

Inventory and Inventory Management

The materials and goods which a business owns in order to ultimately resell them are known as inventory. The component of supply chain management which deals with supervising inventory is known as inventory management. The topics elaborated in this chapter will help in gaining a better perspective about the different types of inventory and their management.

Inventory

Inventory is the term for the goods available for sale and raw materials used to produce goods available for sale. Inventory represents one of the most important assets of a business because the turnover of inventory represents one of the primary sources of revenue generation and subsequent earnings for the company's shareholders.

Inventory is the array of finished goods or goods used in production held by a company. Inventory is classified as a current asset on a company's balance sheet, and it serves as a buffer between manufacturing and order fulfillment. When an inventory item is sold, its carrying cost transfers to the cost of goods sold (COGS) category on the income statement.

Inventory can be valued in three ways. The first-in, first-out (FIFO) method says that the cost of goods sold is based on the cost of the earliest purchased materials, while the carrying cost of remaining inventory is based on the cost of the latest purchased materials. The last-in, first-out (LIFO) method states that the cost of goods sold is valued using the cost of the latest purchased materials, while the value of the remaining inventory is based on the earliest purchased materials. The weighted average method requires valuing both inventory and the cost of goods sold based on the average cost of all materials bought during the period.

Many producers partner with retailers to consign their inventory. Consignment inventory is the inventory owned by the supplier/producer but held by a customer. The customer purchases the inventory once it has resold or once they consume it (e.g. to produce their own products). The benefit to the supplier is that their product is promoted by the customer and readily accessible to end-users. The benefit to the customer is that they do not expend capital until it proves profitable to them, meaning they only purchase it when the end-user purchases it from them or until they consume the inventory for their operations.

Principle of Inventory Proportionality

Inventory proportionality is the purpose of demand-driven inventory management. The leading optimum outcome is actually to give the very same number of days' worth regarding inventory around across almost all merchandise so that the time regarding runout of most

merchandise could be simultaneous. In such a case, there is no “excess inventory, inch that may be, inventory that could be left regarding yet another merchandise if your first merchandise extends out. The actual secondary goal regarding inventory proportionality is actually inventory minimization. Simply by establishing accurate require foretelling of using inventory administration.

Purpose and Application of Inventory

Purpose

Inventory proportionality is the goal of demand-driven inventory management. The primary optimal outcome is to have the same number of days’ (or hours’, etc.) worth of inventory on hand across all products so that the time of runout of all products would be simultaneous. In such a case, there is no “excess inventory,” that is, inventory that would be left over of another product when the first product runs out. Excess inventory is sub-optimal because the money spent to obtain it could have been utilized better elsewhere, i.e. to the product that just ran out.

The secondary goal of inventory proportionality is inventory minimization. By integrating accurate demand forecasting with inventory management, replenishment inventories can be scheduled to arrive just in time to replenish the product destined to run out first, while at the same time balancing out the inventory supply of all products to make their inventories more proportional, and thereby closer to achieving the primary goal. Accurate demand forecasting also allows the desired inventory proportions to be dynamic by determining expected sales out into the future; this allows for inventory to be in proportion to expected short-term sales or consumption rather than to past averages, a much more accurate and optimal outcome.

Integrating demand forecasting into inventory management in this way also allows for the prediction of the “can fit” point when inventory storage is limited on a per-product basis.

Applications

The technique of inventory proportionality is most appropriate for inventories that remain unseen by the consumer. As opposed to “keep full” systems where a retail consumer would like to see full shelves of the product they are buying so as not to think they are buying something old, unwanted or stale; and differentiated from the “trigger point” systems where product is reordered when it hits a certain level; inventory proportionality is used effectively by just-in-time manufacturing processes and retail applications where the product is hidden from view.

One early example of inventory proportionality used in a retail application in the United States is for motor fuel. Motor fuel (e.g. gasoline) is generally stored in underground storage tanks. The motorists do not know whether they are buying gasoline off the top or bottom of the tank, nor need they care. Additionally, these storage tanks have a maximum capacity and cannot be overfilled. Finally, the product is expensive. Inventory proportionality is used to balance the inventories of the different grades of motor fuel, each stored in dedicated tanks, in proportion to the sales of each grade. Excess inventory is not seen or valued by the consumer, so it is simply cash sunk (literally) into the ground. Inventory proportionality minimizes the amount of excess inventory carried in underground storage tanks.

Types of Inventory

There are many different types of inventory and each is accounted for slightly differently. Retailers are the easiest to account for because they typically only have one kind of goods called merchandise. They purchase it from wholesalers or manufacturers as finished products to sell to their customers.

Manufacturers, on the other hand, define inventory a little bit differently because they produce their own products to sell to customers. Thus, they need to account for the inventory at every stage of production. The three categories are raw materials, work-in-process, and finished goods. Let's take a look at each of these categories in the Ford car plant.

1. **Raw materials** – Raw materials are the building blocks to make finished goods. Ford purchases sheet metal, steel bars, and tubing to manufacture car frames and other parts. When they put these materials into produce and start cutting the bars and shaping the metal, the raw materials become work in process inventories.
2. **Work in process** – Work in process inventory consists of all partially finished products that a manufacturer produces. As the unfinished cars make their way down the assembly line, they are considered a work-in-progress until they are finished.
3. **Finished goods** – Finished goods are exactly what they sound like. These are the finished products that can be sold to wholesalers, retailers, or even the end users. In Ford's case, they are finished cars that are ready to be sent to dealers.

Each of these different categories is important and managing them is key to any business' survival. Inventory control is one of the most important concepts for any business especially retailers. Since they purchase goods from manufacturers and resell them to consumers at small margins, they have to manage their purchasing and control the amount of cash that is tied up in merchandise.

Recording Inventory in Accounting

There are many different methods that can be used to record the cost of inventory, but first let's take a look at what each business attributes to the cost.

When retailers purchase goods from wholesalers or manufacturers, they record the price that they paid for the goods. This includes sales tax, delivery fees, and any other fees associated with receiving the goods.

Manufacturers, however, must include all the of the production costs and any other cost like packaging that is necessary to make the inventory ready for sale.

Businesses typically use one of two different accounting systems to keep track of their goods: periodic and perpetual.

The periodic inventory system is simple and only requires an inventory spreadsheet to keep track of sales and goods remaining in stock. Basically, a count is performed periodically throughout the year to see what was sold and what was left. Although this is a very simple way to keep track of merchandise, it has many downsides.

The perpetual inventory system is a highly sophisticated system that keeps tracks of goods as they are purchased and sold in real time using a bar code scanner and computer system. This is far more accurate than a period system and far more costly.

Financial Statement Presentation Example

Inventory is reported on the balance sheet as a current asset. It's typically presented right after cash and accounts receivable. Retailers typically only list one type of merchandise on their balance sheet whereas manufacturers tend to list the three different categories of inventory separately.

Using the FIFO, LIFO, or the weighted average costing method, cost is assigned to the inventory that was sold during the year and is reported as cost of goods sold on the income statement.

Inventory Management Example

Good inventory management is what sets successful retailers apart from unsuccessful ones. Controlling purchasing and evaluating turns helps management understand what they need to stock and what they need to get rid of. It also helps them become more profitable.

Management uses the inventory turnover and the margin ratios to measure the earnings from each piece of merchandise and stock items that will produce more profits for the company. Investors and creditors also look at these ratios as a health indicator of the company.

For instance, a retailer with low turns and high margins is a normal. A retailer with low turns and low margins might indicate the company isn't doing well.

Inventory is typically one of the largest assets on a retailer's balance sheet and there are plenty of accounting oddities with it. Here's more information about how it is valued and accounted for.

Work-in-Process Inventory

Work-in-process inventory is materials that have been partially completed through the production process. These items are typically located in the production area, though they could also be held to one side in a buffer storage area. The cost of work-in-process typically includes all of the raw material cost related to the final product, since raw materials are usually added at the beginning of the conversion process. Also, a portion of the direct labor cost and factory overhead will also be assigned to work-in-process; more of these costs will be added as part of the remaining manufacturing process.

It is time-consuming to calculate the amount of work-in-process inventory, determine the percentage of completion, and assign a cost to it, so it is standard practice in many companies to minimize the amount of work-in-process inventory just prior to the end of a reporting period.

Work-in-process is an asset, and so is aggregated into the inventory line item on the balance sheet (usually being the smallest of the three main inventory accounts, of which the others are raw materials and finished goods).

It is generally considered a manufacturing best practice to minimize the amount of work-in-process in the production area, since too much of it interferes with the process flow. Also, if work-in-process is allowed to pile up at one work center before being shifted to the next one, this means that a series of flawed units could build up before being discovered at the next work center. Further, production expeditors may be used to force certain key jobs through the pile of work-in-process jobs, which throws the production system into an even greater muddle. Instead, work-in-process should move between work centers one unit at a time, with very little inventory piling up between workstations. Ideally, a lean production environment should contain so little work-in-process inventory that the amount on hand is immaterial.

Work-in-process is a much more significant issue when it involves the construction of a building. In this case, work-in-process includes the accumulated cost of the asset, which will continue to increase until the structure is declared complete.

Raw Materials Inventory

Raw materials inventory is the total cost of all component parts currently in stock that have not yet been used in work-in-process or finished goods production.

There are two subcategories of raw materials, which are:

- **Direct materials:** These are materials incorporated into the final product. For example, this is the wood used to manufacture a cabinet.
- **Indirect materials:** These are materials not incorporated into the final product, but which are consumed during the production process. For example, this is the lubricant, oils, rags, light bulbs, and so forth consumed in a typical manufacturing facility.

The cost of raw materials on hand as of the balance sheet date appears in the balance sheet as a current asset. Raw materials may be aggregated into a single inventory line item in the balance sheet that also includes the cost of work-in-process and finished goods inventory.

Raw materials of all types are initially recorded into an inventory asset account with a debit to the raw materials inventory account and a credit to the accounts payable account.

When raw materials are consumed, the accounting treatment varies, depending on their status as direct or indirect materials. The accounting is:

- **Direct materials:** Debit the work-in-process inventory account and credit the raw materials inventory asset account. Or, if the production process is brief, bypass the work-in-process account and debit the finished goods inventory account instead.
- **Indirect materials:** Debit the factory overhead account and credit the raw materials inventory asset account. At the end of the month, the ending balance in the overhead account is allocated to the cost of goods sold and ending inventory.

Raw materials may sometimes be declared obsolete, possibly because they are no longer used in company products, or because they have degraded while in storage, and so can no longer be used. If so, they are typically charged directly to the cost of goods sold, with an offsetting credit to the raw materials inventory account.

Finished Goods Inventory

Finished goods inventory is the third group of inventory owned by a manufacturer and consist of products that are ready for sale. You can think of this like merchandise owned by a retailer. These goods are completely finished, made it through the production process, and ready for consumers to buy.

Finished goods inventory is a unique asset to manufacturers. Retailers don't have to classify their inventory into segments because their entire inventory is completed and ready for sale.

Manufacturers, on the other hand, physically produce their inventory and have to account for it throughout the production process. It might be helpful to take a look at the production process. Let's look at an example.

When a manufacturer decides to make a product, it must order the basis stock needed to build the product. This stock could be bars of steel, sheets of metal, or blanks of plastic—anything in its raw form. The stock is classified as raw materials inventory.

These raw materials are machined and put through the assembly process. This process could take days or weeks. In the meantime, these goods are transferred from the raw materials account into the work in process inventory account.

After the goods have made it through the entire assembly line and are completely ready for sale, they are transferred out of the work in process account to the finished goods inventory account.

As you can see, this process allows a manufacturer to track how much inventory it has at any stage in the production process. At the end of a period, these three categories of inventory are usually stated separately on the balance sheet, so investors and creditors can understand the value of the inventory. In other words, finished goods are usually worth much more than raw materials. Investors and creditors want to know the mix of inventory rather than just having a total.

Vendor-Managed Inventory

Vendor-Managed Inventory (VMI) is a theory based inspired by integration in supply chain management regarding system dynamics. In recent years, various partnerships like vendor managed inventory (VMI) approach have been used in inventory management as a means to cope with the bullwhip effect.

