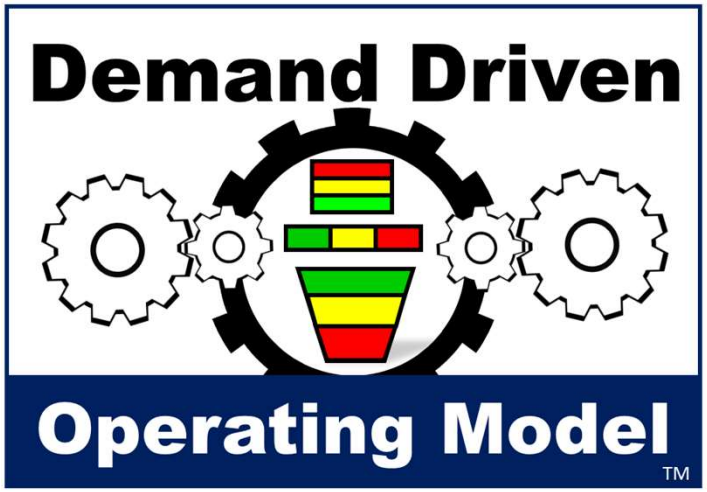
# The Nine Basic Assumptions of the Demand Driven Operating Model

Discussing the Foundation for a Flow Based Operating Approach

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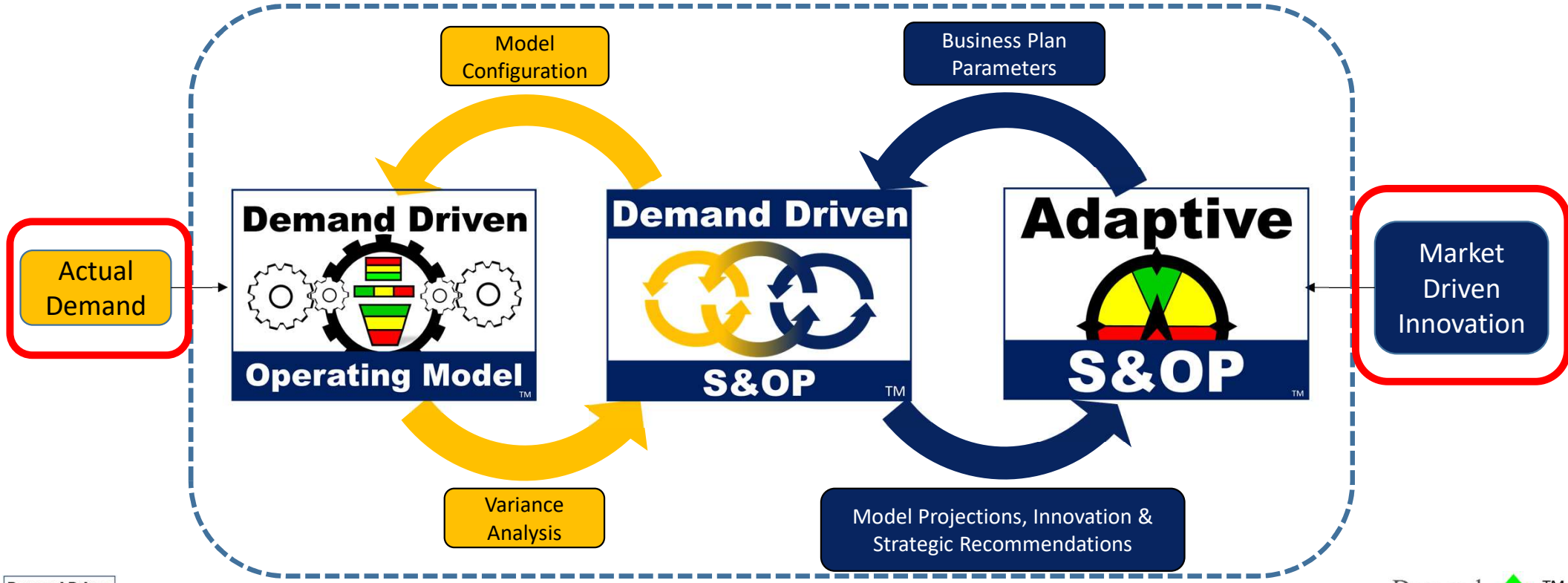
# Demand Driven Adaptive Enterprise Model

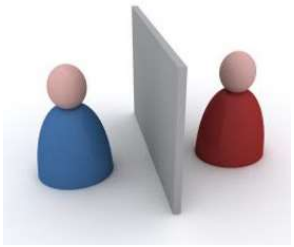


# A Flow Based Operating Model

Combines elements of MRP, DRP, Lean, Theory of Constraints, Factory Physics and Six-Sigma.

Paces operations to **actual demand**

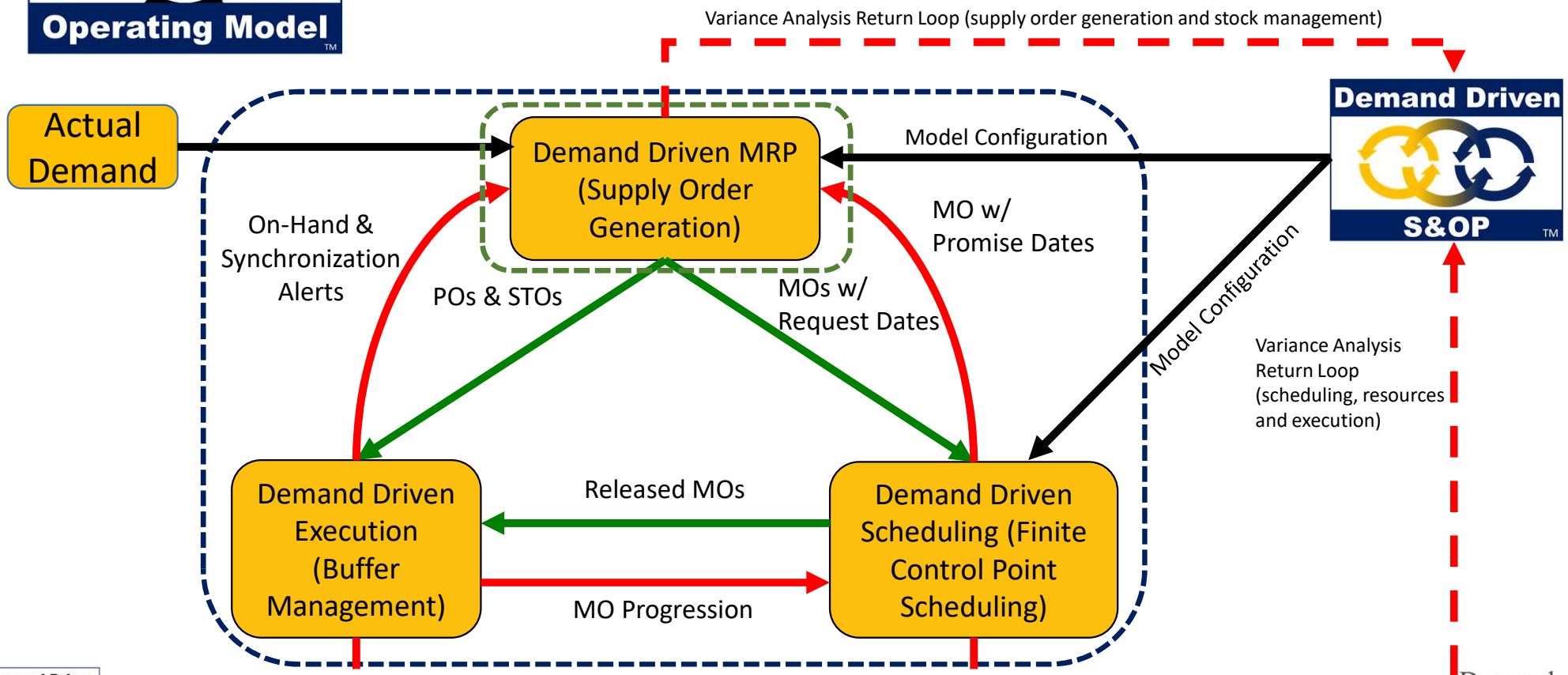

Strategically places **decoupling points** for lead time compression and variability (bullwhip) mitigation



