Economic Ordering Quantity (EOQ)

The Economic Order Quantity (EOQ) is the number of units that a company should add to inventory with each order to minimize the total costs of inventory—such as holding costs, order costs, and shortage costs. The EOQ is used as part of a continuous review inventory system in which the level of inventory is monitored at all times and a fixed quantity is ordered each time the inventory level reaches a specific reorder point. The EOQ provides a model for calculating the appropriate reorder point and the optimal reorder quantity to ensure the instantaneous replenishment of inventory with no shortages. It can be a valuable tool for small business owners who need to make decisions about how much inventory to keep on hand, how many items to order each time, and how often to reorder to incur the lowest possible costs.

The EOQ model assumes that demand is constant, and that inventory is depleted at a fixed rate until it reaches zero. At that point, a specific number of items arrive to return the inventory to its beginning level. Since the model assumes instantaneous replenishment, there are no inventory shortages or associated costs. Therefore, the cost of inventory under the EOQ model involves a tradeoff between inventory holding costs (the cost of storage, as well as the cost of tying up capital in inventory rather than investing it or using it for other purposes) and order costs (any fees associated with placing orders, such as delivery charges). Ordering a large amount at one time will increase a small business's holding costs, while making more frequent orders of fewer items will reduce holding costs but increase order costs. The EOQ model finds the quantity that minimizes the sum of these costs.

The basic EOQ relationship is shown below. Let us look at it assuming we have a painter using 3,500 gallons of paint per year, paying $5 a gallon, a $15 fixed charge every time he/she orders, and an inventory cost per gallon held averaging $3 per gallon per year.

The relationship is where

$$TC = PD + HQ/2 + SD/Q$$

- TC is the total annual inventory cost—to be calculated.
- P is the price per unit paid—assume $5 per unit.
- D is the total number of units purchased in a year—assume 3,500 units.
- H is the holding cost per unit per year—assume $3 per unit per annum.
- Q is the quantity ordered each time an order is placed—initially assume 350 gallons per order.
- S is the fixed cost of each order—assume $15 per order.

Calculating TC with these values, we get a total inventory cost of $18,175 for the year. Notice that the main variable in this equation is the quantity ordered, Q. The painter might decide to purchase a smaller quantity. If he or she does so, more orders will mean more fixed order expenses (represented by S) because more orders are handles—but lower holding charges (represented by H): less room will be required to hold the paint and less money tied up in the paint. Assuming the painter buys 200 gallons at a time instead of 350, the TC will drop to $18,063 a year for a savings of $112 a year. Encouraged by this, the painter lowers his/her purchases to 150 at a time. But now the results are unfavorable.

Total costs are now $18,075. Where is the optimal purchase quantity to be found?

The EOQ formula produces the answer. The ideal order quantity comes about when the two parts of the main relationship (shown above)—"HQ/2" and the "SD/Q"—are equal. We can calculate the order quantity as follows: Multiply total units by the fixed ordering costs (3,500 Ã— $15) and get 52,500; multiply that number by 2 and get 105,000. Divide that number by the holding cost ($3) and get 35,000. Take the square root of that and get 187. That number is then Q.

In the next step, HQ/2 translates to 281, and SD/Q also comes to 281. Using 187 for Q in the main relationship, we get a total annual inventory cost of $18,061, the lowest cost possible with the unit and pricing factors shown in the example above.

Thus EOQ is defined by the formula: EOQ = square root of 2DS/H. The number we get, 187 in this case, divided into 3,500 units, suggests that the painter should purchase paint 19 times in the year, buying 187 gallons at a time.

The EOQ will sometimes change as a result of quantity discounts offered by some suppliers as an incentive to customers who place larger orders. For example, a certain supplier may charge $20 per unit on orders of less than 100 units and only $18 per unit on orders over 100 units. To determine whether it makes sense to take advantage of a quantity discount when reordering inventory, a small business owner must compute the EOQ using the formula (Q = the square root of 2DS/H), compute the total cost of inventory for the EOQ and for all price break points above it, and then select the order quantity that provides the minimum total cost.

