



***Spring 2003  
MBA Logistics Class***

**Multi-Tier Manufacturing and Distribution:  
*Strategy and Case Study***

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***[www.scvisions.com](http://www.scvisions.com)***

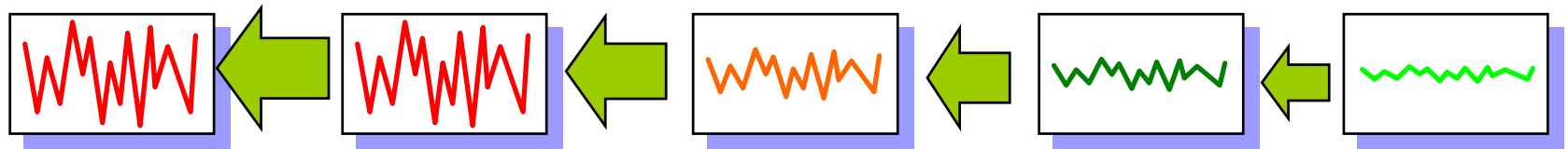
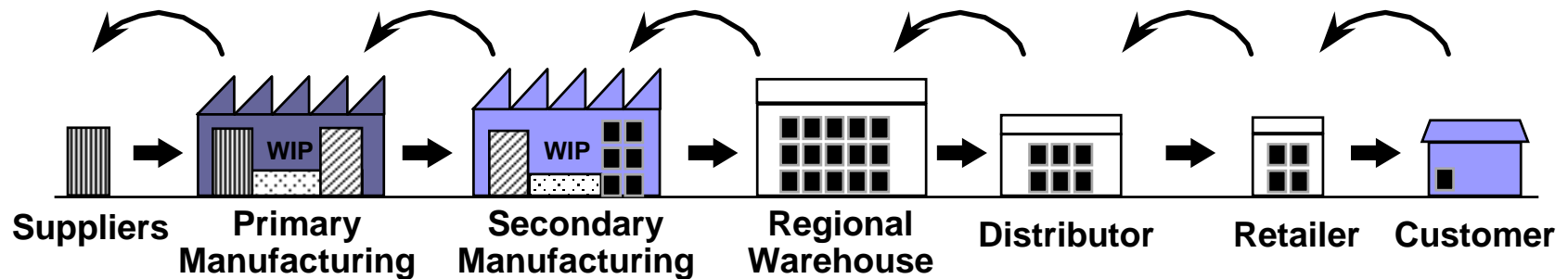
**Supply  
Chain Visions**

# Agenda

- The Supply Demand Mis-Alignment Challenge
- Multi-Tier Manufacturing/Distribution Approach
- Case Study

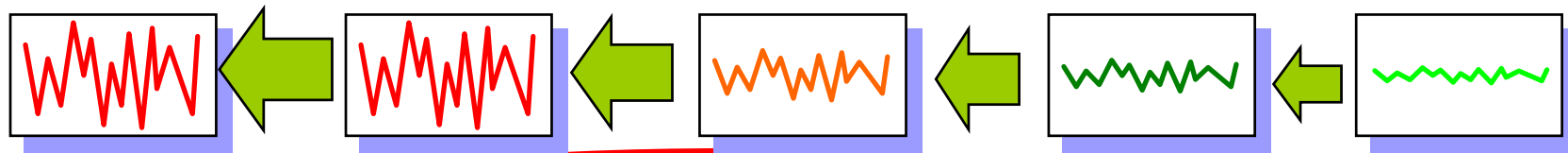
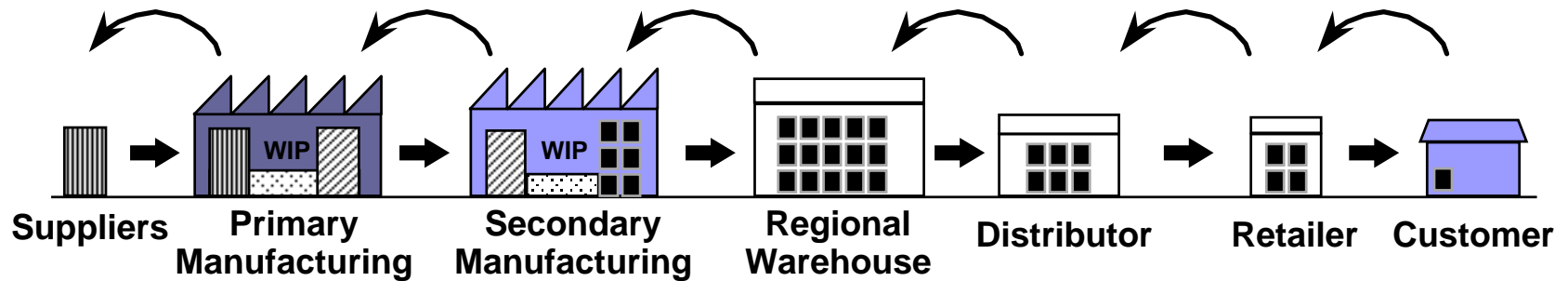
# The “Bullwhip” Effect

