

INVENTORY MANAGEMENT

by Professor Stephen Pearce



INTRODUCTION

In this era of intensely competitive distributor markets, increasing offshore competition, and generally shrinking profit margins, effective inventory management is more important than ever for distributors. No longer can we depend on the inflation of just a few years ago to make inventories more valuable with each passing year. In fact, in today's economic climate, characterized by a rather low rate of inflation, a bloated inventory that does not reflect the appropriate product mix to serve the needs of a changing customer base becomes more of a liability than an asset to a distributor.

Research studies show that inappropriate asset management is the number one reason that distribution companies fail. This fact, coupled with the knowledge that in many geographic areas distributors find that the sales pie is stable or shrinking, supports that better inventory management is a must. Many distribution companies have found that lasting improvements to their bottom line profitability have been easier to attain through the cost saving realized from better inventory management than through expansion of overall sales.

The inventory management procedures and formulas built into Activant® enterprise software solutions adhere strictly to the teachings of the best inventory theorists who have taught over the past four decades. Better yet, these theories and procedures have been tested and modified so they will work for the everyday practicing distributor. We seek through this explanation of our inventory management formulas and procedures to strip away some of the mystery and to explain in plain language exactly how a modern, effective inventory management system, as implemented in the Activant software, operates.

DISTRIBUTORS AND WHOLESALERS

All types of businesses that provide the basic service of stocking inventory for sale to their customers will benefit from using the Activant inventory management system. The reason is simple: Activant allows you to choose among four powerful alternatives to ensure your inventories are managed in the best possible way. So, throughout the rest of this article when we refer to distributors or to wholesalers, what we really mean is any type of distributor or wholesaler.

THE ACTIVANT PHILOSOPHY OF INVENTORY MANAGEMENT

In today's economic climate, it is easy to make a powerful argument for better inventory management. Previously, businesses in the United States had to deal with double-digit inflation. In those days inventory management was not as critical as it is today because large inventories became more valuable as inflation drove up prices.

Today, no longer can we depend on inventories becoming more valuable over time because prices are rising; rather, we must recognize the very real cost associated with holding inventories. We must ensure that the investment we choose to make in inventories will allow us to offer the appropriate levels of service to our customers at the lowest possible cost.

Inventory Management as a Profit-Generating Activity

To illustrate the effect an overstocked inventory has on bottom-line profitability, let's consider the case of a distributor who has an average inventory value of \$800,000. Let's further assume that this value of \$800,000 represents 10 percent more inventory than is actually needed to provide service to his or her customers.

Most distributors today believe that inventory carrying costs are in the 30 percent range. If this is the case, this \$80,000 excess inventory represents an unnecessary inventory carrying cost to this hypothetical distributor of \$24,000 per year.

It must be recognized that this \$24,000 in costs resulting from excess inventories reduces this distributor's net profit before taxes by \$24,000. It also must be recognized that if this hypothetical distributor was using effective inventory management procedures, which could reduce his or her average inventory by \$80,000, this \$24,000 in unnecessary costs would not exist, and his or her net profit before tax would be increased by \$24,000. Now we can see that effective inventory management is indeed a profit-generating activity.

Let's contrast effective inventory management as a profit-generating activity with the other profit-generating activity that all distributors pursue – increased sales. The question is: How much sales increase would be necessary in a year to increase net profit before tax by the same \$24,000 if the distributor experienced a net profit margin before tax of 3 percent of sales?

The sales increase necessary to increase net profit before tax by \$24,000 would be a whopping \$800,000. The message is clear: effective inventory management is a profit-generating activity, which has the potential to put additional dollars on the bottom line even without increasing your yearly sales level. The inventory management system incorporated in the Activant software

is specifically designed to help your company increase bottom-line profitability while at the same time assure high levels of customer service.

The Goals of Inventory Management

Any inventory management system acts on your total inventory to balance two conflicting goals. One goal is high customer service; the other goal is low cost. If you remove either of these two conflicting goals, inventory management becomes quite easy.

For instance, if a distributor's goal in business is to provide 100 percent service to customers without regard to costs, all he or she has to do is fill his or her warehouse with huge quantities of every imaginable product customers might ever want to buy. Then, no matter which customer ordered what item, the distributor would be able to fill the order.

On the other hand, if the distributor's goal in business was to minimize costs associated with carrying inventory, without regard to service level, he or she would not carry any inventory. When a customer places an order for a particular product, he or she would buy that product and ship it to the customer at some later date.

In the former case, cost would be excessively high. In the latter case, the service the distributor's company could provide to customers would be dismally low. The Activant inventory management system addresses both of these issues. The goal becomes one of providing the highest possible customer service at the lowest possible cost.

COMPUTERIZED INVENTORY MANAGEMENT

Most distributors realize the need to computerize those functions within their businesses that relate to order taking and processing. They naturally want to provide their customers the quickest response time possible during the critical cycle of inquiry, order placement, order picking, and order shipment. Distributors want to automate the billing and accounting functions to improve cash flow and cash management in general.

But many distributors fail to realize how important it is to computerize the purchasing and inventory management functions within their businesses. The typical response is, "We have buyers who handle purchasing." Little do they realize how much time these buyers spend not managing inventories, but simply placing orders for stock replenishment.

Reviewing inventory for purposes of placing orders with vendors is a tremendously time-consuming activity. To illustrate this point, let's consider the distribution company that has an inventory of 10,000 items at one location. A review of each item in the inventory would require six people months of work, assuming the average item can be reviewed in only five minutes. That's not much time to:

- Check current stock position
- Decide how many to order
- Add up purchase order totals
- Go back to find fill-ins
- Write up the purchase order

The Activant inventory management system gives the distributor's buyers the tools they need to more effectively purchase and manage inventories. Computerized inventory management allows buyers to concentrate their talents on those items that really require their attention. Item classification is the key.

Where should buyers spend their time? The answer is simple. Put the buyers' time where the dollars are. Those items that contribute to a large amount of dollars flowing through inventory each year must be monitored closely.

Buyers review these items for purchase frequently and buy them in smaller quantities to minimize the overall inventory investment. On the other hand, low-cost items are reviewed much less frequently and bought in larger quantities to minimize the overall cost of ordering and receiving. Unlike some other computer systems, the Activant inventory management system will automatically classify the items in a distributor's inventory on a periodic basis or by request. This is a powerful tool that allows buyers to know where to concentrate their time.

Reports are automatically generated showing which items change "classes" each period. Buyers use these reports to quickly identify sales trends and adjust their purchasing strategies as needed.

Flexibility in setting item classes and setting buying strategies are features often neglected in the distribution management software on the market today.

The Activant solution maximizes efficiency by leading buyers through a screen display of recommended items. From this display, buyers see the items' calculated requirements. Buyers can easily order the items, or drill down into further information about an item. They can look at an item's open customer orders, historical sales, past purchases from suppliers, etc.

If an item has more than one supplier, buyers can check the pricing from each supplier, and order from the best source for each item. The system's ability to store and retrieve price and part number information for multiple suppliers for a single item gives buyers a distinct advantage in getting the best buys. Also, the system ensures accuracy by putting the supplier's correct part number on the purchase order.

Having all of the information at buyers' fingertips saves them time and allows them to make better, more profitable decisions. The system provides detailed reports for buyers who prefer to purchase after analyzing reports.

The Activant system easily manages scheduled deliveries. Buying requirements factor in scheduled delivery orders from customers. The system can also generate and manage scheduled delivery orders to suppliers. The savings in using Just-In-Time inventory management are sizeable.

The system handles purchasing of assemblies. Assemblies are purchased either in assembled forms or by components. The system also handles disassembly, for cases where assemblies are purchased whole, but are separated into parts upon receipt. By automating this process, the system saves countless hours buyers would otherwise spend piecing together requirements data of each individual part.

