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Analysis of Raw Material Inventory Control Using the Economic Order Quantity (EOQ) Method: Study of Simping MSMEs, Purwakarta Regency, Indonesia

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A B S T R A C T

Raw material inventory is an important aspect in managing small and medium enterprises (SMEs). Effective inventory control can help SMEs increase efficiency and profitability. This research aims to analyze raw material inventory control at Simping MSMEs in Purwakarta Regency, Indonesia, using the economic order quantity (EOQ) method. Data was collected through a survey of 30 Simping MSMEs. The research results show that the EOQ method can help Simping MSMEs in determining the optimal number of raw material orders and minimizing inventory costs. Implementing the EOQ method can result in average inventory cost savings of 15% compared to the method currently used.

1. Introduction

Raw material supplies are an important component in production costs for small and medium enterprises (SMEs). Small and medium enterprises (SMEs) are important sectors in the Indonesian economy. According to data from the Ministry of Cooperatives and SMEs of the Republic of Indonesia, in 2023, there will be 64.2 million MSMEs in Indonesia, which will contribute to 61.07% of PDB and 97% of the workforce in Indonesia. One of the key factors in the success of SMEs is effective inventory management. Raw material inventory is an important component of production costs. Effective inventory control can help SMEs increase efficiency and profitability. Effective inventory management can help SMEs increase efficiency and profitability. Simping MSMEs in Purwakarta Regency,

Indonesia, are an important sector in the local economy. This industry produces traditional food products made from rice and cassava flour. The main raw materials for this product are rice and cassava flour. Raw material costs are one of the largest components of production costs. Effective inventory management can help SMEs increase efficiency and profitability. Inventory control is still done manually. Excessive or insufficient supply of raw materials can cause losses for SMEs.[1-3]

Control of raw material inventory at Simping MSMEs is currently still done manually. Excessive raw material inventory can lead to high storage costs and raw material damage. Insufficient supplies of raw materials can cause production process delays and lost sales. The economic order quantity

(EOQ) method can be used to determine the optimal order quantity of raw materials. The optimal order quantity is the amount that minimizes total inventory costs, which consist of ordering costs and holding costs.[4-6] This research aims to analyze raw material inventory control using the EOQ method at Simping MSMEs in Purwakarta Regency, Indonesia.

2. Methods

This research uses a descriptive research design with a quantitative approach. Data was collected through a survey of Simping MSMEs in Purwakarta Regency, Indonesia. The population in this study were all Simping MSMEs in Purwakarta Regency, Indonesia. The research sample was taken using a purposive sampling method, namely by selecting Simping MSMEs that met the following criteria: Have a minimum of 10 employees; Have been in operation for at least 2 years; Have a good raw material inventory recording system. Based on these criteria, 30 Simping MSMEs were obtained as research samples.

The research instrument used was a questionnaire. The questionnaire contains questions about: MSME identity; Raw material demand; Raw material ordering costs; Raw material storage costs. Data was collected by distributing questionnaires to respondents. Questionnaires were distributed directly to respondents and via email. Data analysis was carried out using the economic order quantity (EOQ) method. The optimal quantity of raw material orders is calculated using the following formula:

EOQ = $\sqrt{2DS / C}$

Where:

EOQ = Economic Order Quantity

D = Annual demand for raw materials

S = Ordering cost per order

C = Storage costs per unit of raw materials per year

Data obtained from the questionnaire was analyzed using SPSS software. Data analysis includes: Descriptive analysis to determine the characteristics of Simping MSMEs and the raw material inventory control system used EOQ analysis to calculate the optimal number of raw material orders Comparative analysis to determine the difference in inventory costs between the method currently used and the EOQ method

3. Results and Discussion

Optimal order quantity of raw materials

The research results show that the optimal number of raw material orders for Simping MSMEs varies depending on the demand for raw materials, ordering costs, and storage costs. The following is a calculation of the optimal number of orders for raw materials for Simping MSMEs with the following data: Annual demand for raw materials (D) = 1,200 units; Ordering cost per order (S) = IDR 50,000; Storage costs per unit of raw materials per year (C) = IDR 10,000. The optimal raw material order quantity (EOQ) is calculated using the following formula:

EOQ = $\sqrt{2DS / C}$

EOQ = $\sqrt{2 \times 1,200 \times IDR\ 50,000 / IDR\ 10,000}$

EOQ = 24 units

Based on the calculations above, the optimal number of raw material orders for Simping MSMEs is 24 units.

Inventory cost savings

This research also shows that Simping MSMEs can save inventory costs by using the EOQ method. On average, Simping MSMEs can save inventory costs by 15% by using the EOQ method compared to the method currently used. The following is a calculation of inventory cost savings for Simping MSMEs with the following data: Current inventory costs = IDR 1,200,000; Inventory costs using the EOQ method = IDR 1,020,000; Inventory cost savings = IDR 1,200,000 - IDR 1,020,000 = IDR 180,000; Percentage of inventory cost savings = (IDR 180,000 / IDR 1,200,000) x 100% = 15%. Based on the calculations above, Simping MSMEs can save inventory costs of IDR 180,000 or 15% by using the EOQ method.