*Traditional supply chains amplify instability of demand at each stage*



*Why is this?*

# The “Bullwhip” Effect

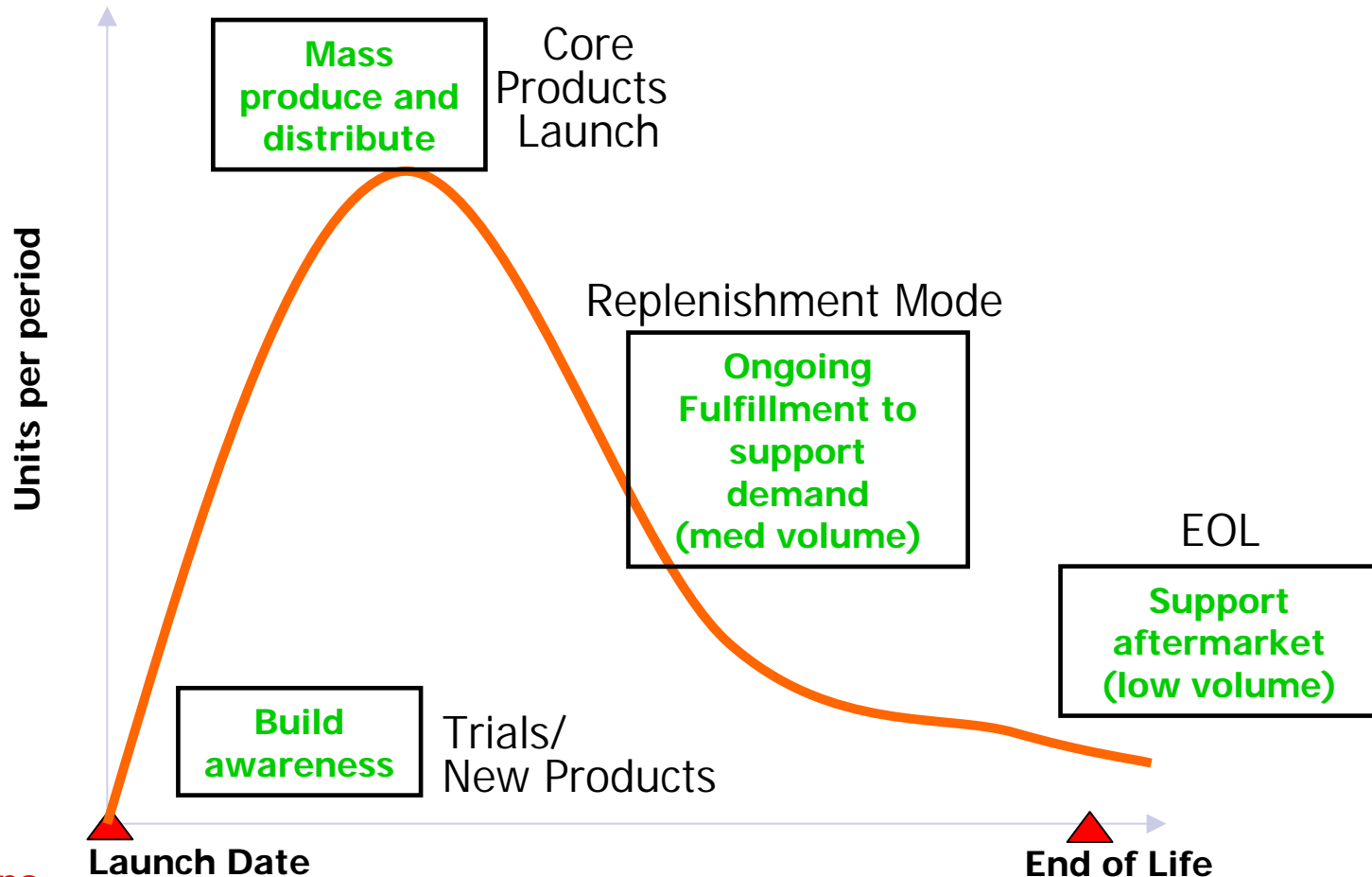


- Forecast updating
- Number of stocking points
- Batching:
  - manufacturing
  - transport
- Lead-times
- Price fluctuations
- Shortages and excesses
- Local optimisation

Source: MIT studies have proven the concept of the “bullwhip effect” naturally occurs in almost all supply chains unless directly combatted with strong supply chain design techniques and execution

# The Product Life Cycle Further Exacerbates the Problem

## Example of Product Life Cycle





# The Supply Demand Alignment Challenge

Different SKUs have different attributes and needs:

How can we capture the profile of what is really happening?

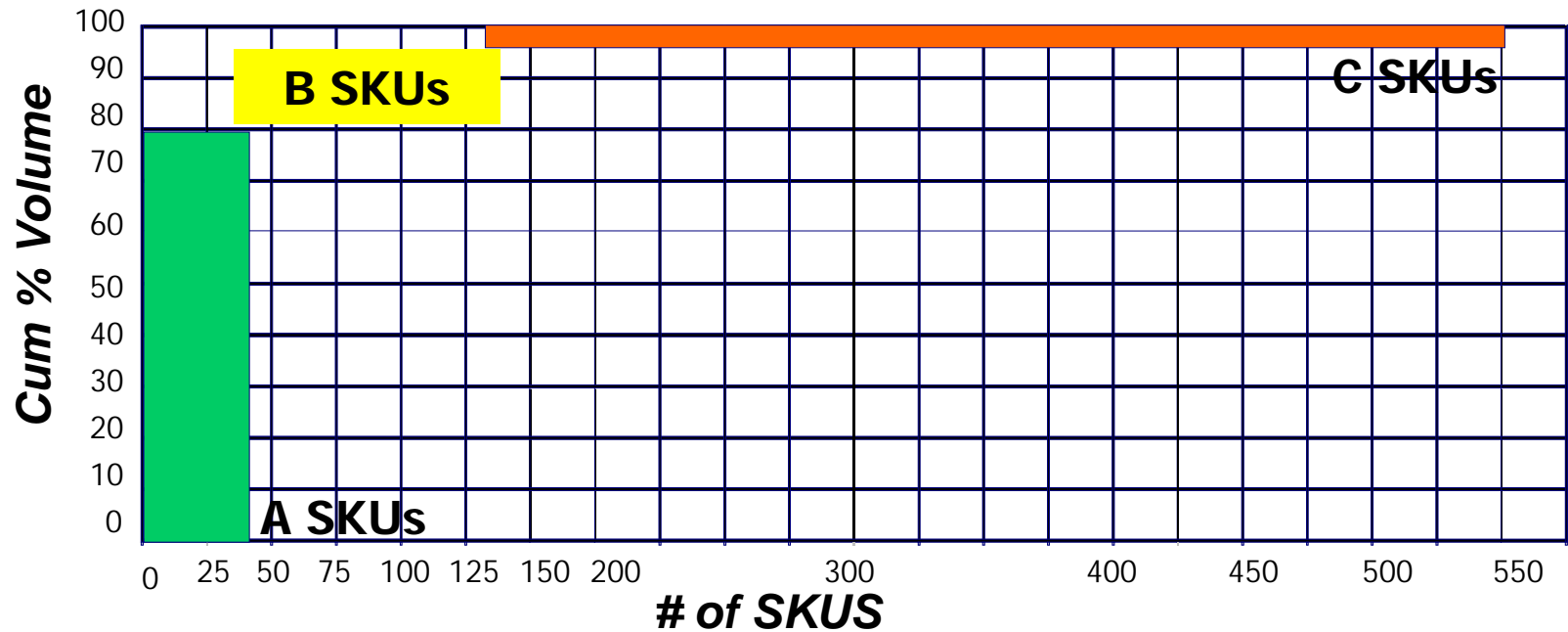
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# Start with a SKU Stratification

