Jurnal Teknologi dan Manajemen

ISSN (Print) 1693-2285 ISSN (Online) 2808-9995

Literature Study

Literature Review of Inventory with Probabilistic Economic Order Quantity (EOQ)

Annisa Wirrdiana Yuniasih[1], Nur Rohmah Lufti A'yuni[2]

[1,2]*Jurusan Pertanian, Politeknik Pembangunan Pertanian Yogyakarta Magelang, Yogyakarta, Indonesia*

ARTICLE INFO

Received : 14 December 2023
Revised : 31 January 2024
Accepted : 31 January 2024

KEYWORDS

Inventory, Inventory Control, Literature Review, Probabilistic EOQ

CORRESPONDENCE

E-mail Correspnding Author:
annisawirrdiana@gmail.com

A B T R A C T

In the current era of global competition, many trading companies compete to meet consumer needs. This competition causes the level of demand between companies to fluctuate, resulting in problems in the company's inventory system for goods or products. Inventory problems that often occur in a company include over stock, stock out, underproduction, overproduction, back log, and inventory that does not in line with company targets. This inventory problem is one of the things that must be overcome by controlling mathematically using methods that suit needs. One method that assumes this fluctuating demand used a Economic Order Quantity (EOQ) Probabilistic model. Therefore, this study aims to examine the use of Probabilistic EOQ in controlling company inventory and determine the effect of using this model in company inventory. This study uses the Systematic Literatur Review or SLR method with a qualitative model that combines several literature articles as a reference for the study. The study produced several important notes on the use of the Probabilistic EOQ model. This model aims to optimize total inventory costs with the assumption that demand for products or goods is very fluctuating. This model assumes that the data is normally distributed with a lead time as the basis for decision making in calculating optimal inventory. Apart from that, other supporting methods are needed to strengthen calculations to overcoming inventory shortages, such as safety stock or safety supplies and reoder point. The research results show that this method can be used on various types of food and non-food items. However, the use of companies with constant demand and other problems that do not comply with the Probabilistic EOQ requitements.

INTRODUCTION

In the current era of global competition, many trading companies compete to meet consumer needs. These consumer needs can be met by the merchandise offered by the company. These goods are related to the company's inventory as one of the conditions for distribution to run smoothly. Inventory is defined as goods or products owned by a company to be sold or reprocessed and used as a source of income for the company (Noer, 2022). The company's operational activities can run smoothly if product or raw material inventory management can be fulfilled properly. However, the company's inventory is not always well met. There are many inventory problems that can occur which can disrupt the goods distribution process. Inventory problems can be a factor that causes losses to an industry or company.

Several problems that often occur in company inventory control include underproduction, overproduction, stock out, late delivery, over stock, and inappropriate supplies (Rachmawati & Lentari, 2022). One of the problems of trading companies is a lack of stock of raw materials and products. Stock shortage or what is usually called stock out a condition where there is no company inventory. This condition causes delays in production flows, increases the number of unfulfilled demands and causes costs of inventory shortages. On the other hand, if the inventory of goods is too excessive due to decreased demand it can cause over stock. This problem can result in disruption to the company's finances with the circulation of company funds being hampered because goods are not sold quickly. The emergence of over stock and out stock is a problem that can cause losses in the company's inventory system (Saputri et al., 2023). This loss is caused by uncertain demand or product sales so inventory control is needed.

Inventory can be said to be optimal if the goods or products stored by the company can match the input and output produced at optimal costs (Ambarita, 2023). Inventory is a resources owned by a company in the form of raw materials

that have not been used and can be processed to become high-value goods (Sultana, 2020). Inventory has several functions such as playing an important role in inventory, fulfilling demand, and comparing the amount of inventory with discounted prices (Ambarita, 2023). According to the production process, inventory has several types, such as (Sultana, 2020) inventory of raw materials, assembly components, auxiliary materials production, work in progress, and finished goods.

Inventory control needs to be carried out in order to optimize inventory costs while still paying attention to the condition of goods or products in stock. Good inventory management can place a company in a safe zone from the threat of inventory problems to meet demand (Nursyanti & Syauqi, 2021). The aim of inventory control is to streamline production activities and be able to provide services for goods needs at any time. There are other objectives specifically for inventory control, such as Sultana (2020) to provide the best service to consumers and streamline production Activities. In addition, inventory control is carried out to overcome inventory shortages Ana minimize problems when prices of goods or raw materials fluctuate.

