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Examining the Effects of the Economic Order Quality Model on Inventory Control

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ABSTRACT

In the current global marketplace, businesses seek expansion and ways to lower their overall costs, and management of these businesses aims to improve quality, productivity, and capacity without raising capital expenditures. Many businesses rely on their capacity to provide goods and services at the appropriate time and location to be successful. In order to manage their inventory and prevent stock-outs and overstocks, many organizations use various inventory control techniques. This essay examines a case study of a Haryanan firm. The inventory management technique known as Economic Order Quantity, or EOQ, is taken into consideration for this study. This organization's inventory management is flawed, which leads to overstock and occasionally stock-outs. This article examines inventory management techniques and compares two approaches—one utilized by the organization, the other a suggested model—by calculating expenses.

1. INTRODUCTION :

One of the most important aspects of correlation is inventory management, which affects how much inventory contributes to an asset by a significant amount, typically varying between 15 and 25%. The two main issues of the inventory management framework are the cost of ordering and transporting stocks, and the aspect of customer administration, such as having the appropriate things in the right place at the right time. This company, which is located in Vasai, does not have a valid inventory

management system. Given that the company's identity is protected, it is referred to be company XYZ in this essay.

When overstock or stock out occurs in the warehouse, the management of this organization faces many challenges. Therefore, a variety of approaches, including JIT (Just in Time), value stream mapping, EOQ, ROP, and others, can be used to overcome these problems. An EOQ technique is selected for research work in this publication.

2. Formulas for Economic Order Quantity (EOQ)

Do people working in the manufacturing industry have the slightest clue as to what EOQ is and how to apply this process? This article by James A. Cargal titled "The EOQ Inventory Formula" explains the fundamental idea behind the Economic Order Quantity. This material was sent by Cargal from Troy State University Montgomery. The article is clear-cut and uncomplicated. Cargal does an excellent job of explaining each element and how it's used. The recipe is written as it appears in condition and is shown as the supplemental,

$$Q = \sqrt{\frac{2DS}{HC}}$$

1) Q = the order quantity for EOQ. It is this variable that requires optimization. There are fixed amounts for each of the other variables.

2) D = the quantity of product required annually per unit of time. This is often referred to as a rate.

3) S = the cost of the product order. This is the flat fee that is applied to all orders, regardless of Q.

4) C = unit cost.

5) H = keeping the cost per unit as a percentage of the total cost

.

Fig. 1: EOQ Graph

3. Assumption:

1) The EOQ model is predicated on the knowledge that demand is steady over time.
2) There can be no shortages.
3) The lead time for order receipt is always the same.
4) All order quantities are received simultaneously.
5) 'The item's buying price is fixed.

4. Literature Review:

In his work "Root of the Economic Order Quantity Formula; translation or change?" published in 2005, Bill Roach provides clarification on the origins of the Economic Order Quantity. It is made obvious by Bug that the Economic Order Quantity (EOQ) is a unique formula for determining the appropriate economic order quantity. He also determines the significance of Ford W. Harris' sense of duty in relation to the EOQ equation. Harris was always a self-motivated individual who received individualized instruction throughout assistant school. As an understudy in 1915, he understands how to create and transmit.

In this work, Nanaware et al. (2017) discuss how ABC inspection and EOQ should be used to enable adequate inventory management. The circulation of A, B, and C type materials is provided by the

application of ABC examination. The economic relevance of the materials is determined by their distribution. A proper quantity of orders placed at the right time is what EOQ provides as results. It avoids delays in the supply of materials and also keeps a safe distance from material waste. A framework for inventory control reduces material waste, thus saving the cost of a task.

Siegel, Shim Executives should evaluate the adequacy of stock dimensions in 2008 as compelling stock organization points of confinement stock, reduces expense, and boosts productivity. These dimensions depend on a number of factors, including sales, liquidity, open inventory financing, production, supplier unwavering quality, latency in receiving new demands, and normality. An increase in stock reduces the likelihood of stock outages and the production bottleneck caused by insufficient stock. The dimensions of stocks are also impacted by temporary loan costs. The ideal dimension of holding.

The role of the Economic Order Quantity model in lowering the cost of raw material inventories at a dairy homestead business was examined by Kisaka (2006). He considered the total expense of raw material inventory that may have resulted from the EOQ application in addition to the expense of raw material inventory generated by the undertaking technique that was applied. Kisaka discovered that cost sparing existed and that the EOQ model might have demonstrated this.

In 2014, Wisner et al. The relationship between cost of stock and customer administration, or item openness, is included into inventory organization. A variety of factors influence inventory-based leadership. Only two will be discussed in this paper: the cost factor and the vulnerability factor, which combines the vulnerabilities of requests and times.

In this study, Dr. Rakesh Kumar (2016) discusses how the Economic Order Quantity is a very useful tool for inventory control. It may have anything to do with work-in-progress inventories, raw material inventories, and full goods inventories. It regulates inventory capacity and purchases to maintain a steady production development while avoiding an unhealthy obsession with stocks.