- What is it?
  - SKU stratifications are a simple ranking of SKUs by an attribute. Typical SKU stratifications are based on **Volumes**, with
    - A SKUs being high volume
    - B SKUs being medium volume
    - C SKUs being low volume
- A better way is to look at both **Volume**, and **Variability** to understand the logistical challenges of different types of SKUs

# Typical ABC SKU Stratification

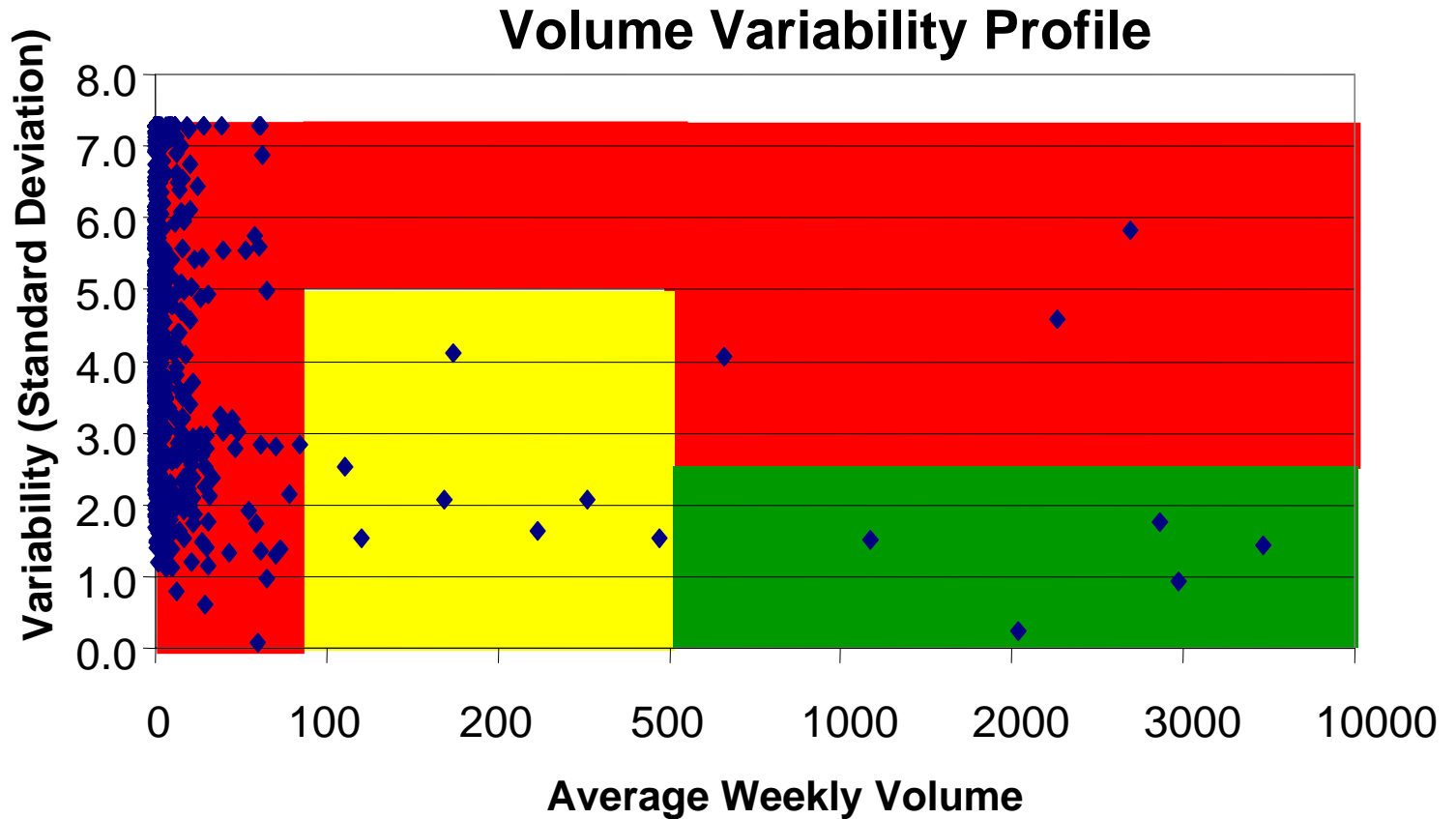


**Top 7% of SKUs  
account for 80%  
of units sold !!!**

## Example SKU Stratification

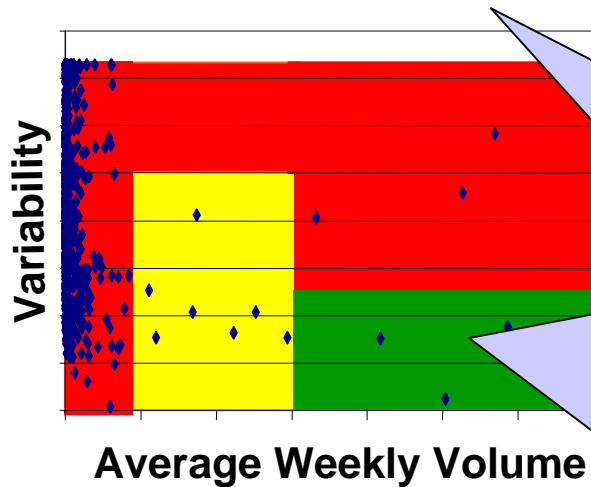
SKUs	Cum.%Units	% Units	% SKUs
1-2	22%	22%	.004%
3-44	80%	58%	7%
45 - 142	95%	15%	18%
143 - 558	100%	5%	75%