Strategically places **control points** for schedule synchronization

Protects decoupling and control points through stock, time and capacity buffers

# The DDOM Schema



# Assumption #1: A key DDOM objective is to promote cash generation NOT cost absorption

$$\Delta\text{Flow} \rightarrow \Delta\text{Cash Velocity} \rightarrow \Delta\left(\frac{\text{Net Profit}}{\text{Investment}}\right) \rightarrow \Delta\text{ROI}$$

## Management Accounting

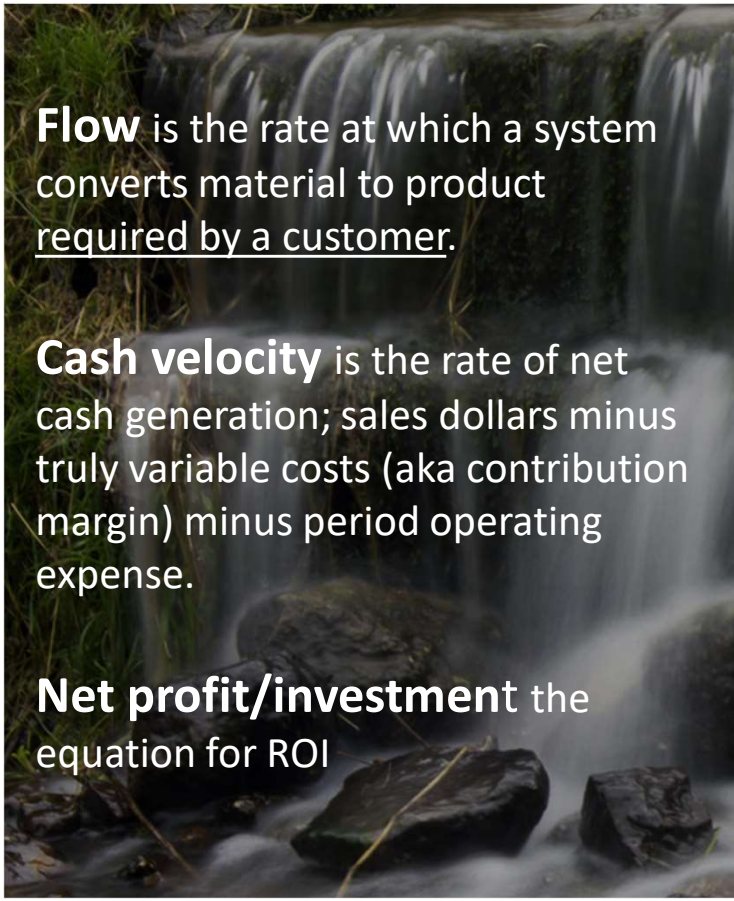
Flow is what is managed. Cost is the outcome of that management.

## Flow and Cost

Unitized cost calculations are based on past activity within a defined period. When things flow well through a defined period costs are controlled.

$$\Delta\text{Cost} \not\rightarrow \Delta\text{Cash Velocity} \rightarrow \Delta\left(\frac{\text{Net Profit}}{\text{Investment}}\right) \rightarrow \Delta\text{ROI}$$

Cost (GAAP) was NEVER intended to be an operational decision driver! Its creation was to ensure transparent and consistent reporting to shareholders and tax authorities!



# Assumption #2: Assets must be as closely synchronized to actual demand as possible

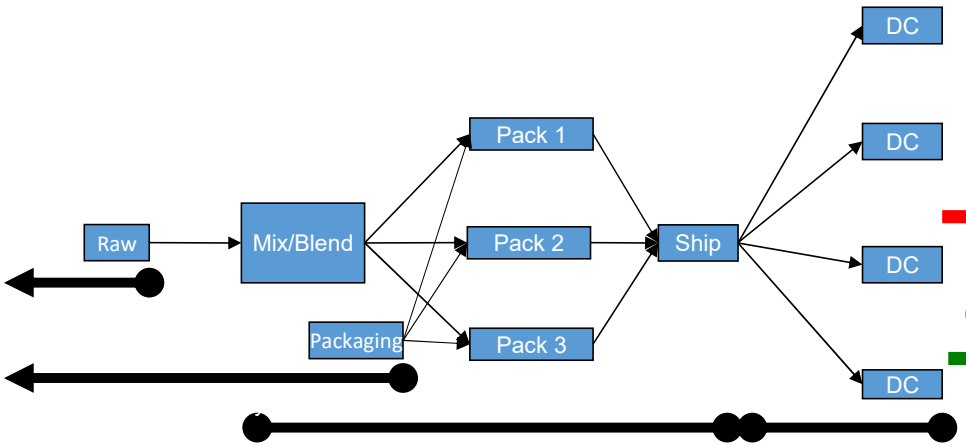
The cost of being wrong has grown dramatically with the VUCA world.

(Volatile, Uncertain, Complex, Ambiguous)

Three universal rules about forecasts:

1. They start out wrong
2. The more detailed the more wrong they are
3. The longer out in time they go the more wrong they are

# The Fallacy of Long Planning Horizons




50 % Accurate

50 days

CTT (actual demand signal)

100 % Accurate

**Actual Demand**

**Capability**

Guaranteed Effects:

1. Too much inventory
2. Shortages
3. Costly Expedites and Schedule Break-ins

BONUS EFFECT: Lots of spreadsheets

# A More Accurate Demand Signal

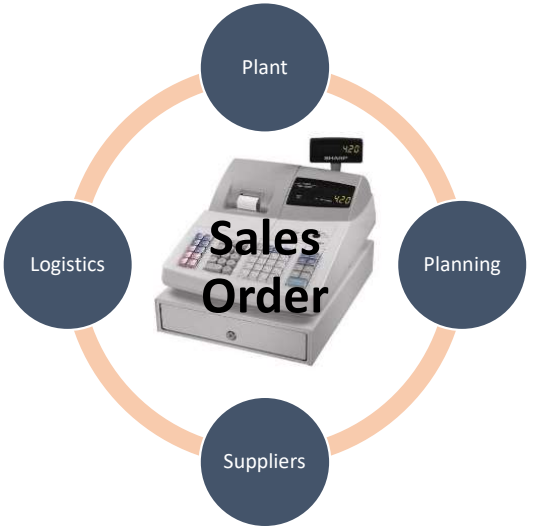
**Conventional MPS-MRP Planning**

Planned orders create supply orders in anticipation of need over a longer planning horizon


Versus

**DDOM Supply Order Generation**

Only qualified sales orders within a short range horizon qualify as demand allocations



# MPS-MRP Was Not Designed for Long Uncertain Planning Horizons

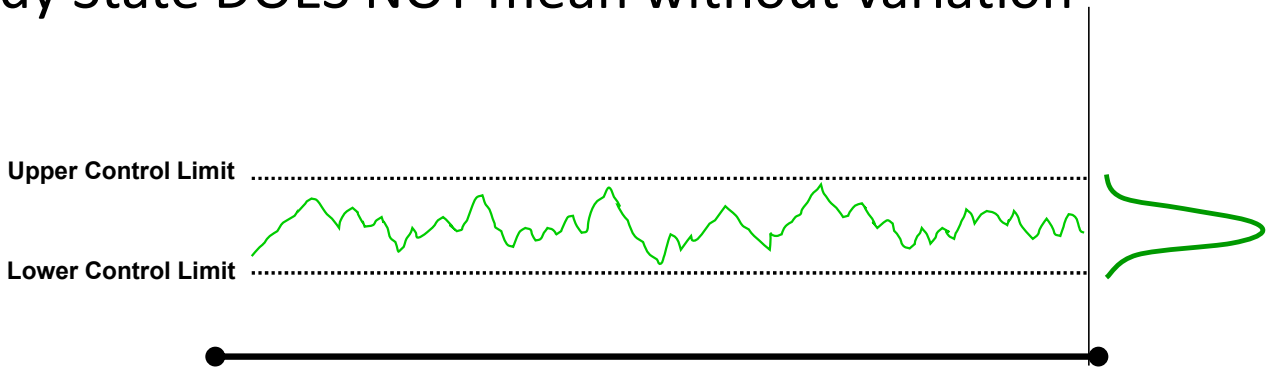
MRP ONLY produces a realistic schedule when its three basic assumptions are valid:

1. Demand is known and does not change
2. There is sufficient time to accomplish all of the required activities within CTT (the demand time fence is supposed to be set to equal CTT)
3. There is no variability in execution (everything must go right)

Which brings us to…

# Assumption #3: Variability cannot be eliminated but its impact on system flow can be effectively controlled and mitigated

- FACT: Normal and random variation exists in any process
- FACT: A process is still deemed in STEADY STATE as long as the variation is within the calculated control limits
- FACT: Steady State DOES NOT mean without variation



# Probability of Simultaneous Availability

- Anytime a step requires at least two inputs it is subject to the service level of both of those inputs.
- The more inputs the worse the effect on the ability of that step to start on time and quantity
- Remember MRP assumes full allocation in its plan.
- More complex environments are much more susceptible to this issue.