In inventory control, various influencing factors are found, such as the emergence of inventory costs and raw material prices. Inventory costs in a company are divided into storage costs, ordering costs, and shortage costs. Storage fees are costs incurred by the company for investment in inventory and maintenance of goods or raw materials in the warehouse. These costs can include warehouse rental costs, costs for treating goods or raw materials, obsolescence costs, taxes, and others (Juniastina, 2018). Ordering cost are cost when ordering and receiving goods or raw materials (Sultana, 2020). Inventory shortage costs are costs that exist due to a lack of inventory, resulting in unmet consumer demand (Juniastina, 2018).

The inventory control process with various existing basic problems can be overcome with an inventory control model. In general, inventory control models are divided into deterministic models and probabilistic or stochastic models (Juniastina, 2018). The deterministic inventory model provides the assumption that each factor or component in the calculation is declared constant. In a probabilistic model each factor or calculation component is assumed to be uncertain or random. Many inventory problems are caused by erratic or inconsistent demand. This gives rise to uncertain operational activities so it can be assumed that the inventory model used is probabilistic.

Probabilistic model can be used to calculate inventory. The model can be used by companies where the number of request at any time is uncertani. Apart from that, it was found that several assumptions were part of this probabilistic model, such as fixed prices, no discounts for large quantities of purchases, and constant waiting times (Juniastina, 2018). The application of this model is widely used by companies or businesses that have fluctuating demand and experience inventory problems. One of the probabilistic models that is often used is the model Economic Order Quantity Probabilistic. Economic Order Quantity (EOQ) Probabilistic is an inventory model based on assumptions about demand and lead time which can not be known with certainty and a probabilistic approach needs to be taken.

Probabilistic inventory calculations can be calculated by determining the optimal items to order and aims to streamline company expenses. The application of the Probabilistic EOQ method can be carried out to determine the safety stock that must be stored in the warehouse to minimize out stock or whatever over stock. In addition, reorder point calculations for stored goods can be calculated in order to continue to meet consumer needs. This study regarding the success of using the Probabilistic EOQ model needs to be turned into an article that can explain the advantages of this inventory model. Using an inventory model that is efficient and appropriate to the company's circumstances can maximize company profits.

The existence of existing inventory problems becomes an obstacle to the distribution of the company's goods or products. In order to reduce company inventory costs, theoretical calculations are needed to prove that inventory control can be applied to overcome this problem. This research aims to examine how the Probabilistic EOQ model is applied in inventory control which has been implemented by several companies or industries. Apart from that, this literature review can prove how big the influence of the Probabilistic EOQ model is in controlling inventory in companies.

METHOD

This research uses qualitative data with literature study. The method chosen is systematic literature review with article sources from several portals such asgoogle scholar and GARUDA (Digital Reference Garba). Article sources were searched based on the selected topic, namely inventory control methods Economic Order Quantity (EOQ) Probabilistic across companies. Systematic Literature Review (SLR) is a research method used to collect literature on a topic along with evaluations of that topic (Triandini et al., 2019). This research technique uses data collection from certain libraries and processes it into a research article on the selected topic (Lati et al., 2023). The aim of the SLR method research is to conduct studies, identify evaluations and interpretations regarding certain

DOI: 10.52330/jtm.v22i1.220

areas that are considered interesting (Triandini et al., 2019). The steps in the literature study carried out begin with (Sulistio, 2018) :

1. Article Selection,
   Article are selected with reference from journals from the last 5 years. The selected articles are articles with a discussion focus on the Probabilistic EOQ method. Articles come from journals indexed with Google Scholar. The research object chosen are finished products, food, raw materials and trade goods. The industries that carry out inventory control using the probabilistic EOQ method.
2. Review,
   The review was carried out by analyzing the problems, method and result of the articles used. The author read in depth the contents of the article by writing important things regarding inventory control in the company.
3. Classification of Articles Based on Method,
   Articles are classified based on the method used. The method reffered to here is the role of using Probabilistic EOQ in controlling company inventory. Another method used as a supporting method for inventory control.
4. Analyze The Results.
   The data analysis or discussion section is analyzed using content analysis or content analysis data or research that is most relevant to the topic (Putri et al., 2020). The analysis is carried out in detail to find out the complete contents of the article and provide information review to the topic raised.