In the traditional inventory management, a retailer (sometimes called buyer) makes their own decisions regarding the order size while in VMI, a retailer shares their inventory data with a vendor (sometimes called supplier) such that the vendor is the decision-maker who determines the order size for both. Thus, the vendor is responsible for the retailer's ordering cost, while the retailer has to pay for their own holding cost. This policy can prevent stocking undesired inventories and hence can lead to an overall cost reduction. Moreover, the bullwhip effect is also reduced by employing the VMI approach in a buyer-supplier cooperation. As replenishment frequencies play an important role in integrated inventory models to reduce the total cost of supply chains which many studies fail to model it in mathematical problems. VMI is a family of business models in which the buyer of a product provides certain information to a supplier (vendor) of that product and the supplier takes full responsibility for maintaining an agreed inventory of the material, usually

at the buyer's consumption location (usually a store). A third-party logistics provider can also be involved to make sure that the buyer has the required level of inventory by adjusting the demand and supply gaps.

As a symbiotic relationship, VMI makes it less likely that a business will unintentionally become out of stock of a good and reduces inventory in the supply chain. Furthermore, vendor (supplier) representatives in a store benefit the vendor by ensuring the product is properly displayed and store staff are familiar with the features of the product line, all these while helping to clean and organize their product lines for the store. VMI can also decrease the magnitude of the bullwhip effect.

One of the keys to making VMI work is shared risk. In some cases, if the inventory does not sell, the vendor (supplier) will repurchase the product from the buyer (retailer). In other cases, the product may be in the possession of the retailer but is not owned by the retailer until the sale takes place, meaning that the retailer simply houses (and assists with the sale of) the product in exchange for a predetermined commission or profit (sometimes referred to as consignment stock). A special form of this commission business is scan-based trading, where VMI is usually applied but its use is not mandatory.

This is one of the successful business models used by Walmart and many other big box retailers. Oil companies often use technology to manage the gasoline inventories at the service stations that they supply (see Petrolsoft Corporation). Home Depot uses the technique with larger suppliers of manufactured goods. VMI helps foster a closer understanding between the supplier and manufacturer by using electronic data interchange formats, EDI software and statistical methodologies to forecast and maintain correct inventory in the supply chain.

Vendors benefit from more control of displays and more customer contact for their employees; retailers benefit from reduced risk, better store staff knowledge (which builds brand loyalty for both the vendor and the retailer), and reduced display maintenance outlays.

Consumers benefit from knowledgeable store staff who are in frequent and familiar contact with manufacturer (vendor) representatives when parts or service are required. Store staff have good knowledge of most product lines offered by the entire range of vendors. They can help the consumer choose from competing products for items most suited to them and offer service support being offered by the store.

At the goods' manufacturing level, VMI helps prevent overflowing warehouses or shortages, as well as costly labor, purchasing and accounting. With VMI, businesses maintain a proper inventory, and optimized inventory leads to easy access and fast processing with reduced labor costs.

Classes in Vendor-Managed Inventory

Bi-Level VMI Mathematical Models

The first class of VMI, bi-level VMI mathematical model, includes two levels (or echelons) in a supply chain: vendor and retailer. There are three types of VMI mathematical models developed from this class, which are single-vendor single-retailer VMI model, single-vendor multi-retailer VMI model, and multi-vendor multi-retailer VMI model. This class has been significantly developing.

For example, single-vendor single-retailer VMI model was extended for multi-product case, the consignment stock (CS), and discount.

Multi-Level VMI Mathematical Models

The second class is multi-level VMI mathematical model such as a single manufacturer-single vendor multi-retailer (SM-SV-MR) VMI model. Those studies fail to model replenishment frequencies cannot classified here. As replenishment frequencies play an important role in integrated inventory models to reduce the total cost of supply chains which many studies fail to model it in mathematical problems.

Business Inventories

Business inventories is an economic figure that tracks the dollar amount of inventories held by retailers, wholesalers, and manufacturers across the nation. Business inventories is the short version term for “Manufacturing and Trade Inventories and Sales,” a monthly report released by the U.S. Department of Commerce.

The business inventories report is compiled from three sources: the Monthly Retail Trade Survey, the Monthly Wholesale Trade Survey, and the Manufacturers’ Shipments, Inventories, and Orders Survey. Retail merchandise inventories are the value of goods held for sale at the retail level at cost as measured primarily by the FIFO (first in, first out) method of valuation. Inventories at wholesalers, the companies that distribute to retailers, are added to the business inventories numbers each month.

At the manufacturing level, stocks of goods, whether in raw material, work-in-process or finished, are valued at cost, again primarily by FIFO. The sum of the three components is the business inventories figure. The monthly survey has a table that breaks down the three numbers with a sequential comparison to the previous month and a year-over-year comparison (current month versus the same month in the prior year). Also, the report shows “adjusted” figures that take into account seasonality.

Inventories-to-Sales Ratio

One of the more interesting data points that come out of the business inventories report is the inventory-to-sales ratio, which gives an indication of the relative size of inventories to the pace of sales. For example, a ratio of 1.5 would mean that there is enough merchandise in the system to cover one and a half months of aggregate sales. The trend line should be used in conjunction with a single static figure. If the ratio is rising, it could be an indication that near-term production of goods will slow down as excess inventories are worked off. On the other hand, if the ratio is falling, it may be a harbinger of increased manufacturing activity to restock business inventories to meet demand. Because it is an indicator of trends within the manufacturing sector, some say the ratio is an indicator of recessions.

The inventory to sales ratio measures how efficient a company is in managing its inventory.

This ratio establishes a relationship between a company’s sales and its inventory.

Inventory management is always a difficult task. You always want to have sufficient inventory to cater to the demand in the market.

At the same time, if the inventory starts to build up, the costs to store and manage it will eat into the firm's profits.

To be efficiently operational, a business has to maintain its inventory in such a way that it never has either too much or too little of it in stock.

Formula:

In order to calculate the inventory to sales ratio of a company, you can use the following formula:

$$\text{Inventory to Sales Ratio} = \frac{\text{Average Inventory}}{\text{Net Sales}}$$

To calculate this ratio, we simply divide the inventory by the total net sales.

Net sales are calculated by subtracting any sales returns from the company's gross sales, like so:

$$\text{Net Sales} = \text{Gross Sales} - \text{Returns}$$

We use the average inventory as it takes out any seasonality effects while calculating the ratio.

Average Inventory is the average of beginning inventory and ending inventory.

$$\text{Average Inventory} = \frac{(\text{Beginning Inventory} + \text{Ending Inventory})}{2}$$

You can easily find the inventory figures on the company's balance sheet, and the sales revenue on its income statement.

Example: Now that you know all the formulas for calculating this ratio, let's consider a quick example.

Company A has \$1,000 in gross sales. But one of its major customers returns \$200 worth of goods during the period. The beginning inventory was \$80, and the ending inventory was \$100.

By using the provided formulas, you can calculate this company's inventory to net sales ratio, as follows:

$$\text{Average Inventory} = \frac{(\$80 + \$100)}{2} = \$90$$

$$\text{Net Sales} = \$1,000 - \$200 = \$800$$

$$\text{Inventory to Sales Ratio} = \frac{\$90}{\$800} = 0.11$$

As you can see that Company A has an inventory to net sales ratio of 0.11.

However, this value alone tells us nothing about how this company is doing with its sales and inventory.

You should keep in mind that this ratio is more useful when tracked on a trend line.

That's to say, you must examine the inventory to sales ratios of a company over the past 3 to 5 years. When you look at multi-year figures, you can easily determine if there's any improvement or regression.

Interpretation and Analysis

- A company can use this ratio to make critical inventory management decisions.
- In general, a low value of this ratio is good for business. A low value might suggest that sales are high and inventory levels are low.
- It means that the business can quickly get rid of its inventory by way of sales and thus represents efficient operations.
- A high value of this ratio could mean two things. Either the firm is witnessing a major increase in its inventory or the firm's sales are dwindling for some reason.
- A company can also use this ratio to see any trend changes by comparing the historical values with the current value.
- The ideal range for this ratio will depend on the industry in which the firm is operating.
- As some industries have a higher inventory requirement, they will have a relatively higher value of this ratio.
- We can use this ratio for comparison with similar firms or with companies operating in similar industries.
- We have to be careful while analyzing this ratio. As we have seen above, a high or a low value has many different interpretations.
- A low value may signify that the firm is quick in converting its inventory into sales.
- But it is not necessary. It may also be the case that both the inventory and sales are coming down drastically but the ratio stays the same.
- Thus it is imperative that you look at inventory and sales individually to ensure that the company is moving in the right direction.
- Similarly, a sudden spike in its value may either mean a very high inventory buildup or a sudden dip in sales.
- Both these causes have the same impact on the ratio, but both problems have very different solutions.

You need to keep these aspects in mind while evaluating this ratio.

Inventory Control

Inventory control is also known as stock control, and the name says it all. It is the practice of generating maximum revenue of the company's inventory by regulating it and adopting various practices.

The sole aim can be to increase the profits with the least amount of investment in the inventory. This fact is taken care of without compromising customer satisfaction.

Inventory control also includes being accounted for all the goods and where they are at a particular moment. Retailers and distributors have adopted the prime use of inventory control to make differences to their profit shares positively.

Let us delve into the areas where inventory control is mainly adopted and followed to reap more profits.

The availability of raw materials is one of the prime factors that affect the working of a company. Only if there are enough raw materials, do a company be able to produce whatever goods they are willing to produce and only then processes will be carried out.

With the lack of raw materials, it will be difficult for the industries and may even lead to the stoppage of production. But if an industrialist decides to keep a huge amount of raw materials in its inventory, it would have to bear the inordinate cost that comes with maintaining it.

Hence the ideal way to tackle this problem will be to order quantities in small amounts on a frequent basis to reduce the inventory costs and thus to ensure the steady supply of raw materials at the same time.

The cost of maintaining the finished goods within the company to be able to charge a high amount to deliver it right to the customers may sometimes increase the cost of inventory and the pricing premium associated with the product may not have any value.

Inventory control thus highlights in the optimum storage capacity and the balancing of finished goods within the company and the backorders.

Another way in which the inventory cost can be eliminated is through the use of just-in-time production where the production is carried based upon the orders placed by the customers.

Another area where the inventory control has its power and influence on is the manufacturing or working area where the products that are being processed contribute to the inventory. To reduce inventory investment, one must reduce the inventory associated with the production process. Reducing the inventory travel time and reducing the workspace has a very good effect in this case.

Other steps would be to reduce the sizes of the job to help in internal logistics and storage.

Another factor that directly deals with the inventory control is the setting of reorder point. This point is the mark where the company or industry decides to reorder the inventory for production purpose. The problem with the setting of reorder point is that too high a value can increase the chances of rising inventory investment and setting a small value can sometimes lead to stock out and disruption in production processes.

All these instances give us insight into the importance of inventory control, and sometimes the companies and industries outsource certain aspects of production to transfer the burden of inventory control over to them.

Some of the more common areas in which to exercise inventory control are:

- **Raw materials availability:** There must be enough raw materials inventory on hand to ensure that new jobs are launched in the production process in a timely manner, but not so much that the company is investing in an inordinate amount of inventory. The key control designed to address this balance is ordering frequently in small lot sizes from suppliers. Few suppliers are willing to do this, given the cost of frequent deliveries, so a company may have to engage in sole sourcing of goods in order to entice suppliers into engaging in just-in-time deliveries.
- **Finished goods availability:** A company may be able to charge a higher price for its products if it can reliably ship them to customers at once. Thus, there may be a pricing premium associated with having high levels of finished goods on hand. However, the cost of investing in so much inventory may exceed the profits to be gained from doing so, so inventory control involves balancing the proportion of allowable backorders with a reduced level of on-hand finished goods. This may also lead to the use of a just-in-time manufacturing system, which only produces goods to specific customer orders (which nearly eliminates inventory levels).
- **Work in process:** It is possible to reduce the amount of inventory that is being worked on in the production process, which further reduces the inventory investment. This can involve a broad array of actions, such as using production cells to work on subassemblies, shifting the work area into a smaller space to reduce the amount of inventory travel time, reducing machine setup times to switch to new jobs, and minimizing job sizes.
- **Reorder point:** A key part of inventory control is deciding upon the best inventory level at which to reorder additional inventory. If the reorder level is set very low, this keeps the investment in inventory low, but also increases the risk of a stockout, which may interfere with the production process or sales to customers. The reverse problems arise if the reorder point is set too high. There can be a considerable amount of ongoing adjustment to reorder levels to fine tune these issues. An alternative method is to use a material requirements planning system to order only enough inventory for expected production levels.
- **Bottleneck enhancement:** There is nearly always a bottleneck somewhere in the production process that interferes with the ability of the entire operation to increase its output. Inventory control can involve placing an inventory buffer immediately in front of the bottleneck operation, so that the bottleneck can keep running even if there are production failures upstream from it that would otherwise interfere with any inputs that it requires.
- **Outsourcing:** Inventory control can also involve decisions to outsource some activities to suppliers, thereby shifting the inventory control burden to the suppliers (though usually in exchange for a reduced level of profitability).