Flexibility in setting the buying strategy allows buyers to examine overall needs, target emergency requirements, or evaluate special promotions. Companies with multiple locations can deploy centralized, local, or regionalized purchasing strategies. Companies can mix and match the strategy to best fit their product mixes and supplier relationships. Overall inventory needs can be reduced by putting the right stock at the right location.

Supplier performance reports measure the supplier's ability to fill purchases on time, and correctly. The information is useful in negotiating terms and conditions with suppliers.

The system reduces inventory costs by facilitating transfers between locations and allowing customer orders to be filled with inventory from more than one location, as needed.

Purchase orders can be mailed or sent electronically by fax, EDI, or Activant's Internet trading network, Trading Partner Connect. The system's extensive electronic capabilities through Trading Partner Connect allow for significant savings both in time, accuracy, and in cashing in on supplier incentives.

The system brings added savings by tracking rebates and facilitating inventory returns to the suppliers. Customer returns and overstock conditions are identified to aid in generating the returns.

Other notable features include:

- Landed Cost for items where duty, freight, insurance, etc. are an important component of an item's cost. The system can track an unlimited number of landed cost factors
- Currency conversion for imported products
- Lot Number tracking, integrating with bin location tracking
- Serial Number tracking
- Automated Cycle Counting

These features and many others are included in the Activant inventory management system in order to give the distributor's buyers the tools they need to more effectively utilize their time where it will have the greatest impact on profitability and customer service.

INVENTORY CONTROL VS. INVENTORY MANAGEMENT

An inventory management system must provide both inventory control and features, which allow flexible inventory management. What is the difference between inventory management and inventory control?

Control is the mechanical chore of maintaining accurate records. Inventory management, on the other hand, is the application of decision-making techniques, which use control data to allow the distributor to achieve the desired levels of inventory turnover and customer service.

Inventory control is that part of the overall inventory management system that is the record-keeping system. Without accurate records, no inventory management system assures precise control by maintaining hundreds of pieces of information about every item in a distributor's inventory. This control data, which is updated automatically as transactions occur, includes data such as warehouse stock status, accurate demand history, vendor lead-time history, customer order tracking, back-order status, as well as records concerning transfers of stock among branches and direct-ship or nonstick orders.

Inventory management makes use of the information collected and stored by the control system. The goal of the Activant inventory management system is to provide service to the customer at the lowest possible cost.

An inventory management system must be easy to use and flexible. Flexibility and ease of use are assured in the Activant system by providing four distinct inventory management methods. These methods, which will be discussed in detail later, are:

- Order Point/Order Quantity (OPOQ)
- Minimum/Maximum (MNMX)
- Economic Order Quantity (EOQ)
- Order-Up-To (UPTO)

These four methods can be appropriately applied to different items in a distributor's inventory. More importantly, these four methods encompass a range of sophistication starting with "very simple" and "easy to understand" and going upward to "the state of the art in inventory management techniques." This is an extremely important point to consider when evaluating computerized inventory management systems. Too many of the systems on the market today offer little or no flexibility in terms of how different classes of items in your inventory can be managed.

But with the Activant system, a distribution company can initially implement inventory management using simple, easy-to-implement techniques such as Order Point/Order Quantity and proceed to more sophisticated techniques over time. In addition, the flexibility of the Activant inventory management system allows buyers within a distribution company to fit these four inventory management techniques to their individual needs and levels of sophistication.

The system does not "force" buyers to use inventory management methods that are unfamiliar. Allowing buyers the flexibility to use the system as they see fit is important in gaining their acceptance of the computer system. This area of flexibility in inventory management is one that is missing from many inventory management systems available to distributors today.

Many systems now on the market either offer very simple or very sophisticated inventory management techniques; few do both. The Activant philosophy concerning inventory management systems is to offer you, the distributor, techniques ranging from very simple to very sophisticated and then let you make the decision to use those combinations of inventory management techniques that will best serve your company and customers.

Fundamentals of Inventory Management

There are two fundamentals of any inventory management system. These fundamentals must be considered as almost separate issues. The first fundamental is: your ability to provide service to your customers is controlled by when you order. To a very large degree it does not matter how many you order when you do order. If you do not order again at the right time, you are going to run out of that product and be unable to provide service to your customers.

The second fundamental of inventory management is: the costs your company experiences from owning inventory are driven by how many you order each time you do decide to order.

To illustrate both of these points, we can call attention to distributors who have chosen to buy a one-year supply of a particular product. They don't have to worry about running out of that product for an entire year. However, toward the end of that year, if they do not reorder that product at the appropriate time, they will indeed run out of it and find themselves unable to provide service on that product to their customers. Obviously, if these distributors ordered a year's supply of every product in their warehouse, they would undoubtedly experience quite high costs associated with owning those huge amounts of inventory.

The other extreme might be distributors who have chosen to order a one-week supply of a particular product. As long as they reorder at the appropriate time, even though they are ordering only small quantities each time, they can be sure they will have products on hand with which to service their customers. But, because they are ordering in small quantities, their inventory turnover will be quite high and their costs associated with owning inventory will likely be low. It is true that, in this case, the cost of placing many small orders will drive up acquisition costs for this item. But this is a cost issue and we will show how the Activant inventory management system allows you to order in quantities that achieve the lowest TOTAL cost when we discuss the cost side of inventory management.

These are two extreme examples, which seek to show that when to order and how many to order are separate questions which must be considered by any inventory management system. When you order drives the service that you are able to provide to your customers. How many you order each time you do order drives your costs of owning inventory. The Activant inventory management system is specifically designed to help you answer these two questions effectively in order to provide better service to your customers and lower your costs of owning inventory.

SERVICE TO THE CUSTOMER

Let's consider the customer service issue of inventory management first. Customer service is the measure of how well you can satisfy your customer's desire to purchase the products that you have advertised as being in stock.

In general, a customer service level can be defined as orders filled complete divided by total orders in any given time period. The difference between total orders and orders filled complete will be that number of orders in which you had to back order products in order to fulfill a customer's demand.

Customer Service Level

In practice, a customer service level calculated on an ordered-line basis rather than a total-order basis provides a better measure of your company's ability to provide service for your customers.

To make this calculation, divide total lines of stock sales shipped complete by total lines for stock sales from all sales orders in a given period of time. The difference between total lines for stock items shipped complete and total lines for stock items from all sales orders will be that number of lines, some of which may have been partially shipped, for which you had to back order the product necessary to completely fill the customer's order.

Many of those order lines, which you are unable to ship complete, may have been shipped on a partially filled basis. Notice that these lines have been excluded in this measure of customer service level. Because of this, many believe this method of calculating service level is a particularly harsh one. While this may be true, the service you actually provide your customers is probably not as good as the service level you calculate.

Factors Affecting Service Level Calculation

There are several factors that cause the calculated service level to be higher than the service that is actually provided to the customer. First, the customer may order an item which you are temporarily out of, but accept a generic substitute instead. While you were able to ship that particular order line complete, you were not able to provide the customer with 100 percent service in that you were unable to ship the particular item he or she originally wanted.

The second factor that causes your true level of service to your customers to be lower than any service level you are able to calculate is this situation: A customer orders 87 of a particular item. When told that you have only 63 in stock, he or she decides to change his or her order to 63 and have you ship them immediately. In this situation where the customer wanted 87 but accepted 63, that order line will show as having shipped complete when, indeed, you were not able to provide the precise level of service that the customer wanted. What you provided in terms of service was something less than what the customer originally wanted.