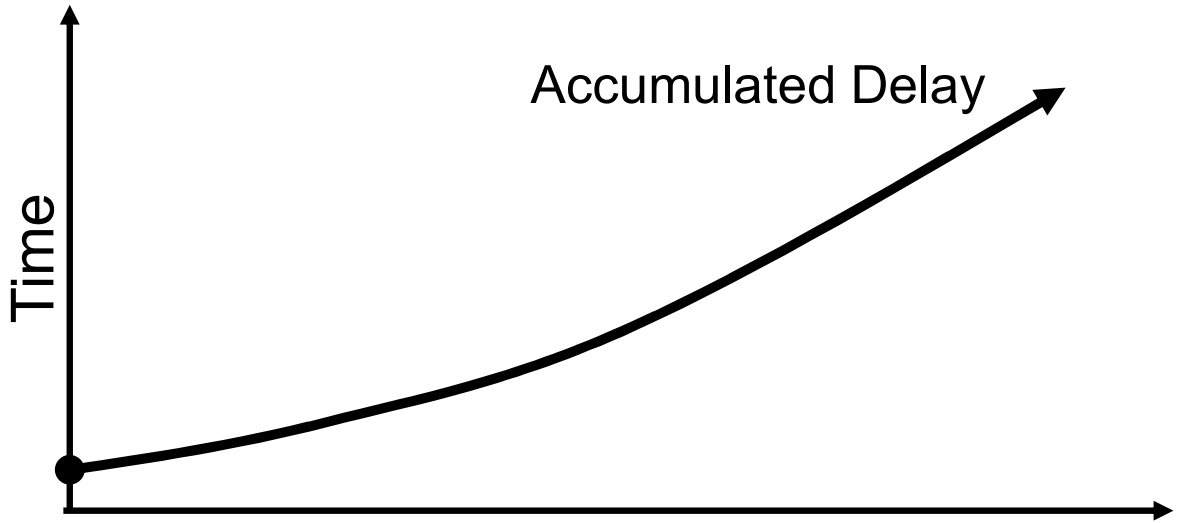
| | Service Level | |
|---|---|---|
| # of component items | 90% | 95% |
| 1 | 0.9 | 0.95 |
| 2 | 0.81 | 0.902 |
| 3 | 0.729 | 0.857 |
| 4 | 0.656 | 0.814 |
| 5 | 0.59 | 0.774 |
| 6 | 0.531 | 0.735 |
| 7 | 0.478 | 0.698 |
| 8 | 0.43 | 0.663 |
| 9 | 0.387 | 0.63 |
| 10 | 0.348 | 0.599 |
| 11 | 0.313 | 0.569 |
| 12 | 0.282 | 0.54 |
| 13 | 0.254 | 0.513 |
| 14 | 0.228 | 0.488 |
| 15 | 0.206 | 0.463 |
| 20 | 0.121 | 0.358 |
| 25 | 0.071 | 0.26 |

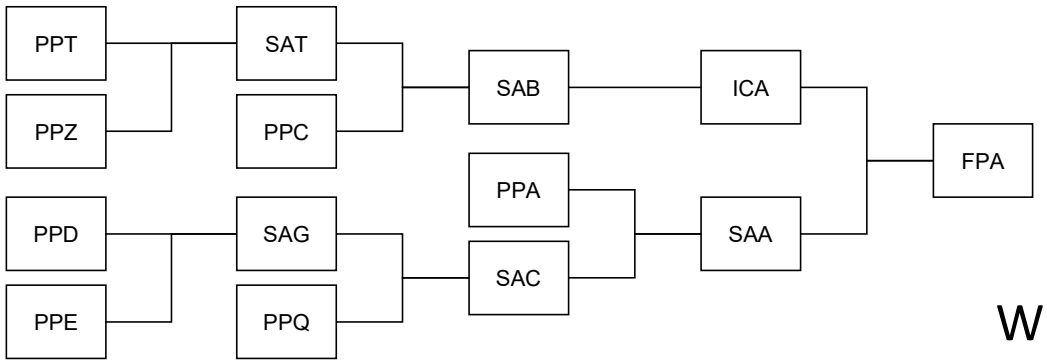
# Delays Accumulate – Gains do not

Many components can have very good availability, but it only takes one to have serious implications for the parent item.

| Component Number | Availability Level | Probability of Simultaneous Availability |
|---|---|---|
| 1 | 95.0% | 95.0% |
| 2 | 72.0% | 68.4% |
| 3 | 98.0% | 67.0% |
| 4 | 97.0% | 65.0% |
| 5 | 99.0% | 64.4% |

# Accumulated Delay




Which brings us to…

# Assumption #4: Constant and precise synchronized planning and scheduling across all materials and resources is pointless

- Detailed MRP and shop-floor schedules are ALWAYS precisely wrong.
- There is no precisely right schedule no matter how much money you spend on software or time you spend on spreadsheets.
- Constantly rescheduling to attempt to account for variation in execution introduces MORE variability and subsequent confusion.
- Instead, variability must be absorbed at buffered positions (time, stock and capacity) to mitigate its effects on **critical scheduled resources** and customer commitments.

Which brings us to…

# Assumption #5: Some level of inventory is required at some stage in the supply chain

What do we know?

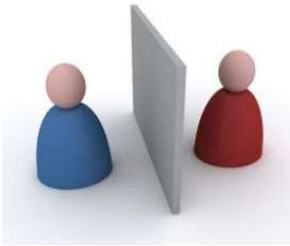
1. Inventory cannot be entirely eliminated.
2. At the same time, inventory should not be everywhere.
3. Cumulative lead times exceed customer tolerance times in almost every industry
4. Long planning windows actually disconnect supply and demand

Conclusion:

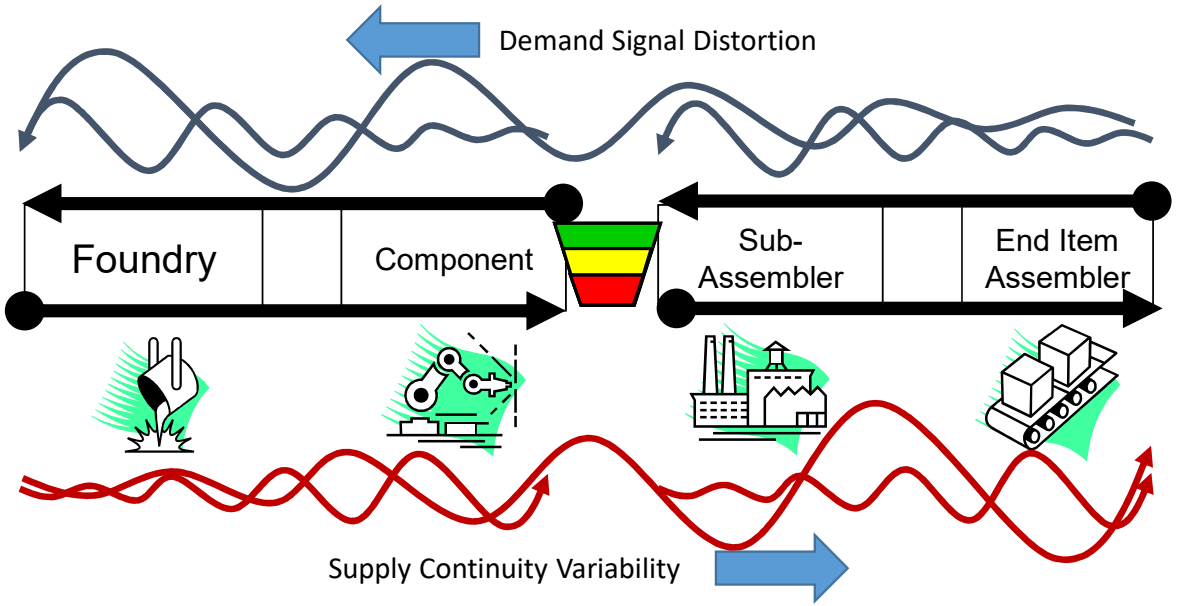
The choice of where to place inventory is highly strategic since it determines the customer lead time and the level of working capital.