The issues noted here highlight how difficult it can be to manage the inventory control function. Your operating boundaries are to either invest too much in inventory, or to have too little inventory on hand to satisfy the production manager or customers.

Inventory Control Process

For the convenience to understand the topic, the inventory control system may be divided into three parts:

- (i) Process of Purchasing of Materials
- (ii) Inventory Storing Procedure
- (iii) Process of Issue of Materials

Process of Purchasing of Materials

Its steps are as follows:

1. **Establishment of Purchase Department:** A different department should be established for purchase of materials. This department not only ensure the availability of raw material but also, machines, stationary etc. are purchased by this department. Purchase of materials should be centralized. All purchase should be under a single department. Control centralized purchase is generally possible only in these industries, which are located at a single place only and nature of production is of same type. But if an industry has different production centre at different places, then it becomes compulsory to follow decentralized purchase system. Thus it is compulsory to have a complete knowledge about the nature of production, capacity of locality etc.
2. **Preparation of Purchasing Budge:** First of all the production target of the company should be determined, on the basis of which the budget for purchasing of material is prepared. Following points should be kept in mind while preparing purchase budget:
 - System to receive the materials.
 - The quantity and quality of the material according to the production requirements.
 - Source of supply.
 - Present balance of materials and predictions to receive the materials ordered.
 - Available cash for debtors.
 - On which date the indent is made by concerned department.
 - The conditions regarding the value of the material and rebate or discount on it.
3. **Preparation of Purchase Requisition Slip:** The initiations of purchase begin with the formal request from the various sections or departments to the purchase department to order goods. The request is made in a prescribed form to the purchase department by the departments needing the goods, authorizing the purchase department for procuring the goods as per the specifications given in the slip by the date mentioned on it.
4. The requisitions are generally prepared in triplicate the original copy is sent to the purchase department, the second copy is retained by the store or the department initiating the purchase requisition and third are is sent to the costing department.

Specimen of a PRS

No. Pr Date:
 Cost Centre

**Katech Corporation Ltd
 Purchase Requisition Slip**

Please purchase for department

Item No.	Code No.	Description	Quantity Required	Remark

Required by Checked by Approved by

For use of department issuing this requisition				For use of Purchased department		
Item No.	Quantity in stock	Consumption per day/month	Quantity required	Purchase order no.	Supplier	Delivery Date

Store keeper

Specimen of a PRS

- Obtaining the Tender: After the decision for purchase tenders are invited from the prospective suppliers on studying the terms of supply and the quantity and quality of the goods. Vendor is selected out of the tenderers for the comparative study of tenderers. Following type of table may be used:

Type of Specimen of Tenderer Table

**Katech Corporation Ltd.
 Schedule of Quotations**

Material Date S.No

Name of the party	Quantity offered	Rate/Unit	Terms	Time of delivery	Mode of delivery	Remarks

Store keeper

Date

- Sending Purchase Order: After comparing different tenderers, the best vendor is decided and the order of required material quotation is placed to him. Purchase order is prepared in prescribed form by the purchase department and sent to the vendor authorizing him to supply a specified quantity and quality of the materials at the stipulated terms at the time and place mentioned therein. Generally purchase order has the following information:
 - Name of the purchaser, serial no. and date of order.
 - Name of vendor and address.
 - Full details of materials quantity etc.
 - Value, rebate and terms of payment etc.
 - Time and place of delivery.

- Directions regarding packing and despatching.
- Signature of purchaser.
- Method of follow-up.

Specimen of a Purchase Order

Katech Corporation Ltd.

Cable S. No.
 To, Telephone
 M/s Date
 Reg. No.
 Our Ref.

Please supply the following items in accordance with the terms and conditions mentioned herein

Item No.	Description	Quantity	Price	Unit	Amount	Remarks

Terms and conditions:

Delivery at Sales Tax
 Discount Freight
 Excise Duty Terms of Payment

For Katech Corporation Ltd.
 (Signature)

Acknowledgement

Kindly acknowledge the receipt of this order:

Received on
 Date of Delivery
 Challan Date
 Invoice No. Date

Specimen of a Purchase Order

Specimen of Goods Received Note

Katech Corporation Ltd.

Goods Received Note

From

M/s (Supplier) No. VRN
 Date

Goods	Quantity	No. of Packets etc.	Order No.	Delivery Note No.	Demanded by department	Remarks	Inspection
Description	Code						Qty. rejected
							Reason
Carrier	Received by	Store A ledger	A/c & ref.	Inspector's signature			

Specimen of Goods Received Note

7. **Receiving and Inspection of Materials:** When goods arrive they are taken delivery of and parcels or packet unpacked and the contents of the packages are checked by the receiving clerk with the order placed by the purchasing department to the vendor. After proper checking goods should be delivered to the laboratory or inspection department. Goods received note is prepared here.
8. **Returning the Materials:** On checking if any discrepancy is found as regards to quality and quantity. It should immediately be referred to the purchasing department so that the discrepancy may be adjusted or steps may be taken to return the defective or damaged goods in exchange of proper quality material on credit note.

9. **Payment of Purchased Material:** After required inspection etc. final report is sent to purchase officer, who sent it to payment officer after placing required entries in the report. After checking the ledger, payment officer authorize accounts clerk for payment.

Process of Issue of Materials

To control the issue of materials following procedure is followed:

- Issue of Materials:** When a foreman of any production department needs materials from store, he prepares three copies of goods requisition slip. If the material is costly and important then factory manager also sign these copies. One copy of requisition slip is kept by foreman itself and other two copies are given to stores. According to the requisition slip the store-keeper issues the materials to foreman. Foreman signs the two copy of store's requisition slips to verify that he has received the materials. Then storekeeper makes the required entries in the bin card. After signing both the copies of requisition slip storekeeper sent one copy to accountant of store. After recording the issue of materials, store accountant sent this copy to costing department.

Sigma Corporation Ltd.
Material Requisition Slip

To No

..... Date

Deliver following material to Fore order No.

and Job No.

Quantity	Unit	Description	Code No.	Office use only		Remarks
				Rate Amount	Issued by	
Authorised by		Store Ledger No.		Issued by	Received by	Cost office Ref. No. Price by

Sigma Corporation Ltd.
Materials Requisition Slip

Job No. Material Requisition Slip No.

Department Date

Inter Departmental Transfer of Materials: (For details see 'Inventory Storing Procedure')

Please send the following materials.

Quantity	Code or Symbol	Description of Materials	Rate*	Amount*

ABC Co. Ltd.
Materials Transfer Slips

Issuing Department Serial No.

Receiving Department Date

Please receive the following materials.

Quantity	Code or Symbol	Description of Materials	Rate*	Amount	Reason for Transfer

Foreman Bin No.

Store Ledger Folio Returned

Storekeeper Cost Clerk

Foreman Transfer Foreman Transferee Cost Clerk
* To be filled by Cost Clerk.

* Both these entries are to be done by cost clerk.

- To Prepare Material Abstract:** (For details see Inventory Storing System)

Sigma Corporation Ltd.
Material Abstract

Week ending on

Materials Requisition Slips		Job Numbers					
Slip No.	Amount	N ¹	N ²	N ³	N ⁴	N ⁵	N ⁶
Total							

Material Requisition Slip

2. **Periodical Checking of Materials:** To control the issue of materials this is very much necessary that bin cards, store control records and store ledgers are checked regularly and if any discrepancy is found, proper corrective actions should be taken.
3. **Physical Stock Checking of Materials:** Physical stock checking in stores should be done to prevent materials loss, material damage and theft. This checking can be done weekly, monthly etc. Physical stock checking means the verification of actual quantity in stores. This checking should be done surprisingly or at random basis. If any discrepancy is found and corrective actions should be taken to reduce or eliminate them the possible reasons may be wear and tear of materials, absorption of moisture, evaporation, waste, breakage, theft or wrong recordings. This is assumed to be the best method of inventory control.

Inventory Storing Procedure

Inventory storing procedure is an important part of inventory control management or materials management. Following procedure is followed in inventory storing:

1. **Receipt of Material in Store:** The storekeeper receives the material along with the goods received note from the receiving section. The material is then classified according to the nature of the material. The material should be arranged in bins especially meant for the materials. A bin card is attached with each bin or rack displaying the identification mark or code, minimum, maximum and ordering levels of materials and receipts, issues and balance of materials in hand, so that the exact position may be known at any time whenever desired.

Specimen of Bin Card

ABC Co. Ltd.

BIN CARD

Description Maximum Level
 Material code Minimum Level
 Location code Danger Level
 Bin No. Ordering Level
 Store Ledger Folio No. Re-order Quantity

Receipts			Issues			Balance	Audit	
Date	G.R.N. No.	Qty.	Date	Rege.	Qty.	Qty.	Date	Initial

Specimen of Bin Card

2. **Issue of Material from Store:** The store undertakes the responsibility of issuing the material to the using departments. In order to prevent malpractices, the materials must be issued only against the properly authorised requisition slips. These requisition must be properly checked and scrutinised to avoid overissue of materials. All requisition received must be posted immediately or daily on the bin cards and on the stock control cards. Generally three copies of requisition slips are prepared – first two copies are given to the stores

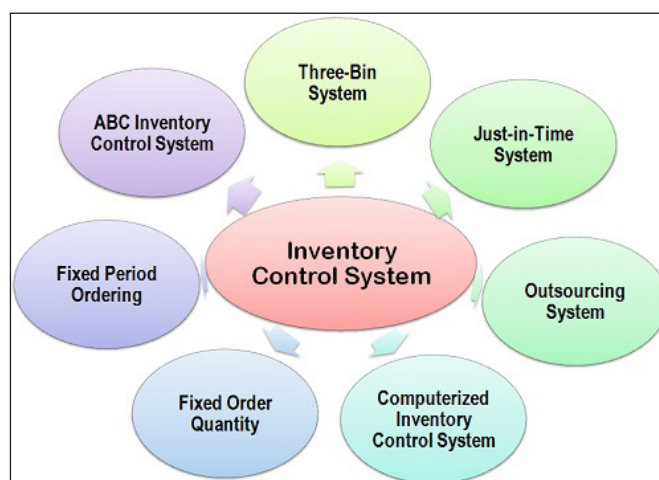
and third copy kept with the demanding department. Store incharge keeps one copy of requisition slip for himself and other copy he sent to accounts department.

3. **Return of Material to Store:** If a department uses less material to its demand then it return the material to stores. Goods return slips are sent along with the materials. The same specifications and details of materials are given in goods return slips as they were mentioned in requisition slips. Three copies of goods return slips are prepared. First two copies are sent to stores department and third copy is kept by the goods returning department itself. Store keeper sent one copy to accounts department. The colour of both requisition slip and return slips are kept different to identify them easily.
4. **Transfer of Material:** The transfer of materials from one department to another department is generally not appreciated, because it creates problems in material control process. But sometime when there is emergency, the transfer of material from one department to other department is allowed. The department transferring he materials makes four copies of material transfer slips. First copy is sent to the needy department along with material. Second and third copies are sent to stores department and accounts department for their information.
5. **Material Abstract:** In big industries where the large quality of materials are received, issued and transferred daily, “material abstract” is prepared weekly or fortnightly to control the inventory. A physical verification of quantity in stores and other departments is done by material abstract.

If any discrepancy is found in physical verification of quantity in store or other department. It is brought into the notice of top management this type of check plays a very important role in inventory control. Thus material abstract is a summary of materials received, issued and transferred, for a given time period.

Inventory Control System

The Inventory control system is maintained by every firm to manage its inventories efficiently. Inventory is the stock of products that a company manufactures for sale and the components or raw materials that make up the product. Hence, an inventory comprises of the buffer of raw material, work-in-process inventories and finished goods.



