Leveling Mix versus Leveling Volume

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High Mix Lean

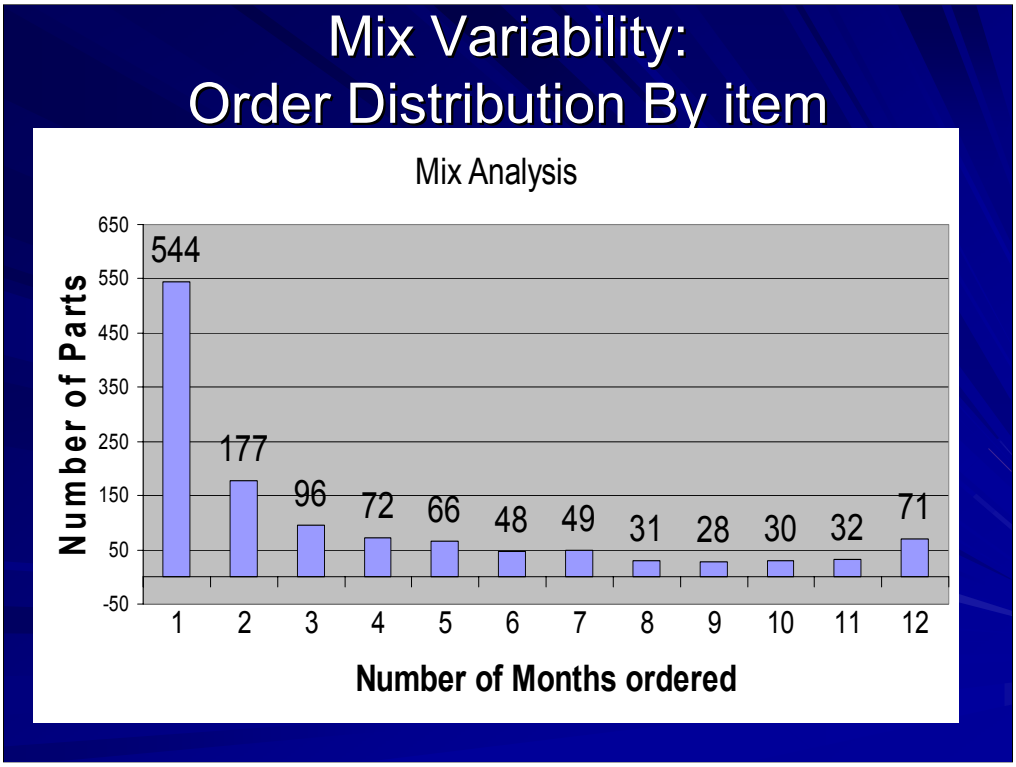
This presentation will cover the difference between leveling product mix , meaning that each option and each model will be built in a certain frequency throughout an interval as opposed to being built completely together , compared to leveling only volume , which means that the value stream will do the same amount of work each day but not necessarily build the same products each day for each interval.

Mix and Volume variability definitions

- Mix variability is a measure of how often the models and their variants actually are sold.
- Volume variability is measured by simply determining whether the total amount of work required in the factory by the customer orders varies significantly from period to period.

We should make an upfront distinction between selling a level mix and producing to a level mix . Toyota produces to a level mix but clearly does not sell a level mix. This process occurs by simply taking the expected sales forecast for one month, and then equally parsing out the sequence of all the possible combinations that will be sold during the month .