The proper management of these inventory positions will largely determine the operational success of the chain.

# Strategic Decoupling



Strategically places decoupling points of inventory within the product structure and supply chain.




This stops the transfer and amplification of variability in BOTH directions where it matters most.

Planning horizons shorten AND lead times compress.

# Six Tests for Stock Buffer Success (promote and protect flow)

- Decoupling Test
- Bi-Directional Benefit Test
- Order Independence Test
- Primary Planning Mechanism Test
- Relative Priority Test
- Dynamic Adjustment Test

# Do Safety Stock and Order Point Cut It?

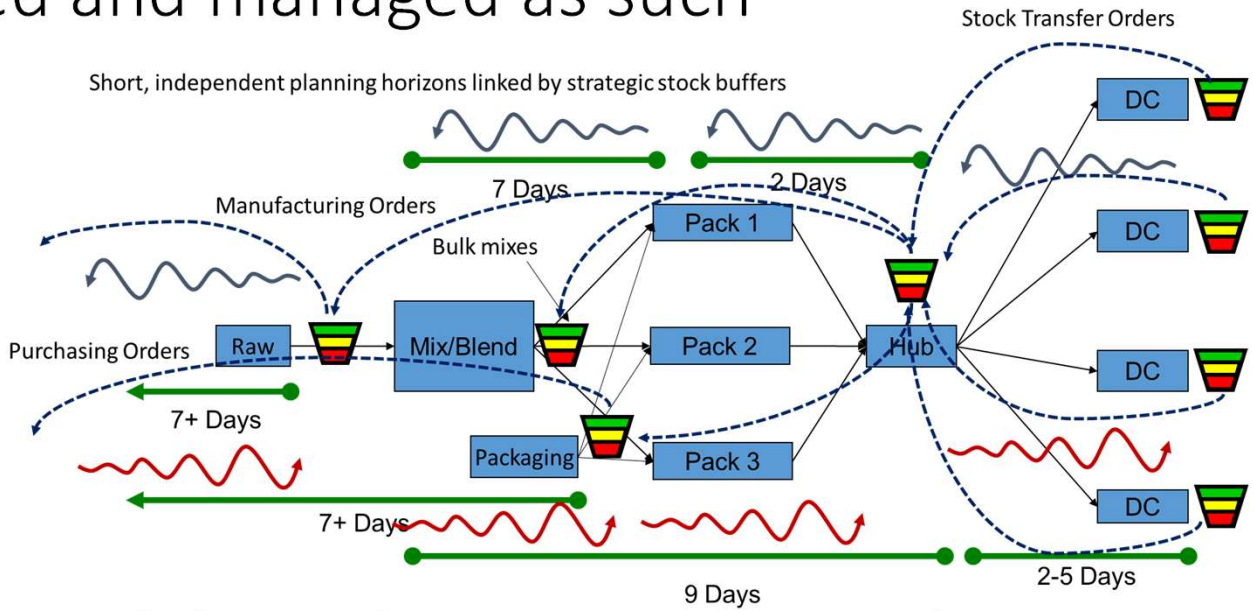
| Buffer Success Criteria | Safety Stock? |
|---|---|
| It must decouple the supply side lead time | NO |
| It must provide benefit for both sides of the buffer | NO |
| It must be order independent | YES |
| It is the primary planning mechanism | NO |
| It clearly depicts relative priority between orders | NO |
| It must be dynamically adjusted based upon rate of use changes over a user defined horizon | RARELY |

| Buffer Success Criteria | Order Point? |
|---|---|
| It must decouple the supply side lead time | YES |
| It must provide benefit for both sides of the buffer | NO |
| It must be order independent | YES |
| It is the primary planning mechanism | YES |
| It clearly depicts relative priority between orders | NO |
| It must be dynamically adjusted based upon rate of use changes over a user defined horizon | NO |


No demand consideration and often incorporates a safety stock mechanism

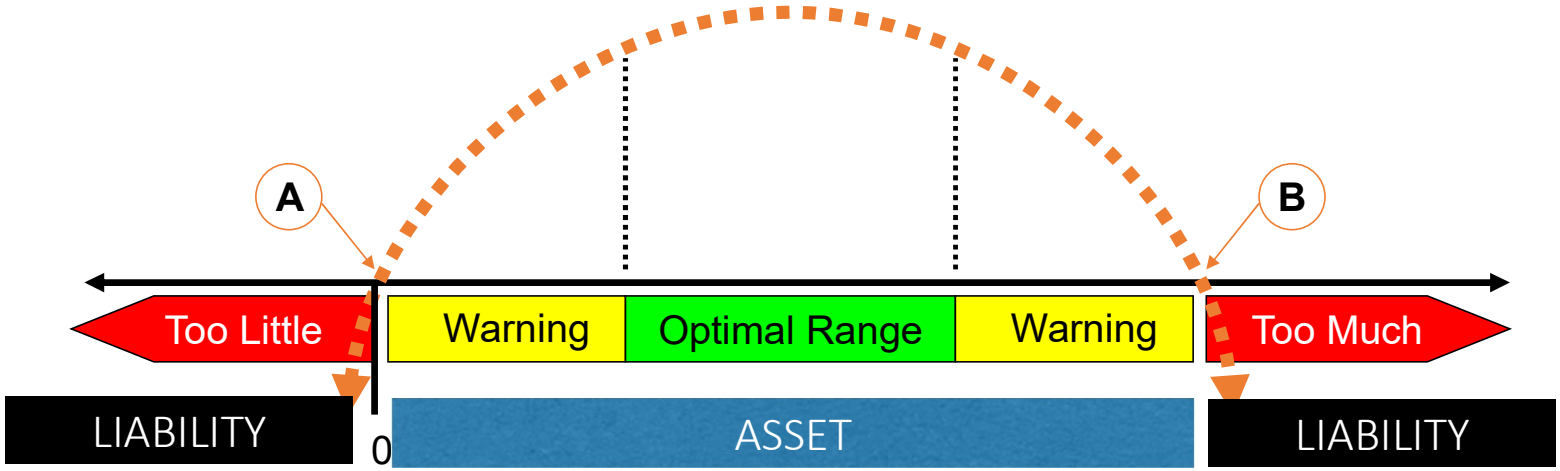
Which brings us to…

# Assumption #6: Inventory is an asset and should be treated and managed as such

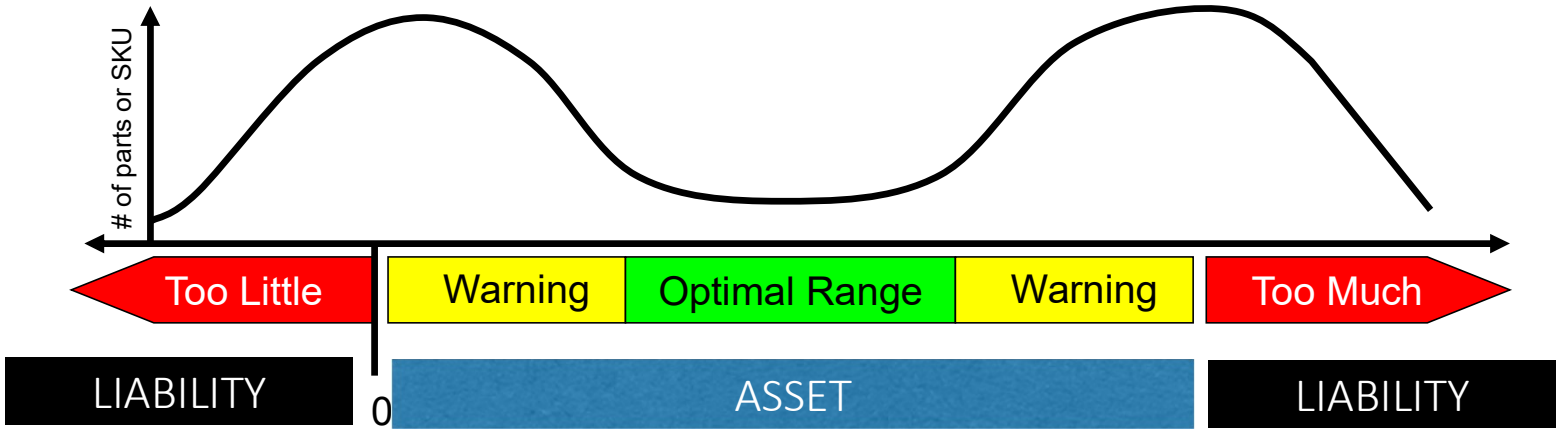



- The decision of where to place inventory is a strategic decision – it must be placed at points that protect and promote flow.
- Once the placement has occurred, careful management is required to make sure that the inventory position continues to be an asset to flow.