Following are the popular Inventory Control Systems that are being used by big manufacturers and the retail units:

1. ABC Inventory Control System
2. Three-Bin System
3. Just-in-Time (JIT) System
4. Outsourcing Inventory System
5. Computerized Inventory Control System
6. Fixed Order Quantity
7. Fixed Period Ordering

There are several inventory control systems that are in practice, and these range from simple system to a complex one depending upon nature and the size of the business operations. Talking about the simple system, several small manufacturing firms operate a Two-Bin System; wherein inventory is stored in two bins. Once the inventory in one bin is used, and the order is placed, meanwhile, the inventory from the other bin is used by the firm.

This system is quite inadequate for the larger firms that deal in several product lines and maintain a heavy sales counter. Thus, self –operating or an automatic computer system is to be employed to keep track on the inventory stock and place the order in case of a shortage.

Inventory Management

Inventory management is a component of supply chain management that involves supervising non-capitalized assets, or inventory, and stock items. Specifically, “inventory management supervises the flow of goods from manufacturers to warehouses and from these facilities to point of sale.” Thus, inventory management hinges on detailed records of products or parts as they enter and leave warehouses and points of sale.



Inventory management is critical to the bottom line because inventory is a major asset that remains an investment until the products sell. Several costs are tied to inventory management because businesses must store, track, and insure inventory. Overall, best practices in inventory management involve sound purchasing plans to guarantee items are available when they are needed without having too few or too many on hand and the necessary tools for tracking existing inventory.

Methods of Inventory Management

There are two common inventory management strategies: the just in time method and the materials requirement planning method.

Just in Time Method

The just in time method (JIT) of inventory management involves companies planning to receive items as they are needed instead of maintaining high levels of inventory. One benefit of this inventory management method is that companies do not have a great deal of money tied up in inventory levels; they reduce storage and insurance costs and the cost of liquidating unused inventory. Another benefit of the just in time method is that companies reduce waste.

Challenges of the just in time method of inventory management come into play when manufacturers and retailers have to work together to monitor the availability of manufacturing resources and consumer demand. Just in time inventory management also is considered risky because companies take a gamble with being unable to fill orders; being out of stock reduces revenue and may harm customer relations.

Materials Requirement Planning Method

The materials requirement planning method (MRP) of inventory management involves companies scheduling material deliveries based on sales forecasts. Typically a computer-based inventory management system, MRP breaks down inventory requirements into planning periods so that production can be completed efficiently while keeping inventory levels and storage costs at a minimum. Another benefit of MRP inventory management is that it aids production managers in planning for capacity needs and allocating production time.



One of the most significant disadvantages of the MRP inventory management method is that the systems often are expensive and involve a time-consuming implementation period. It also may be challenging for companies to put quality information into the MRP system to gain accurate forecasts; to reap the full benefits of MRP inventory management, organizations must be prepared to maintain current and accurate bills of materials, part numbers, and inventory records.

Inventory Management Best Practices

Companies that continue to rely on manual inventory tracking with spreadsheets run the risk of data entry errors, shipping mistakes, and lack of inventory knowledge. Thus, implementing inventory management best practices is important for business success and the bottom line:

1. Determine whether a continuous review system or periodic review system is the best type of inventory management system for your business.
2. Implement a cycle counting program after considering counting frequency, counting strategy, and cycle count management.
3. Manage your inventory by knowing the inventory levels that are most beneficial to the flow of your business; track data to make better inventory management decisions.
4. Implement quality control procedures so that all employees can work toward the same goals
5. Optimize inventory levels to boost efficiency and meet customer demands.
6. Prepare for growth and implement inventory management best practices that will support your business goals.

Inventory management is critical to a company's success and bottom line. Determining which inventory management method is better suited to your business and following through with inventory management best practices is key to successful inventory management for the long term.

Importance of Inventory Management

Inventory Management includes managing and controlling raw materials, stocks, finished goods, warehousing, storage and other aspects which help reach the product from production to distributor or retailer. Each organization regularly strives on efficient inventory management to uphold optimum inventory to be able to meet its necessities and avoid over or under inventory that can impact the monetary statistics of the firm.

Inventory is forever dynamic. A prerequisite of inventory management is steady and vigilant assessment of exterior and interior factors and control via planning and evaluation. Most of the businesses have an individual department of inventory planners who incessantly observe, control and evaluate inventory and interface with manufacturing, procurement and finance sections of the firm.

In a business or association, all the functions are interlinked and coupled to each other and are time and again overlapping. Some key features like supply chain management, logistic handling

and inventory management form the spine of the business delivery function. Therefore these functions are very significant to the managers.

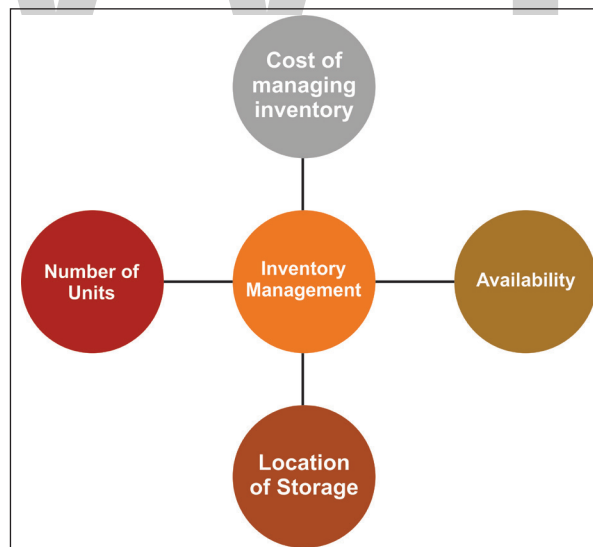
Inventory Management Example

Inventory Management is very important for a business to run smoothly. Imagine a cake manufacturing shop if it keeps running out of flour and sugar. Flour and sugar are like the main raw materials which keep the business process running. The cake maker needs to plan the quantities of sugar and flour so that he never runs out of them when he wants to make a cake. But inventory management is just not about bulking up the supplies. If too much flour and sugar are stocked and there is not as much demand for cake, the flour and sugar would go bad which would cause financial losses to business. Inventory Management advocated optimization of inventory. The inventory management makes sure that the cake maker has almost the exact amount of sugar and flour which are just enough to make cakes which match with the demand of cake eaters who order cake from his shop.

Inventory Management Parameters

Inventory management can be efficiently done on the basis of 4 broad parameters:

- Number of units in the stock
- Cost of managing inventory
- Availability of inventory on time
- Location for storing inventory



Challenges of Inventory Management

1. Understanding the Inventory – Organizations should take a holistic view into knowing both basic vs. non-basic matter and at what time they should be ordered. Basic items are those that you sell ant time of the year and need incessant replenishing of stock. By sorting

these out from non-basic or seasonal items inventory levels can be much more allied with a recognized schedule and product lifecycle. However, knowing your items are is just the first step. One must have knowledge about stock capacity, what is going to be ordered, the size of the order, and what needs to be refilled.

2. Incompetent Processes – Built on or rely on dated software or manual processes are used for inventory management systems. This creates an extremely demanding work setting for anybody caught up in the inventory management process. One must begin with a review of current standard operating procedures and settle on where gaps may lie in the systems.
3. Client Demand – Customers' needs are varying daily and they are looking to their distributors to allow for elasticity in orders. With the mounting demand of struggle it becomes more taxing to keep up with the exclusive needs of the consumers to reassure they do not have those needs met by some other firm. All these factors help in understanding inventory management.

Principles of Inventory Management

There five key principles of inventory management:

1. Demand forecasting
2. Warehouse flow
3. Inventory turns/stock rotation
4. Cycle counting
5. Process auditing

Focusing on these five fundamentals can yield significant bottom-line savings.

Demand Forecasting

Depending on the industry, inventory ranks in the top five business costs. Accurate demand forecasting has the highest potential savings for any of the principles of inventory management. Both over supply and under supply of inventory can have critical business costs. Whether it is end-item stocking or raw component sourcing, the more accurate the forecast can be.

Establishing appropriate max-min management at the unique inventory line level, based on lead times and safety stock level help ensure that you have what you needs when you need it. This also avoids costly overstocks. Idle inventory increases incremental costs due to handling and lost storage space for fast-movers.

Warehouse Flow

The old concept of warehouses being dirty and unorganized is out dated and costly. Lean manufacturing concepts, including 5S have found a place in warehousing. Sorting, setting order, systemic cleaning, standardizing, and sustaining the discipline ensure that no dollars are lost to poor processes.

The principles of inventory management are not any different from other industrial processes. Disorganization costs money. Each process, from housekeeping to inventory transactions needs a formal, standardized process to ensure consistently outstanding results.

Inventory Turns/Stock Rotation

In certain industries, such as pharmaceuticals, foodstuffs and even in chemical warehousing, managing inventory down to lot numbers can be critical to minimizing business costs. Inventory turns is one of the key metrics used in evaluating how effective your execution is of the principles of inventory management.

Defining the success level for stock rotation is critical to analyzing your demand forecasting and warehouse flow.

Cycle Counting

One of the key methods of maintaining accurate inventory is cycle counting. This helps measure the success of your existing processes and maintain accountability of potential error sources. There are financial implications to cycle counting. Some industries require periodic 100% counts. These are done through perpetual inventory count maintenance or through full-building counts.

Process Auditing

Proactive error source identification starts with process audits. One of the cornerstone principles of inventory management is to audit early and often. Process audits should occur at each transactional step, from receiving to shipping and all inventory transactions in between.

By careful attention to each of these critical core principles, your business can increase efficiency and reduce costs.

Inventory Management Software

Inventory management software is a software system for tracking inventory levels, orders, sales and deliveries. It can also be used in the manufacturing industry to create a work order, bill of materials and other production-related documents. Companies use inventory management software to avoid product overstock and outages. It is a tool for organizing inventory data that before was generally stored in hard-copy form or in spreadsheets.

Features

Inventory management software is made up of several key components working together to create a cohesive inventory of many organization's systems. These features include:

Reorder Point

Should inventory reach a specific threshold, a company's inventory management system can be programmed to tell managers to reorder that product. This helps companies avoid running out of products or tying up too much capital in inventory.

Asset Tracking

When a product is in a warehouse or store, it can be tracked via its barcode and/or other tracking criteria, such as serial number, lot number or revision number. Systems. for Business, Encyclopedia of Business, 2nd ed. Nowadays, inventory management software often utilizes barcode, radio-frequency identification (RFID), and/or wireless tracking technology.

Service Management

Companies that are primarily service-oriented rather than product-oriented can use inventory management software to track the cost of the materials they use to provide services, such as cleaning supplies. This way, they can attach prices to their services that reflect the total cost of performing them.

Product Identification

Barcodes are often the means whereby data on products and orders are inputted into inventory management software. A barcode reader is used to read barcodes and look up information on the products they represent. Radio-frequency identification (RFID) tags and wireless methods of product identification are also growing in popularity.

Modern inventory software programs may use QR codes or NFC tags to identify inventory items and smartphones as scanners. This method provides an option for businesses to track inventory using barcode scanning without a need to purchase expensive scanning hardware.

Inventory Optimization

A fully automated demand forecasting and inventory optimization system to attain key inventory optimization metrics such as:

- **Reorder point:** the number of units that should trigger a replenishment order.
- **Order quantity:** the number of units that should be reordered, based on the reorder point, stock on hand and stock on order.
- **Lead demand:** the number of units that will be sold during the lead time.
- **Stock cover:** the number of days left before a stockout if no reorder is made.
- **Accuracy:** the expected accuracy of the forecasts.

Purpose

Companies often use inventory management software to reduce their carrying costs. The software is used to track products and parts as they are transported from a vendor to a warehouse, between warehouses, and finally to a retail location or directly to a customer.

Inventory management software is used for a variety of purposes, including:

- Maintaining a balance between too much and too little inventory.

- Tracking inventory as it is transported between locations.
- Receiving items into a warehouse or other location.
- Picking, packing and shipping items from a warehouse.
- Keeping track of product sales and inventory levels.
- Cutting down on product obsolescence and spoilage.
- Avoiding missing out on sales due to out-of-stock situations.

Manufacturing Uses

Manufacturers primarily use inventory management software to create work orders and bills of materials. This facilitates the manufacturing process by helping manufacturers efficiently assemble the tools and parts they need to perform specific tasks. For more complex manufacturing jobs, manufacturers can create multilevel work orders and bills of materials, which have a timeline of processes that need to happen in the proper order to build a final product. Other work orders that can be created using inventory management software include reverse work orders and auto work orders. Manufacturers also use inventory management software for tracking assets, receiving new inventory and additional tasks businesses in other industries use it for.