RESULT AND DISCUSSION

Economic Order Quantity Probabilistic

Economic order quantity or known as EOQ, is a mathematical method for calculating inventory by calculating the number of orders in each period in order to minimize total inventory costs (Dania et al., 2019). In EOQ there are two models that are the basis for data processing, namely constant and uncertain demand. Uncertainty in several company demands requires the need to calculate an inventory model that can accept the uncertainty in demand. The existence of a probabilistic EOQ is one way to determine optimal orders to minimize total inventory costs (Dania et al., 2019). The assumptions of this inventory model can be adjusted to the conditions in the company, including :

1. happen backlog for unfulfilled deliveries,
2. request uring lead time unchanged, and
3. there are no outstanding orders.

The probabilistic model has assumptions that are sensitive to changes in parameters, so many companies use this method because the demand for goods or raw materials is uncertain. Other assumptions are given in probabilistic inventory, these other assumptions are as follows :

1. demand is probabilistic with average demand and standard deviation having a normal distribution pattern,
2. constant price of goods or products,
3. ordering costs are constant and proportional to the price of goods and storage time,
4. service levels or the possibility of inventory shortages can be known, and shortage costs are proportional to the amount of demand that cannot be met.

Probabilistic EOQ calculations are carried out by processing company data in the form of primary and secondary data. Determining total orders is done by forecasting the use or need for goods for the coming period. The next stage is to calculate each supporting method that influences EOQ such as total inventory costs, safety stock, reorder point, service level, and the possibility of unmet demand (Situmorang & Purwaningsih, 2021). Calculations for each supporting factor need to be done to formulate the total cost of inventory required by the company.

Safety stock or safety stock is additional stock reserved to anticipate product or raw material stock shortages. Reorder point or reprocurement point is a condition where inventory is in minimum quantity and resupply needs to be carried out to avoid stock shortages. The optimum number of orders or order calculations that must be present in each order is calculated as the beginning of this calculation. Total inventory costs are costs calculated from all types of inventory costs required by the company. Total inventory costs include holding costs, stock-out costs, ordering costs, and other costs.

Previous Research

The following research is used as the basis for the researcher's analysis regarding the application of the inventory method economic order quantity probabilistic.

Table 1. Previous Research

No	Article Title	Writer	Year	Data Analysis Techique	Result
1	Analysis of Karra Inner Product Inventory System Using Simple Probabilistic EOQ Method on Kimka Hijab	(Lati et al., 2023)	2023	Economic Order Quantity (EOQ) Probabilistic	The research results show that the supply of Kara Inner products requires points reorder point amounting to 621 pcs, safety stock amounting to 45 pcs, with a total inventory cost of Rp5,685,619,326.97 per year.
2	Product Inventory Control Analysis Skincare at PT RRI	(Hilman & Budiarty, 2022)	2022	Economic Order Quantity (EOQ) Probabilistic	The research results show inventory calculations for five PT RRI products with codes KVU001, LCC006, SF003, SF017, and SIT005. Each product has safety stock, reorder point, and the optimum order quantity through calculations which results in TIC value savings of 21.74% from the company's initial TIC.
3	Analysis of Acrylic Raw Material Inventory Control Using Probabilistic EOQ Method and Monte Carlo Simulation at PT. XYZ	(Chandra et al., 2022)	2022	Economic Order Quantity (EOQ) Probabilistic and Simulasi Monte Carlo Simulation	The research results show inventory calculations for three types of acrylic, namely Clear ARC, Milk White ARC and Black ARC. Each product hassafety stock, reorder point, and the optimum order amount through calculations which results in savings in TIC value of 1.57% or Rp310,941,861 from the company's initial TIC.
4	Model Inventory Economic Order Quantity (EOQ) Probabilistics in Controlling Material Inventory at PT Perusahaan Es Siantar	(Situmorang & Purwaningsih, 2021)	2021	Metode Economic Order Quantity (EOQ) Probabilistik	The research results show that the supply of granulated sugar raw materials requires pointsreorder point as much as 8.827 kg safety stock amounting to 7551.53 kg, with a total inventory cost of Rp52,280,167 or can save Rp41,389,949 with a percentage of 44.18% of the company's current TIC.
5	Merchandise Inventory Control Using a Probabilistic Model (Case Study: XYZ Store)	(Diniaty et al., 2020)	2020	Forecasting Method using Weight Moving Average and Exponential Smoothing. Inventory method Economic Order Quantity (EOQ) Probabilistic	The research results show inventory calculations for four of XYZ Store's trading commodities, namely rice, sugar, cooking oil and flour. Each product has safety stock, reorder point, and optimum order quantity. The TIC generated for each item is Rp 386,671,032 per year for rice, Rp 125,072,163 per year for cooking oil, Rp254,573,746 per year for sugar and Rp125,909,965 per year for flour.
6	Implementation of Fabric Raw Material Inventory Policy Twist Using the Simple Probabilistic EOQ Method at PT Multi Garmenjaya	(Setiadi & Raihan, 2020)	2020	Economic Order Quantity (EOQ) Probabilistic	The research results show policyinventory fabric raw materialstwist the most economical is 29,428 m/year,safety stock for raw materials of 129 meters, and pointreorder point when stock is 154 meters. As for total TIC, using Probabilistic EOQ can reduce costs by Rp 7,490,741 per year.