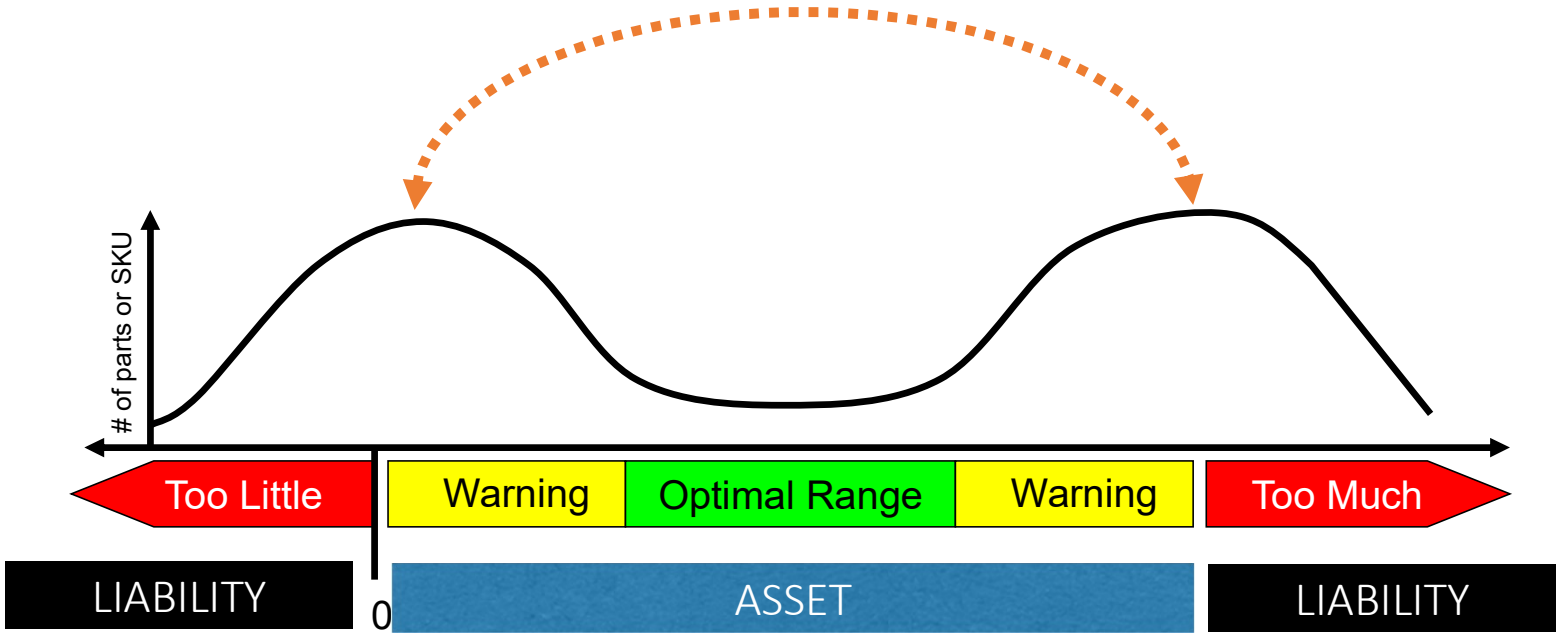
# Two Universal Points of Inventory



# The MRP “Bimodal” Distribution

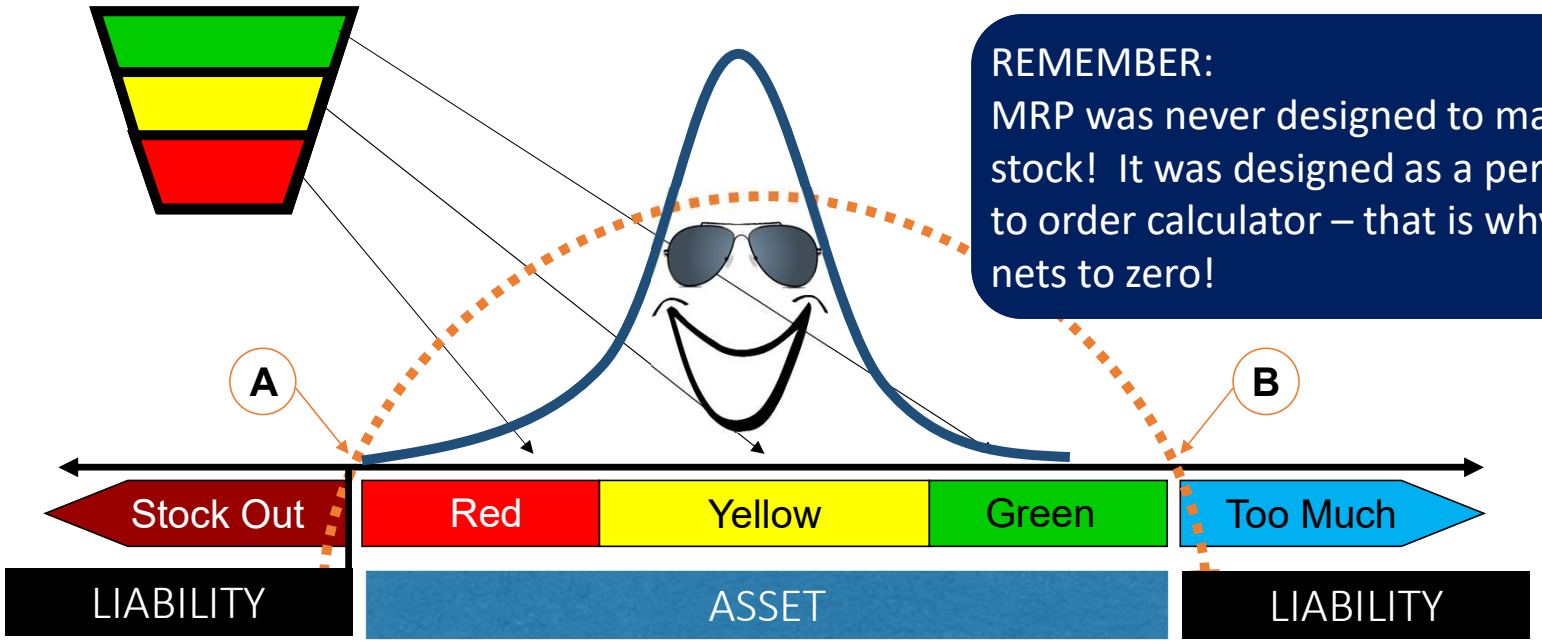


# The Oscillation



# DDMRP Buffer Zones

The size of the buffer is the summation of three calculated zones.

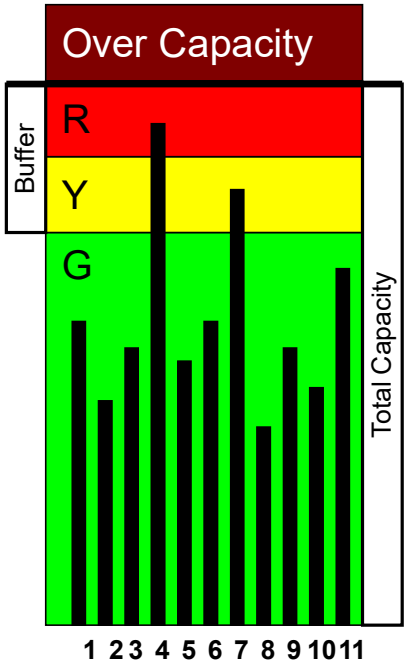


# Assumption #7: Some level of protective capacity MUST exist in any environment with multiple interacting resources

- The perfectly balanced line is still a mythical creature with an enormous price tag for most companies.
- Resources have disparate levels of capacity relative to their respective required tasks and volume.
- This disparity means that precaution must be taken against misusing or wasting points of additional capacity.