Advantages of ERP Inventory Management Software

There are several advantages to using inventory management software in a business setting.

Cost Savings

A company's inventory represents one of its largest investments, along with its workforce and locations. Inventory management software helps companies cut expenses by minimizing the amount of unnecessary parts and products in storage. It also helps companies keep lost sales to a minimum by having enough stock on hand to meet demand.

Increased Efficiency

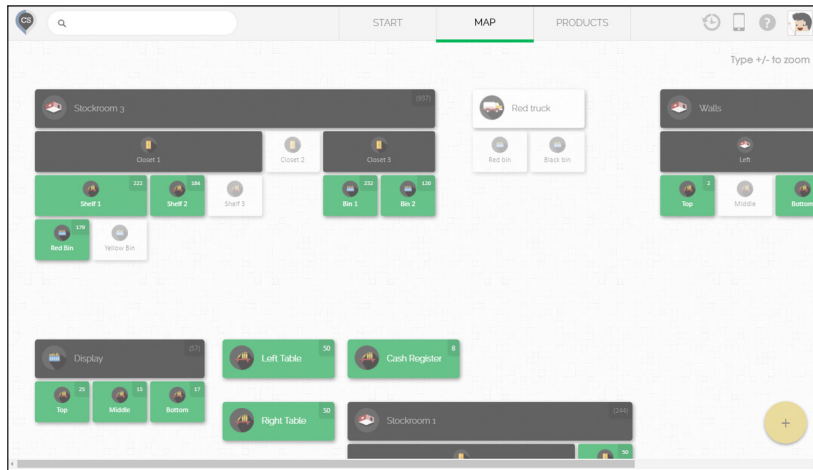
Inventory management software often allows for automation of many inventory-related tasks. For example, software can automatically collect data, conduct calculations, and create records. This not only results in time savings, cost savings, but also increases business efficiency.

Warehouse Organization

Inventory management software can help distributors, wholesalers, manufacturers and retailers optimize their warehouses. If certain products are often sold together or are more popular than others, those products can be grouped together or placed near the delivery area to speed up the process of picking.

By 2018, 66% of warehouses “are poised to undergo a seismic shift, moving from still prevalent pen and paper processes to automated and mechanized inventory solutions. With these new automated processes, cycle counts will be performed more often and with less effort, increasing inventory

visibility, and leading to more accurate fulfillment, fewer out of stock situations and fewer lost sales. More confidence in inventory accuracy will lead to a new focus on optimizing mix, expanding a selection and accelerating inventory turns.”



As businesses move away from pen and paper processes to automated solutions, visibility becomes a key factor in inventory management.

Updated Data

Up-to-date, real-time data on inventory conditions and levels is another advantage inventory management software gives companies. Company executives can usually access the software through a mobile device, laptop or PC to check current inventory numbers. This automatic updating of inventory records allows businesses to make informed decisions.

Data Security

With the aid of restricted user rights, company managers can allow many employees to assist in inventory management. They can grant employees enough information access to receive products, make orders, transfer products and do other tasks without compromising company security. This can speed up the inventory management process and save managers' time.

Insight into Trends

Tracking where products are stocked, which suppliers they come from, and the length of time they are stored is made possible with inventory management software. By analysing such data, companies can control inventory levels and maximize the use of warehouse space. Furthermore, firms are more prepared for the demands and supplies of the market, especially during special circumstances such as a peak season on a particular month. Through the reports generated by the inventory management software, firms are also able to gather important data that may be put in a model for it to be analyzed.

Disadvantages of ERP Inventory Management Software

The main disadvantages of inventory management software are its cost and complexity.

Expense

Cost can be a major disadvantage of inventory management software. Many large companies use an ERP as inventory management software, but small businesses can find it difficult to afford it. Barcode readers and other hardware can compound this problem by adding even more cost to companies. The advantage of allowing multiple employees to perform inventory management tasks is tempered by the cost of additional barcode readers. Use of smartphones as QR code readers has been a way that smaller companies avoid the high expense of custom hardware for inventory management.

Complexity

Inventory management software is not necessarily simple or easy to learn. A company's management team must dedicate a certain amount of time to learning a new system, including both software and hardware, in order to put it to use. Most inventory management software includes training manuals and other information available to users. Despite its apparent complexity, inventory management software offers a degree of stability to companies. For example, if an IT employee in charge of the system leaves the company, a replacement can be comparatively inexpensive to train compared to if the company used multiple programs to store inventory data.

Benefits of Cloud Inventory Management Software

The main benefits of cloud inventory management software include:

Real-Time Tracking of Inventory

For startups and SMBs, tracking inventory in real time is very important. Not only can business owners track and collect data but also generate reports. At the same time, entrepreneurs can access cloud-based inventory data from a wide range of internet-enabled devices, including smartphones, tablets, laptops, as well as traditional desktop PCs. In addition, users do not have to be inside business premises to use web-based inventory program and can access the inventory software while on the road.

Cut Down Hardware Expenses

Because the software resides in the cloud, business owners do not have to purchase and maintain expensive hardware. Instead, SMBs and startups can direct capital and profits towards expanding the business to reach a wider audience. Cloud-based solutions also eliminate the need to hire a large IT workforce. The service provider will take care of maintaining the inventory software.

Fast Deployment

Deploying web based inventory software is quite easy. All business owners have to do is sign up for a monthly or yearly subscription and start using the inventory management software via the internet. Such flexibility allows businesses to scale up relatively quickly without spending a large amount of money.

Easy Integration

Cloud inventory management software allows business owners to integrate with their existing systems with ease. For example, business owners can integrate the inventory software with their eCommerce store or cloud-based accounting software. The rise in popularity of 3rd party marketplaces, such as Amazon, eBay and Shopify, prompted cloud-based inventory management companies to include the integration of such sites with the rest of a business owner's retail business, allowing one to view and control stock across all channels.

Enhanced Efficiency

Cloud inventory systems increase efficiency in a number of ways. One is real-time inventory monitoring. A single change can replicate itself company-wide instantaneously. As a result, businesses can have greater confidence in the accuracy of the information in the system, and management can more easily track the flow of supplies and products – and generate reports. In addition, cloud-based solutions offer greater accessibility.

Improved Coordination

Cloud inventory programs also allow departments within a company to work together more efficiently. Department A can pull information about Department B's inventory directly from the software without needing to contact Department B's staff for the information. This inter-departmental communication also makes it easier to know when to restock and which customer orders have been shipped, etc. Operations can run more smoothly and efficiently, enhancing customer experience. Accurate inventory information can also have a huge impact on a company's bottom line. It allows you to see where the bottlenecks and workflow issues are – and to calculate break-even points as well as profit margins.

Disadvantages of Cloud Inventory Management Software

1. **Security and privacy:** Using the cloud means that data is managed by a third party provider and there can be a risk of data being accessed by unauthorized users.
2. **Dependency:** Since maintenance is managed by the vendor, users are essentially fully dependent on the provider.
3. **Decreased flexibility:** Depending on the cloud service provider, system and software upgrades will be performed based on their schedule, hence businesses may experience some limitations in flexibility in the process.
4. **Integration:** Not all on-premises systems or service providers can be synced with the cloud software used.

Inventory Management System

An inventory management system is the combination of technology (hardware and software) and processes and procedures that oversee the monitoring and maintenance of stocked

products, whether those products are company assets, raw materials and supplies, or finished products ready to be sent to vendors or end consumers. A complete inventory management system consists of:

- A system for identifying every inventory item and its associated information, such as barcode labels or asset tags.
- Hardware tools for reading barcode labels, such as handheld barcode scanners or smartphones with barcode scanning apps.
- Inventory management software, which provides a central database and point of reference for all inventory, coupled with the ability to analyze data, generate reports, forecast future demand, and more.
- Processes and policies for labeling, documentation, and reporting. This should include an inventory management technique such as Just in Time, ABC Analysis, First-In First-Out (FIFO), Stock Review, or another proven methodology.
- People who trained to follow these policies and processes.



Search ERP defines inventory management as “the supervision of non-capitalized assets (inventory) and stock items.” Inventory management is a component of supply chain management that oversees the flow of items (products, goods, etc.) as they move from the manufacturer to the warehouse and then to the point of sale. “A key function of inventory management is to keep a detailed record of each new or returned product as it enters or leaves a warehouse or point of sale,” Search ERP explains, which points to the importance of having a clear and established inventory management system to ensure that the process and documentation are as streamlined and efficient as possible, as well as to minimize error.

Benefits of Inventory Management Systems

Without an inventory management system, the goods and products that flow through an organization will inevitably be in disarray. An inventory management system enables a company to

maintain a centralized record of every asset and item in the control of the organization, providing a single source of truth for the location of every item, vendor and supplier information, specifications, and the total number of a particular item currently in stock.

Because inventory often consists of movable assets, inventory management systems are critical for keeping tabs on current stock levels and understanding what items move quickly and which items are more slow-moving, which in turn enables organizations to determine when it's time to reorder with greater accuracy. Overall, a comprehensive inventory management system offers countless benefits to companies including:

- Improved cash flow,
- Better reporting and forecasting capabilities,
- Reduction in storage costs (overhead),
- Reduced labor costs,
- Reduction in dead stock,
- Better organization,
- Enhanced transparency,
- Improved supplier, vendor, and partner relationships.

Challenges of Inventory Management Systems

Inventory management systems can have a dramatic effect on productivity and efficiency when implemented properly. Most of the challenges associated with inventory management systems arise from failing to follow best practices or relying on outdated methods, such as manual documentation and inconsistent storage layouts and processes. In these cases, a complete inventory management overhaul may be in order to streamline inventory management and add clarity and consistency to the process company-wide.



A good inventory management system reduces human error by eliminating manual documentation through the use of barcode labels, barcode scanners, and inventory management software, reducing costly mistakes such as:

- Having too much slow-moving inventory in stock, taking up valuable storage space and eating into the company's bottom line.
- Unexpectedly running out of stock of an essential inventory item, which can delay the supply chain due to backorders.
- Inaccurate records (wrong part numbers, incorrect inventory counts) that arise from manual documentation errors.
- Wasted man hours spent tracking down items that are stored in the wrong locations. Inventory storage that's not optimized for efficiency (due to poor warehouse or stock room layouts) can also increase stock picking time, which also increases labor costs.

Best Practices for Inventory Management Systems

Cleary Inventory explains that a good inventory management system can help to enhance productivity, but only if you set it up with some basic essentials including:

- Location names,
- Easy-to-read location labels,
- Unique item identification numbers,
- Units of measure,
- A starting count,
- A software solution that effectively monitors and tracks activity,
- Clear, company-wide policies and processes,
- People who know how to support these policies and processes.

Implementing a comprehensive inventory management system can be complex. It's not merely a matter of purchasing a good software program; an inventory management system must address the people, processes, and technologies from end-to-end. Following best practices to set up a comprehensive, company-wide inventory management system is an investment that will pay for itself again and again through greater efficiency and a boost to the bottom line.

Demand Management

Demand management is a planning methodology used to forecast, plan for and manage the demand for products and services. This can be at macro-levels as in economics and at micro-levels within individual organizations. For example, at macro-levels, a government may influence interest rates in order to regulate financial demand. At the micro-level, a cellular service provider may provide free night and weekend use in order to reduce demand during peak hours.

Demand management has a defined set of processes, capabilities and recommended behaviors for companies that produce goods and services. Consumer electronics and goods companies often lead in the application of demand management practices to their demand chains; demand management outcomes are a reflection of policies and programs to influence demand as well as competition and options available to users and consumers. Effective demand management follows the concept of a “closed loop” where feedback from the results of the demand plans is fed back into the planning process to improve the predictability of outcomes. Many practices reflect elements of systems dynamics. Volatility is being recognized as significant an issue as the focus on variance of demand to plans and forecasts.

In Economics

Macroeconomics

In macroeconomics, demand management is the art or science of controlling aggregate demand to avoid a recession.

Demand management at the macroeconomic level involves the use of discretionary policy and is inspired by Keynesian economics, though today elements of it are part of the economic mainstream. The underlying idea is for the government to use tools like interest rates, taxation, and public expenditure to change key economic decisions like consumption, investment, the balance of trade, and public sector borrowing resulting in an ‘evening out’ of the business cycle. Demand management was widely adopted in the 1950s to 1970s, and was for a time successful. However, it did not prevent the stagflation of the 1970s, which is considered to have been precipitated by the supply shock caused by the 1973 oil crisis.