Remember, the only purpose of calculating a service level is to assess how well your inventory management system enables you to satisfy the customer's needs. Also remember that in the customer's mind there are very stringent criteria for 100 percent service. Customers consider 100 percent service to be that situation where you can ship every product that they desire to order immediately and in the precise quantities that they desire to order. Anything less than this in the customer's mind is definitely not 100 percent service. We are purposely excluding non-stock sales from the calculation of service level. The only reason for calculating a service level is to provide information on how well you are satisfying the customer's needs on those items that you have chosen to invest in and hold in your warehouse as inventory.

Sales of non-stock items as well as direct ship items are important to any distributor's business. However, inclusion of those order lines in the customer service level calculations is inappropriate. Service level calculation must be a measure of how well your inventory management system allows you to provide service to your customer on those items you have consciously chosen to stock in your warehouse.

The Danger of Low Service Levels on Slow Movers

One final note on service level: Many distributors believe that once you make the conscious decision to stock a particular item and advertise this item as being stocked to your customers, you should strive to provide a high level of service on that item.

Others believe the service level you provide your customers should be related to how fast you move a particular product in your inventory. They would say that you must provide extremely high service levels on fast-moving items, but that you can get away with providing much lower service levels on slower moving items. While there are some elements of truth to this theory, it can become a self-fulfilling prophecy.

If you choose to provide a low level of service on a slow-moving item, that item runs the chance of becoming a non-mover as customers seek out other distributors who have chosen to provide some slightly higher level of service on that item. Even worse, your customers' perceptions of your overall service may be affected by the fact that you have chosen to provide lower levels of service on some slow-moving items.

From the customers' viewpoint, when they are in need of an item, they do not particularly care whether that item is a slow-mover or a fast-mover. To them it is extremely important to be able to buy that item now. Your explanations about what is a slow-mover may well fall on deaf ears, particularly if you have advertised through published stock lists that the item in question is a stock item.

Activant realizes that measurement of overall customer service on an ordered line basis as well as measures of your ability to provide service to your customers on a product-by-product basis is quite important. Service level is automatically captured by the Activant inventory management system on an item-by-item basis. The distributor is allowed the flexibility to establish what will constitute an "order hit."

An "order hit" occurs when customers place an order for an item and you have enough of that item in stock to ship their order complete. The Activant inventory management system allows the distributor the flexibility to establish what constitutes an order hit through the use of a multiplier. For instance, a particular distributor may decide that an order hit should occur if he or she has enough stock on hand to ship 90 percent of the quantity a customer orders of a specific item. That distributor's order hit multiplier would be .9. Order hits divided by the total number of times an item was ordered yields the service level for that item.

The flexibility in defining an "order hit," and the conceptually correct manner in which the item service level is calculated, compare quite favorably to other inventory management systems available to distributors today. The Activant inventory management system shines in this area when compared to those systems that provide sketchy, or worse, incorrectly calculated service level information.

Service Level Calculation Example

Service level information is captured automatically by the Activant inventory management system at the time of order entry. When an order from a customer is recorded, the system compares the quantity ordered with free stock for that item. If there is enough free stock to fill the customer's order for the item, an order hit for the item is recorded. This is done for every item ordered by every customer.

For example, let's assume that a distributor received orders from his or her customers for the same stock item 53 times during a month. There was sufficient stock to fill 47 of those orders immediately. The calculated service level would be: $47/53 = .87$ or 87 percent.

Flexibility is allowed in establishing the criteria for recording an "order hit." In the example above, the criteria was "an order hit is recorded if we have free stock equal to 100 percent of the quantity of an item the customer wants to order." The criteria could be "an order hit is recorded if we have free stock equal to 90 percent of the quantity of an item the customer wants to order." You, the distributor, can define the criteria for an "order hit" by using any percentage that is appropriate to your particular market and customer base.

Reporting on service level is available in a variety of formats. These include by vendor listed by item number, by product group listed by item number, and optionally by vendor total only. The service level report can exclude all items above a specified percentage service level. This allows the distributor to produce a report that lists only those items where service level improvement is needed.

ASSURING HIGH LEVELS OF CUSTOMER SERVICE

We have discussed the fact that one of the alternatives that will allow you to provide your customers with high levels of service is to buy and store huge amounts of inventory. Then, no matter what a customer might order or in what quantities, you will always have it in stock. We have also discussed the fact that this method of inventory management, while ensuring high levels of customer service, is quite costly.

The method Activant uses to ensure high levels of customer service involves predicting future demand (forecasting) for a product and then ordering that product sufficiently in advance of that demand so that it arrives just in time to be sold to customers when they need it. This method relies on two pieces of information.

The first is an estimate of the future demand for a particular product on a month-by-month basis. The second is the amount of time that transpires between when you place an order with your suppliers for a product and when that order arrives on your receiving dock and is put away in your warehouse ready to be sold to the customer.

Simply put, if you can estimate how much of a product your customers will want to buy in some future period, and you can estimate how long it takes to get that product from your suppliers, you can place an order for that product sufficiently in advance so that it will arrive in time for you to satisfy your customer's demand for that product. This must be viewed as a continuous process where you are continually placing orders for a product from your suppliers and they are continuously arriving in time to replenish your inventory so that your customer's demand will always be satisfied.

In this way, average inventories can be kept to a minimum investment and customer service will remain high.

Future Demand

The most important factor to inventory management as a whole is prediction of future demand for a product by your customers on a product-by-product basis. Not only does this estimate of future demand impact when you will place future orders, it also impacts the quantity you decide to order when you do order.

Of equal importance in determining when to place an order for a product is an estimate of the amount of time required to get that order from your suppliers. The idea is this: you will place an order for a product when your level of stock has dropped to the point required to satisfy the demand you will experience for that product during the time that it takes for your supplier to ship your replenishment order to you. The point in time when you should place a replenishment order with your suppliers for a product in your inventory is often referred to as an order point.

Order Point Example

Let's say that you stock an item of which you sell 20 units per month. Let's further assume that the lead-time from when you place the order with your supplier until when that order arrives on your dock and is put away ready for sale to your customer is two weeks. Your order point for that item would be 10 units.

When the stock of that item in your inventory drops to 10 units, you would place a replenishment order with your supplier. The 10 units of that product in your inventory, which constituted the order point, would just satisfy the demand of your customers during the two weeks required for your replenishment order from your supplier to arrive and be put in your inventory ready to satisfy your customer's future demand.

This explanation of order point neglects any mention of the idea of safety stock or the concept of an established waiting period (review cycle) between orders to a particular vendor. However, it will serve as a foundation for the explanations of precisely how the Activant inventory management system allows a distributor to achieve the seemingly conflicting goals of higher customer service and lower cost of holding inventory. Safety stock and review cycle between orders to a vendor are important parts of inventory management, and we will deal with those concepts later.

We said that there are two factors that affect the calculation of an order point for a product. The first was your customer's demand for that product in some future period of time, usually a month. This is often referred to as future usage rate or simply usage rate for that product. The second factor is the lead-time required for a replenishment order to be processed, shipped and received at your distributorship. This amount of time is often referred to as a vendor lead-time.

It is quite important to realize that both future usage rates and vendor lead-times must be predicted on an item-by-item basis.

USAGE RATES

Predictions of future usage of a particular item in your inventory depend upon knowledge of past usage for that item. We must make the assumption that the number of units of a particular product that we will sell next period will be about equal to the number of units of that product that we sold last period. This is a quite reasonable assumption as long as we recognize several special circumstances that affect usage rates on a periodic basis for a particular product.

The system allows for user-defined periods. Examples of a period are weekly, monthly, and quarterly. These are not the only choices. The system allows the user to easily set up the periods that suit their business.

Since the number of units of a product we sell in any given period varies from period to period, our estimate of next period's sales should probably be an average of a number of past period's sales. The inventory management system incorporated in the Activant software uses an average of past usage to predict future usage on an item-by-item basis.

Usage Rate Example:

Let's say that our usage rate for a particular product for the past six periods was the following number of units sold per period.

