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# Inventory Management Optimization using ABC-XYZ Analysis

Article · December 2021

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# Combining ABC and XYZ analyses to manage inventory

*Improve framework to develop and refine inventory policies, systems and procedures*

By Steve Greene

**A**BC analysis is an efficient and effective tool to optimize inventory. This approach to manage inventory classifies stock items by the amount of value they bring to a business. This value could be measured by many variables, such as revenue, profit, sales demand, service level requirements, relation to other items, life cycle and customer value.

ABC inventory analysis is also known as “always better control.” It is based on the Pareto principle (the 80/20 rule) of the “vital few and trivial many.” More specifically, better control over high-value inventory improves availability, reduces losses and lowers the cost of both working capital and carrying costs.

Inventory managers use ABC analysis to determine appropriate rules for each of the three inventory classes: A, B, and C (Figure 1). Managers establish inventory policies based on different service levels, safety stock levels and reordering parameters.

## Three ABC inventory classes

Sorting inventory into A, B and C value classes allows inventory managers to optimize resources to stock, store, count and control the “strong” stock (Class A). Managers can reduce resources spent to control “weak” stock (Class B) and spend even less resources to control the “weakest” stock (Class C).

Class A items have inventory policies that require tighter controls, more secured storage areas and better sales forecasts. Their reorder points are more frequent. Class A items should be located closer to the picking, packing and shipping areas. If Class A items are commodities, pricing wars may ensue between competing companies. Class A items are appropriate for vendor managed inventory (VMI).

Class B items need less inventory control. In dynamic mar-

kets, they could be upgraded to Class A items or downgraded to Class C items. Class C items have the least corporate value. Managers should consider keeping Class C item inventory low or even eliminate it. They should be stored at a location that is out of the way. Class C items carry the biggest risk of obsolescence under normal operating conditions.

An inventory manager’s foremost concern is avoiding stock-outs of Class A items. Fewer stock-outs result in improved production efficiency, more reliable cycle time, lower costs, less expediting, increased profits and improved customer satisfaction.

Managers use ABC analysis to better understand where to place an inventory item in its product life cycle so they can better determine the correct safety stock levels.

A manufacturer often makes Class A items at a high frequency such as each week or every other week. That is where a company can get the largest reductions in safety stock savings as there is often a replenishment order quantity on the schedule.

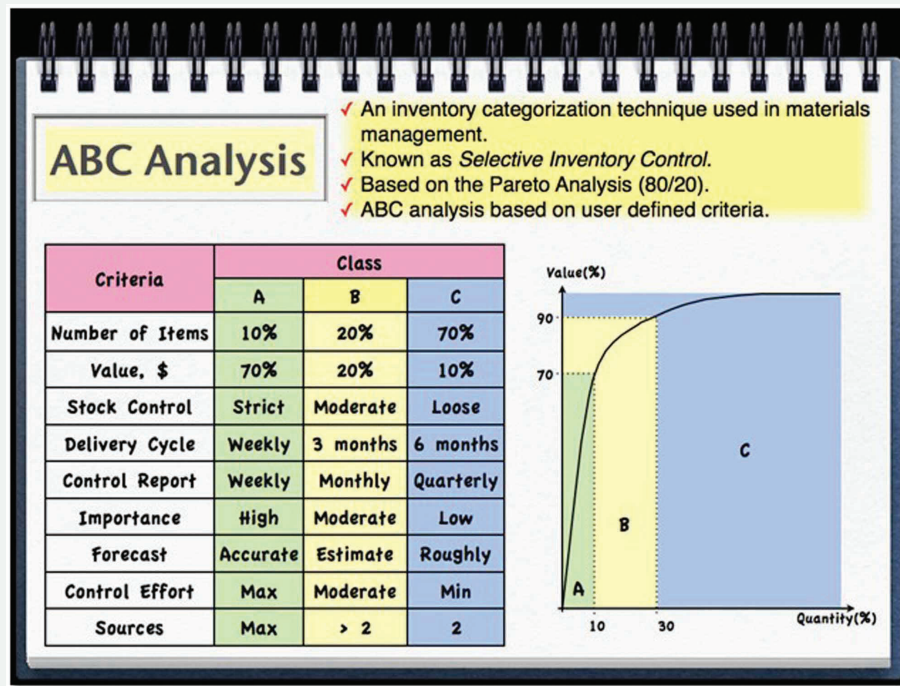
A company that prides itself on providing just in time or overnight delivery may locate a distribution center that is close to its larger customers. Rather than stock every item in its portfolio there, which would be cost-prohibitive, the company would stock the Class A and some Class B items that are “super movers.” Also the reordering parameters have the same impact for manufacturing companies on scheduling frequency and thus impact cycle stocks and safety stocks.

