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Various Designs and Techniques of Inventory Control: A Case Study under Field Of Operation Research

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Abstract – The importance of inventory to a firm stems from two points of view: financial and operational. First, inventory represents a major financial investment for any company. Inventories represent of 25 to 50 per cent of total assets in manufacturing firms and 75 to 80 per cent in wholesalers and retailers. On the other hand, from the operational perspective, inventories add an operating flexibility.

Keywords: Inventory Control, Operation Research, Goods, Company

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INTRODUCTION

Keeping an inventory (stock of goods) for future sale or use is common in business. In order to meet demand on time, companies must keep on hand a stock of goods that is awaiting sale [Olsson, F. 2009]. The purpose of inventory theory is to determine rules that management can use to minimize the costs associated with maintaining inventory and meeting customer demand [Frank, Katia C., Rachel Q. Zhang, and Izak Duenyas, 2003]. Inventory is studied in order to help companies save large amounts of money. Inventory models answer the questions:

(1) When should an order be placed for a product?

(2) How large should each order be?

The answers to these questions are collectively called an inventory policy.

Companies save money by formulating mathematical models describing the inventory system and then proceeding to derive an optimal inventory policy [Howard, C. ,2010)]. This study is an introduction to the study of inventory theory. We consider two models: deterministic continuous review models and stochastic models. First we learn that each model has a couple of variations to it. In addition, we learn how to derive the models, and use the models in examples. Next, we discuss quantity discounts and how these discounts affect the model. Then, we use the models to tackle a conceivable real world situation. Finally, we look at a company and see if we can use any of our newfound knowledge to help this company with its inventory policy.

REVIEW OF LITERATURE:

Although it is a distinct discipline in its own right, Operations Research (O.R.) has also become an integral part of the Industrial Engineering (I.E.) profession. This is hardly a matter of surprise when one considers that they both share many of the same objectives, techniques and application areas. O.R. as a formal subject is about fifty years old and its origins may be traced to the latter half of World War II. Most of the O.R. techniques that are commonly used today were developed over (approximately) the first twenty years following its inception, during the next thirty or so years the pace of development of fundamentally new O.R. methodologies has slowed somewhat. However, there has been a rapid expansion in

(1) The breadth of problem areas to which O.R. has been applied, and

(2) In the magnitudes of the problems that can be addressed using O.R. methodologies.

Today, operations research is a mature, well-developed field with a sophisticated array of techniques that are used routinely to solve problems in a wide range of application areas. In recent years, Inventory Management has attracted a great deal of attention from people both in academia and industries. A lot of resources have been devoted into research in the inventory management practices of organizations [Ozer, Ozalp, and Wei Wei, 2004]. Companies with superior forecasting abilities can afford to procure or produce a large fraction of their demand by making use of low production methods and inexpensive logistics services. These companies pay more for faster production and logistics services only when the demand surges or goes up unexpectedly. On the other hand, companies with irregular demands and inferior forecasting abilities have to pay more for using fast production methods to respond to unexpected surges in demand.

The first mathematical inventory model is generally referred to as the Economic Order Quantity (EOQ) model which was developed by Harris in 1915. The first full length book attempts to explain how various extensions of EOQ can be used in practice is Raymond's. Further research works showed that the EOQ model appears to be quite insensitive to errors in the specification of the appropriate cost parameters and the estimation of demand. The importance of the EOQ model is not only from the historical point of view but also because many other models designed to cope with different situations have been based on this model [Muckstadt, J.A. and Sapra, A. 2010].

However, this mathematical modeling technique of inventory management had very little application at that time. Perhaps this was because the new conceptions always need a period of maturation during which details can be improved upon and the original claim about increased productivity and performance can be proven through the test of time.

Some of the most important techniques of inventory control system are:

1. Setting up of various stock levels.
2. Preparations of inventory budgets.
3. Maintaining perpetual inventory system.
4. Establishing proper purchase procedures.
5. Inventory turnover ratios. and
6. ABC analysis.

1. Setting up of various stock levels:

To avoid over-stocking and under stocking of materials, the management has to decide about the maximum level, minimum level, re-order level, danger level and average level of materials to be kept in the store.

These terms are explained below:

(a) Re-ordering level:

It is also known as ‘ordering level’ or ‘ordering point’ or ‘ordering limit’. It is a point at which order for supply of material should be made.

This level is fixed somewhere between the maximum level and the minimum level in such a way that the quantity of materials represented by the difference between the re-ordering level and the minimum level will be sufficient to meet the demands of production till such time as the materials are replenished. Reorder level depends mainly on the maximum rate of consumption and order lead time. When this level is reached, the store keeper will initiate the purchase requisition.

Reordering level is calculated with the following formula:

Re-order level =Maximum Rate of consumption x maximum lead time

(b) Maximum Level:

Maximum level is the level above which stock should never reach. It is also known as ‘maximum limit’ or ‘maximum stock’. The function of maximum level is essential to avoid unnecessary blocking up of capital in inventories, losses on account of deterioration and obsolescence of materials, extra overheads and temptation to thefts etc. This level can be determined with the following formula. Maximum Stock level = Reordering level + Reordering quantity —(Minimum Consumption x Minimum re-ordering period)

(c) Minimum Level:

It represents the lowest quantity of a particular material below which stock should not be allowed to fall. This level must be maintained at every time so that production is not held up due to shortage of any material.

It is that level of inventories of which a fresh order must be placed to replenish the stock. This level is usually determined through the following formula:

Minimum Level = Re-ordering level — (Normal rate of consumption x Normal delivery period)

(d) Average Stock Level:

Average stock level is determined by averaging the minimum and maximum level of stock.

The formula for determination of the level is as follows:

Average level =1/2 (Minimum stock level + Maximum stock level)

This may also be expressed by minimum level + 1/2 of Re-ordering Quantity.

CONCLUSION:

In this paper we found that inventory management techniques improve our inventory turnover ratio and transform frozen assets into cash! Inventory management techniques deliver results that go far beyond initial expectations.

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