Theoretical criticisms of demand management are that it relies on a long-run Phillips Curve for which there is no evidence, and that it produces dynamic inconsistency and can therefore be non-credible.

Today, most governments relatively limit interventions in demand management to tackling short-term crises, and rely on policies like independent central banks and fiscal policy rules to prevent long-run economic disruption.

Natural Resources and Environment

In natural resources management and environmental policy more generally, demand management refers to policies to control consumer demand for environmentally sensitive or harmful goods such as water and energy. Within manufacturing firms the term is used to describe the activities of demand forecasting, planning, and order fulfillment. In the environmental context demand management is increasingly taken seriously to reduce the economy’s throughput of scarce resources for which market pricing does not reflect true costs. Examples include metering of municipal water and carbon taxes on gasoline.

Welfare Economics

Demand management in economics focuses on the optimal allocation resources to affect social welfare.

Welfare economics uses the perspective and techniques of microeconomics, but they can be aggregated to make macroeconomic conclusions. Because different “optimal” states may exist in an economy in terms of the allocation of resources, welfare economics seeks the state that will create the highest overall level of social welfare.

Some people object to the idea of wealth redistribution because it flies in the face of pure capitalist ideals, but economists suggest that greater states of overall social good might be achieved by redistributing incomes in the economy.

Because welfare economics follows the techniques of microeconomics, where demand planning is part of the process especially the redistribution of the funds through government taxes, fees and royalties to programs for societal good, such as roads, services, income support and agriculture support programs.

Demand Management as a Business Process

Demand management is both a stand-alone process and one that is integrated into sales and operations planning (S&OP) or integrated business planning (IBP).

Demand management in its most effective form has a broad definition well beyond just developing a “forecast” based on history supplemented by “market” or customer intelligence, and often left to the supply chain organization to interpret. Philip Kotler notes two key points: 1. Demand management is the responsibility of the marketing organization (in his definition sales is subset of marketing); 2. The demand “forecast” is the result of planned marketing efforts. Those planned efforts, not only should focus on stimulating demand, more importantly influencing demand so that a business’s objectives are achieved.

The components of effective demand management, identified by George Palmatier and Colleen Crum, are:

1. Planning demand,
2. Communicating demand,
3. Influencing demand, and
4. Prioritizing demand.

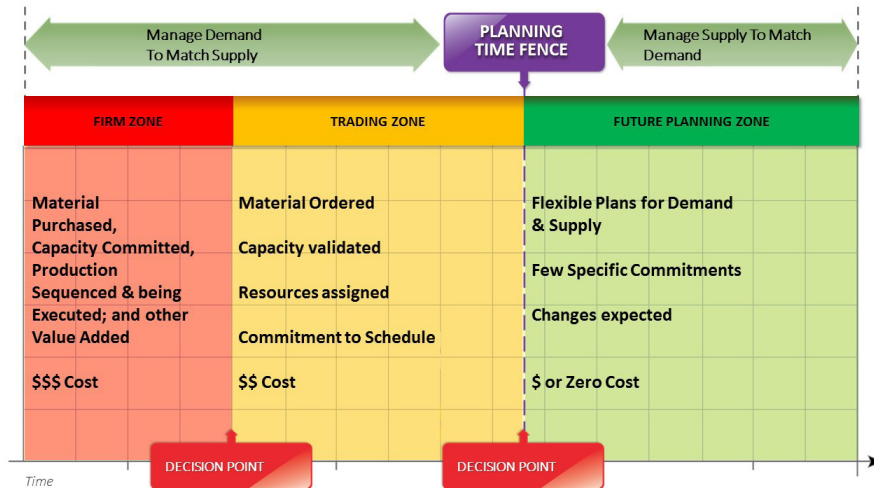
Demand Control

Demand control is a principle of the overarching demand management process found in most manufacturing businesses. Demand control focuses on alignment of supply and demand when there is a sudden, unexpected shift in the demand plan. The shifts can occur when near-term demand becomes greater than supply, or when actual orders are less than the established demand plan. The result can lead to reactive decisions, which can have a negative impact of workloads, costs, and customer satisfaction.

Demand control creates synchronization across the sales, demand planning, and supply planning functions. Unlike typical monthly demand or supply planning reviews, demand control reviews

occur at more frequent intervals (daily or weekly), which allows the organization to respond quickly and proactively to possible demand or supply imbalances.

Time Fences



The demand control process requires that all functions agree on time fences within the planning horizon, which should be no less than a rolling 24 months based on integrated business planning best practices. A time fence is a decision point within a manufacturer's planning horizon. Typically, three established time fences exist within a company:

- Future planning zone - Supply is managed to match demand
- Trading zone - Demand is managed to match supply for production
- Firm zone - Demand is managed to match supply for procurement

Demand Controller

A demand controller is established when a company implements a demand control process. Unlike a demand planner who focuses on long-term order management, the demand controller is responsible for short-term order management, focusing specifically when demand exceeds supply or demand appears to be less than planned, and engages sales management in both situations. The demand controller works across multiple functions involved in the supply and demand processes, including demand planning, supply planning, sales, and marketing.

Elements

Planning demand involves a full multiple-view process or work flow; including statistical forecast as a baseline from clean "demand history" [not shipments], using the most effective statistical models. Kai Trepte developed the Microsoft Excel add-in "Forecast X" to provide practitioners with a workstation capability to assess the best matches between data and forecast models. Increasingly "predictive forecasts" have moved from a limited use to becoming best practice for more companies. Predictive forecasts use simulation of potential future outcomes and their probabilities

rather than history to form the basis for long range (5-10+ years) demand plans. Baseline forecasts are typically developed by demand planners and analysts, who may be regional or centrally located. They work under the guidance of the demand manager. Baseline forecasts are communicated to members of the demand management team. This usually includes regional sales leaders, market managers, and product managers. The team may include customer service leads who manager orders under service agreements with customers and have direct insight into customer demand. For major retailers this is often point of sale data provided to suppliers.

Information Technology

Information technology and information system demand managers seek to understand in advance how to best meet the needs and expectations of customers, clients, partners, and enablers. Thus, proper forecast and sizing of demand is required in order to deliver a stable and effective technology environment.

Demand Management as Part of Project Portfolio Management

Romano, Grimaldi, and Colasuonno consider demand management as a harvesting activity, governed by a strategy that gives portfolios direction and a selection model intended to select the best beneficial set of activities aligned with strategic objectives. They suggest component-oriented demand management be approached proactively, with a strategy driven by business objectives, and responsibility of top management representing the chosen strategic direction.

Strategies to Improve Inventory Management

Inventory management is one of the most critical functions in any organization. An effective inventory management system enables organizations to react swiftly to market demands and also bring in substantial cost reduction through optimal stock holding. An inventory that falls short translates to lost sales opportunities, while a surplus inventory entails unnecessary operational costs in terms of handling, transportation and storage.

A Supply Chain research study shows U.S. companies have an average inventory versus sales ratio of 1.43. This means for every dollar of sales made, the company holds \$1.43 worth of inventory. Among small businesses, 46% did not have an automated inventory management system.

The following strategies can help companies improve and optimize their inventory management for better results:

Inventory Management Tools

There are many tools and platforms available in the market today – both enterprise level and cloud based – that automate the inventory management process and minimize the need for manual intervention. The right tools can bring precision into the process and prevent errors that happen due to human oversight. Also, they help manage inventory across various channels like physical stores, online stores and mobile apps.

Data Analytics

Data analytics is increasingly being used in optimizing inventory management. It helps companies to look at inventory from an organizational level instead of a branch level. It uses real time data to predict market demand, which can help companies scale their inventory up or down on time, resulting in profits and cost benefits. Inventory managers can utilize the unique insight derived from data analytics to move or reallocate inventory and capitalize on market opportunities.

Product Segmentation

It pays to take a granular look into your inventory to segment products based on their characteristics like market appeal, profitability, and supply versus demand pattern. The rate at which a depleting inventory is replenished can be decided based on this segmentation. This strategy helps in maximizing profits and minimizing operational costs on less profitable products. The more criteria a company uses to classify its products, the more refined and profitable is its inventory management.

Mobile Inventory Management

Mobile applications that interact with inventory real time can be used by store managers and associates to accurately track stock, improve customer service and plan offers and promotions. Mobile inventory management allows tracking and update of inventory at the most rudimentary level, apart from providing real time inventory information, product details, brand information, etc. to the store associates. Having ready access to such information empowers store associates to engage better with customers, encourage purchase decisions and generate leads.

Inventory Optimization Software

Inventory optimization software takes an organizational level view of the inventory instead of a localized branch or store level view. It uses historical data to determine probability of demand, which helps inventory managers to maintain optimal level of inventory and reduce risk of product obsolescence. The inputs from the optimization software can also be used to revise inventory management policies to make them more effective.

Suppliers should be audited periodically to ensure consistent, timely and accurate delivery. The categorization of a product should also be frequently reviewed to accommodate recurring changes in demand and supply. Companies that have an effective and efficient inventory management process will be better equipped to meet sales opportunities and generate high profits.

Advantages of Holding a Large Amount of Inventory

Inventory management impacts your ability to operate a low-cost, high profit margin business. Typically, a product reseller wants to hold just enough inventories to meet near-term customer demand. Excess inventory is costly to hold and manage in most cases. However, carrying extra products can provide some benefits even with the added costs.

Customer Satisfaction

In comparing the extremes of running out of stock and holding more inventory than you need,

stock outs are definitely worse. If customers come to your business and you don't have goods they want, you risk alienating them and losing them to competitors. Carrying extra inventory in your retail storage area or in a nearby distribution center helps keep shelves fully stocked during periods of peak customer demand.

Supplier Price Discounts

One reason some resellers bite the bullet and carry extra inventory is because of the cost advantages from buying in bulk. Typically, if you order larger product lots, you get a lower cost per unit. This strategy improves your potential gross profit, since a lower cost of goods sold means you make more on each sale. Alternatively, if you operate as a low-cost provider, you could pass the discounts on to your customers and potentially increase your sales volume.

Protection against Order Delays

Holding extra inventory gives you greater control. Though you can develop strong partnerships with suppliers, you can't always control the efficiency with which they ship goods after an order. Delays in processing replenishment orders could contribute to stock outs or low supplies when customers want the products most. In some cases, production or distribution may be affected by the weather, or factors beyond the control of your suppliers.

Merchandising and Promotion

Fully stocked shelves or promotional displays also contribute to effective in-store merchandising. An aesthetically-pleasing store setup is integral to keeping customers around and getting them to return to your store. Fully-stocked shelves give the impression that your company has good product variety and assortment. Displays and shelves also look better with good product supplies rather than bare spots. You can also strategically place high-demand goods in checkout aisles or near the front of the store to entice impulse buys.

Disadvantages of High Inventory Levels

Having high inventory levels generally means your company is struggling to turn over inventory and make sales. When you have a high level of inventory, you face significant costs and inventory management requirements that have disadvantages relative to companies that have better inventory turnover and require less resource utilization to manage inventory.

Poor Turnover

Companies typically want to produce or maintain only enough inventories to meet immediate demands and to avoid stock outs. When companies have excessive amounts of inventory, they are generally not selling enough to prevent inventory buildup. This is not a good situation as businesses need to turn over inventory efficiently to maintain reasonably high profit margins and to avoid the costs and other disadvantages that come with high levels of inventory.

High Costs

Carrying excess inventory has significant costs. One of the highest costs for many companies is

financing the purchase and holding of inventory. Also, the more inventories you hold, the more you have to spend on labor to manage it, space to hold it, and in some cases, insurance to protect against its loss or damage. Physically counting and monitoring the levels of inventory you hold also takes time and has costs.

Loss or Damage

Related to the high costs of high inventory, some inventory can also go bad after a certain amount of time and go to waste. When retailers buy excess inventory of perishable food items, for instance, they may have to throw out inventory that spoils or becomes rotten. When you carry high inventory, you also have greater exposure to lost or damaged product. Thieves have more products to choose from and you have greater potential for product to turn up missing or broken when you count inventory.