Major enterprise resource planning (ERP) packages have built-in functions for ABC analysis. ERP users execute ABC analysis based on user-defined value criteria. The ERP system will apply an ABC class to the items. An inventory manager reserves the right to judiciously override an ERP’s ABC classifications.

FIGURE 1

## Inventory basics

ABC analysis classifies stock items by the amount of value they bring to a business.



### ABC analysis drawbacks, frequency

Even though ABC analysis is a relatively straightforward way to classify and manage the company's inventory, it also has a number of limitations. Inventory managers need to decide what value factors to use to rank stock items into the ABC classes. Managers often use the revenue generated – units sold multiplied by average selling price – to rank stock items. Using profitability – average profit of the item multiplied by unit sales – provides an excellent read of the item's impact to the company's bottom line. With this method, even an item with very low sales but extremely high profit margin can rate higher than a Class C item.

For managers who classify items based on one or two factors, the classifications might be too simplistic. In a dynamic marketplace, product sales can be erratic, so items can move between the ABC classes quickly. Without frequent analysis, the company's current ABC classification can become obsolete.

The need for inventory managers to review the ABC classes routinely is well understood. The question is timing. Once a manager makes ABC value changes in an ERP, it takes time for the purchase and production orders to cycle through before the impact on inventories are realized.

Thus, a monthly ABC review is not ideal for most companies. It can be chaotic to change both cycle and safety stock amounts every month. ABC classification reviews that are quarterly or conducted every six months may be more ideal.

Furthermore, changes to ABC classes may impact service level agreements. For example, a service level policy could

dictate that Class A items will be make-to-stock and shipped within 24 hours of the receipt of a customer order. But if a company changes what qualifies as Class A items every month, it could be difficult to both keep company staff updated and manage customer expectations. Item class changes need to be well-communicated to a company's sales and marketing staff.

### Pairing ABC (item value) and XYZ (demand variation)

While it seems somewhat simple at first look, the practical applications of ABC analysis can often get complicated. ABC analysis greatly benefits from being more dimensional, such as being paired with an analysis of order frequency variation, known as XYZ analysis. It is a framework to classify products based on their variation of demand. This ABC-XYZ pairing can be better seen using a nine-box approach in Figure 2 (Page 34).

Class X items are ordered frequently such as daily. With frequent replenishment, they should have low demand variation that is predictable. Class Y items are ordered less frequently such as every few weeks or less. There is more variation in demand amount. Class Z items orders are infrequent and irregular. They have both the most variation in demand and are most difficult to predict.

As XYZ item analysis can be related to their level of demand predictability, it also relates to the likelihood of an item to vary from its forecast or forecast ability.

A company should never be out of stock on Class AX items.

FIGURE 2

## Nine-box approach

The ABC-XYZ pairing combines item value with frequency-variation.

	A	B	C
X	<b>AX Class</b> High consumption value Even demand Reliable forecasts	<b>BX Class</b> Medium consumption value Even demand Reliable forecasts	<b>CX Class</b> Low consumption value Even demand Reliable forecasts
Y	<b>AY Class</b> High consumption value Predictably variable demand Less reliable forecasts	<b>BY Class</b> Medium consumption value Predictably variable demand Less reliable forecasts	<b>CY Class</b> Low consumption value Predictably variable demand Less reliable forecasts
Z	<b>AZ Class</b> High consumption value Sporadic, variable demand Forecasting unreliable/impossible	<b>BZ Class</b> Medium consumption value Sporadic, variable demand Forecasting unreliable/impossible	<b>CZ Class</b> Low consumption value Sporadic, variable demand Forecasting unreliable/impossible

Class AZ items could result from a large one-time purchase so it's likely they would not be inventoried. Class CZ items are inventory liabilities.

Managers can use customized ERP nine-box reports. For example, reporting done in SAP can use data from the business warehouse regarding order frequency to automate the classification process. Managers can also manually determine ABC item classes and then download order data into Excel to arrive at XYZ codes. It can be done either way but automation is preferred.

### Inventory management policy: A further nine-box approach

With a good analysis of both ABC analysis (item value) and XYZ analysis (demand variation), inventory managers can then collaborate with other key functional managers in production, accounting, IT, logistics and procurement. Together, the managers should both establish inventory management policies and develop systems and processes to implement these policies (Figure 3).