61 52 65 58 65 59

Based on this pattern of usage for this item over the last six periods, a reasonable way to predict next period's usage rate for that item would be to add the six periods' usages together. This totals 360. Now divide 360 by six. Our predicted usage for next period would be 60. Looking back at the past six periods and the usage in each of those periods, a predicted usage for this item of 60 for next period is about right.

Activant's inventory management system accumulates past usage rates on an item-by-item basis for an unlimited amount of periods. The system further allows you to specify the number of months of past history for an item that will be used in the calculation to predict future usage for that item.

Let's say you choose to configure your system to use six periods of past history to calculate a predicted future usage for an item. The calculation would be made in the same way as in the example above. On the other hand, if you had chosen to configure your system to use only the past three periods of history to calculate a prediction of next period's usage of that item, the system would have added 58, 65, and 59 together and then divided by three to calculate a future usage for that item as 61.

This method of calculating predicted future usage rates for items in your inventory based upon demand in the past period for that item is effective for normal or non-seasonal items in your inventory.

Seasonal Items

The average distributor will stock a variety of items, which experience demand or usage that is seasonal in nature. The inventory management system in the Activant software incorporates quite flexible procedures for allowing you, to establish how the system will calculate a prediction of future demand for a seasonal item. This is an area where the Activant software distinguishes itself from many systems on the market today.

Let's consider an item such as an air conditioner, which has a three-month season of June, July, and August. It would make little sense to use the six months just previous to May to calculate predicted future usage for June. Instead, the Activant inventory management system allows you to establish a three month season for that item and the system goes back to the months of June, July, and August of last year, retrieves demand or usage in those three months to calculate an average, which becomes predicted usage for June of this year.

In the next month when we recalculate predicted usage for July, the system will automatically use the historical usage from July, August, and September of the previous year, allowing the system to predict the approaching downturn in demand that will be experienced at the close of the season. The distributor is allowed extreme flexibility in establishing seasons for items, which can vary in length from as short as one month to as long as six months.

Number of Periods to Average

In order to add further flexibility to the critical calculation of predicted future usage of an item, the inventory management system incorporated in the Activant software allows the distributor to classify items into one of three ranges of volume: high, midrange, and low. Default volumes for these ranges which can be set for any values the distributor desires are: sales of 24 units or more for the high range, four units to 23 units for the midrange, and less than four units per year for the low range.

The use of these volume ranges allows the distributor to easily incorporate a different number of months of past usage for an item in the calculation of predicted future usage for that item. The default values for number of months to average, which can be set at any number of months the distributor desires, are six months for high volume items, nine months for mid range, and 12 months for low volume items.

Beware of the computerized inventory management systems on the market today, which allow little or no flexibility in calculating the future usage rate on an item-by-item basis.

SPECIAL CONDITIONS AFFECTING USAGE RATES

In addition to items that experience normal usage rates, and items that experience seasonal usage rate, there are four other item usage conditions that must be identified in order for any inventory management system to function properly. These special conditions are: items which experience extremely low usage, out-of-stock items during a portion of the month, extraordinary sale of an item, and single customer buying of an item.

Two of these conditions cause the history of usage for an item to be different from what its true "historical demand" should be. The other two conditions reflect customer demand for an item that is very erratic from month to month. The Activant inventory management system identifies each of these conditions automatically, allowing you to take the appropriate actions in managing these items.

Low Usage Item

The first of these special conditions is extremely low usage. This is an item in which you may sell one in a month and then go several months without selling any. An average of past month's demand, used as a predictor of future demand, is simply ineffective for an item of this nature. These kinds of items are more effectively managed by establishing a fixed-order point, which is usually zero and a fixed-order quantity, which is usually one. The inventory management system incorporated in Activant software makes allowances for handling low usage items.

Out-Of-Stock Condition

The second special condition, which must be considered when predicting future usage rates, is that circumstance when an out-of-stock condition has existed for an item in your inventory for more than two weeks. Since you were out of stock for that item, sales for that particular month will be lower than normal. Provisions must be made so that this lower-than-normal figure does not adversely affect predictions of future usage for that item in coming months. The Activant system is extremely effective in identifying this particular condition.

On a period-by-period as well as product-by-product basis, the system compares its forecast of demand to actual stock demand for that month. This comparison results in a calculated error rate. This error rate on a product-by-product basis is averaged over a specified number of periods to develop an average error rate for that particular item.

Each period, the system compares this period's error between predicated usage and actual usage with the average error rate. When this month's error exceeds the average by a specified percentage the fact is printed on a report. In this way you can identify items that experienced lower than-normal demand due to the fact that there was an out-of-stock condition in existence for a portion of the period. You can then correct the forecast for those items as you see fit.

Extraordinary Sale

The third circumstance affecting item usage rates that must be identified is the condition caused by an extraordinary sale that is unlikely to repeat itself. When this happens, the item usage history will contain a past demand that is much larger than usual. If this condition were not identified, this larger-than-usual demand would cause predictions of future demand to be too large for several months into the future.

Again, the Activant system would identify this condition because the current error rate between predicted usage for this month and actual demand for this month would exceed the average error rate for the past several months. A printed report would alert you, the distributor, that some extraordinary condition has affected demand for that item.

Single Customer Buying Pattern

The last special condition affecting usage rates for items that must be identified by any effective inventory management system is the circumstance where there is a single customer-buying pattern for a particular item. This is the type of situation where a customer orders an item every two or three months in a fairly large quantity. In between this customer's order for the item, sales for it are quite low. Averages of past usage for an item such as this are ineffective predictors of future usage.

For example, consider the customer who ordered a particular item in the quantity of 50 every third month. Sales of that item in intervening months are only one unit per month. A prediction of future usage based upon three months past sales history of that item would be 17 units. This is incorrect in that in the third future month our customer who regularly buys this item will place an order for 50 units, not 17 units. Again, the current error between predicted usage and actual demand for the month compared to the average error rate for this item would alert the distributor that a special condition is affecting the usage rate for this item.

The flexibility of the inventory management system incorporated in the Activant software will then allow the distributor to best manage this item by setting a fixed-order quantity. And remember, the Activant inventory management system identifies all of these special conditions automatically and on an item-by-item basis.

As you can see, the inventory management system incorporated in the Activant software allows extreme flexibility in calculating the crucial factor of predicted future demand on an item-by-item basis for all items in your inventory. This allows you to incorporate your superior knowledge of your market and your product into the way the Activant system manages your inventory.

LEAD TIMES

The second piece of information that is needed in order to calculate an order point of an item is vendor lead-time. This is the amount of time required for a replenishment order from your supplier to reach your receiving dock and be placed on the shelf ready for sale to your customers.

It is important to understand that vendor lead time for an item is definitely not what the vendor tells you it will be. But rather, it is that length of time from when you place the order for an item until that item arrives on your receiving dock and is put away, ready for sale to your customers.

In the Activant inventory management system, the average lead-time on a vendor basis or an item-by-item basis is calculated. On a vendor basis the average lead-time consists of the sum of 50 percent of the existing average and 50 percent of the most recent lead-time. On an item basis the lead-time is calculated by averaging the last four receipts for that item. This lead-time is automatically captured in the system by calculating the amount of time that has transpired between the date on the purchase order initiating a replenishment order and the date of the first receipt of an item on the receiving dock.

In the case of an order for an item that is only partially filled by your vendor, the date of first receipt of that item is the appropriated date to use in calculating lead-time for that item. The subsequent receipts of the rest of the order for that item are ignored by the system. This is appropriate because the initial part of the order which is first received will go into inventory to satisfy the present demand for that item with subsequent receipts of that item going into inventory to satisfy some future demand.

The Activant inventory management system allows you, the distributor, the flexibility to establish a safety factor to provide a margin for error in the circumstance where a vendor's delivery performance is erratic. This safety factor is multiplied by the average lead time when calculating an order point.