# *Volume AND Variability are BOTH Better!*




# Using Different Mfg/Distribution Solutions

*Goal is to match the manufacturing/distribution strategy to the volume and variability of each SKU*



 "A"s - Build to Stock

 "B"s - Kanban

 "C"s - Make to Order

# Example of Tiered Mfg/Dist Strategy

<b>Volume</b>	<b>Replenishment Strategy</b>	<b>Manufacturing Strategy</b>
<b>A</b>	Rate Based	Assembly Line; Daily Level Load
<b>B</b>	Kanban	Assembly Line or Demand Driven Kanban
<b>C</b>	Build to Order	On Demand Manufacturing;* Manufacturing Cells

*\* For some products such as in the High Tech Industry for CDs and Print commodities, on demand Manufacturing techniques may be available for low volume SKUs.*

# SKU Stratification Logic (High Level)

## ■ **A SKUs**

- *Medium to high volume*
- *Stable order rate/low variability = easy to plan*
- *Longer term lifecycle*

## ■ **B SKUs**

- *Medium volume*
- *Order rate low/high variability = harder to plan*
- *Longer term lifecycle*

## ■ **C SKUs**

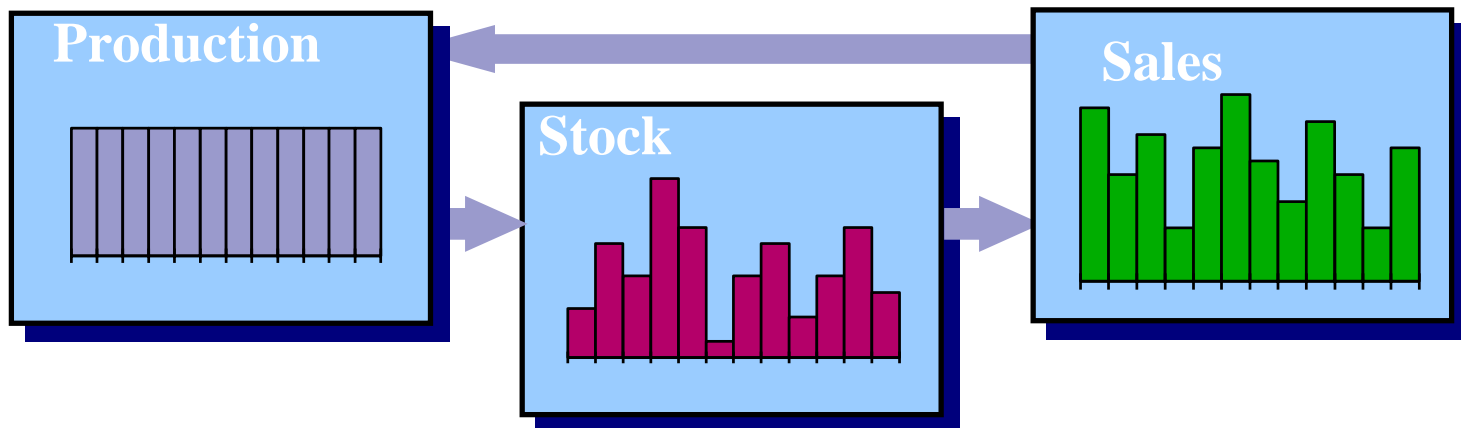
- *All low volume regardless of lifecycle*
- *Order rate/high variability = hard to plan*
- *Short to medium term lifecycle SKUs*

## ■ **D SKUs**

- *Any volume SKU with very short (e.g. primarily launch) ifecycles*
- *Any high volume SKU with high variability*