 DOI: 10.52330/jtm.v22i1.220

Application of Probabilistic Economic Order Quantity in Company Problems

The Probabilistic EOQ model has been proven to be able to solve inventory problems in various industries (Lati et al., 2023). One example is that this model was applied to the garment industry for Karra Inner products from Kimka Hijab which was researched Bay Lati et al (2023). This is because the Karra Inner product is the product with the highest demand which experiences raw material problems in the product manufacturing process. The process of ordering Karra Inner raw materials can reach a waiting time of 3-4 days which causes the availability of raw material stock to be uncertain. This problem caused Kimka Hijab production to be disrupted so that incoming consumer orders could not be carried out immediately. This is in line with the absence of an inventory policy from Kimka Hijab to anticipate this problem. Therefore, it is necessary to calculate inventory policies according to uncertain demand conditions using the Probabilistic EOQ method.

The application of the Probabilistic EOQ method was also carried out at a skincare company that had inventory problems. This research was conducted by Hilman and Budiarty (2022), the research problem stems from high demand with reduced product inventory in the warehouse. Insufficient product supplies have caused production to decrease, which is not commensurate with the increasing demand for skincare from customers. The impact of this imbalance is out of stock or product shortages. Out of stock that occurs is indicated by sales data that is out of stock or over stock. From the identification of existing problems, inventory control was carried out using the Probabilistic EOQ method as a data processing tool in inventory control problems.

Research on Probabilistic EOQ strengthens the problems that exist at PT XYZ which operates in the acrylic manufacturing sector. Chandra et al (2022) stated that PT. XYZ is a production company in the Tangerang area, Banten and was established in 2019. The company has a focus on making acrylic from the income of raw materials until the product can be marketed to consumers. Even though the company already has a large production capacity, PT XYZ has not been able to forecast production needs. In the production process, businesses still apply estimates without a specific inventory theory. This causes problems such as stock outs or shortages of raw materials which have the potential to hamper company production. Probabilistic demand data and waiting times that can reach 1-4 days make it important that problems need to be resolved. Apart from that, to ensure optimal and more efficient availability of raw materials, it is necessary to solve problems using the Probabilistic EOQ method.

Apart from problems with non-food raw materials such as the research above, there are studies that carry out inventory control on food ingredients such as raw materials for ice and soft drinks. This research was conducted by Situmorang and Purwaningsih (2021) at PT. Siantar Ice Factory which is a producer of ice bars and soda drinks located in Pematang Siantar City. This factory always targets total annual production of 480,000 crates of bottles each year. In inventory management, the company has managers who have full responsibility for managing production. However, planning activities are still not planned properly and often cause stock outs. There is out of stock orout of stock causing delays in the production process of the company's products. This inventory problem is an interesting thing to research because it has a big impact on the company's operational side. The Probabilistic EOQ model was chosen to analyze inventory control using probabilistic principles due to uncertain or probabilistic economic changes.