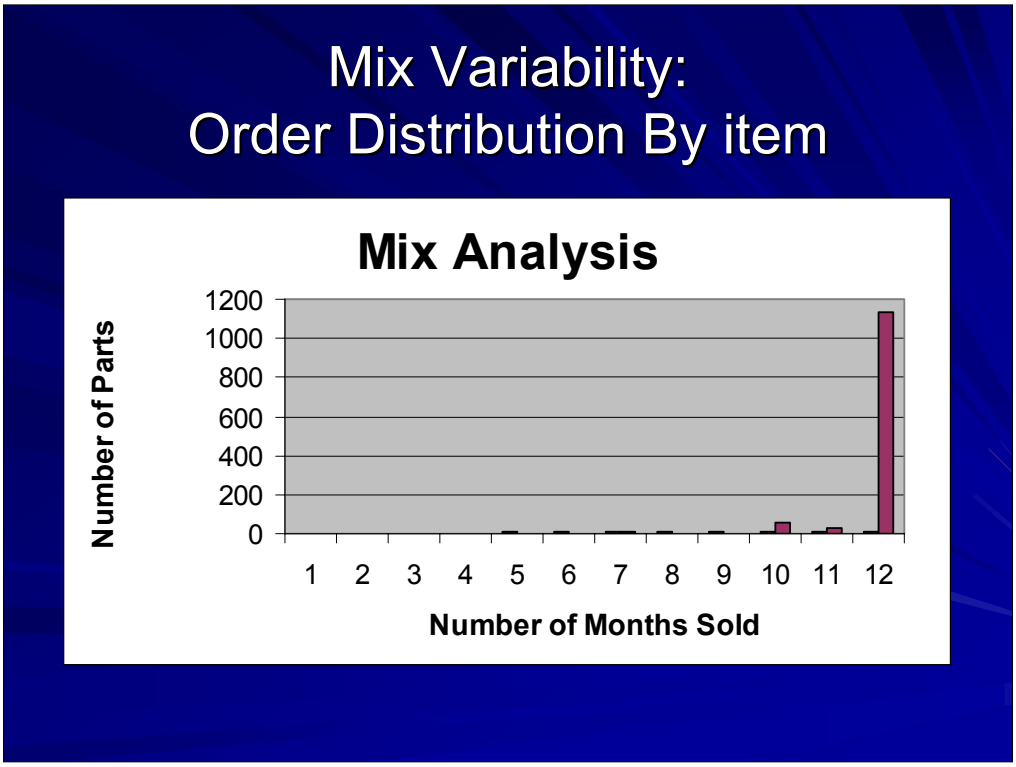
Volume variability is only concerned with whether the sales can be covered by the capacity within the plant on average basis . In other words if we average selling 5,000lb. of product each week , how far away from the 5,000lb. are the actual sales during any week .



This chart would be one way to show how much mix variability would be present within a value stream . In this case we have simply shown how many months each product has sold in over the course of a year . The time frames for all of this type of analysis should be the interval for the value stream. If a product had sold in each month then it would be represented in the “12” column for number of months ordered . On the other hand If the product had sold only once during the year it would be in the “1” column for the number of months ordered .

As you can see from the chart , this particular value stream had many items with infrequent sales over the course of the year , and a few products which sold in each month . This would be a value stream which would be considered to have high mix variation . This value stream would probably not be a good one to level mix, but to go with a level volume strategy.

1244 total parts, only 71 have a customer order each month. This is less than 6%.



This value stream has a relatively low product mix variation, as most items sell every month. This value stream would be a good candidate to level mix.

Leveling Production mix versus sales mix

- Forecast = 100 A, 50 B and 50 C this month
- At 20 days in month, this is 10 per day
- Production sequence = A B A C A B A C A B A C etc
- The actual sales may not equal the forecast.
- A finished goods inventory handles this.

This is an example of how mix is leveled. In most cases, this is done against a sales forecast for all of the items in the value stream. The key is that production makes the average amount of all products, without regard to the actual sales as they are realized. Next month, if the sales mix has changed, then the sequence will be reset to reflect this change.