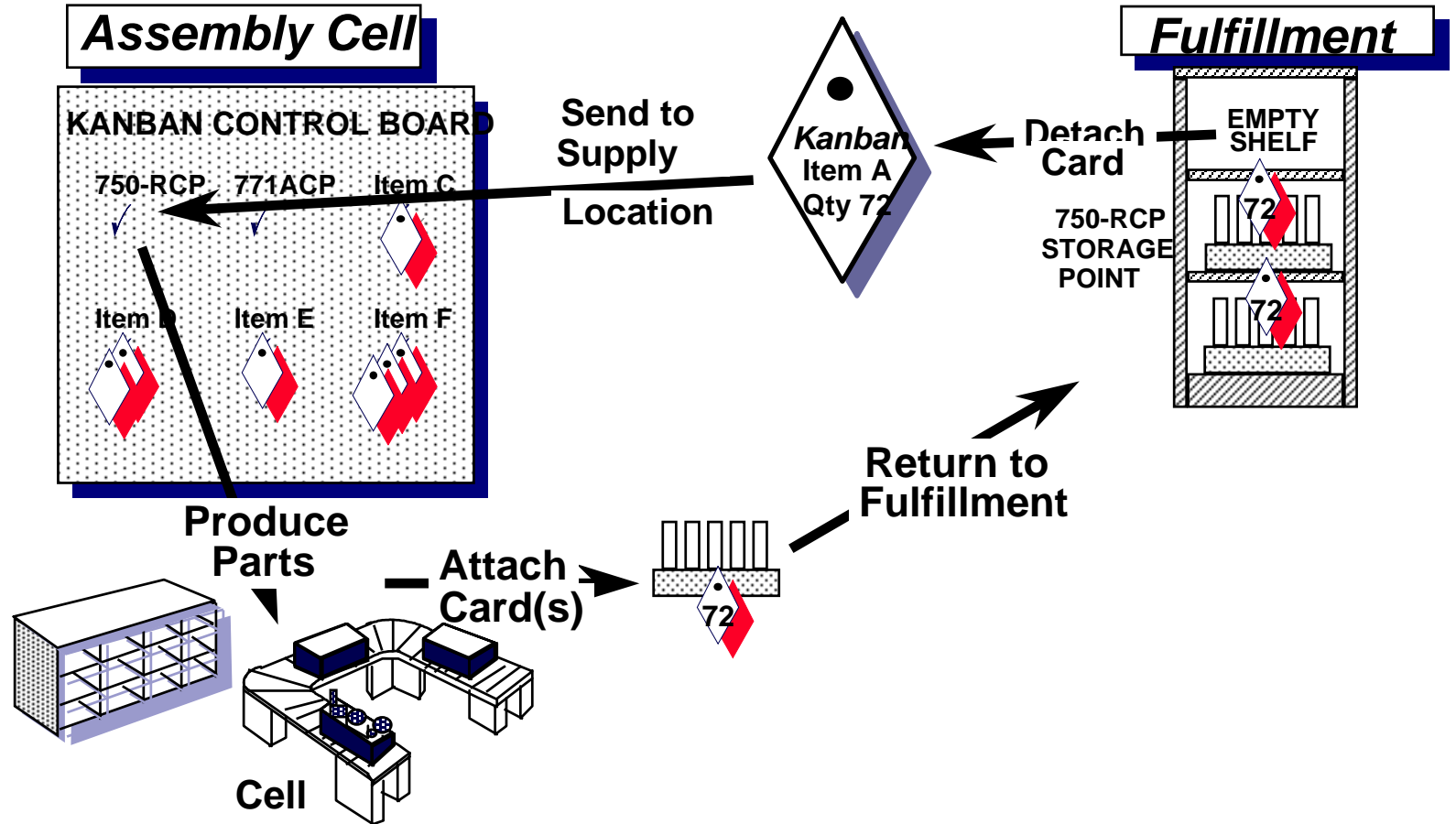
# Rate Based: How it Works....

- All qualifying “A” SKUs produced to same schedule every day to level load the factory
- Daily rate analyzed and modified weekly
- Mean average deviation tool sets the rate and stocking level
  - measures variability of orders using statistical methods

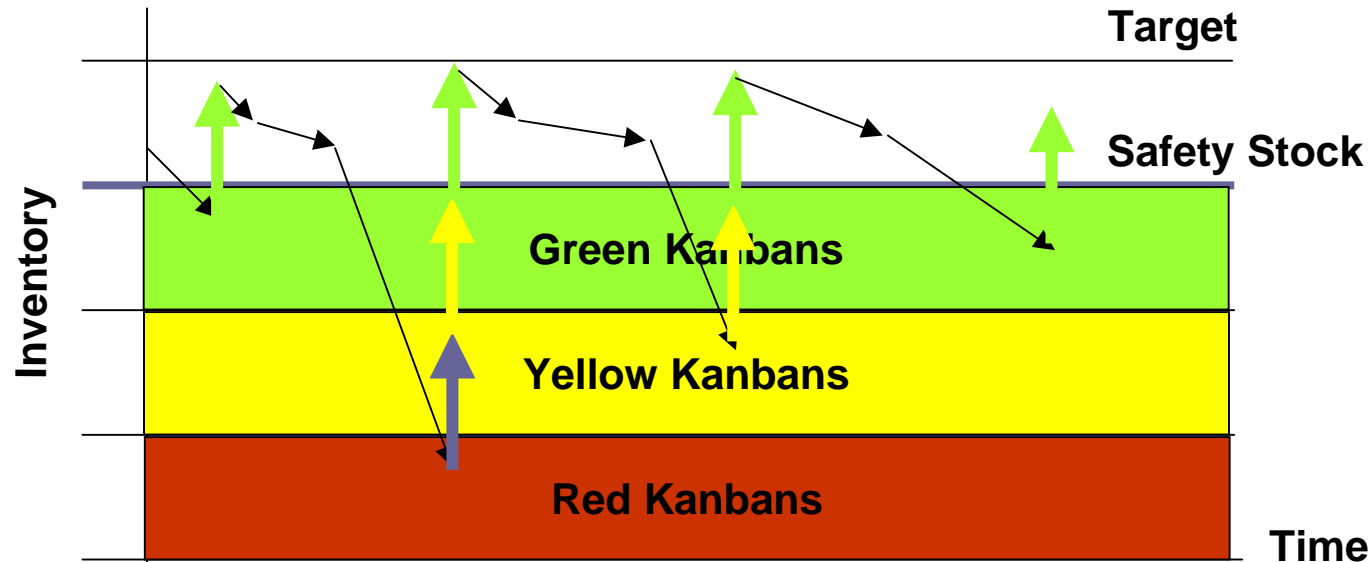


# Kanban Process: How it Works...

*The Kanban process is a simple way to align demand with supply by taking the guess out of how much to make.*



# Setting the 'safety stock'



- Safety stock logic will re-order a part with the kanban lot size as soon as the on-hand inventory falls below the Safety Stock level
- Kanbans can be prioritized (e.g. Red/Yellow/Green) for easy identification of what needs to be focused on or expedited

# *Pop Quiz*

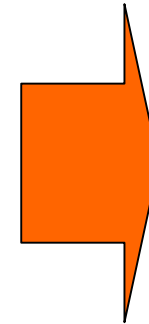
The Million Dollar Question:  
How Do You Know The Min Max Levels  
for Build to Order SKUs?