Inventory policies may include:

- Degree of automation and timing of replenishment processes.
- Mutually agreed upon inventory parameters for ABC items.
- Inventory control, such as cycle counting frequencies.

Four benefits of combining ABC and XYZ analysis are:

## 5 reasons to prioritize inventory management

The COVID-19 pandemic revealed why effective inventory control can be the key to managing in a crisis and avoiding both excess inventory and shortages. Here are five reasons it's worth the time and investment.

- 1. It helps predict demand.** By keeping track of changes in stock, trends will be more visible, allowing for better preparation.
- 2. Automation saves time.** An effective point-of-sale and inventory management system can manage data more effectively than manually counting products and using spreadsheets that slow down the process while reducing the amount of human error.
- 3. Generate reports easily.** To see how your business is performing, you need to know what's happening in your warehouse, in detail. Inventory management tools can turn out reports quickly to show major trends in any time frame to make more informed decisions.
- 4. Allows for safe and confident growth.** Real-time inventory management allows for steady growth knowing key items are in stock, which can avoid disappointed customers.
- 5. It helps cut costs.** A good system involves upfront investment but will pay for itself over time by automating tasks to better use employees' time.

Source: [roboticsandautomationnews.com](http://roboticsandautomationnews.com)

FIGURE 3

## Further 9-box approach

Inventory managers can apply ABC and XYZ analyses to classify items in collaboration with managers in production, accounting, IT, logistics and procurement.

	A	B	C
X	<b>AX Class</b> Automated replenishment Low buffer; just in time or consignment transfers the responsibility for security of supply Perpetual inventory	<b>BX Class</b> Automated replenishment Low buffer; safety first Periodic count; medium security	<b>CX Class</b> Automated replenishment Low buffer; safety first Free stock or periodic estimation by inspection or weighing; low security
Y	<b>AY Class</b> Automated with manual intervention Low buffer; accept stock-out risk Perpetual inventory	<b>BY Class</b> Automated with manual intervention Manually adjust buffer for seasonality Periodic count; medium security forecasts	<b>CY Class</b> Automated replenishment High buffer; safety first Free stock or periodic estimation by inspection or weighing; low security
Z	<b>AZ Class</b> Buy to order No buffer; customer understands lead times Not stocked	<b>BZ Class</b> Buy to order No buffer; customer understands lead times Not stocked	<b>CZ Class</b> Automated replenishment High buffer; safety first Free stock or periodic estimation by inspection or weighing; low security

1. It provides a scientific and transparent framework to develop and refine inventory management policies.
2. It better tailors inventory systems and procedures to corporate objectives or a supply chain operations reference model.
3. It optimizes trade-offs between the costs, risks (long lead times) and benefits of holding stock.
4. It breaks down silos – key stakeholders needs are known and can be factored into inventory policy.

### The real-world part: Fun stuff that starts supply chain debates

Order frequency is an important factor when purchasers and planners determine how aggressive they can be on an order amount or stocking level.

Knowing how many distribution outlets an inventory item can go through is an important factor in determining the risk of obsolescence.

An item only sold once a year can still have a Class A value.

A company could have a fast moving, high-value stock item that goes to only one customer with no underlying sales agreement. In that case, the company is at risk if the sole customer stops buying. But this data would not necessarily tell a manager that using a traditional ABC analysis.

If a company operates in a global distribution requirements planning (DRP) network, each network node in the supply

chain could have its own ABC classification established.

Globally, an item may be Class A coded in one country but not even on the radar in another.

Within a large company, there may be different ABC classes for the same item depending on the company location and the end-use stock item.

Under a product launch, many managers initially assign new item as a Class “L” for an ABC analysis review period. They would then stock this item using the special criteria to support the launch. This way managers can more readily see it is a new inventory item that should be more closely monitored during the launch phase.

For example, managers could run reports by Class L code. This additional class category also helps with life-cycle management as the company may decide to move a product from launch status to regular production after a pre-defined period such as three to six months.

Alternatively, some companies classify a new launch item as a Class B item, picking the middle-ground between Class A and Class C until there is data to refine the classification. ❖

*Steve Greene, CSCP, CLTD, is an academic advancement and logistics specialist at Greenville Technical College in Greenville, South Carolina. Contact him at [steve.greene@gvltec.edu](mailto:steve.greene@gvltec.edu).*