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Effective Inventory Analysis

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This report is the sixth in a series of white papers designed to help forward-thinking distributors increase efficiency, customer service, and profitability with smart inventory management strategies based on tried and proven methods and best practices.

Inventory is the largest and probably the most important asset of many distributors. More money is likely tied up in inventory than in buildings or equipment. And inventory is usually less “liquid” than accounts receivable. That is, it’s harder to turn inventory back into cash to pay employees and expenses. If distributors do not have this money invested in the right amount of the right products, they cannot provide the service to customers necessary to be successful. It is crucial that every distributor develops and uses a comprehensive set of tools that allows them to closely monitor the performance of their investment in inventory. In this document we will discuss several simple measurements that will help ensure that you are maximizing the profitability and productivity of your investment in inventory.

Customer Service Level

The first measurement is “customer service level,” or how often you have the items you’ve committed to stock when your customers want them. It is the most important measurement because if you don’t have what your customers want, when they want it, they will probably look for it elsewhere. The customer service level is calculated with the following formula:

$$\frac{\text{Number of line items for stocked products shipped *complete* in one shipment by the promise date}}{\text{Total number of line items for stocked products ordered}}$$

Notice that we measure line items shipped complete. That is, when the entire quantity ordered is delivered by the date promised to the customer. If the customer orders ten pieces, and you ship ten pieces, you get credit toward the customer service level. But if a customer orders 25 pieces, and you ship only 24 pieces before the promise date, you get no credit. Why no “partial credit” for shipping 24 out of 25 pieces?

- If the customer wanted 24 pieces, he or she would have ordered 24 pieces. They want 25! The customer has to find that last one somewhere else. Probably at your competitor’s warehouse down the street.
- Even if your customer doesn’t immediately need all 25 pieces and can wait for you to receive more in a replenishment shipment, your failure to have all 25 pieces in stock causes them to experience the cost of processing two stock receipts (and your warehouse to absorb the cost of filling two orders for the single transaction).

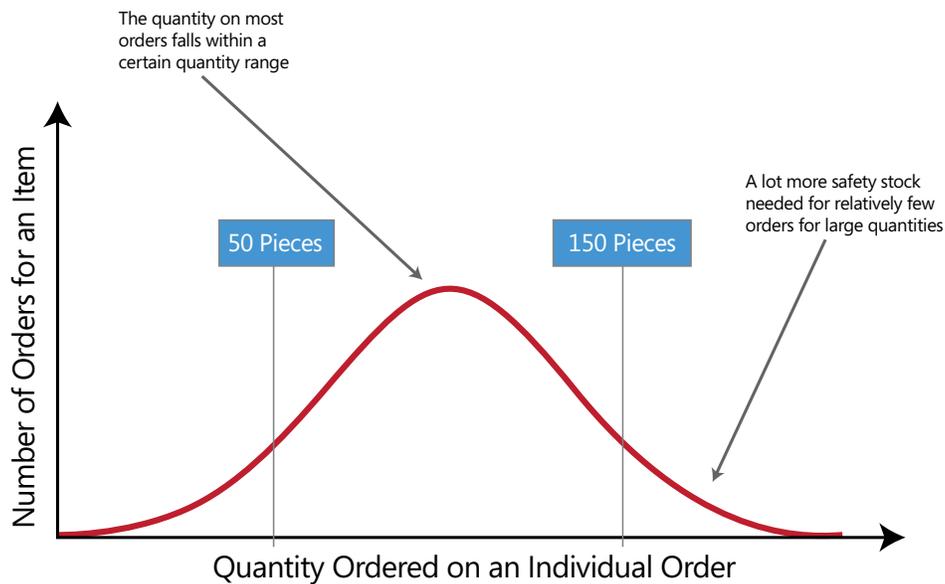
When calculating your customer service level, we only include sales of stocked items that are filled using warehouse inventory. We don’t include sales of other kinds of products such as:

Special order items—Items that you do stock, but are specially ordered to fill specific customer requirements.

Direct or “drop” shipments—Material sent directly from a vendor to your customer.