# How Do You Know The Right Levels?

*Read your Operations Management book and do the math.....or develop a program to calculate it for you automatically!!!*

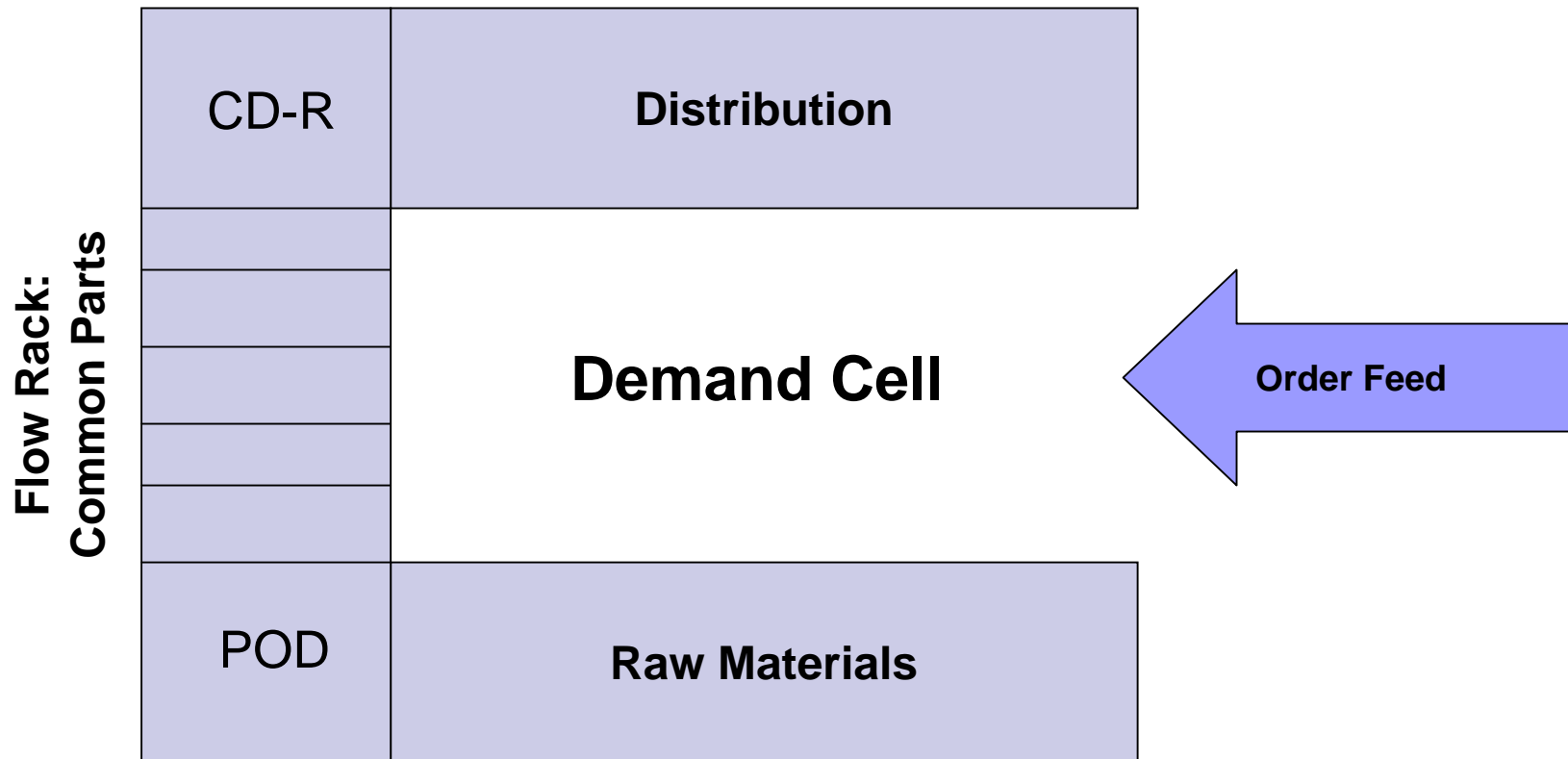
$$SL_{\max} = (LT \times Qty) + (\sqrt{LT} \times SF \times NSD \times Qty)$$

- SL<sub>max</sub> = Maximum Stock Level
- SL<sub>min</sub> = Minimum Stock Level
- QTY = Average Daily Demand in Units
- LT = Manufacturing or Purchasing  
Lead Time in Days
- SF = Service Factor as specified in  
Normal Demand Table
- NSD = Normal Standard Deviation as  
specified in Normal Demand  
Table



# Manufacturing Cell Process: How it Works....

*Cellular manufacturing is an ideal way to manage low volume production runs vs using an assembly line with long setup times.*



# On Demand Manufacturing Justification

Type	Order Quantity	Unit Cost	Total Cost	Obso Costs	Real Unit Costs
CD	500 (minimum)	\$.50	\$250	\$200	\$5.00
CDR	50	\$3.00	\$150	\$0	\$3.00