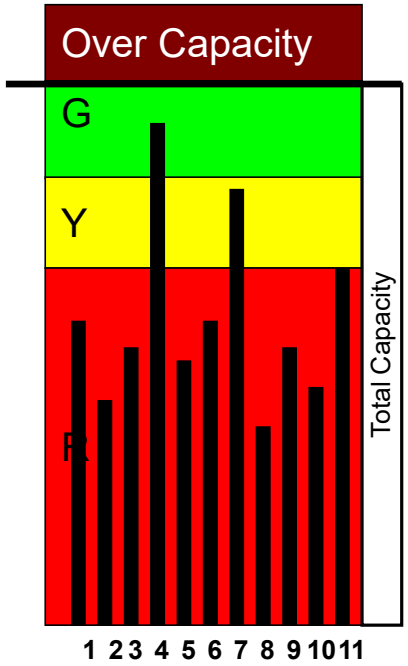
# Two Different Views on Capacity

## Flow Centric



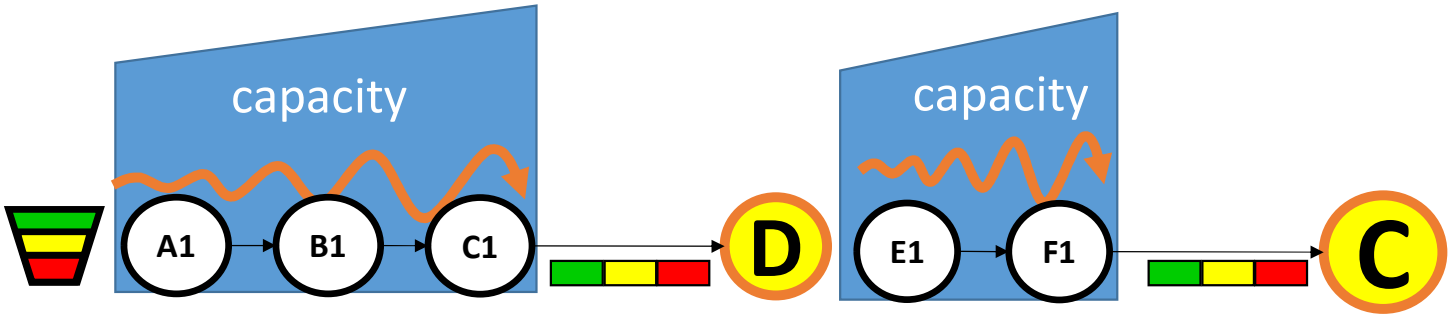

- Capacity buffers protect control and decoupling points and offer opportunity for additional cash contribution (tactical capability)
- Utilization metrics rooted firmly in erroneous cost assumptions lead to the misuse of protective capacity.

## Cost Centric



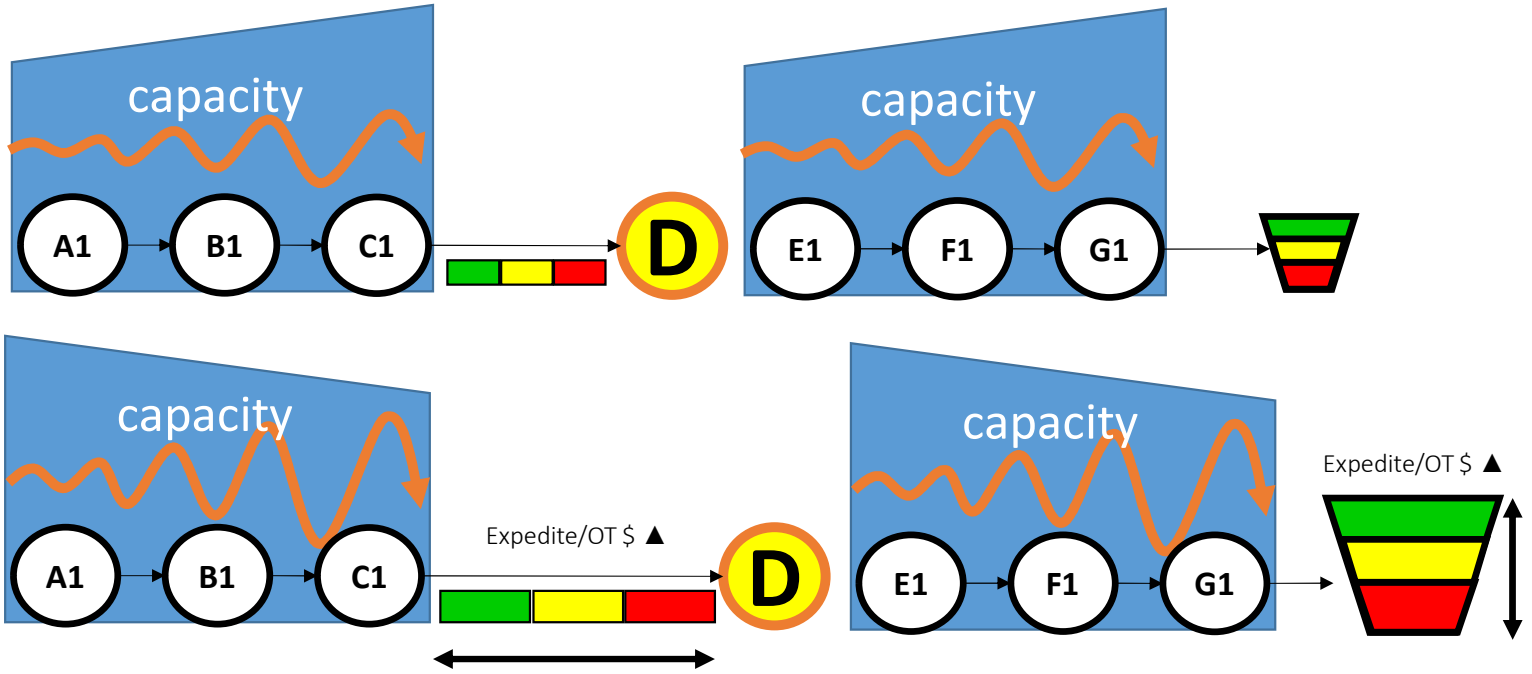
# Capacity Structure Considerations

- Commitment to invest in flexible labor and/or sprint capacity to prevent floating bottlenecks




- As variability grows in dependent systems capacity should be structured and/or aligned to deal with it.

# Trade-offs Between Capacity, Time, Stock and Expenses




Which brings us to…

# Assumption #8: Batching decisions should be based on flow considerations instead of cost considerations

- Batching is reality in most industries (especially CPG & FMCG)
- Typically industry uses batch sizes that are unrelated to demand
  - Economic Order Quantities
  - Minimum Run Sizes
  - Minimum Order Quantities
  - Minimum Freight Policies
  - Minimum Order Cycles
- What typically drives these batch sizes?  Flow or Cost?

