Inventory Analytics with Nine Block Segmentation

The Nine Block Concept
Segmentation is the idea of putting materials that have similar attributes and behaviors into sets, so you can manage the set in a common way to create repeatable and predictable results. These logical groupings are fundamentally a way of setting priorities for inventory planning.

A common segmentation strategy is to group materials based on two sets of characteristics. ABC segmentation may be the first segmentation most materials people get exposed to. This is the classification of a group of items in decreasing order of annual dollar volume (A=85% B=10% C=5%).

Where this gets useful is when the segments are looked at in terms of part numbers. Typically the A segment has the fewest part numbers even though it is has the highest usage value. And typically the C segment has the most part numbers. It would make sense then to focus our planner's time more on A items then C items. How do we develop a strategy to do that?

When we add the concept of variability, we can build out our nine block. The basic idea is that some items have very little variation in demand, while others have significant variation. Items that are more reliable are easier to manage than items with less reliable behaviors. We use coefficient of variation to drive this segmentation.

	X	Y	Z
A	High Usage Value Low Usage Variation	High Usage Value Medium Usage Variation	High Usage Value High Usage Variation
B	Medium Usage Value Low Usage Variation	Medium Usage Value Medium Usage Variation	Medium Usage Value High Usage Variation
C	Low Usage Value Low Usage Variation	Low Usage Value Medium Usage Variation	Low Usage Value High Usage Variation

Nine Block Standards
ABCXYZ can be different for different industries. In retail or distribution businesses, the in-stock availability for AX AY and BX inventories maybe critical to making the sales projections, and high service factors may be assigned to these categories. In many situations, the decision to buy one item is independent of the availability of the other items on the shopping list.

Grocery stores are an example. If you go in with a list of 20 items, you may end up buying 22 items, or only 18. If the store does not have the yogurt you like, you may buy a different yogurt, or pass on the yogurt, and proceed down your list. In general the lack of one item won't cause you to leave without any of the other items. Demand for the items on the list is mostly independent from the other items.

It is different in situations where the dependency of usage between items is high. In complex assembly operations, where an assembly may have 10 "C" items and one "A" items, the direction maybe to stock "C" items at a higher service level to avoid having the many inexpensive items gate the few higher value components. The usage of these materials is dependent on each material's availability. It is not independent, and the nine block strategy should be different.

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In situations where many, inexpensive low and medium variation materials (CX CY) supporting a few high value materials, we may buffer the "C" items with a higher service level target than the "A" items. We don't want to stock out on the "C" and cause the "A" item to become "trapped".

The key idea is that we want to manage the "C" items less, so we carry more buffer stock. This allows us to manage the "A" items more.

Other Segmentation Options
Additional factors to consider are HIJ (frequency of Usage) and EFG (Lead Times).

HIJ- For many companies, the original XYZ was frequency of usage, sometimes called "Runners, Repeaters and Strangers". Some Universities still teach it this way. Strategies for items used hundreds of times a day will be different than strategies on items used dozens of times a year, even if they have similar bell curve/coefficient of variation and end up in the same ABCXYZ segment.

In SAP, the HIJ designates the frequency of usage, with frequently used items referred to as H items, items with less frequent usage Are I items, and items with rare usage are J materials.

Frequently used items that stock out can have a much bigger impact on a production site than rarely used items. At the same time, frequently used items may be more readily available since the supply may be steadier. The pipeline is always "full".

HIJ may also be helpful with Z items. In the world of Runners, Repeaters, and Strangers, an item used frequently got attention. In a nine blocker based on COV outliers may cause repeaters (and even runners) to look like strangers. Items that are Z and H or I should be looked at and investigated. A CZH is probably just a Z because of some spike, and may need to be considered without that spike in the equation.

EFG - Very short lead time items can be managed much more loosely than long lead time items, simply because if you stock out, you can replenish with less delay. Most organizations will work towards reducing lead times as a strategic goal, in order to mitigate both the cost of carrying inventory on long lead time items, and the risk of stocking out on the same items.

One additional method of segmenting materials to consider is one that factors in margin. On highly profitable items, there may be much more motivation to keep them in stock than on a lower margin. The impact of margin can change your view on other financial considerations such as turns. One company I worked at accepted low turns on a set of parts because they had a fifty point margin. Here we did not want to miss any sales due to lack of availability.

How Do We Use a Nine Block
When introducing nine blocks, I tend to start it as a conversation. It is important to get a holistic understanding of the nine- block. The conversation should include buffers, replenishment strategies, and lot sizes.

It can be helpful to start with a blank nine block on a white board, and then to start to have the conversation and populate examples. I don't typically coach to standard work here, as I am most interested in them getting the concept first.