For example, say that the painter can order 200 gallons or more for $4.75 per gallon, with all other factors in the computation remaining the same. He must compare the total costs of taking this approach to the total costs under the EOQ. Using the total cost formula outlined above, the painter would find TC = PD + HQ/2 + SD/Q = (5 Ã— 3,500) + (3 Ã— 187)/2 + (15 Ã— 3,500)/187 = $18,061 for the EOQ. Ordering the higher quantity and receiving the price discount would yield a total cost of (4.75 Ã— 3,500) + (3 Ã— 200)/2 + (15 Ã— 3,500)/200 = $17,187. In other words, the painter can save $875 per year by taking advantage of the price break and making 17.5 orders per year of 200 units each.

EOQ calculations are rarely as simple as this example shows. Here the intent is to explain the main principle of the formula. The small business with a large and frequently turning inventory may be well served by looking around for inventory software which applies the EOQ concept more complexly to real-world situations to help purchasing decisions more dynamically.

ABC Analysis

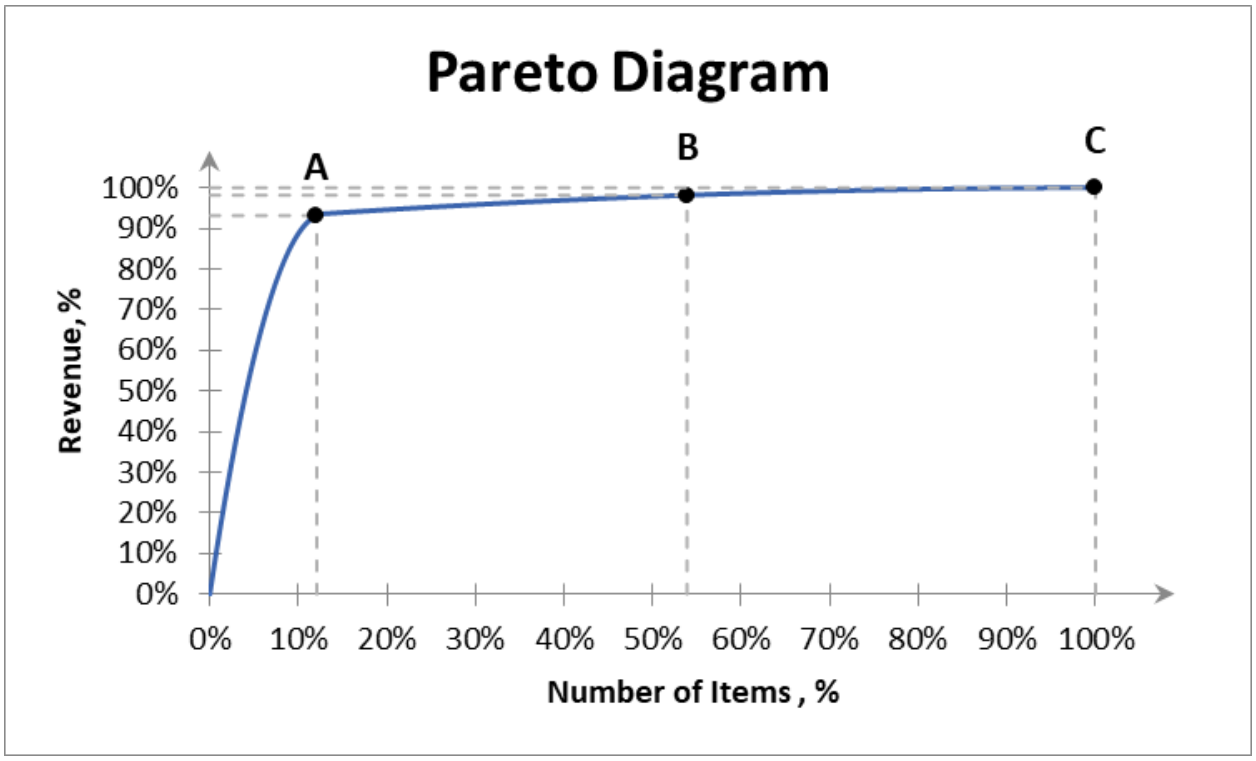
ABC analysis may be seen to share similar ideas as the Pareto principle, which states that 80% of overall consumption value comes from only 20% of items. Plainly, it means that 20% of your products will bring in 80% of your revenues.