Other previous research was conducted by Diniaty et al (2020) at Toko XYZ which is a grocery store with wholesale and retail purchasing services. Based on the information obtained, XYZ Store orders goods from other parties when the goods in the warehouse run out. If shop demand is high then the shop cannot meet demand because inventory is low. So buyers are required to wait for the goods to arrive first. The trading goods that XYZ Store sells are sugar, cooking oil, rice and flour. Ordering or waiting times take 3-12 days so cannot be predicted well. Other obstacles that occur are caused by several factors which are in accordance with the condition or form of the goods being sold. These factors include season, infrastructure, and production technology for several goods. This problem requires inventory control which is expected to anticipate shortages of goods. The research was conducted using the Probabilistic EOQ model to take into account demand behavior and order waiting times. Another objective of this research is to determine the company's safety stock and inventory costs.

Inventory control policies are carried out to minimize shortages of raw material supplies during the production process. This is in accordance with the objectives of the research conducted by Setiadi and Raihan (2020) at PT Multi Garmenjaya with company inventory data for 2019. This company is a type of textile and garment company which is a business that provides clothing for the community. The increasing needs of society cause the level of market demand for clothing products to continue to exist. The increase in demand causes competition in obtaining raw materials and gaining market share. In order to achieve maximum company profits, efficient inventory management related to company finances is needed. This research aims to determine the company's optimal

inventory policy, the company's service level, and the inventory costs that the company can incur in one period.

From the introduction of previous research and the background of each company's problems, it can be concluded that the inventory problem is one of the problems that needs to be resolved immediately. Solving inventory problems for uncertain demand can be calculated using a probabilistic model. The EOQ model in probabilistic form can determine the most optimal total purchases to overcome stock out. The calculation of this model begins by calculating and mapping the distribution of requests and waiting times bor lead time. Not all inventory models calculate lead time or lead time which can estimate the need for raw materials or goods as they occur lead time. This waiting time is the distance between the order arriving until the consumer or customer receives the order for the goods that must be ordered. Meanwhile, for goods that must be processed, the waiting time is the production process time until the consumer gets the product.

Waiting time data is compiled to carry out calculations safety stock Ana reorder point if there is an increase in demand. This data is compiled based on waiting time data for one period. After the waiting time data and demand data are arranged with a certain probability, the data can be tested using the normality test. This data normality test was carried out statistically using a Test Kolmogorov-Smirnovwith a significance level of 5%. This test is mandatory because in probabilistic calculations the value sought is the expectation of a shortage of demand that cannot be fulfilled during the waiting time. If the data is normally distributed then it can be continued with the calculation of the Probabilistic EOQ model. The data requirement is normally distributed with a data significance level of more than 0.05. In several studies, data normality tests were carried out as a requirement for the inventory model. This is to convince the company that with this method the possibility of a shortage of inventory after counting is no more than 5% (Setiadi & Raihan, 2020).

$$S_L = Sd \times \sqrt{L} \qquad (1)$$

The next calculation is carried out to determine requests that are not fulfilled during the waiting time orlead time. This calculation is used to calculate expected demand that is not met by the company. The calculation requires the standard deviation value during the stance time using the formula (Setiadi & Raihan, 2020).

After obtaining the standard deviation value, it can be searched for the value of demand that has not been fulfilled during lead time with the formula.

$$N = S_L[f(Z\alpha) - Z\alpha\Psi(Z\alpha)] \qquad (2)$$

After calculating the unknown demand value, data can be searched in the form of calculating orders or production with the most economical or optimal orders with demand for goods, ordering costs, storage costs and shortage costs using the economic ordering formula as follows

$$Qo = \sqrt{\frac{2D\ (A + CuN)}{H}} \qquad (3)$$

Optimal Q calculations are carried out to plan optimal orders or procurement of goods for one order. When calculating the economic order size, a significance level of 5% is used or the possibility of a calculation error does not reach 5%. Apart from calculating the optimal Q value, companies can also calculate the level of service that the company can provide with a significance level of 5% using a formula.