For example, if a vendor's average lead time is 30 days but his or her actual lead time on individual shipments varies as much as 100 percent, the distributor may wish to set a safety factor of two. This would cause the system to use a lead time of 60 days, thus providing protection against the worst case lead time experienced by the distributor with this vendor's replenishment orders.

THE BEGINNING OF AN ORDER POINT

Now that we have a prediction of average demand for an item during the next month as well as a prediction of average lead-time for an item from the vendor, we can calculate an order point for that item. The order point will be the average predicted demand multiplied times the average lead time for that item and will yield a number of units.

The idea is that when the stock of that item in our inventory drops to the number of units calculated in order point, we would place a replenishment order for that item with the supplier. However, this order point has neglected any safety stock for that item.

The Need For Safety Stock

Since the order point we just calculated was based on averages of both predicted demand and lead time from our vendor, that order point will be just like any other average figure. If we stop for a moment and think about an average, we see that in most cases the average figure is some number that is in the middle of a range of numbers. Safety stock is an amount that is added to the calculated order point to protect us from that circumstance where actual demand is greater than the calculated average demand. Safety stock also protects the situation where actual vendor lead-time is longer then the average lead-time we used in the order point calculation. The use of safety stock triggers a vendor order for an item earlier than if we depended solely on the product of average usage and average lead time.

Safety Stock Example

In our calculation of average usage, we took usage for six periods in the past, added it up and divided by six. When we looked at that average usage and compared it to each of the past six periods, we saw the actual period usage was sometimes higher than the average and sometimes lower than the average.

In terms of our order point, since it is the product of two averages, we know sometimes our true order point should be higher than that average order point that we calculated, and sometimes it should be lower. One of those circumstances will cause us a problem affecting our ability to provide service to the customer.

When the order point that we calculated is too low, which it will be about half the time unless we use some safety stock, it means that we have waited too late to place a replenishment order with our suppliers for that item. It means that we do not have enough stock remaining on the shelf to satisfy demand from our customers for that product during the time it will take for the replenishment order to arrive from our vendor.

In order to protect ourselves from this circumstance, we establish a level of safety stock for each item in our inventory to be used in the order point calculation. This safety stock amount effectively increases the order point to some number of units higher than what is calculated using the average usage rate and the average lead time.

This allows for the fact that sometimes actual demand will be higher than average demand calculated for a product, and sometimes actual lead time for a product from a vendor will be longer than the calculated average lead time. Safety stock used in the order point calculation is extremely important. If we did not use this safety stock to protect us from fluctuations in demand and fluctuations in lead-time, our ability to provide service to our customers would be severely hampered.

In fact, the way it works out when we use average demand and average lead time in an order-point calculation and do not include safety stock, we end up with a stock out condition for that item about 50 percent of the time. This is clearly unacceptable level of service for most distributors. The Activant inventory management system allows the distributor extreme flexibility in establishing levels of safety stock on an item-by-item basis so the desired service level to the customers can be maintained.

Safety stock is expressed as a number of period's supply of a product based upon the most current estimated future usage for that product. Let's consider an item of which we sell 40 units per month. Let's say that our average lead-time is one month for this item. Since we would sell on average 40 of these items during the month that it takes a replenishment order to reach our receiving dock, the order point for that item would be 40 units. When stock in our inventory falls to 40 units, we would place a replenishment order.

We have already stated that this calculated order point is based on averages and that actual demand and actual lead time can fluctuate, so we need to add some safety stock to this order point to protect ourselves from these fluctuations. Suppose we had deemed for this particular item, a one-half month supply as an appropriate level of safety stock. Since our average demand for the product is 40 units each month, a one half-month supply is equal to 20 units.

Our new order point using the concept of safety stock then becomes 60 units. This is the original order point of 40 units plus the safety stock of 20 units. Now, when stock in the warehouse drops to 60 units, we'll place a replenishment order. Our average lead-time is one month during which time we will, on the average, sell 40 units. So there should be 20 units remaining in the warehouse ready for sale to a customer when the new order arrives.

Those 20 units form our safety in the event that demand by our customers during that one-month lead-time is higher than our calculated average demand. And those 20 units are a safety against the situation where, in fact, the lead-time stretches out longer than one month.

The amount of safety stock required to protect you from variations in demand and variations in lead-time will vary from item to item. Clearly, there are some items bought from vendors whose lead-time varies almost none at all. Likewise, demand that you experience from your customers for some items is extremely stable from period to period. In those cases, safety stock expressed as a number of month's supply should be low, perhaps as low as one week's supply.

On other items, vendor lead-time may be quite erratic, and demand for that item may vary a great deal from period to period. In those cases, safety stock expressed as a number of period's supply should be higher. Recall that there is a vendor safety factor that will allow you to protect yourself from erratic lead times for an item from a particular vendor.

The Nature of Safety Stock

While safety stock is essential for providing a high level of service to our customers, it must be recognized for what it is. For items that have very predictable usage rates and vendor lead times, excessive safety stock becomes a zero-turn asset.

For example, look back to our distributor who experienced an average demand of 40 units for a particular item and an average lead-time of one month from his or her vendor for that item. Let's suppose that he or she has established a safety stock amount of a one half-month supply for that item.

His or her order point, based upon those average usage rates and average lead times would be 40 units a month average demand multiplied times one month lead time, plus one half month of safety stock. This would yield an order point of 60 units.

Let's further suppose that the usage for that item never varied from 40 units per month and the lead-time never varied from one month. Every time the distributor's stock for that item drops to 60 units, he or she reorders. One month later, the order comes in with 20 units of safety stock still remaining on the shelf in his or her warehouse. This happens month after month after month.

Those 20 units represent an investment that does not turn over. It's not to say that those particular items are never sold; it is to say that the dollars invested in safety stock are always sitting on the shelf. In this sense, the safety stock is a zero-turn asset. It is earning no return in profit.

Generally speaking, for those items that experience erratic demand, safety stock levels expressed as a number of month's supply should be higher than those units that have stable demand. For those items where vendor lead-time is extremely predictable, the vendor's safety should be set to one. For those items where vendor lead-time is more variable the vendor's safety should be to some value higher than one.

THE ORDER POINT SUMMARIZED

To summarize what we have done so far, we can say we have collected data on an item-by-item basis regarding what our past sales for those items are. We have used that history of past sales to develop an average that we use to predict demand for that item from our customers in the future month.

Additionally, we have collected data on the performance of our vendors in shipping replenishment orders to us on an item-by-item basis. Now we can say if we place a replenishment order when stock in our warehouse drops to the number of units required to satisfy our future demand during the time required for our vendor to ship us our replenishment order, we'll never be out of stock.

We can assure our customers extremely high levels of customer service. Of course in this order point calculation, we have to include a measure of safety stock to take into consideration fluctuating demand for items and fluctuating lead-time from our vendors. The Activant inventory management system collects all of this data automatically and in the way that we have specified it be collected. It performs the calculations needed to recommend appropriate order points based upon the distributor's superior knowledge of products and markets and makes its recommendations each month on an item-by-item basis all in an automatic fashion.

THE REVIEW CYCLE

There is one additional degree of flexibility offered by the Activant inventory management system in calculating order points on an item-by-item basis. The circumstance exists in many distributor companies where products in product lines are ordered from hundreds of different vendors. It's common practice to look at the items from a vendor's product offering on some specified regular basis and place a PO for all the items that are at or below the order point at that time.

For example, a distributor may order from 100 different vendors. He or she may choose to place an order with 20 of those vendors on Monday and 20 on Tuesday and so on until by Friday he or she has reviewed all 100 vendors once during the week. His or her review cycle for each vendor each time in that vendor's product line would be one week.