Strategic Planning Time

Company leaders typically have to spend more time in strategic planning meetings when the company has high inventory levels. Management must figure out how to communicate with suppliers, how to improve ordering processes or how to increase market demand to reduce the high levels of inventory. This problem takes away from the ability of these managers to focus on other proactive or more important strategic decisions to move the company forward. Dealing with inventory problems is a more reactive strategy to resolve the issue at hand.

Inventory Valuation

An inventory valuation allows a company to provide a monetary value for items that make up their inventory. Inventories are usually the largest current asset of a business, and proper measurement of them is necessary to assure accurate financial statements. If inventory is not properly measured, expenses and revenues cannot be properly matched and a company could make poor business decisions.

Inventory Accounting System

The two most widely used inventory accounting systems are the periodic and the perpetual:

- **Perpetual:** The perpetual inventory system requires accounting records to show the amount of inventory on hand at all times. It maintains a separate account in the subsidiary ledger for each good in stock, and the account is updated each time a quantity is added or taken out.
- **Periodic:** In the periodic inventory system, sales are recorded as they occur but the inventory is not updated. A physical inventory must be taken at the end of the year to determine the cost of goods.

Regardless of what inventory accounting system is used, it is good practice to perform a physical inventory at least once a year.

Inventory Valuation Methods - Perpetual

The perpetual system records revenue each time a sale is made. Determining the cost of goods

sold requires taking inventory. The most commonly used inventory valuation methods under a perpetual system are:

1. First-in first-out (FIFO)
2. Last-in first-out (LIFO)
3. Highest in, first out (HIFO)
4. Average cost or weighted average cost

These methods produce different results because their flow of costs are based upon different assumptions. The FIFO method bases its cost flow on the chronological order purchases are made, while the LIFO method bases its cost flow in a reverse chronological order. The average cost method produces a cost flow based on a weighted average of goods.

Periodic versus Perpetual Systems

There are fundamental differences for accounting and reporting merchandise inventory transactions under the periodic and perpetual inventory systems. To record purchases, the periodic system debits the Purchases account while the perpetual system debits the Merchandise Inventory account. To record sales, the perpetual system requires an extra entry to debit the Cost of goods sold and credit Merchandise Inventory. By recording the cost of goods sold for each sale, the perpetual inventory system alleviated the need for adjusting entries and calculation of the goods sold at the end of a financial period, both of which the periodic inventory system requires.

In Perpetual Inventory System there must be actual figures and facts.

Using Non-Cost Methods to Value Inventory

Under certain circumstances, valuation of inventory based on cost is impractical. If the market price of a good drops below the purchase price, the lower of cost or market method of valuation is recommended. This method allows declines in inventory value to be offset against income of the period. When goods are damaged or obsolete, and can only be sold for below purchase prices, they should be recorded at net realizable value. The net realizable value is the estimated selling price less any expense incurred to dispose of the good.

Methods used to Estimate Inventory Cost

In certain business operations, taking a physical inventory is impossible or impractical. In such a situation, it is necessary to estimate the inventory cost.

Two very popular methods are:

1. Retail inventory method
2. Gross profit (or gross margin) method

The retail inventory method uses a cost to retail price ratio. The physical inventory is valued at retail, and it is multiplied by the cost ratio (or percentage) to determine the estimated cost of the ending inventory.

The gross profit method uses the previous year's average gross profit margin (i.e. sales minus cost of goods sold divided by sales). Current year gross profit is estimated by multiplying current year sales by that gross profit margin, the current year cost of goods sold is estimated by subtracting the gross profit from sales, and the ending inventory is estimated by adding cost of goods sold to goods available for sale.

Inventory Accounting

Inventory accounting is the process of tracking and accounting for changes in the value of inventory over time as it relates to manufacturing and costs of goods sold.

Types of Inventory Accounting

Accountants need to determine whether to use first in, first out (FIFO), last in, first out (LIFO), weighted average method, or specific identification method of inventory accounting. If older inventory is less expensive, and you use it first, you would choose the FIFO accounting method. Or, you could assume that you used the most recent, most expensive inventory using the LIFO accounting method.

If FIFO and LIFO will not work for your business for one reason or another, your other options include the weighted average method or the specific identification method. The weighted average method of inventory accounting uses the average cost of your total inventory to assign value to each item used, while the specific identification method involves tracking the cost of each inventory item separately and charging the specific cost of an item to the cost of goods sold.

Continue reading to learn more about each type of inventory accounting.

- **FIFO Inventory Accounting Method** – When using the FIFO method, accountants assume the items purchased or manufactured first are used or sold first, so the items remaining in stock are the newest ones. The FIFO method aligns with inventory movement in many companies, which makes it a common choice. Prices also rise each year, so accountants who assume the earliest items are the first used can charge the least expensive units to the cost of goods sold first. As a result, the cost of goods trends lower and leads to a higher amount of operation earnings and more taxes to pay. It also means that companies use oldest items first and don't have to worry about expiration dates or inventory that does not move.
- **LIFO Inventory Accounting Method** – Accountants who opt for the LIFO method assume items purchased or manufactured last are sold first, so the items remaining in stock are the oldest. As such, this method does not follow most companies' natural inventory flow and is banned by International Financial Reporting Standards. When prices rise, the last units purchased are the first used, so the cost of goods trend higher and results in a lower amount of operating earnings and fewer income taxes to pay. Companies using the LIFO method also struggle with obsolete inventory.



- **Weighted Average Accounting Method** – Companies opting for the weighted average method have just one inventory layer. They also roll the cost of new inventory purchases into the cost of existing inventory to determine a new weighted average cost that is readjusted as more inventories is purchased or manufactured.
- **Specific Identification Method** – The specific identification method requires companies to track the cost of each inventory item separately and charge the specific cost of an item to the cost of goods sold when you sell the specific item. Because this inventory accounting method requires a great deal of data tracking, it is best suited to high-cost items.

Cost of Goods Sold

Cost of goods sold (COGS) is the carrying value of goods sold during a particular period.

Costs are associated with particular goods using one of the several formulas, including specific identification, first-in first-out (FIFO), or average cost. Costs include all costs of purchase, costs of conversion and other costs that are incurred in bringing the inventories to their present location and condition. Costs of goods made by the businesses include material, labor, and allocated overhead. The costs of those goods which are not yet sold are deferred as costs of inventory until the inventory is sold or written down in value.

Many businesses sell goods that they have bought or produced. When the goods are bought or produced, the costs associated with such goods are capitalized as part of inventory (or stock) of goods. These costs are treated as an expense in the period the business recognizes income from sale of the goods.

Determining costs requires keeping records of goods or materials purchased and any discounts on such purchase. In addition, if the goods are modified, the business must determine the costs incurred in modifying the goods. Such modification costs include labor, supplies or additional material, supervision, quality control and use of equipment. Principles for determining costs may be easily stated, but application in practice is often difficult due to a variety of considerations in the allocation of costs.

Cost of goods sold may also reflect adjustments. Among the potential adjustments are decline in value of the goods (i.e. lower market value than cost), obsolescence, damage, etc.

When multiple goods are bought or made, it may be necessary to identify which costs relate to which particular goods sold. This may be done using an identification convention, such as specific identification of the goods, first-in-first-out (FIFO), or average cost. Alternative systems may be used in some countries, such as last-in-first-out (LIFO), gross profit method, retail method, or combinations of these.

Cost of goods sold may be the same or different for accounting and tax purposes, depending on the rules of the particular jurisdiction. Certain expenses are included in COGS. Expenses that are included in COGS cannot be deducted again as a business expense. COGS expenses include:

- The cost of products or raw materials, including freight or shipping charges;
- The cost of storing products the business sells;
- Direct labor costs for workers who produce the products;
- Factory overhead expenses.

Cost of Goods for Resale

Cost of goods purchased for resale includes purchase price as well as all other costs of acquisitions, excluding any discounts.

Additional costs may include freight paid to acquire the goods, customs duties, sales or use taxes not recoverable paid on materials used, and fees paid for acquisition. For financial reporting purposes such period costs as purchasing department, warehouse, and other operating expenses are usually not treated as part of inventory or cost of goods sold. For U.S. income tax purposes, some of these period costs must be capitalized as part of inventory. Costs of selling, packing, and shipping goods to customers are treated as operating expenses related to the sale. Both International and U.S. accounting standards require that certain abnormal costs, such as those associated with idle capacity, must be treated as expenses rather than part of inventory.

Discounts that must be deducted from the costs of purchased inventory are the following:

- Trade discounts (reduction in the price of goods that a manufacturer or wholesaler provides to a retailer) - includes a discount that is always allowed, regardless of the time of payment.
- Manufacturer's rebates - is based on the dealer's purchases during the year.
- Cash discounts (a reduction in the invoice price that the seller provides if the dealer pays immediately or within a specified time) - it may reduce COGS, or it may be treated separately as gross income.

Value added tax is generally not treated as part of cost of goods sold if it may be used as an input credit or is otherwise recoverable from the taxing authority.

Cost of Goods made by the Business

The cost of goods produced in the business should include all costs of production. The key components of cost generally include:

- Parts, raw materials and supplies used,

- Labor, including associated costs such as payroll taxes and benefits,
- Overhead of the business allocable to production.

Most businesses make more than one of a particular item. Thus, costs are incurred for multiple items rather than a particular item sold. Determining how much of each of these components to allocate to particular goods requires either tracking the particular costs or making some allocations of costs. Parts and raw materials are often tracked to particular sets (*e.g.* batches or production runs) of goods, and then allocated to each item.

Labor costs include direct labor and indirect labor. Direct labor costs are the wages paid to those employees who spend all their time working directly on the product being manufactured. Indirect labor costs are the wages paid to other factory employees involved in production. Costs of payroll taxes and fringe benefits are generally included in labor costs, but may be treated as overhead costs. Labor costs may be allocated to an item or set of items based on timekeeping records.

Costs of materials include direct raw materials, as well as supplies and indirect materials. Where non-incidentally amounts of supplies are maintained, the taxpayer must keep inventories of the supplies for income tax purposes, charging them to expense or cost of goods sold as used rather than as purchased.

Materials and labor may be allocated based on past experience, or standard costs. Where materials or labor costs for a period fall short of or exceed the expected amount of standard costs, a *variance* is recorded. Such variances are then allocated among cost of goods sold and remaining inventory at the end of the period.

Determining overhead costs often involves making assumptions about what costs should be associated with production activities and what costs should be associated with other activities. Traditional cost accounting methods attempt to make these assumptions based on past experience and management judgment as to factual relationships. Activity based costing attempts to allocate costs based on those factors that drive the business to incur the costs.

Overhead costs are often allocated to sets of produced goods based on the ratio of labor hours or costs or the ratio of materials used for producing the set of goods. Overhead costs may be referred to as factory overhead or factory burden for those costs incurred at the plant level or overall burden for those costs incurred at the organization level. Where labor hours are used, a burden rate or overhead cost per hour of labor may be added along with labor costs. Other methods may be used to associate overhead costs with particular goods produced. Overhead rates may be standard rates, in which case there may be variances, or may be adjusted for each set of goods produced.

Identification Conventions

In some cases, the cost of goods sold may be identified with the item sold. Ordinarily, however, the identity of goods is lost between the time of purchase or manufacture and the time of sale. Determining which goods have been sold, and the cost of those goods, requires either identifying the goods or using a convention to assume which goods were sold. This may be referred to

as a cost flow assumption or inventory identification assumption or convention. The following methods are available in many jurisdictions for associating costs with goods sold and goods still on hand:

- **Specific identification:** Under this method, particular items are identified, and costs are tracked with respect to each item. This may require considerable recordkeeping. This method cannot be used where the goods or items are indistinguishable or fungible.
- **Average cost:** The average cost method relies on average unit cost to calculate cost of units sold and ending inventory. Several variations on the calculation may be used, including weighted average and moving average.
- **First-In First-Out (FIFO)** assumes that the items purchased or produced first are sold first. Costs of inventory per unit or item are determined at the time made or acquired. The oldest cost (i.e. the first in) is then matched against revenue and assigned to cost of goods sold.
- **Last-In First-Out (LIFO)** is the reverse of FIFO: Some systems permit determining the costs of goods at the time acquired or made, but assigning costs to goods sold under the assumption that the goods made or acquired last are sold first. Costs of specific goods acquired or made are added to a pool of costs for the type of goods. Under this system, the business may maintain costs under FIFO but track an offset in the form of a LIFO reserve. Such reserve (an asset or contra-asset) represents the difference in cost of inventory under the FIFO and LIFO assumptions. Such amount may be different for financial reporting and tax purposes in the United States.
- **Dollar Value LIFO:** Under this variation of LIFO, increases or decreases in the LIFO reserve are determined based on dollar values rather than quantities.
- **Retail inventory method:** Resellers of goods may use this method to simplify recordkeeping. The calculated cost of goods on hand at the end of a period is the ratio of cost of goods acquired to the retail value of the goods times the retail value of goods on hand. Cost of goods acquired includes beginning inventory as previously valued plus purchases. Cost of goods sold is then beginning inventory plus purchases less the calculated cost of goods on hand at the end of the period.