$$\eta = 1 - \frac{N}{DL} \qquad (4)$$

Calculations of the level of service provided need to be carried out to determine the extent of the company's service level that can be provided using this method. The EOQ calculation model requires other supporting methods to reduce fluctuations, namely existencesafety stock (Ulfa, 2018). The existence of this safety stock is needed so that the distribution process is not disrupted due to a shortage of materials or a shortage of goods. Safety inventory has the function of guarding against the possibility of shortages of raw materials or goods due to uncertain demand and delays in the supply of raw materials or goods in storage warehouses.

$$SS = Z\alpha \times S_L \qquad (5)$$

Calculation of safety stock orsafety stock This is the basis for the company's inventory during stock shortages so that it can still serve consumers. Safety inventory can fully cover inventory shortages to maintain the company's service level for customers (Juniastina, 2018). This safety stock calculation is to calculate the cost of existing inventory so as to minimize inventory shortages.

In addition to the amplifier calculation withsafety stock, calculations need to be made using the methodreorder point. This method is one of the inventory controls when determining orders or resupply of goods. This is in line with Setiadi and Raihan (2020) research that Activities reorder point This is done when a company has to reorder raw materials or goods so that they arrive at the right time. The purpose of the calculation reorder point to anticipate

DOI: 10.52330/jtm.v22i1.220

low stocks of raw materials or goods using mathematical calculations. Reorder point can be determined in various ways such as (Ulfa, 2018):

1. set the amount of usage during the waiting time,
2. determine the amount of safety stock, and
3. set lead time as minimum cost.

The formula used in the determinationreorder point is as follows.

$$ROP = (D \times L) + SS \qquad (6)$$

In the probabilistic method all existing costs are assumed to be expectations (Juniastina, 2018). Total inventory costs are the total costs of purchasing, ordering, storing and shortages of goods (Lati et al., 2023). This total cost is the cost that is the main benchmark in calculating the EOQ model which is considered to be able to reduce the total cost of inventory using the formula.

$$TIC = DP + \frac{AD}{Qo} + H\left(\frac{1}{2}Qo + SS\right) + \frac{CuDN}{Qo} \qquad (7)$$

The total cost of research conducted by Lati et al (2023) produces a total inventory cost of Rp 5,685,619,326.07 per year with safety stock which must be saved is 45 pcs for Karra Inner products. This is supported by the re-procurement point when the inventory was 621 pcs. The results of this research are considered effective in determining optimal inventory calculations in companies where there is no inventory calculation comparison.

The advantages of the Probabilistic EOQ method are also explained by research by Hilman and Budiarty (2022) that the results of the analysis of the application of the Probabilistic EOQ method during April-June can meet all consumer needs and there is no problemstock out product. This is in line with customer satisfaction who are happy because there are no missing products. The Probabilistic EOQ method can also reduce total inventory costs by 21.74% of the total initial costs. The costs incurred using this method are Rp 1,630,181,953 per year, which is greater than the company's total initial inventory costs of Rp 2,083,090,750 per year. Probabilistic EOQ calculations are carried out to determinesafety stock, reorder point and optimum order quantity for several products with codes KVU001, LCC006, SF003, SF017, and SIT005.

Savings in total inventory costs were also produced by research by Chandra et al (2022) by implementing Probabilistic EOQ PT XYZ which can save inventory costs. The difference in total inventory costs at PT In this research, optimal inventory calculations were carried out,reorder point and total inventory costs of Rp19,400,673,130 with Monte Carlo Simulation. The optimal order value for each product was found for clear ARC at 34 tonnes, Milk White ARC at 5.4 tonnes and Black ARC at 7.3 tonnes.

The reduction in total inventory costs was proven again in research by Situmorang and Purwaningsih (2021) which resulted in total inventory costs at PT Perusahaan Es Siantar amounting to Rp 52,280,167 or a decrease of 44.18% from the total conventional inventory costs of Rp 93,669,662. So using the Probabilistic EOQ method saves total inventory costs of Rp 41,389,949 per period. The optimal purchase of granulated sugar is that the company is required to purchase 7,035.2 kg for each purchase. Forecasting the reorder point requires the company to procure when stock reaches 8,827 kg using the Probabilistic EOQ method. The amount of safety stock that needs to be reserved in the company is 7,552 kg to anticipate demand during waiting time.