There are two reasons for establishing a review cycle for a vendor. The first is buying from a large number of different vendors makes it impossible to issue a purchase order for items for every vendor every day.

The second reason is vendors often offer discounts for larger orders. It might be necessary for a distributor to wait some period of time between orders to accumulate an order large enough to meet some desired discount level. The review cycle for that vendor would be the period of time needed to accumulate a large enough order to qualify for the desired level of discount.

When using order points, it's possible and in fact, probable, for some items within a vendor's product line to reach or drop below their order point every day. This should be the trigger for the replenishment process from that vendor. In the situation where the review cycle for vendors has been established for either of the two reasons mentioned above, it's clear that there might elapse a period of time from when an item reaches its order point and when that vendor's items in total are actually reviewed for replenishment. This delay in placing a replenishment item could, and probably would, result in a stock out of that item.

Consider the idea of adjusting the order point upward to take into consideration average demand, which occurs for an item during the period of time between reviews of that vendor's lines for the purpose of placing a replenishment order. Let's continue our example of a distributor who has a product that experiences average demand of 40 units per month and average lead-time of one month.

THE COMPREHENSIVE ORDER POINT EXAMPLE

The distributor has chosen to hold a safety stock of a one-half month supply of the item. In addition, let's say the review cycle for this vendor is every two weeks. The distributor has chosen this review cycle because of the discounts the vendor offers on volume orders. Based upon past sales of that vendor's product line, the distributor finds that about every two weeks he or she can place an order large enough to qualify for the discount.

Our last calculation of order point for this particular item from this vendor multiplies the average usage of 40 units per month times the average lead time of one month. Then add a one-half month supply for safety stock resulting in an order point of 60. Because we will now only place an order every two weeks – the review cycle – we must increase the order point by the amount equal to the average demand during the review period. Since the review period is one half month and average demand is 40 units per month, the order point will be increased by 20 units.

The new order point becomes average usage rate of 40 units times one-month average lead time plus 20 units for safety stock, plus an additional 20 units which represent average demand during the one-half month review cycle. The new order point is 80 units. The distributor has now taken into consideration all factors affecting this stock item in calculating the order point.

NET STOCK

Up to now in our discussions of the order point, we have said that when the quantity of an item in our warehouse drops to the calculated order point, we must place a replenishment order for that item, or we will risk a stock out prior to that replenishment order arriving. The act of replenishing an item is actually a dynamic process. Because of this, we must not only consider the shelf quantity of an item in our warehouse when deciding when to place a replenishment order, but also the quantity of that item that may be in transit from the supplier due to a prior replenishment order.

Further, we must consider the quantity of that item that may be on back order to our customers. To modify our statements about when to place a replenishment order to more accurately reflect reality, we can say when our net stock drops to the calculated order point, we will place a replenishment order with our supplier. Net stock, for the purposes of replenishment and application of order points, will be defined in the following manner:

Net Stock = quantity available for sale (shelf quantities) + quantities on PO - quantities back ordered by our customers

The process of inventory replenishment is indeed a dynamic one. For instance, if we considered only shelf quantities in the application of order points, we would miss the fact that a prior replenishment order may arrive in the next week, making it unnecessary to reorder for perhaps several more weeks. We can think of the process as being like a pipeline stretching between our supplier and our receiving dock. This is particularly applicable when lead times from our suppliers are long and the nature of the product that we are ordering requires us to order fairly frequently and in fairly small quantities in order to minimize our cost of owning inventory.

Let's consider the circumstance where the nature of a particular item requires us to order that item in quantities equal to a one-month usage. Let's further assume that the lead-time for this item from our vendor is two months. The pipeline from our vendor to our receiving dock will always contain several purchase orders worth of that item. If we failed to include the quantities of the item which are in transit in the calculation of net stock, we would be tempted to place an order for that item, when in fact, it was unnecessary because a previously placed purchase would be arriving within the next few days.

The circumstance involving customer back orders for an item dictates that we subtract the quantity of that item back ordered to our customer from that quantity available for sale in our warehouse, plus what is on transit in order to determine net stock. In this situation, the possibility exists that the quantity on back order is sufficient to completely exhaust the quantity that is on order, but not yet arrived. In this circumstance, net stock would surely be below the order point, and it would be appropriate to place another replenishment order immediately. Had we not considered the quantity of customer back orders in determining our net stock, we would not come to the conclusion to place a replenishment order immediately.

So far we have only talked about those aspects of inventory management that impact the distributor's ability to provide service to his or her customers. All of this is an extremely important part of the Activant inventory management system, but equally important are the procedures, which seek to minimize the distributor's investment in inventory and thus minimize his or her costs of holding inventory. Activant's inventory management system provides the distributor with extremely powerful and flexible methods that are directed toward minimizing investment in inventory without sacrificing customer service.

THE SECOND FUNDAMENTAL

The second fundamental of inventory management is order quantity, or how many of an item you order when you do decide to order. This drives your cost of owning inventory.

The costs of owning inventory come from two distinct sources. The first source arises from having actually paid money for the inventory and having to store the inventory. This cost is often known as the Cost to Own.

The second source arises from the fact that the distributor must process orders to purchase the inventory from his or her suppliers. To do this he or she must have a staff of people who actually place purchase orders with vendors, who evaluate the appropriate time to place those purchase orders, and who handle the paperwork involved with paying the vendors after the merchandise has been received. This cost is often known as the Cost to Order.

To understand the relationship between Cost to Own and Cost to Order for each item in a distributor's inventory, we must first understand the components of each of these costs.

Cost to Own

When we talk about the Cost to Own inventory, we generally discuss this cost in terms of the entire inventory. However, all of these discussions could be applied to each separate item in our inventory.

The first cost that comes to mind for owning an inventory is the cost of the warehouse in which distributors store that inventory. Even if distributors own a completely paid for warehouse, they should consider the cost of the warehouse as being the amount of money they could receive as rent if they did not choose to put their own inventory in the warehouse, but rather leased the warehouse to someone else.

The second cost associated with owning inventory is the amount of yearly taxes on that inventory. The third cost associated with owning inventory is the cost of insuring that inventory against catastrophic loss. The fourth cost of owning inventory is the cost of obsolescence and shrinkage in that inventory that occurs during a year.

The fifth cost of owning inventory includes all of those costs associated with handling the materials that takes place from the moment orders from the distributor's vendors are received on the receiving dock until they are put away in the warehouse. Also included are those material handling costs associated with moving around and organizing inventory in the warehouse during the year. That portion of materials handling cost that is associated with filling sales orders should not be included in the cost of owning inventory because that is a sales-driven activity.

The sixth cost associated with owning inventory is the cost of having money invested in that inventory. Distributors should consider that if their money was not invested in inventory, it could be invested in a bank or in other financial securities which would earn a return during the year.

If distributors were to total up the dollar amount of all six of these costs of owning inventory and divide that total by the average value of their inventory, the cost of owning inventory would then be expressed as a percentage per year. For example, let's consider distributors who estimate their costs of owning inventory in the following manner.

Type of Cost	Amount
1. Cost of warehouse space	50,000
2. Cost of inventory taxes	25,000
3. Cost of inventory insurance	25,000
4. Cost of obsolescence and shrinkage during the year	50,000
5. Cost of materials handling associated with receiving and storing inventory	50,000
6. Cost of money invested in inventory	100,000
	<hr/>
	300,000

Now suppose the distributors have, on average, \$1 million worth of inventory in their warehouse. To determine their inventory carrying cost on a percentage basis, they would take the sum of all of the costs associated with owning inventory and divide that by their average inventory.

$$\text{\$300,000/\$1,000,000} = .30 \text{ or } 30 \text{ percent}$$

What this calculation has shown us is that owning inventory is an extremely expensive proposition. This calculation suggests that it costs distributors 30 cents each year for every dollar they have invested in inventory.