Lacey Chambers 2011, this study states that inventory management involves balancing the benefits of maintaining inventory against the costs associated with doing so. An inventory has the benefit of ensuring that

products will be available when needed. The open door cost of the capital utilized to support the inventory, ordering costs, and capacity costs are the three main costs associated with an inventory. The

goal of inventory management is to increase the inventory's net advantage—that is, its benefits less expenses.

5. The study's objective:

The primary goals of inventory control are

1) To create a system for managing inventories that works well.
2) To keep inventory levels at their ideal level.
3) To Minimizing on time and carrying costs.
4) Determining the ideal reorder level to help with ordering timing.
5) To assess how the suggested model's predicted inventory compares with the current inventory.

5.1. Example Case Study:

This contextual analysis is carried out by XYZ Company. This business was established in 2008 and manufactures and distributes a range of blowers. The company has served several Indian clients with its products. For marketing purposes, the company has an office in Nallasopara (E.), Maharashtra. The raw materials needed to make blowers are paint, nut screws, C-channel, L-edge, H.R. Sheet, and motors with different horsepower. Inventory control is the primary concern in this industry while acquiring raw materials and supplying blowers to clients. A contextual inquiry is conducted to oversee raw

6. The Problem:

This company's current forecasting approach has caused several problems due to inaccurate predictions. The basic normal forecasting technique, which is based on normal verifiable interest, has been used; nonetheless, this has led to unrealistic expectations.
This study's goal is to recommend strategies to help the company cut costs and stock by using progressively persuasive expectation EOQ and ROP. For this reason, an analysis of one of the company's products is conducted using data from the previous year. Finally, the cost is assessed to determine its importance and to compare the relevant factors with the current and suggested models.

7. Purpose of EOQ:

The cost of ordering and holding, as well as the firm's annual interest, are needed to calculate EOQ. This paper discusses the EOQ of the HR sheet in light of the challenging inventory management of this product in this business. The total ordering and holding costs are also calculated in this article.

Yearly demand:

Based on this company's average monthly turnover, the annual demand for lug is computed.

There is a monthly requirement of 3000 kg for HR sheets.

D= $\frac{3000\ kg}{month} \times 12$

= 36000 kg / year Unit Cost:

Cost of one unit is Rs.60 / kg.

∴ C= Rs.60/kg Ordering Cost :

The present forecasting model used by the organization states that orders are placed once a month for a total price of Rs. 200000.The cost of ordering, according to the company's data, is 10% of Rs. 200000.

So, ordering cost / order = Rs.20000/-

Therefore, cost of H.R. Sheet = Rs.200000 , Rs.20000, Rs180000/-

Therefore number of kg of H.R

$$Sheet\ purchased = \frac{\text{cost of H.R.Sheet}}{\text{unit cost of H.R. Sheet}} = \frac{180000}{60} = 3000\ \text{kg}$$

Company makes 1 order in a month, so number of orders = 12 orders in a year.

$$Ordering\ cost\ per\ kg\ = \frac{20000 + 12}{3000}\ Rs.80\ /\ kg$$

After calculating costs we can estimate EOQ :

$$EOQ\ = \sqrt{\frac{2 \times\ D \times\ S}{H \times\ C}}$$

$$EOQ\ = \sqrt{\frac{2 \times 36000 \times 80}{0.03 \times 60}}$$

Consequently, the H.R. sheet EOQ is roughly 1789 kg. In order to reduce costs, the company should reduce its current order volume of 3000 kg to 1789 kg.

Calculating the total cost:

For EOQ=1789 kg , $Holding\ cost = \frac{Q}{2} \times H$

$$= \frac{1789}{2} \times 1.8$$

= Rs.1610.1

Ordering cost = No. of order × cost of order / kg

$$= \frac{36000}{1789} \times 80$$

= Rs.1609.84

Total cost = Holding cost + Ordering cost

= 1610.1+1609.84

= Rs.3219.94

From Company's data (Q= 3000 kg)

$Holding\ cost = \frac{Q}{2} \times H$

Ordering cost = No. of order × cost of order per kg

$= \frac{36000}{3000} \times 80$= Rs. 960

Total cost Holding cost + Ordering cost

= 2700 +960

= Rs.3660

The difference between total cost for Q = 3000 kg and for EOQ = 1789 kg

= (3660-3219.94) = Rs.440.06 which is greater than EOQ quantity.

The result is summarized as:

Table: 1.1 Summary of result

Term	EOQ Technique	Company's current technique
Annual Demand (kg)	38000	38000
Order Quantity (kg)	1989	3200
No. of Order	23	14
Holding Cost (Rs.)	1810.10	2900
Ordering Cost (Rs.)	1809.84	1160
Total Cost (Rs.)	3419.94	3860

Therefore, Q= 1789 kg is the optimal order quantity, as it reduces the overall cost of keeping inventory.