Leveling Mix

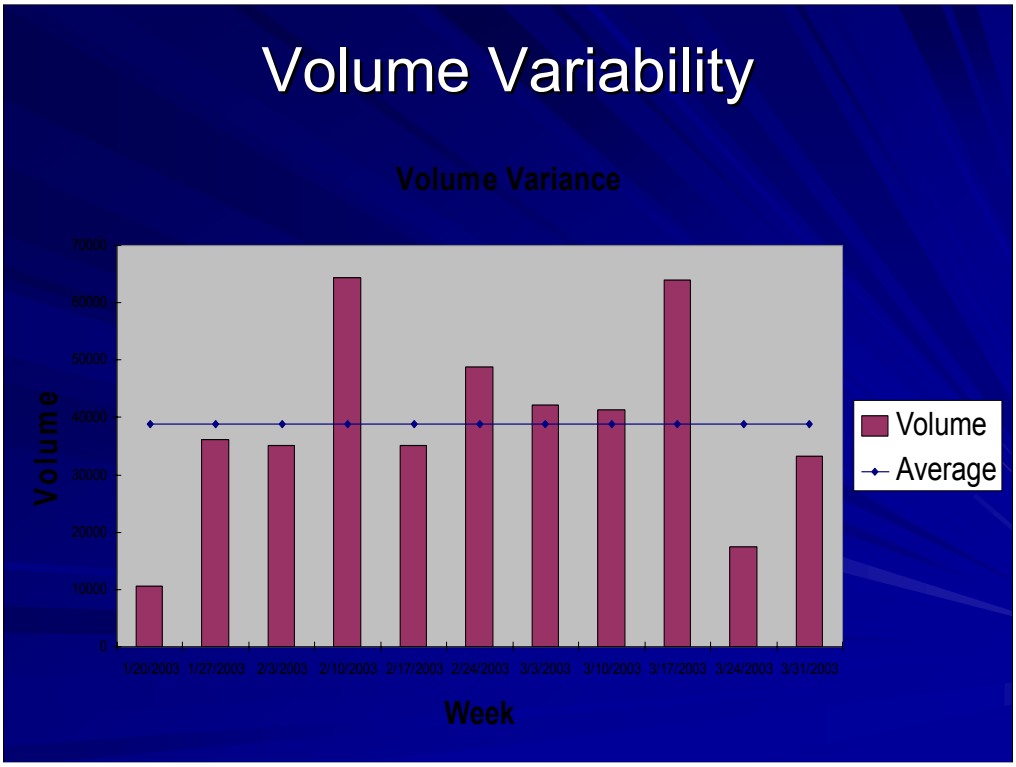
- Pull systems work better when mix is leveled because the supplying operation will receive the same pull signals each interval.
- Shared resources can be synchronized based on the production pattern and have some sort of block scheduling logic.
- Capacity requirements for the value stream will fit the average requirements during each interval, therefore we do not have to plan for flexible capacity of resources other than to accommodate for absentees.
- FIFO lanes are kept to a minimum with regards to the need to balance operations for mix.

There are many advantages to completely leveling the mix in a value stream. Most of these revolve around the fact that most long term planning involves some sort of averages for the product required in the value stream, from the amount of equipment needed to the manpower employed to the size of supermarkets. Because leveling the mix means producing the average, the decisions made in the long term planning will generally work as designed.

Leveling mix in a high mix environment

- High inventory investment
- Potentially high obsolete inventory
- Potential poor customer service (reliant on forecast accuracy) (The forecast will most likely be inaccurate, due to the high mix variability)

If a company does decide to level the mix in a high mix variability value stream, there will probably be some poor results. This list is by no means exhaustive, these are still serious considerations for management.



This chart shows one way to measure volume variation within a value stream. This particular value stream has significant volume variation between intervals, in this case weekly. The value stream manager will need to create a strategy to level work into this value stream.

Leveling only volume

- The buffer for the value stream may (or needs to, or should) contain only high volume items
- We need to have separate strategies for high volume and low volume items when loading the heijunka box.
- Interval should be based on a time slice of volume and the number of items sold during the time slice.

Because the mix does not allow for leveling of the entire mix of products without significant amount of waste, the strategy must somehow level work into the value stream without the waste accompanying a full supermarket of slow moving items. This can usually be done by keeping a supermarket of only high volume, frequently ordered items, and treating the rest of the items as make to order items. The high volume items have several advantages as a buffer: They are less likely to become obsolete, and, because they are frequently ordered, it is easier to adjust the inventory level on them.

This strategy requires the separation of the supermarket items from the rest, with the following rules usually in place: Load the Heijunka box with the make to order items first, then fill the remaining capacity with the supermarket items.

Because not all of the items will be produced in each interval, the interval needs to be revised to be the required items to build in a period, based on what is actually sold in the period, not all of the products in the family.

Leveling only volume, Cont.

- More elaborate capacity planning is necessary due to work content variations caused by varying mixes of products being sold.
- Cross training of operators is needed to handle required flexibility from various mixes as well as for absentees

Because we will not be producing the average product mix in any period, we are vulnerable to the swings in work content caused by the various product mixes that are needed. In other words, we may have “Floating bottlenecks” in the shop. This means that it is not sufficient to simply level the work at the pacemaker, but to also check to make sure that all of the other resources can produce the parts necessary to make the product mix. This requires a bit more sophistication in the capacity planning portion of the value stream.

For the same reason, it is necessary to have more fully cross trained operators when only leveling volume, since to some extent it should be expected that operators will need to move around to where the work is for any particular product mix.

Bill Kerber can help

- My combination of services, along with extensive hands on experience, supports every step of a Lean project, from setting the buffering strategy, value stream mapping, creating flow and pull, through demand leveling and capacity planning.
- See more at: WWW.Highmixlean.com