The Probabilistic EOQ method is used to take into account the existence of uncertain demand and waiting times in XYZ Store merchandise inventory by Diniaty et al (2020) with the aim of determinis safety stock, optimal inventory costs and reorder times. The calculation process produces inventory costs for each merchandise. Trade goods in the form of rice cost Rp 368,671,032 per year, sugar goods Rp 254,573,746 per year, cooking oil goods Rp 125,072,163 per year, and total inventory costs for flour amount to Rp 125,909,965 per year. There is safety stock needed by Store XYZ to anticipate waiting times. The safety stock is set at 22 sacks of rice, 15 jerry cans of cooking oil, 18 sacks of flour, and 6 sacks of sugar (Diniaty et al., 2020).

Based on several articles that have been reviewed, the results show that Probabilistic EOQ inventory model can be a solution for mathematical inventory control in overcoming inventory problems. The use of this probabilistic method can be applied to companies or industries that experience inventory problems with certain assumptions. These assumptions include having an uncertain quantity of demand and a constant price. This method is effective and efficient for use in companies because the results of this method are considered to be able to reduce total inventory costs and also design safety stock and accurate reorder points. Companies with various demand problems that are irregular or probabilistic in nature can apply the Probabilistic EOQ model. This type of model can be used as an inventory parameter because it takes into account delivery times or uncertain waiting times. Not only goods companies, companies that produce products or provide raw materials can also use this method as a method of managing inventory.

CONCLUSION

Planning for inventory control is an important thing in the company's distribution process. Company inventory problems can occur because demand for products or goods is too fluctuating so mathematical control is needed. One of the methods used in inventory control is mathematical use Economic Order Quantity (EOQ) Probabilistic. This method analyzes the optimal inventory that the company must determine to overcome shortages or excess stock. The research results show that this method can be used on various types of food and non-food items. From several articles which are sources of literature, researchers can conclude that the use of the Probabilistic EOQ method can reduce total inventory costs. Apart from that, other supporting methods are needed to strengthen calculations in overcoming inventory shortages, such as safety stock or safety supplies and reoder point or reorder point. The safety stock method is used as a support for the Probabilistic EOQ model to apply how much inventory must be available so that inventory remains safe. Meanwhile, the reorder point is used as a method to determine the time to reorder when the product has reached a certain limit.

REFERENCES

Ambarita, M. F. (2023). *Analisis Pengendalian Persediaan Bahan Baku untuk Mencapai Efisiensi Persediaan pada Konveksi Abed Klaten*. Universitas Atma Jaya Yogyakarta.

Chandra, A., Kristina, H. J., & Andres. (2022). Analisis Pengendalian Persediaan Bahan Baku Akrilik Menggunakan Metode EOQ Probabilistik dan Simulasi Monte Carlo Pada PT. XYZ. *Jurnal Mitra Teknik Industri*, *1*(1), 94–105.

Dania, W. A. P., Mustaniroh, S. A., & Primasari, A. (2019). Probabilistic Economic Order Quantity (EOQ) for the Flour Inventory Control (Case study in Company Z). *ACM International Conference Proceeding Series*, *1*, 172–175.

Diniaty, D., Rani, S. M., Anggraini, W., Permata, E. G., Silvia, & Mas'ari, A. (2020). Pengendalian Persediaan Barang Dagang Menggunakan Model Probabilistik (Studi Kasus: Toko XYZ). *Jurnal Sains, Teknologi Dan Industri*, *18*(1), 87.

Hilman, T., & Budiarty, A. F. (2022). Analisis Pengendalian Persediaan Produk SkinCare di PT RRI. *Jurnal Bisnis Dan Pemasaran*, *12*(2), 1–9.

Juniastina, E. (2018). *Model EOQ Probabilistik untuk Barang Perishable dengan Umur Simpan Tetap*. Universitas Brawijaya.