Jane owns a business that resells machines. At the start of 2009, she has no machines or parts on hand. She buys machines A and B for 10 each, and later buys machines C and D for 12 each. All the machines are the same, but they have serial numbers. Jane sells machines A and C for 20 each. Her cost of goods sold depends on her inventory method. Under specific identification, the cost of goods sold is 10 + 12, the particular costs of machines A and C. If she uses FIFO, her costs are 20 (10+10). If she uses average cost, her costs are 22 $((10+10+12+12)/4 \times 2)$. If she uses LIFO, her costs are 24 (12+12). Thus, her profit for accounting and tax purposes may be 20, 18, or 16, depending on her inventory method. After the sales, her inventory values are 20, 22 or 24.

After year end, Jane decides she can make more money by improving machines B and D. She buys and uses 10 of parts and supplies, and it takes 6 hours at 2 per hour to make the improvements to each machine. Jane has overhead, including rent and electricity. She calculates that the overhead

adds 0.5 per hour to her costs. Thus, Jane has spent 20 to improve each machine ($10/2 + 12 + (6 \times 0.5)$). She sells machine D for 45. Her cost for that machine depends on her inventory method. If she used FIFO, the cost of machine D is 12 plus 20 she spent improving it, for a profit of 13. Remember, she used up the two 10 cost items already under FIFO. If she uses average cost, it is 11 plus 20, for a profit of 14. If she used LIFO, the cost would be 10 plus 20 for a profit of 15.

In year 3, Jane sells the last machine for 38 and quits the business. She recovers the last of her costs. Her total profits for the three years are the same under all inventory methods. Only the timing of income and the balance of inventory differ. Here is a comparison under FIFO, Average Cost, and LIFO:

			Cost of Goods Sold			----- Profit -----			
Year	Sales		FIFO	Avg.	LIFO		FIFO	Avg.	LIFO
1	40		20	22	24		20	18	16
2	45		32	31	30		13	14	15
3	38		32	31	30		6	7	8
Total	123		84	84	84		39	39	39

Write-Downs and Allowances

The value of goods held for sale by a business may decline due to a number of factors. The goods may prove to be defective or below normal quality standards (subnormal). The goods may become obsolete. The market value of the goods may simply decline due to economic factors.

Where the market value of goods has declined for whatever reasons, the business may choose to value its inventory at the lower of cost or market value, also known as *net realizable value*. This may be recorded by accruing an expense (*i.e.* creating an inventory reserve) for declines due to obsolescence, etc. Current period net income as well as net inventory value at the end of the period is reduced for the decline in value.

Any property held by a business may decline in value or be damaged by unusual events, such as a fire. The loss of value where the goods are destroyed is accounted for as a loss, and the inventory is fully written off. Generally, such loss is recognized for both financial reporting and tax purposes. However, book and tax amounts may differ under some systems.

FIFO and LIFO Accounting

FIFO and LIFO accounting are methods used in managing inventory and financial matters involving the amount of money a company has to have tied up within inventory of produced goods, raw materials, parts, components, or feedstocks. They are used to manage assumptions of costs related to inventory, stock repurchases (if purchased at different prices), and various other accounting purposes.

FIFO

“FIFO” stands for *first-in, first-out*, meaning that the oldest inventory items are recorded as sold first but do not necessarily mean that the exact oldest physical object has been tracked and sold. In other words, the cost associated with the inventory that was purchased first is the cost expensed first. With FIFO, the cost of inventory reported on the balance sheet represents the cost of the inventory most recently purchase.

Consider this example: Foo Co. had the following inventory at hand, in order of acquisition in November:

Number of units	Cost
100 units	\$50
125 units	\$55
75 units	\$59

If Foo Co. sells 210 units during November, the company would expense the cost associated with the first 100 units at \$50 and the remaining 110 units at \$55. Under FIFO, the total cost of sales for November would be \$11,050. The ending inventory would be calculated the following way:

Number of units	Price per unit	Total
Remaining 15 units	\$55	\$825 (\$55 x 15 units)
75 units	\$59	\$4425 (\$59 x 75 units)
Total		\$5250

Thus, the balance sheet would now show the inventory valued at \$5250.

LIFO

“LIFO” stands for *last-in, first-out*, meaning that the most recently produced items are recorded as sold first. Since the 1970s, some U.S. companies shifted towards the use of LIFO, which reduces their income taxes in times of inflation, but since International Financial Reporting Standards (IFRS) banned LIFO, more companies returned to FIFO.

LIFO is used only in the United States, which is governed by the generally accepted accounting principles (GAAP). Section 472 of the Internal Revenue Code directs how LIFO may be used.

In the example above, the company (using LIFO accounting) would expense the cost associated with the first 75 units at \$59, 125 more units at \$55, and the remaining 10 units at \$50. Under LIFO, the total cost of sales for November would be \$11,800. The ending inventory would be calculated the following way:

Number of units	Price per unit	Total
Remaining 90 units	\$50	\$4500 (\$50 x 90 units)
Total		\$4500

The balance sheet would show \$4500 in inventory under LIFO.

The difference between the cost of an inventory calculated under the FIFO and LIFO methods is called the *LIFO reserve* (in the example above, it is \$750). This reserve is essentially the amount by which an entity’s taxable income has been deferred by using the LIFO method.

In most sets of accounting standards, such as the International Financial Reporting Standards, FIFO (or LIFO) valuation principles are “in-fine” subordinated to the higher principle of lower of cost or market valuation.

In the United States, publicly traded entities which use LIFO for taxation purposes must also use LIFO for financial reporting purposes but such companies are also likely to report a LIFO reserve to their shareholders. A number of tax reform proposals have argued for the repeal of LIFO tax provision. The “Save LIFO Coalition” argues in favor of the retention of LIFO.

Inventory Costs

Inventory Costs also defined as the total cost that a company experiences while holding inventory, inventory cost is often one of the most substantial factors in the success of a business. Inventory-cost control has many facets, including financing, equipment, labor, protective measures, insurance, handling, obsolescence, losses by pilferage, and the opportunity cost of choosing to deal with inventory. These factors all combine to create the total cost of holding inventory.

Inventory Cost Explanation

Inventory cost, explained by each business owner with varying importance, plays a major role in the working capital requirements of a business. Based on the overall inventory needs, a company can plan the cash flow cycles properly to avoid problems which may even cause the business to cease operations. This makes sense when one keeps in mind that perhaps the most common reason a business closes is lack of cash.

There are a variety of inventory cost methods to minimize expenditure. On the material side, a business can set up equipment, ranging from simple placement of items for optimal usage to accounting systems which serve as inventory management, which simplify and change based on the needs the business has for its inventory. In reference to processes, employees can be trained to use available resources to achieve maximum effect. When you understand the science of supply chain management, you can make sense of the most complicated of inventory projects. For smaller assignments, the average person can turn a catastrophe to a working system with a foundation of proper planning. Inventory can be as affordable or costly as the business and manager allow it to be.

Inventory Cost Formula

The inventory cost formula, summing total cost of inventory, is often referred to as inventory carrying rate.

Inventory Carrying Rate = (Inventory Costs / Inventory Value) + Opportunity Cost (as a percentage) + Insurance (as a percentage) + Taxes (as a percentage).

Inventory Cost Calculation

When one has the proper information, inventory cost calculations can be very simple.

Example: If:

- Inventory Costs = \$5,000

- Inventory Value = \$50,000
- Opportunity Cost = 10%
- Insurance = 4%
- Taxes = 7%

$$\text{Inventory Carrying Rate} = (\$5,000 / \$50,000) + 10\% + 4\% + 7\% = 10\% + 10\% + 4\% + 7\% = 31\%$$

Inventory Cost Example

For example, Stan is the warehouse manager for a distribution plant. His work has made him an expert in the science of managing inventory operations. Stan understands his work and enjoys doing it.

However, Stan wants to assemble inventory cost accounting figures. As the essence of the business, Stan makes sure to keep track of this value on a regular basis.

First, Stan calculates inventory costs:

If:

- Equipment = \$2,500
- Labor = \$1,500
- Protective measures = \$300
- Handling = \$500
- Obsolescence = \$100
- Pilferage = \$100

Then:

$$\text{Inventory Cost} = \$2,500 + \$1,500 + \$300 + \$500 + \$100 + \$100 = \$5,000$$

Next, Stan finds the ratio of inventory costs to inventory value:

If:

- Cost of Inventory = \$5,000
- Value of Inventory = \$50,000

Then:

$$\text{Inventory Cost} / \text{Inventory Value} = \$5,000 / \$50,000 = 10\%$$

Stan then does research to find the cost of opportunity, insurance, and taxes. These are found as a percentage:

- Opportunity Cost = 10%

- Insurance = 4%
- Taxes = 7%

Finally, Stan adds these percentages together to finally find inventory carry rate:

$$\text{Inventory Carrying Rate} = 10\% + 10\% + 4\% + 7\% = 31\%$$

Stan's inventory carry rate has remained unchanged. Stan is happy about this. Therefore, he keeps constant research in the industry magazines, with professional contacts, and the newest products and services. As long as Stan maintains this research he can keep his warehouse running in peak condition.

Inventory costs can be classified as follows:

Ordering Costs

Ordering costs, also known as setup costs, are essentially costs incurred every time you place an order from your supplier. Examples include:

- Clerical costs of preparing purchase orders — there are many kinds of clerical costs, such as invoice processing, accounting, and communication costs.
- Cost of finding suppliers and expediting orders — costs spent on these will likely be inconsistent, but they are important expenses for the business.
- Transportation costs — the costs of moving the goods to the warehouse or store. These costs are highly variable across different industries and items.
- Receiving costs — these include costs of unloading goods at the warehouse and inspecting them to make sure they are the correct items and free of defects.
- Cost of electronic data interchange (EDI) — These are systems used by large businesses and especially retailers, which allow ordering process costs to be significantly reduced.

There will be an ordering cost of some amount, no matter how small your order might be. The more orders placed, the greater the ordering costs. This ordering cost can be spread out if you placed a bulk order to use goods over a long period of time. However, if your business orders raw materials only as needed so that it keeps little stock on hand, you might be able to tolerate high ordering costs as this is balanced by an overall lower holding cost.

Holding Costs

Also known as carrying costs, these are costs involved with storing inventory before it is sold.

- Inventory financing costs — this includes everything related to the investment made in inventory, including costs like interest on working capital. Financing costs can be complex depending on the business.
- Opportunity cost of the money invested in inventory — this is found by factoring in the lost alternatives of tying money up in inventory, such as investing in term deposits or mutual funds.

- Storage space costs — these are costs related to the place where the inventory is stored and will vary by location. There will be the cost of the storage facility itself, or lease payments if it is not owned. Then there are facility maintenance costs like lighting, heating, and ventilation. Depreciation and property taxes are also included in this.
- Inventory services costs — this includes the cost of the physical handling of the goods, as well as insurance, security, and IT hardware and applications if these are used. Expenses related to inventory control and cycle counting are further examples.
- Inventory risk costs — a major cost is shrinkage, which is the loss of products between purchasing from the supplier and final sale due to any number of reasons: theft, vendor fraud, shipping errors, damage in transit or storage. The other main example is dead stock.

Shortage Costs

These costs, also called stock-out costs, occur when businesses become out of stock for whatever reason.

- Disrupted production — when the business involves producing goods as well as selling them, a shortage will mean the business will have to pay for things like idle workers and factory overhead, even when nothing is being produced.
- Emergency shipments — for retailers, stock-outs could mean paying extra to get a shipment on time, or changing suppliers.
- Customer loyalty and reputation — aside from the loss of business from customers who go elsewhere to make purchases, the company takes a hit to customer loyalty and reputation when their customers are unhappy.

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