Shipments of these types of items do not reflect how well you stock material to meet your customers’ immediate needs. Distributors who include special order items and direct shipments when calculating a customer service level tend to overstate how well they are serving their customers from warehouse inventory.

Sure, you would probably like to be able to fill 100 percent of customer requests for stock items out of your warehouse inventory. But this is often not practical. To understand why, let's look at a graph that compares the number of customer orders for a popular stock item against the quantity ordered on each order:



For example, the quantity ordered of a specific stocked item is most often between 50 and 150 pieces. But you might have a few orders for more than 500 pieces. Do you want to always have enough inventory on hand to fill these few orders for an unusually large quantity? You probably can't afford to maintain enough stock to fill unusually large sales of every stock item. That's why most distributors are satisfied with a 95 percent customer service level. That is, 95 percent of the time they have the entire quantity requested of a stock item. *However, a distributor may want to raise his or her service level to 98 percent or even 99 percent on select "critical" items. This would result in being able to fill nearly all customer requests, complete in one shipment from warehouse stock.*

Number of Stockouts

Some distributors have trouble accurately measuring their customer service level. An alternative is to monitor both the number and length of stockouts, particularly of fast-moving "A-ranked" products. After all, if you do not have a product in stock, it cannot be immediately supplied to a customer. And A-ranked products are those that are requested most often by customers.

The reason we track both the number of times a product is out of stock and the length of each stockout is that each measurement can identify a different problem. If the number of stockouts is high, you probably are continually receiving shipments of the product but the quantity is quickly used or sold. *Your buyers are not ordering enough of the product on each replenishment order!* On the other hand if you are out of an item for an extended length of time, the problem is probably associated with a longer than anticipated lead time from the supplier. *Your buyers need to work to improve the reliability of their source of supply.*

Inventory Turnover

Inventory turnover measures the number of times we sell or “turn” our average inventory investment. In other words it determines the number of “opportunities to earn a profit” you experience each year from your investment in stock inventory. Inventory turnover is calculated by dividing annual cost of goods sold from stock sales during the past 12 months by the average inventory value during the same 12 months:

$$\frac{\text{Cost of goods sold from stock sales during the past 12 months}}{\text{Average inventory value during the past 12 months}}$$

As with the customer service level, non-stock sales and direct shipments are excluded from the “cost of goods sold” figure in the numerator of the equation. These special sales are not filled from inventory and including them in the calculation would exaggerate turnover. We use the cost of goods sold during the past 12 months to avoid distortions in turnover throughout the year. If we used “annualized” year-to-date figures (that is, year-to-date figures projected for the entire year) and the first several months were the “slow” period of the year, we would underestimate inventory turnover. On the other hand if the first several months comprised the popular season, turnover would be overestimated during these months. Using the cost of goods sold during a “rolling” 12 months eliminates this effect of seasonality in our calculation. The average inventory value in the denominator of the turnover equation is calculated by taking the average of the ending inventory value during each of the past 12 months.

The “cost basis” used to calculate the cost of goods sold and inventory value is usually average cost, but replacement or standard cost can also be applied. By using the same 12-month history and cost basis in the numerator and denominator of the turnover equation, we obtain an accurate measurement that can be used to track improvement in inventory performance over time.

Customer service level and stockout analysis reveal how well you are meeting your customers’ expectations. That is, how often you have what they need or want available for immediate delivery. Turnover is different. It is a gauge of profitability. Let’s look at an example: Suppose you sold \$10,000 worth of a product in the past 12 months and the average value of the inventory of the product was \$1,000. The result is 10 inventory turns ($\$10,000 \div \$1,000$), or 10 opportunities to earn a profit from the \$1,000 average inventory investment. But should you always strive to maximize your inventory turnover or opportunities to earn a profit? Not necessarily. You also have to consider the profitability of each of these opportunities. An analysis that combines turnover with profitability is the “turn-earn index.”

Turn-Earn Index

If a distributor enjoys high profit margins, he can be very successful with low inventory turnover. Many surplus wholesalers justify keeping items in their warehouses for years because they bought material at a very low cost and will eventually sell some of it at a premium price. On the other hand, some distributors have very low profit margins. In order to survive they have to have a high rate of inventory turnover.

