of the holding and ordering costs

curve. This method assumes a definite demand with orders being made constantly and no inventory shortage. According to Rangkuti (2007), the assumptions that must be fulfilled in the EOQ method are as follows.

a. The level of demand comes constantly and repeatedly and is known.

b. Stockouts are not allowed.

c. Materials are ordered and produced at one time.

d. The ordering cost of each unit is constant.

e. Single item ordered.

However, these assumptions cannot be fulfilled in reality because of conditions and circumstances that can sometimes occur suddenly. Therefore, the EOQ method underwent development adapted to the company's conditions and circumstances. But in general, the EOQ method can be seen in Formula 2.5.

$$EOQ = \sqrt{\frac{2.\,P.\,D}{S}} \qquad (2.5)$$

Information:

P   : Coast each time order

D   : Demand level per planning time horizon

S   : Storage costs per planning time horizon

Graphic depiction of economic order quantity according to Heizer and Render (2015:93) which can be seen in Figure 2.2.
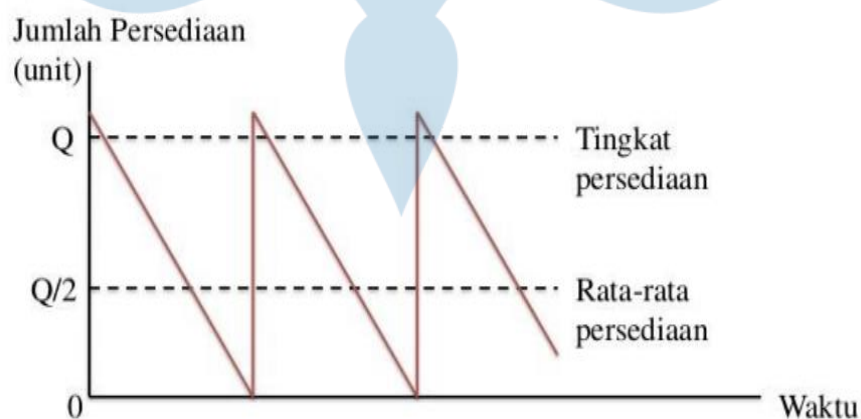

Figure 2.2. Graphic Economic Order Quantity (EOQ)

(Source: Heizer and Render, 2015)

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The optimal Q value can be obtained using tables, graphs, or formulas.

2.2.8. Always Better Control (ABC Analysis)

The ABC Analysis system method is An approach that considers variable like price, frequency, inventory value, etc. Different degrees of control are needed for each component. Pareto's law is used in this ABC analysis to ascertain each item's degree of control. According to Heizer and Render (2020), the Pareto principle is creating an inventory policy that concentrates on the inventory components that are deemed vital. This is due to the irrationality of monitoring fundamental commodities with the same intensity or attention and expecting them to yield comparable outcomes to low-cost items with less effort. This approach will categorize and object into three classes, A, B, and C, with distinct classification for each category. Given its significance and massive sales volume, Category A is a product area that needs additional focus. 15% of all inventory items and 70-80% of all monetary consumption are accounted for by Category A. Products in Category B are medium-volume items that need regular or routine supervisory oversight. Category B accounts for 15-25% of overall monetary utilization and 30$ of all inventory goods. Product group C is low volume; 5% of total use dollars and 55% of all inventory items are in category C. Using this ABC technique, we can determine which items fit into categories A, B, or C, allowing us to develop strategies and final decisions that have strategic and final decisions that have strategic value for the company or shop owner.

2.2.9. Perpetual Inventory System Method

According to Horngren, Harrison, and Oliver (2012) in their book entitled Financial and Managerial Accounting, the perpetual method is a method of recording inventory with constantly updated data, usually using computer devices. This system has better control than inventory. In general, modern perpetual inventory systems record the following things: units purchased and their costs, units sold and their costs, and the amount of inventory on hand. There are several goals to be achieved by applying this method, as follows.

a. Real-time monitoring

Changes that occur must be recorded actually and in real-time. By implementing this method, employees/business actors do not need time and energy to inspect goods physically.

b. Accurate recording

Defect recording becomes more accurate with this method because it involves computerized applications and systems, so the accuracy of perpetual recording can be guaranteed. Calculation errors can be continuously reduced to make the data obtained more accurate.

c. Fast error detection

One of the impacts of a computerized system is that it is easy to detect errors related to the inventory held. Not only does it record every incoming and outgoing item, but it can also help track lost shipments.

d. Individual transactions

Every product sold or purchased will be recorded in detail. The perpetual inventory system will always record each transaction to obtain transaction data quickly.