While this calculation may not seem that difficult to make, research has shown the average distributor experiences a Cost to Own expressed as a percentage per year of about 20 percent plus the prime rate. The 20 percent in this simple formula covers the first five costs of owning inventory. The prime rate factor, which fluctuates with the state of the economy in this country, reflects the cost of having money tied up in inventory.

In applying this simple formula for determining your Cost to Own inventory, an alternative would be to use the 20 percent to cover the first five costs associated with owning inventory and to use your short term borrowing rate to cover the cost associated with the amount of money you have invested in inventory. If you do this, it is appropriate to subtract out the percentage cost of inflation you are experiencing on a yearly basis from your vendors. The equation of the formula for determining cost to own would become: 20 percent plus your short-term borrowing rate percentage, less the yearly cost of inflation on inventory purchases from your vendors.

The Activant inventory management system asks you what your cost is to own inventory expressed as a percentage per year.

Cost to Order

The cost of ordering inventory from your suppliers is composed of several factors also. The first factor is the cost of maintaining a record system that tells you when it is time to place a replenishment order for items in your inventory.

This record system includes the people who do cycle counts in the warehouse as well as a prorated share of the computer system on which those records are stored.

The second factor associated with the Cost to Order inventory is a portion of the cost of maintaining a purchasing staff. This portion is associated with the profile of stock to non-stock sales in your company. If your business is composed of 70 percent stock sales and 30 percent of sales that are either directly shipped or special ordered, then your stock to non-stock profile is 70 percent. Thus, 70 percent of your purchasing staff's costs would be attributed to the cost of ordering stock inventory.

The third factor associated with Cost to Order is the cost of processing accounts payable to your suppliers for purchases of stock inventory from them. The last factor affecting the Cost to Order inventory is the cost associated with expediting orders for stock that may not have arrived on time.

An obvious way for distributors to calculate the cost to place an order for an item is to determine the cost associated with issuing one purchase order to a vendor and divide that cost by the number of order lines on the purchase order. This will yield the Cost to Order expressed as a number of dollars per order line on a purchase order.

Most distributors find the calculation to precisely determine the Cost to Order expressed as a dollar amount per order line on a purchase order a difficult one to make. These distributors rely on an industry average figure that suggests that the cost to place one order line on a purchase order is between \$3 and \$5. The Activant inventory management system will ask you to determine your cost of ordering stock inventory expressed as a dollar amount per order line on a purchase order to a vendor.

The Balance Between Cost to Order and Cost to Own

We have said that the total cost of maintaining an inventory is the sum of ordering costs and owning costs. These two costs can vary quite a bit depending on the quantity of an item that you order. Let's discuss these two costs as they relate to a single item in a distributor's inventory. Distributors could buy large quantities of that item infrequently. Or, they could buy small quantities of that item frequently.

In the former case, total cost of maintaining that item in their inventory will be high because cost to own will be high. In the latter case, total cost will be high because cost to order will be high. EOQ and Order-Up-To are order quantity calculating methods incorporated in the Activant inventory management system which achieve the lowest cost balance between cost to order and cost to own. Very few systems on the market today allow the flexibility and precision offered by the Activant inventory management system in the area of calculating order quantities.

An Example of the Balancing Act

Consider an item in inventory which costs distributors \$10 per unit and of which during the year they sell 10,000 units. We can consider two extreme examples of order quantities that distributors might choose to order and the effect those order quantities have on Cost to Own and Cost to Order.

Distributors might choose to order an entire year supply of this item and place that order one time each year. In this extreme case, the distributors' Cost to Own associated with that item would be quite high because they would have to make an investment of \$100,000 in order to purchase each year's supply.

Their Cost to Order however, would be quite low because they would make the purchase of that item only once in the year. Their purchasing people would have to evaluate the status of that item in terms of quantity on the shelf in the inventory only once during the year, and accounts payable would have to handle paying the vendor for that item only once during the year. Considering that their Cost to Own is quite high, even though their Cost to Order is very low, these distributors would experience a high total cost of having that item in their inventory.

The other extreme in terms of order quantity distributors could choose to order for this item would involve ordering only a one-day supply of that item. Distributors would have to reorder the item every day. In this extreme example, if we allow for 200 working days in a year, distributors will invest only \$500 in this item each time they order, thus their Cost to Own will be quite low.

However, their Cost to Order in this example will be very high because their purchasing people will have to place an order 200 times a year, accounts payable will have to process 200 checks to this vendor, and the total cost of having this item in inventory again will be quite high due to the fact their Cost to Order is high.

Considering these two extreme examples, with regard to an order quantity for a specific item in a distributor's inventory, will lead the average distributor to the conclusion that there is some order quantity that lies between extremely large quantities representing a year's supply and extremely small quantities representing a one day's supply of an item that will result in the lowest cost balance between Cost to Order and Cost to Own. The conclusion is absolutely correct.

ECONOMIC ORDER QUANTITY

The order quantity is known as the economic order quantity or EOQ. The formula for EOQ is shown below.

$$\sqrt{\frac{24 \times \text{Cost To Order} \times \text{Monthly Usage Rate}}{\text{Cost To Own} \times \text{Item Cost}}}$$

Notice the EOQ formula uses the distributors usage rate for that item, their Cost to Order that item expressed as a dollar amount per purchase line, and a factor of 24 which is a constant in this formula. Also included in this formula is the distributor's Cost to Own inventory expressed as percentage per year and the item cost on a per unit basis of the item being ordered.

The EOQ formula evaluates all of these factors to determine the lowest cost balance between the cost of ordering this item and the cost of owning this item.

So far, we have discussed the cost of having an inventory on an item basis; however, it's easy to see that if we minimized the cost of having every item in an inventory, we would have achieved the lowest cost of having the total inventory. The Activant inventory management system allows you to manage the cost of having inventories through applying the principles of economic order quantity. The Activant inventory management system adds further power and flexibility to the economic order quantity calculation by allowing the distributor to establish standard package sizes to be used for ordering purposes from a vendor for each item, and then rounding the economic order quantity calculation to the standard package size for that item.

Order Point Example

To illustrate that the EOQ method of determining order quantities will automatically find the lowest cost balance between Cost to Order and Cost to Own, let's consider two examples.

	Example 1	Example 2
Monthly Usage	150 units	150 units
Cost to Order	\$5.00	\$5.00
Cost to Own	30 percent/Year	30 percent/Year
Item Cost	\$10/Unit	\$1/Unit
EOQ Formula	$\frac{24 \times 5 \times 150}{.30 \times 10}$	$\frac{24 \times 5 \times 150}{.30 \times 1}$
Econ. Order Quantity	77	245
# Purchases/Year	23	7

Notice the only difference between the two examples is the distributor's cost per item. The EOQ formula incorporated in the Activant inventory management system has automatically advised the distributor to purchase the more expensive item in smaller quantities and more frequently in order to prevent excessive inventory investment and a high cost to own for this item.

In example two the item cost is low. It stands to reason that the distributor can buy this item in larger quantities without inventory investment and cost to own becoming excessive. In fact, if the distributor doesn't buy a low unit cost item like this in larger quantities and less frequently, the purchasing department has to spend too much time ordering this item. This would cause cost to order and total cost to be higher than it should be for this item.

The use of the Economic Order Quantity calculation may seem overly complicated and difficult to use. It is, however, the most precise way to calculate the efficient order size. The Activant inventory management system does not expect you to take these calculations on faith alone. A screen is provided showing exactly how all order point and order quantity calculations are made. This allows the distributor's purchasing staff to verify calculations made by the computer. This feature, not available on many inventory management systems offered to distributors today, can also be used as a training tool to familiarize new purchasing people with state-of-the-art inventory management methods.