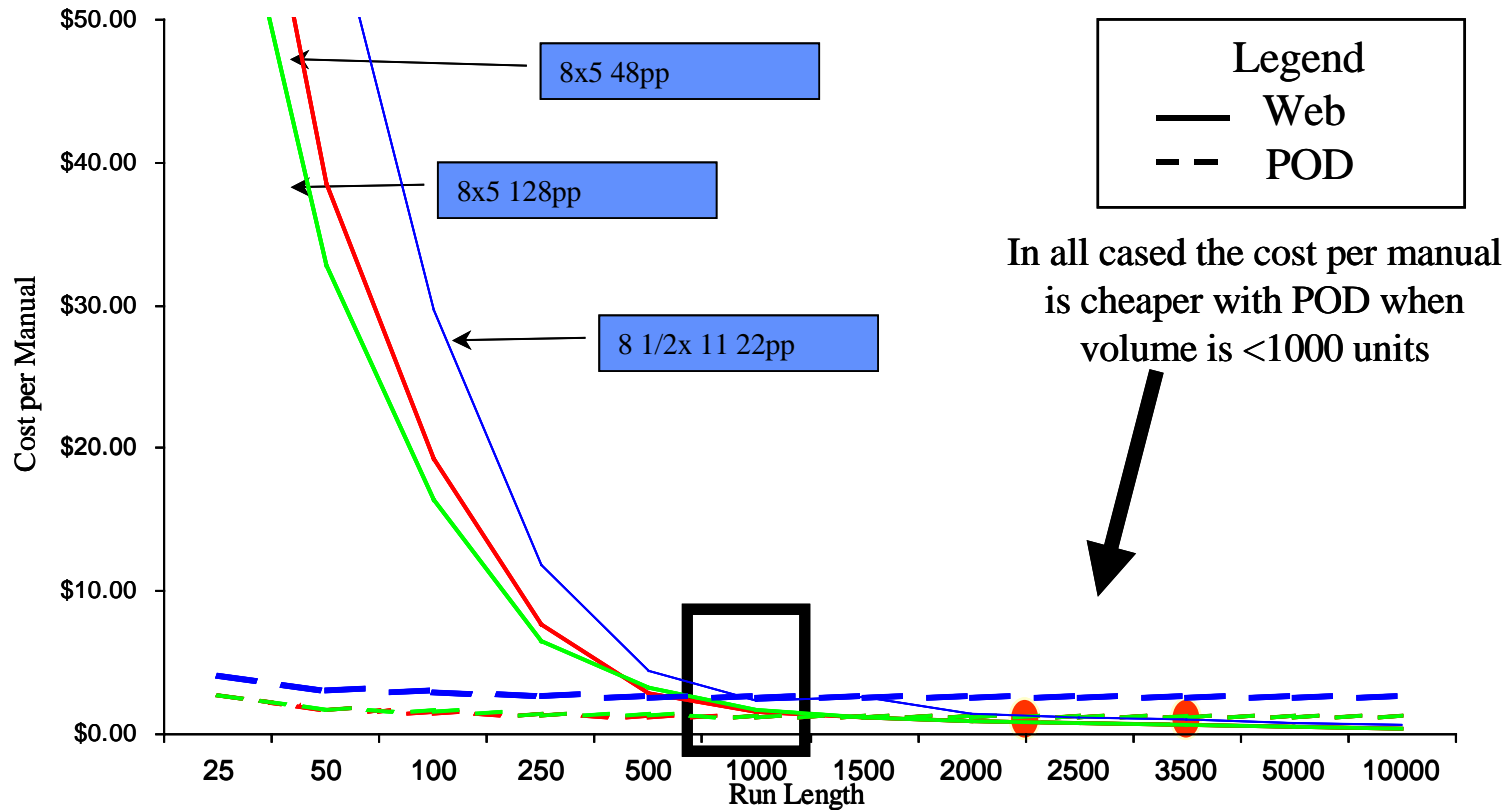
**Part  
Number  
XX**

**Demand  
= 50 units**

# Benefits: Reduced Costs

*Financials support the breakeven unit point for moving from a traditional web press to a POD solution was approximately 1000 units.*