ABC analysis works by breaking it down in the following ways:

A-items: 20% of all goods contribute to 70-80% of the annual consumption value of the items

B-items: 30% of all goods contribute to 15-25% of the annual consumption value of the items

C-items: 50% of all goods contribute only 5% of the annual consumption value of the items In order to calculate the annual consumption value of any item or items:



Value analysis

Value analysis is a problem-solving system implemented by the use of a specific set of techniques, a body of knowledge, and a group of learned skills. It is an organized creative approach whose purpose is the efficient identification of unnecessary costs, i.e. cost that provides neither quality nor use nor tool life nor appearance nor customer features."

The term **Value Analysis / Value Engineering** originated in the early days of technique development and its first approach was to increase value, rather than to reduce costs. Therefore there was a need to analyze value. *"*Value analysis approaches may assist all branches of an enterprise-engineering - manufacturing, procurement, marketing, and management by securing better answers to their specific problems in supplying what the customer wants at lower production costs. Quite commonly, 15 to 25 per cent and often more of manufacturing costs can be made unnecessary without any reduction in customer values by the use of this problem-solving system in significant decisional areas*."* VA/VE is an extremely powerful approach with over a century of worldwide application and it can be applied to any cost generating areas with equal success.

What is value-

Different customers will answer to that question in different ways. The value of a product can be the performance of its functions or its aesthetic beauty, when applicable and needed. As a general statement high level performances, capabilities, emotional appeal, style, all compared to cost is commonly what we consider as value.

Value=Function/Cost

Value Analysis is a standardized, multi-skilled team approach which aims at identifying the lowest cost way and ensuring the highest worth to accomplish the functions of a product, process or service. Value analysis means to assess product functions and value-to-cost ratios, and to find opportunities for costs reduction.

Classification and codification

Classification and codification of materials are steps in maintaining stores in a systematic way. Materials are classified in such way that storing, issuing and identifying of materials become easy. Generally, **materials are classified** on the basis of their nature. Materials can also be classified on the basis of quality and utility. For example, materials may be classified as raw materials, consumable stores, components, spares and tools. Thus classifying materials on different bases such as nature, quality and utility is called classification of materials.

For the purpose of identification and convenience in storage and issue of materials, each item of material is given a distinct name. Such a process of giving distinct names and symbols to different items of materials is called codification of materials. **Good store-keeping** requires proper classification and codification of various items of stores on stock. Stores are generally classified either by their nature or by their usage. The former method of classification or classification by the nature of materials is most commonly used. Under this method of classification, the various items of stores are divided into specific groups like construction materials, belting materials, consumable stores, spare parts and so on. All the items are grouped, so that each item of stores will be conveniently codified on alphabetical, numerical or alpha-numerical basis concept and given a distinctive store code number.

In numerical codification, each item is allotted a number, The numbering may be straight or in groups or blocks. This method is very suitable for those companies where the number of items are very large.In alphabetical codification, each item is denoted by a combination of the alphabets, for example, A for nut, B for screw and so on. This system is not suitable if there are large number of store items. In alpha-numeric codification, alphabets along with numbers are used for coding. The decimal codification system is more commonly used. The number of digits in the code will depend upon the extent of classification required. The greater the number of details to be covered, the greater will be the number of digits. Following are the advantages of classification and codification of materials Quick and easy identification of materials. Helps ensure a proper material control. Secrecy of materials. Saving of time in material handling. Eliminating the chances of wrong issue.