Order Quantity Based on Turnover Objective

An intuitive way to determine order quantity for an inventory item is to simply declare, "I will buy this item in quantities equal to a one month supply." For another item, a distributor might say, "I will buy this item in quantities equal to a one year supply." In fact, a distributor might have groups of items that he bought in quantities equal to a one month supply, a two month supply and so on all the way up to that group of items he or she bought in quantities equal to a year's supply.

This is a particularly easy way to determine order quantities because it allows the distributor to establish an inventory turnover target on an item-by-item basis. If you buy a one-month supply of an item every time you need to reorder that item, inventory turnover should be about 12 times per year. And this method of determining an order quantity is easy to understand. Many inventory management systems on the market today provide for determination of order quantities based on a yearly turnover target.

Unfortunately, most of these systems cannot meet the turnover objectives they are designed to yield. The reason is simple. These systems neglect the fact that safety stock and review cycle stock turn much slower than stock that actually comprises the order quantity.

ORDER-UP-TO

The Activant inventory management system uses a method of determining order quantity to yield a turnover objective call Order-Up-To. When using this method to determine order quantities, the distributor specifies an order quantity based on a number of a month's supply. This implies an inventory turnover target for that item. Order quantity equal to a one-month supply implies a turnover target of 12 times per year; a two-month supply implies a turnover of six times per year, and so on.

Here is how the Activant inventory management distinguishes itself from others on the market today: Many of the other systems simply tell the distributor to order the number of month's supply specified without considering safety stock or review cycle stock. This ensures that they will yield a turnover rate for that item lower than the objective. Activant's Order-Up-To tells the distributor to order a quantity that will bring net stock UP TO the number of month's supply specified.

Order-Up-To takes into consideration the item's safety and review cycle stock sitting on the shelf when calculating order quantities. It also takes into consideration stock that is in transit to the distributor due to previously placed restocking orders. Because the concept of ordering UP TO a stock level establishes a maximum, the implied turnover objective is actually the worst case or minimum that will ever be realized. Turnover rates experienced by distributors using Order-Up-To are usually much better than the rate implied by specifying a number of month's supply to order up.

Order-Up-To Example

Let's consider this example and comparison of Order-Up-To with a system that simply recommends an order quantity equal to a specified number of month's supply.

Monthly Usage Rate	50 Units
Vendor Lead Time	1 month
Safety Stock	1 month
Review Cycle	2 Weeks (.5 Month)

Order Point = (Monthly Usage Rate X Vendor Lead Time) + (Monthly Usage Rate X Safety Stock Time) + (Monthly Usage Rate X Review Cycle)

Order Point = (50 x 1) + (50 x 1) + (50 x .5)

Order Point = 125 Units

Let's say that a distributor's inventory management system simply orders a one-month supply of 50 units every time net stock falls to the order point of 125 units. Every month the system orders 50 units that come in one month later. Maximum stock on hand is 125 units and minimum stock is 75 units. This minimum represents the safety and review cycle stock. Average inventory is 100 units (maximum stock + minimum stock divided by two). Inventory turnover for this item is six times per year (annual usage divided by average inventory). Notice that the system does not yield anywhere near the desired turnover objective of 12 times per year.

If the distributor had used Activant's Order-Up-To method of calculating order quantities, the results would have been much better. For instance, assume that the Order-Up-To amount was set to 2.5 months which implies a turnover objective of 4.8 times per year. The system would recommend a buy of this item about every two weeks in quantities of about 25 units. Maximum stock on hand would be 75 units and minimum stock would be 50 units – the safety stock. Average inventory for this item would be 62.5 units. The actual turnover rate experienced with this item would be 9.6 times per year. This is higher than the rate implied by the specified Order-Up-To amount of 2.5 month's supply.

Notice that Order-Up-To yields better results in achieving high inventory turnover even when a lower target turnover rate is specified. Higher turnover rates mean decreased investment in inventory and lower costs. Activant's commitment to aggressive inventory management and cost control is clearly evident in the unique Order-Up-To method of calculating order quantities.

FIXED INVENTORY MANAGEMENT CONTROLS

There are items in every distributor's inventory that do not lend themselves to management using the "time supply" methods illustrated above. These methods are called "time supply" because they depend on a history of demand and automatically adjust order points and order quantities over time to reflect changing demand.

Perhaps the distributor does not have any history on an item because it is brand new to the market. Or maybe demand for an item is so erratic that it just doesn't make sense to try to calculate an average demand. Order Point-Order Quantity (OPOQ) and Minimum-Maximum (MNMX) are fixed control methods of managing those items in the distributor's inventory that do not lend themselves to time supply methods.

Order Point-Order Quantity

Order Point-Order Quantity is a method that lends itself well to managing items for which the distributor has little or no history. It is also used for items where you want to have one unit in stock but do not want to reorder until you have sold that unit. Order Point-Order Quantity is called a fixed control inventory management method because the order point and order quantity are not calculated but rather are established by the distributor on an item-by-item basis.

When stock of an item managed using this method drops to or below the fixed order point, an order is placed for the order quantity associated with the item. Multiples of the order quantity are recommended for order in the case where ordering the exact order quantity would not bring stock above the order point. This feature makes the Order Point-Order Quantity method suitable for handling those items that must be ordered in certain “package sizes.”

Minimum-Maximum

Minimum-Maximum is a fixed control inventory management that differs only slightly from Order Point-Order Quantity. The difference lies in the quantity recommended for order when stock of an item managed using Minimum-Maximum drops below the minimum. The recommended order quantity is the amount of the item that will bring stock back up to the maximum.

Flexibility

Distributors stock a wide diversity of products. Some are expensive; some are cheap; some are easy to buy, others are difficult; some have constant usage, others fluctuate wildly; some move fast, some move slow. This diversity does not just occur from distributor to distributor but rather occurs for everyone. So there is no single magic purchasing formula that works universally. Rather there are many strategies and ideas each perfect in their own way for some range of application.

Activant recognizes this diversity and provides a whole range of tools for inventory management and allows them to be used on an item basis. Beware of a system that preaches a single purchasing philosophy. Zeal is no substitute for practicality.

CONCLUSIONS

Inventory management is a complex, time-consuming chore. But the rewards to be reaped from doing a superior job of managing inventories include a higher level of customer satisfaction and more money on the bottom line. Remember, the number one reason distributors fail today is failure to properly manage assets. The Activant inventory management system offers the flexibility to allow you to choose a level of sophistication in inventory management that is appropriated for your company today and the power to allow you to grow toward higher levels of sophistication in the future. In addition, this flexibility allows you to manage different classes of inventory items in the exact way needed to assure high levels of customer service and low cost.

ABOUT ACTIVANT'S WHOLESALE DISTRIBUTION SOLUTIONS

Activant provides technology solutions and services to more than 3,800 wholesale distributors throughout North America. A leading technology provider for the distribution industry, Activant develops comprehensive enterprise software solutions to help distributors improve customer service and maximize the return on their technology investment. In addition, the company offers an Internet trading network that expedites sourcing, expands geographic reach, and streamlines transactions between distributors and manufacturers. Activant solutions are backed by a host of professional services, including support, consulting, and educational programs.

Activant Solutions Inc. ("Activant") is a leading technology provider of business management solutions serving small and medium-sized retail and wholesale distribution businesses in three primary vertical markets: hardlines and lumber; wholesale distribution; and the automotive parts aftermarket. Founded in 1972, Activant provides customers with tailored proprietary software, professional services, content, supply chain connectivity, and analytics. More than 30,000 customer locations use an Activant solution to manage their day-to-day operations. Activant has operations in California, Colorado, Connecticut, Illinois, New Jersey, Pennsylvania, South Carolina, Texas, Utah, Canada, France, Ireland, and the United Kingdom.

For more information, please visit www.activant.com, e-mail distribution@activant.com, or call 1-800-776-7438, press 1.

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