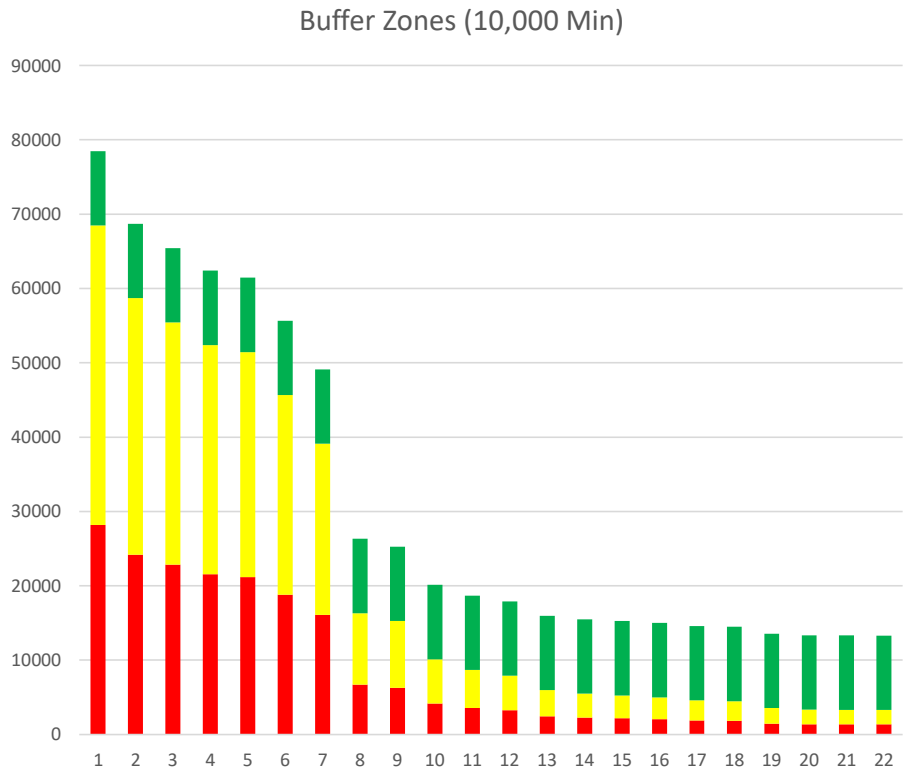
# The Demand Driven Batching Rule

## Batch for FLOW NOT UNIT COST

- Flow is tied to actual demand, cost is not
- When things flow well, cost is under control – the inverse is NEVER true
- Cost is a measure of performance over a past period – if that past period had good flow performance then there is a favorable impact to cost!
- NOTHING is ever truly utilized without considering ACTUAL demand

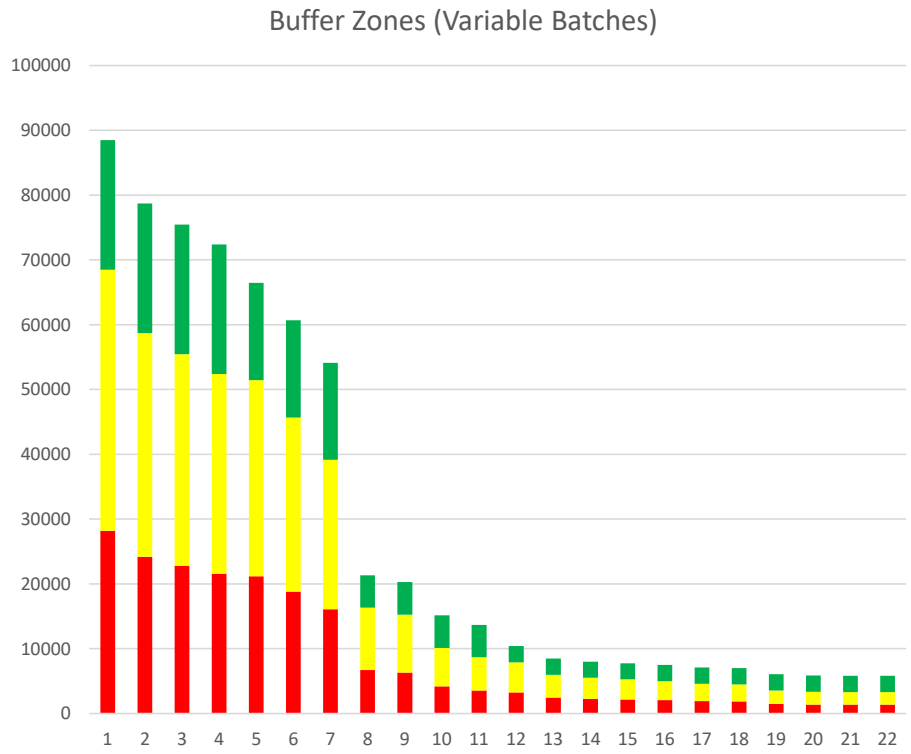
# What Does Batch for FLOW Mean in a DDOM?

- Batching for FLOW also means capacity is considered (we can't set our batches so that we create capacity constraints due to set-ups)
- In a DDOM each process batch is typically tied to the replenishment of a strategic stock buffer
- Order minimums affect the zonal profile of a buffer (Green zone impact)



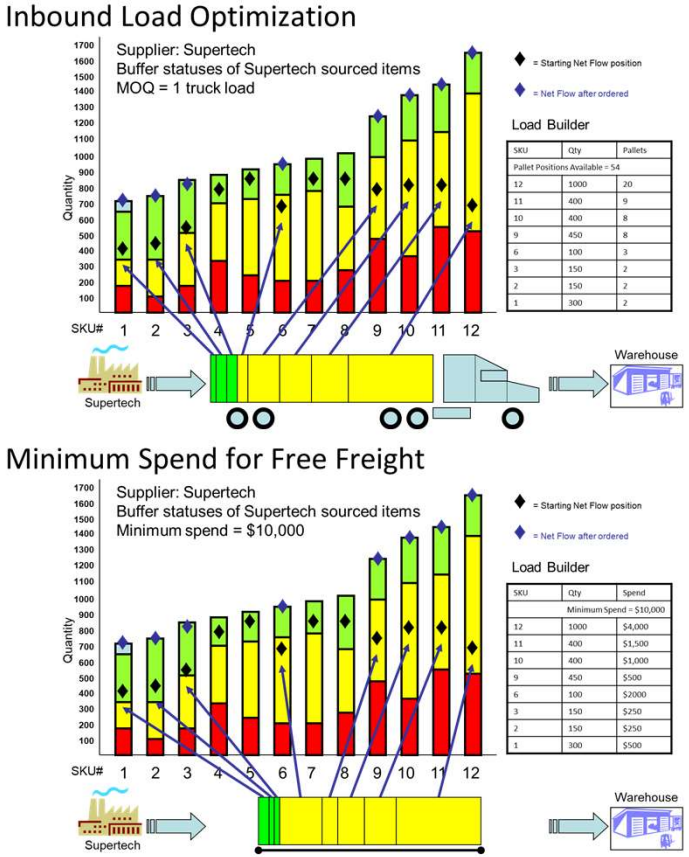
# What Does Batch for FLOW Mean in a DDOM?

- Some batches can increase while others can decrease
- This negates additional set-ups due to smaller batches on lower runners
- Reduces number of set-ups due to schedule break-ins
- Lowers total average inventory
- Better aligns capacity and space usage to actual market consumption rates