	X or H	Y or I	Z or J
A	Buffer conversation should start at one week. Lot sizes should also be considered, and held at a lower level than a C item. For example, one week of supply of an A item maybe reasonable. AX items converted to pull replenishment methods allows you to select the few items with the highest value impact for your lean initiatives, so that can be one part of the conversation.	Buffer conversation should start at one to two weeks. If an item has a coefficient of variation that is near X you may want to treat it like an X.	Needs to be investigated but in general I would use Forecast as a guideline. The hazard of consumption is that as an item dies, it becomes more variable, and will want higher buffers. Z items maybe best left with no buffer and run off straight MRP. Or if MRP says it is more stable going forward, perhaps it should be a X or a Y. HIJ may help here as well.
B	Buffer conversation should start at two weeks. A lot size of two weeks of supply may also be appropriate. At some sites, B items look and act a lot like C items so you may decide to treat them the same.	Buffer conversation should start at two to four weeks.	Needs to be investigated but in general I would use Forecast as a guideline.
C	Buffer conversation should start at 2 to 4 weeks. Depending on cost, a quarter maybe the right period to cover. Note lead time can change this considerably. Larger lot sizes, for example 20 to 60 days of supply, maybe appropriate on inexpensive items. Inexpensive items are also candidates to make expense items and 3rd party replenishment.	Buffer conversation should start at 2 to 4 weeks. Note lead time can change this considerably. Larger lot sizes, for example 20 to 60 days of supply, maybe appropriate on inexpensive items. Inexpensive items are also candidates to make expense items and 3rd party replenishment.	Needs to be investigated but in general I would use Forecast as a guideline. Note some MOQs will be so high you effectively have buffer built in. You may still want to add a time based buffer as if you rarely buy something, you may need to resource it next time you need it. HIJ can be helpful. If it is an H you probably want some buffer.

Once you have your nine block built, start looking at the detail data.   Build it out and then start documenting in detail your rules. Try not to bog down on exception, and focus on rules that cover most

of the parts. At times when my team would start to bog down, I have used 12 blocks, where one set of blocks was a parking lot to put exceptions in.

The idea here was to avoid exceptions driving the conversation, and to focus on the common. I have seen 27 blocks where value (ABC), variation (XYZ), and frequency of usage (HIJ) were all broken out. For me this is quite a lot. I usually go with the ABCXYZ nine block (or twelve block depending on who is on the team), and then when in individual segments we would use HIJ to validate a parts membership in that segment.

If you don't have the MRP Monitor, or are operating in a different system such as Oracle, you should still be able to do this. You would need cost, usage history and frequency of usage data, and then you would need to make up some rules.

When building a "from scratch" segmentation, and making up the rules to drive the segments, it will be important to make sure your nine blocks actually show differentiation. The core idea is that different segments behave differently, and that results in you adopting different buffer, replenishment and lot sizing strategies to achieve more optimal results.

Types of Replenishment
The world of replenishment involves both materials that react to a forecast, and materials that are planned based on consumption. Understanding what environment you are in matters quite a bit for your replenishment approach. There are many ways to do replenishment in SAP and other systems, but the best way to screw it up is to try and apply a strategy that does not fit the system you are operating in.

For example, a highly repeatable business run on Kanban should think hard before trying to plan replenishment to a forecast MRP signal at the component level. Consumption based replenishment is probably more in line with how materials are actually flowing in your shop, and may be a better choice.

Types of Lot Sizes
In SAP there are three general types of lot sizing, two of which I have experience with. They are sometimes referred to as static vs periodic (also sometimes called dynamic). Typical static lot sizes would be fixed lot or lot for lot. Both can have minimum lot sizes, and lot for lot can include a rounding value. When looking at these methods, consider how many order proposals you want to see in a given period, and how long a period do you want the supply to cover.

Periodic lot sizes look at a range of time and generate a proposal to cover a specific period of time. Minimum lot sizes and rounding values can be used with these settings as well.

Types of Buffers
Periodic versus Static Buffers: General recommendation is to us the scientific method and test and see which parameters provide more stability in supply and inventory. When testing measure the standard deviation of the requirements (which should not change), the receipts (which will change) and the projected inventory (which will change). You can if you want to, have periodic buffers with static lot sizes and rounding values. If you are using standard containers you probably have to do this.

Most of the safety stock calculations involve an understanding of variation. Most involve consumption variation. Some include variation in supply. Some involve variation in forecast. These lead to different

results.   Running a statistical calculation can be helpful, but is not a perfect guarantee of inventory success (the right amount but not too much). Certain constraints may need to be set. For example, we may deicide no "A" safety stock should exceed a one month supply.

Developing and documenting the rules is important, and then coming back to the document 90 – 120 – 180 days later to see if we had the anticipated impact is important.