The turn-earn index combines gross margin and turnover. It is calculated by multiplying inventory turnover by gross margin percentage:

$$\text{Turnover} \times \text{Gross margin} = \text{Turn-earn index}$$

For example, if a distributor has an average gross margin of 25 percent and experiences six inventory turns, he has a turn-earn index of 150:

$$6 \text{ (turns)} \times 25 \text{ (percent gross margin)} = 150 \text{ turn-earn index}$$

A distributor with an average 10 percent gross margin has to turn her inventory 15 times to achieve the same turn-earn index:

$$15 \text{ (turns)} \times 10 \text{ (percent gross margin)} = 150 \text{ turn-earn index}$$

But if a distributor has a relatively high gross margin of 50 percent, he only needs three inventory turns to attain the same turn-earn index:

$$3 \text{ (turns)} \times 50 \text{ (percent gross margin)} = 150 \text{ (turn-earn index)}$$

Many "best practice" distributors have a turn-earn index above 180. That requires turning over inventory nine times with a 20 percent gross margin or four times with a 45 percent gross margin.

Gross Margin Return on Investment (GMROI)

A similar measurement to the turn-earn index is gross margin return on investment or GMROI. The GMROI represents the amount of gross profit earned for every dollar of the average inventory investment. It is calculated by dividing gross profit dollars by the average inventory investment:

$$\frac{\text{Gross margin \$}}{\text{Average inventory investment \$}}$$

Note that while the turn-earn index and GMROI both measure profitability against inventory investment, they are two different metrics. Compare the turn-earn index and GMROI for an item with the following characteristics:

Annual sales	= \$10,000
Annual cost of goods sold	= \$7,500
Annual gross profit	= \$2,500
Average inventory value	= \$2,000

Turn-earn index =

$$\begin{array}{rclcl} \text{Gross margin} & \times & \text{Annual turnover} & & \\ (\$10,000 - \$7,500) \div \$10,000 & \times & \$7,500 \div \$2,000 & & \\ 25\% & \times & 3.75 & = & 93.75 \end{array}$$

GMROI =

$$\begin{array}{rclcl} \text{Gross profit \$} & \div & \text{Average inventory value} & & \\ (\$10,000 - \$7,500) & \div & \$2,000 & = & 125.00 \end{array}$$

The turn-earn index is not better than the GMROI (or vice versa). These measurements just use different scales, like Fahrenheit and centigrade temperatures. Be sure not to confuse one with the other. GMROI will always be greater than an equivalent turn-earn index. *Our minimum "best practice" turn-earn index goal of 180 is equivalent to a GMROI of 225!*

There are literally hundreds of measurements to evaluate inventory. A distributor can drown in the analysis reports produced by many computer systems. The customer service level/stockout analysis, inventory turnover, and turn-earn index/GMROI provide clear, concise examinations of the current state of this large, critical investment. Each can be applied to a single item, a specific product line, the entire stock of a warehouse, or a distributor's entire inventory. They also can be used to measure the improvement in inventory performance over time. Without meaningful analysis, can you tell if you are making progress?

About the Author

Jon Schreibfeder

Jon Schreibfeder is president of Effective Inventory Management, Inc., a firm dedicated to helping manufacturers, distributors, and large retailers get the most out of their investment in stock inventory. For over 20 years, Jon has helped over two thousand firms improve their productivity and profitability through better inventory management. Jon has designed several inventory management computer systems and has also served as a distribution industry “troubleshooter” for two major computer companies. He is the author of numerous articles and a series of books on effective inventory management, including the recently published *Achieving Effective Inventory Management (5th edition)* and the *National Association of Wholesale Distributors' Guess Right – Best Practices in Demand Forecasting for Distributors*.

A featured speaker at seminars and conventions throughout North America, Latin America, Europe, Asia, and the Pacific Rim, Jon has been awarded the title “Subject Matter Expert” in inventory management by the American Productivity and Quality Center. He is an advisor and guest lecturer in the Industrial Distribution Program at Purdue University.

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