The EOQ (economic order quantity) method is a method used to determine the optimal order quantity of raw materials. Raw material demand is the amount

of raw materials needed by a company in a certain period. This factor is important to consider because companies need to ensure that they have enough raw materials to meet customer demand. Ordering costs are the costs that a company incurs every time it orders raw materials. These costs may include transportation costs, administrative costs, and other costs. Storage costs are costs incurred by a company to store raw materials. These costs can include warehouse rental fees, insurance fees, and other costs. By using the EOQ method, companies can balance ordering costs and holding costs to achieve minimum total inventory costs. This can help companies to increase efficiency and profitability. The following are some of the advantages of using the EOQ method: Minimizes total inventory costs; Improving inventory management efficiency; Increase profitability; Reduce the risk of raw material shortages; Reduces the risk of excess inventory. However, keep in mind that the EOQ method has several assumptions, including: Constant demand for raw materials; Ordering costs and holding costs are constant; Lead time (waiting time) is constant. If these assumptions are not met, then the EOQ method may not provide optimal results. Therefore, it is important to consider these factors before implementing the EOQ method.[7-11]

One of the main advantages of using the EOQ (economic order quantity) method is that it helps Simping MSMEs avoid excess inventory (overstock), which can cause high storage costs. Excess inventory occurs when Simping MSMEs order more raw materials than needed in a certain period. This can be caused by several factors, such as Inaccurate demand forecasts, Promotions or discounts from suppliers, and the desire to avoid stockouts. Simping MSMEs have to incur additional costs to store excess raw materials, such as warehouse rental costs, insurance costs and maintenance costs. Raw materials that are stored for too long can become damaged, resulting in Simping MSMEs experiencing financial losses. Excess inventory can make inventory management more difficult and complex. High storage costs and damage to goods can reduce the profitability of Simping

MSMEs. The EOQ method helps Simping MSMEs determine the optimal quantity of raw material orders based on demand, ordering costs, and storage costs. Simping MSMEs only order as many raw materials as needed, thereby avoiding excess inventory. Storage costs can be minimized because Simping MSMEs do not need to store excess raw materials. Inventory management becomes more efficient because Simping MSMEs only need to focus on the raw materials needed. By minimizing storage costs and increasing efficiency, the profitability of Simping MSMEs can increase.[12-15]

Apart from helping Simping MSMEs avoid excess inventory, the EOQ (economic order quantity) method also helps in avoiding understock, which can cause disruption to the production process and lost sales. Inventory shortages occur when Simping MSMEs do not have enough raw materials to meet production needs. This can be caused by several factors, such as: Inaccurate demand forecasts; Delay in delivery from suppliers; Sudden increase in demand. Inventory shortages can result in several negative impacts for Simping MSMEs. Simping MSMEs cannot produce products according to target because they do not have enough raw materials. Simping MSMEs cannot meet customer demand because they do not have products ready to sell. Customers who cannot buy the desired product will feel disappointed and dissatisfied. The reputation of Simping MSMEs may decline because they cannot fulfill promises to customers. The EOQ method helps Simping MSMEs in determining the optimal quantity of raw material orders based on demand, ordering costs and storage costs. Simping MSMEs order raw materials in sufficient quantities to meet production needs and avoid inventory shortages. The production process can run smoothly because Simping MSMEs have enough raw materials. Customers can buy the products they want because Simping MSMEs always have products ready to sell. The reputation of Simping MSMEs can increase because they can always fulfill their promises to customers.[16-18]

Although the EOQ (economic order quantity) method has many advantages in controlling raw material inventory, the accuracy of raw material demand data, ordering costs, and storage costs is very important to ensure the effectiveness of the EOQ method. Inaccurate data can cause inaccurate EOQ calculations, resulting in excess or shortage of inventory. It is important to measure and record data carefully and periodically to ensure accuracy. Fluctuating demand for raw materials can be a challenge in implementing the EOQ method. If raw material demand varies significantly, the calculated EOQ may not be optimal for all periods. Several alternative methods can be used to overcome demand fluctuations, such as the dynamic EOQ method or the variable lot size method. The availability of funds for ordering raw materials needs to be considered when applying the EOQ method. Ordering large quantities of raw materials can require significant funds, which may not always be available to MSMEs. It is important to balance ordering costs and holding costs by considering the availability of funds. Other factors to consider: Lead time: the time required to receive an order for raw materials; Discount rate: discounts offered by suppliers for large orders; Storage space: availability of storage space for raw materials; Damage to raw materials: risk of damage to raw materials during storage. The EOQ method is a useful tool for controlling raw material inventory, but it is not always the perfect solution for all situations. It is important to consider the factors mentioned above before implementing the EOQ method and choose the method that best suits the needs and conditions of MSMEs.[19,20]

4. Conclusion

Based on the research results, it can be concluded that the EOQ method can help Simping MSMEs control raw material inventories and minimize inventory costs. The application of the EOQ method can increase the efficiency and profitability of Simping MSMEs.

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