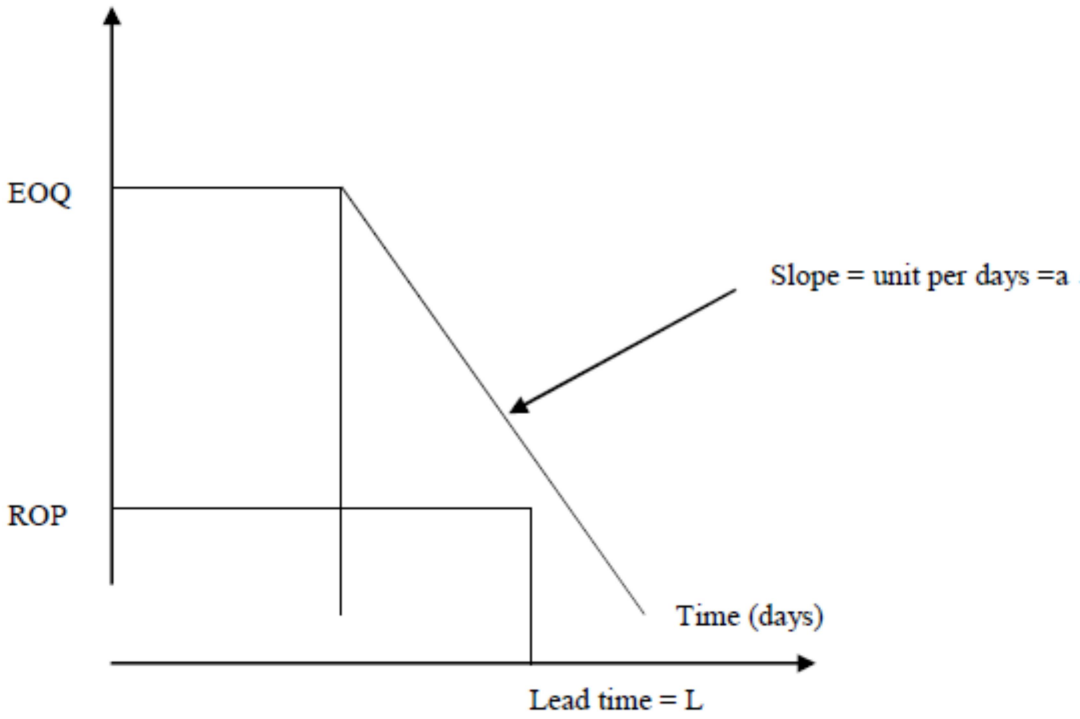
Reorder Point :

The basic EOQ model makes the following assumption: that an order is received instantly.

1) When the company's inventory for a given product runs out, an order is placed.
2) The ordered stuff will be delivered to it right away. Lead time is the amount of time between placing an order and receiving it; it can be as little as a few hours or as lengthy as several months. The point of reorder is provided as,

Demand per day × Lead time for a new order in days = D × L= ROP

Demand both during the lead time and during the lead time itself is assumed to be constant in this ROP calculation. By dividing the annual demand D by the total number of working days in a year, one can find the demand per day.



Given that a 10-day delay is the most crucial, the company should place an order at 986.30 kg of stock.

8. Outcome and Conclusion

The cost of ordering and keeping inventory is reduced when using the EOQ inventory management technique. In this sense, this lowers the company's overall costs. This exploratory study shows a 10% reduction in the overall cost of inventories.

According to the aforementioned report, the sector does not generally seek a sophisticated inventory management strategy. Here, supplies are ordered based on mutual understanding or when stockpiles run low. They maintain a one-month supply of raw materials on hand before placing a spot order for the next shipment. As a result, either overstocking or understocking is a problem for the company.

In light of this, the business requires a respectable inventory system to keep operating costs to a minimum. Holding costs and ordering costs can be reduced to a more notable degree if the management applies the Economic Order Quantity model with suitable judgment. The business can use this model to determine how much material to order carefully and when to submit new requests for each item. When the next order is scheduled, it might very well be resolved based on the reorder point calculation.

A few things should be changed in order to reduce the expenses associated with raw material inventory, as this company does not use a systematic inventory management structure to monitor its raw material stockpiles. Next, the following are recommended:

1) The company should make improvements to the way they record purchases. If it is possible, the business should automate these processes.

2) Vendors and supply staff should be given work training on store and supply organization to enhance their knowledge and proficiency in the field, as neglect of the quantitative techniques of inventory organization shows a lack of organization in business capacities.

3) Similar suggestions are made that an occasional review in which inventories are examined over a regular period of time may be an acceptable approach for the association to understand the "when to order" problem.

9. **Restrictions for the study:**

It is unthinkable to obtain information due to restriction as demanded by firm structure. It was also quite difficult to compile data from every division that was accessible. The estimation of the economic order amount is based on various assumptions. In this case, demand is believed to have remained steady throughout time. That being said, demand fluctuates over time.

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