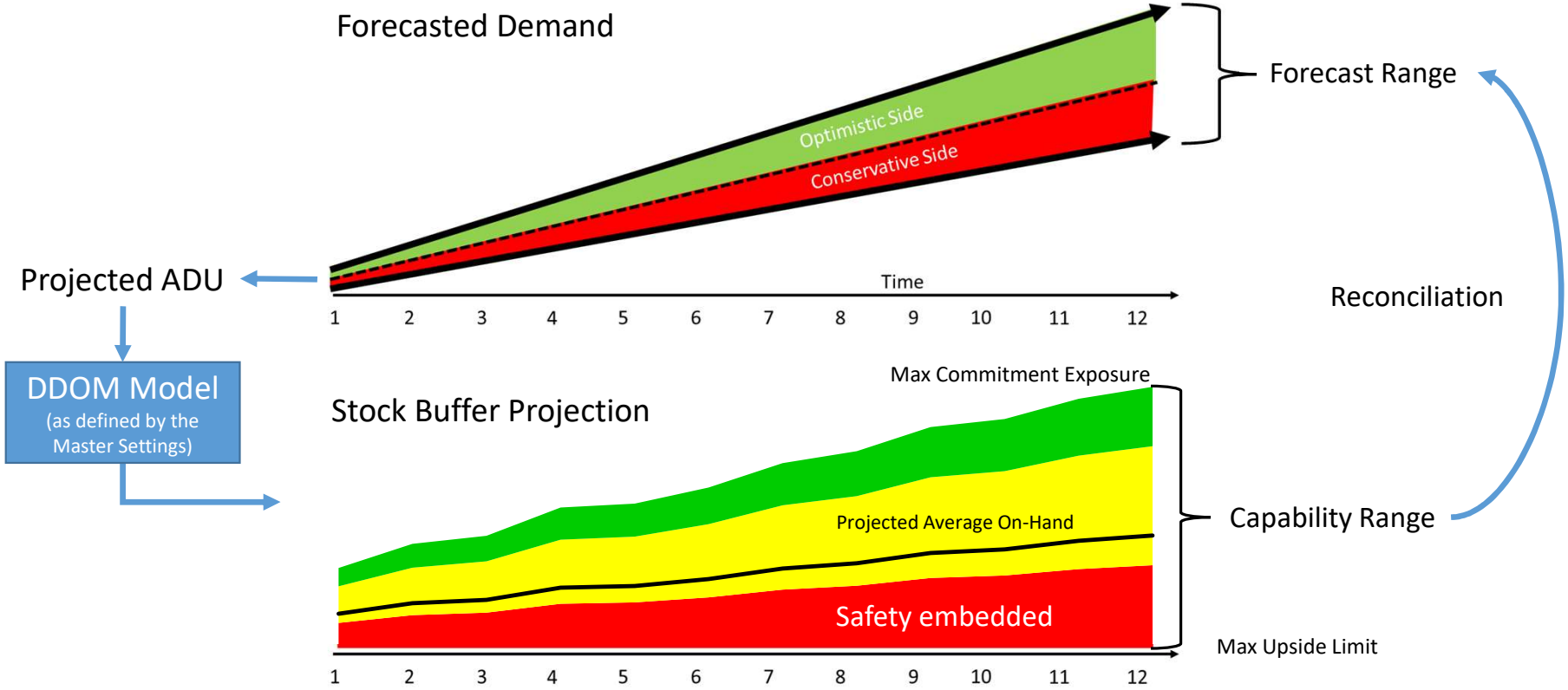


# Batching for Flow with Prioritized Share

- An allocation schema for grouping supply order generation across multiple items
- Based on the Net Flow equation (DDMRP supply order generation equation)
- Based on certain limitations or constraints to be managed (freight, spend or space)



# Assumption #9: Capability must be tied to the expected future for the company



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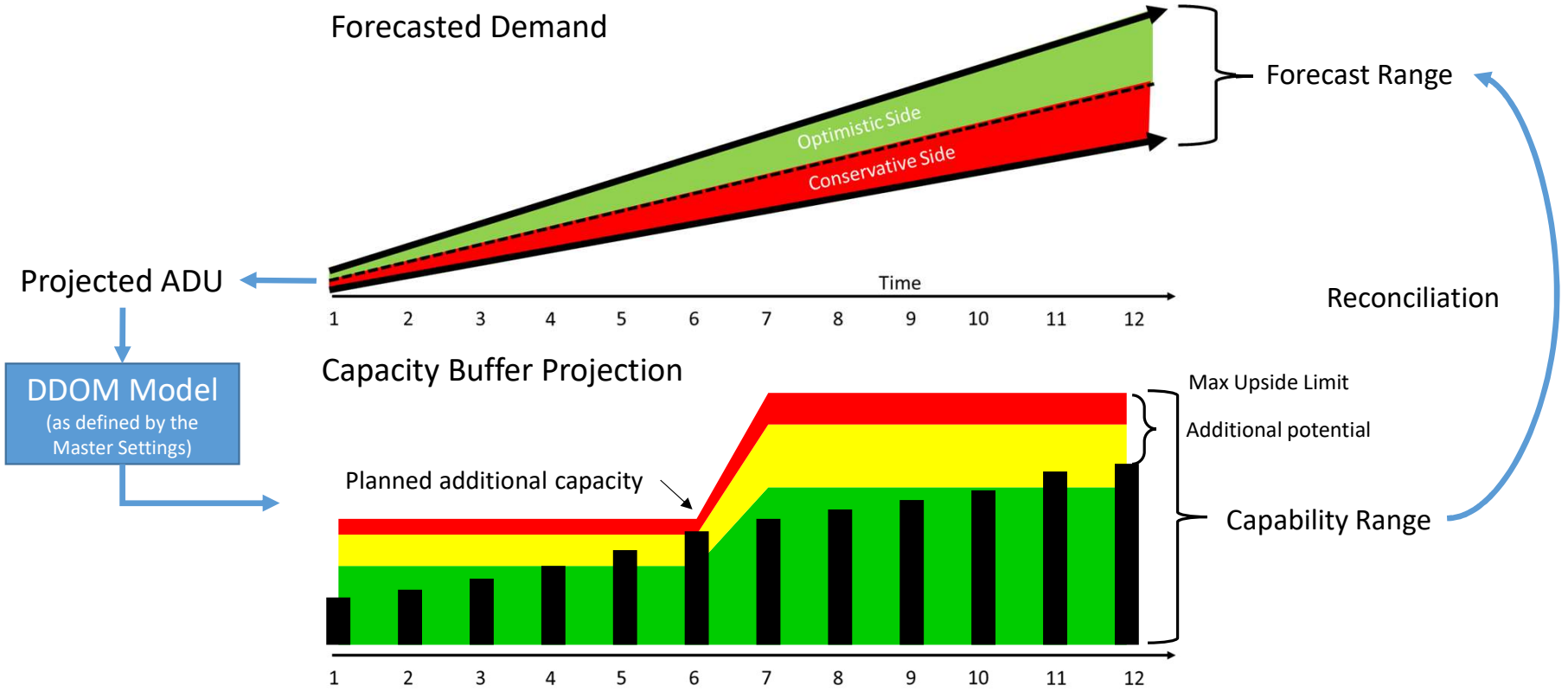
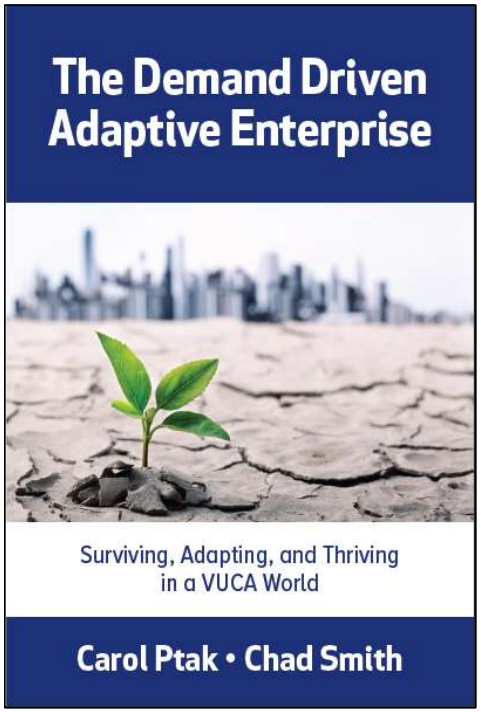


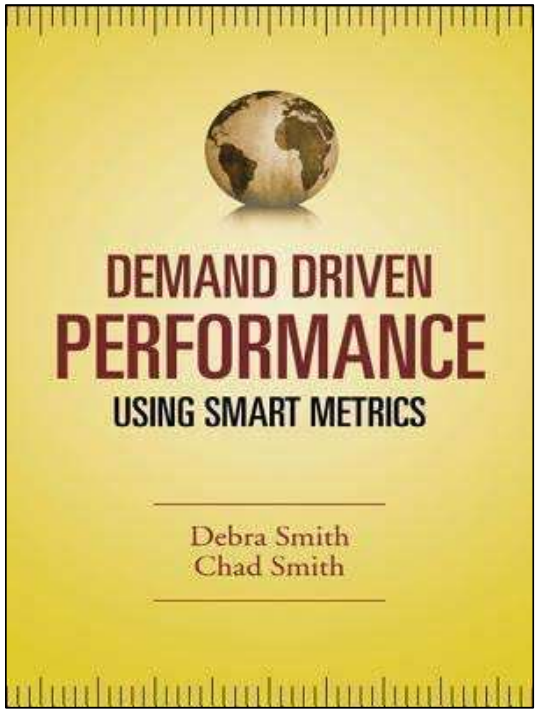
# Conventional Scheduling & Execution vs. DDOM

- Early release of production orders
- Batching for resource efficiency
- Release with shortage
- Past due on release
- Critical resources lumpy loads
- Floating bottlenecks
- Constant rescheduling/optimization
- Expediting
- Late deliveries
- High inventory

- No early release
- Batches are built for flow
- No release with shortage
- No scheduling in the past
- Finitely scheduled critical points
- No floating bottlenecks
- Very little rescheduling
- Expediting only to buffer status
- Few late deliveries – buffer status
- Maintains low WIP levels

# Learn More About the DDOM

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