Lati, G. M., Wahyudiana, Q. S. P., & Anistiasari, D. (2023). Analisis Sistem Persediaan Produk Karra Inner Menggunakan Metode EOQ Probabilistik Sederhana pada Kimka Hijab. *Jurnal Logistik Bisnis*, *13*(1), 1–8.

Noer, A. M. (2022). *Analisis Pengendalian Persediaan pada UD Dippo Jaya Sentosa Bandar Lampung*. Universitas Lampung.

Nursyanti, Y., & Syauqi, A. (2021). Optimasi Inventori Produk Primaticol dengan Pendekatan Probabilistik Back Order. *Jurnal Manajemen Dan Bisnis Indonesia*, *07*(02), 89–104.

Putri, F. A., Bramasta, D., & Hawanti, S. (2020). Studi Literatur Tentang Peningkatan Kemampuan Berpikir Kritis Siswa dalam Pembelajaran Menggunakan Model Pembelajaran The Power of Two di SD. *Jurnal Educatio FKIP UNMA*, *6*(2), 605–610.

Rachmawati, N. L., & Lentari, M. (2022). Penerapan Metode Min-Max untuk Minimasi Stockout dan Overstock Persediaan Bahan Baku. *Jurnal INTECH Teknik Industri Universitas Serang Raya*, *8*(2), 143–148.

Saputri, G., Momon, A., & Herwanto, D. (2023). Pendekatan Metode Economic Order Quantity dan Forecasting dalam Analisis Kontrol Persediaan Bahan Baku Kecap. *Jurnal Serambi Engineering*, *8*(2), 5342–5353.

Setiadi, H., & Raihan, S. N. (2020). Penerapan Kebijakan Persediaan Bahan Baku Kain Twist Menggunakan Metode EOQ Probabilistik Sederhana di PT Multi Garmenjaya. *Jurnal Logistik Bisnis*, *10*(02), 60–63.

Situmorang, L. A., & Purwaningsih, R. (2021). Model Inventory Economic Order Quantity (EOQ) Probabilistik dalam Pengendalian Persediaan Material pada PT Pabrik Es Siantar. *Seminar Dan Konferensi Nasional IDEC*, 2579–6429.

Sulistio, J. (2018). Sebuah Studi Literatur Mengenai Pengukuran Kinerja Rantai Pasok pada Industri Strategis di Indonesia. *Teknoin*, *24*(2), 123–134.

Sultana, F. S. (2020). *Inventory Control dan Perencanaan Persediaan Bahan Baku Produksi Menggunakan Metode EOQ (Economic Order Quantity) pada Sate Tukri Sobikun Ponorogo (Studi Pada Sate Tukri Sobikun Ponorogo)*. Universitas Muhammadiyah Ponorogo.

Triandini, E., Jayanatha, S., Indrawan, A., Putra, G. W., & Iswara, B. (2019). Metode Systematic Literature Review untuk Identifikasi Platform dan Metode Pengembangan Sistem Informasi di Indonesia. *Indonesian Journal of Information Systems*, *1*(2), 63–77.

Ulfa, M. (2018). *Analisis Pengendalian Persediaan Obat dengan Metode ABC (Always Better Control) dan EOQ Probabilistik (Studi Kasus : Logistik Farmasi Rumah Sakit Muhammadiyah Gresik)*. Universitas Muhammadiyah Gresik.

 DOI: 10.52330/jtm.v22i1.220

NOMENCLATUR

EOQ	definition from Economic Order Quantity
TIC	definition from Total Inventory Cost
Sd	definition from Standard Deviation
L	definition from Lead Time
S_L	definition from Standard deviation during lead time
N	definition from Value of Unfulfilled Requests
Zα	definition from Z value in the standard normal distribution for level α
f(Zα)	definition from Function of the z value of the standard normal distribution for α
(Zα)	definition from Function of Standard normal distribution z values for α during lead time
D	definition from Goods Request
A	definition from Order Cost
H	definition from Storage Cost
Cu	definition from Shortfall Cost
Qo	definition from Optimal Ordering
SS	definition from Safety Stock
ROP	definition from Reorder Point
P	definition from Product Selling Price
ϩ	definition from Service Level

This page is intentionally left blank

This page is intentionally left blank

 DOI: 10.52330/jtm.v22i1.220