## *- Break Even Analysis -*

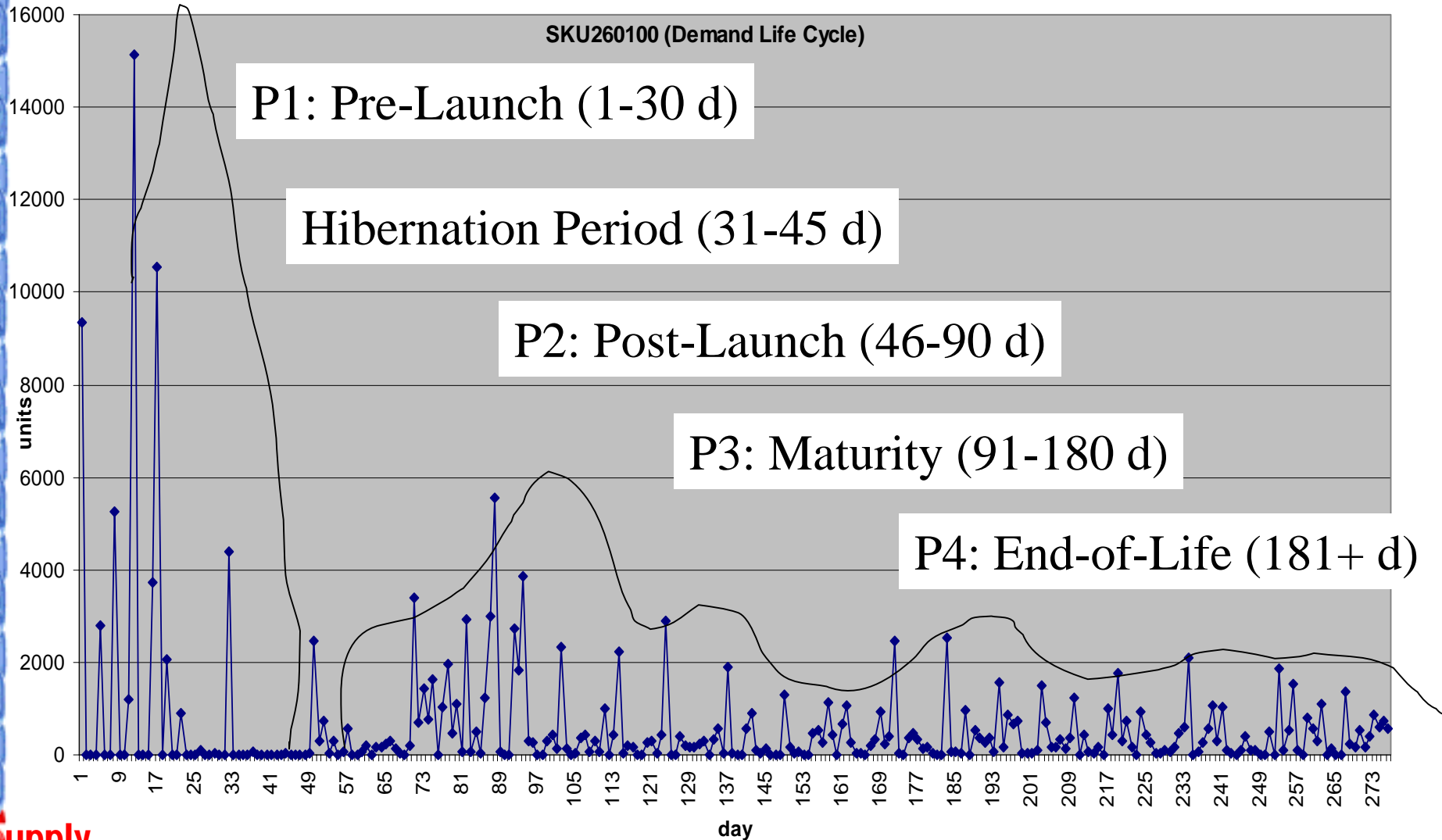


*Does not include a one time set up charge of between \$505 and \$720 per SKU for web printing.*

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# A Typical QuickBooks Life Cycle



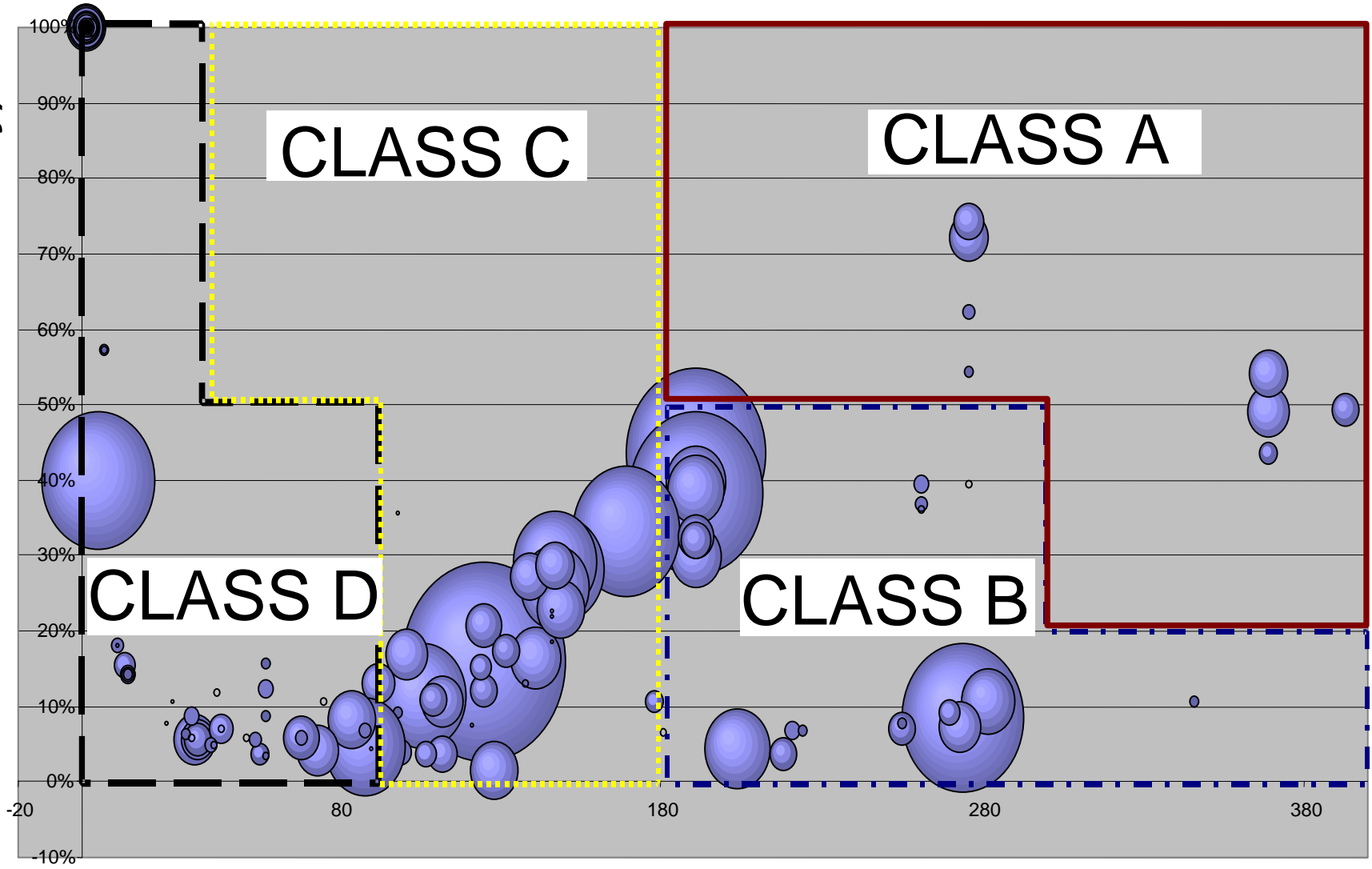
# Impact to Intuit

- The Build-to-Stock inventory management approach for all SKUs across all product families creates an large amounts of excess and obsolescence costs for FY02.
- Intuit's Manufacturer's inability to respond to real-time changes in the market demand created an average of 14 days backlog recovery time due its rigid manufacturing flex window.
- Opportunity existed to reduce the excess and obsolescence costs by 50% while shortening the backlog recovery time to 5 days in FY03 by reengineering the Intuit supply chain configurations.

*Intuit Operations Objective:  
Align Supply and Demand to mitigate the risks of the  
bullwhip effect and an extreme product life cycle*

# QuickBooks SKU Stratification Analysis

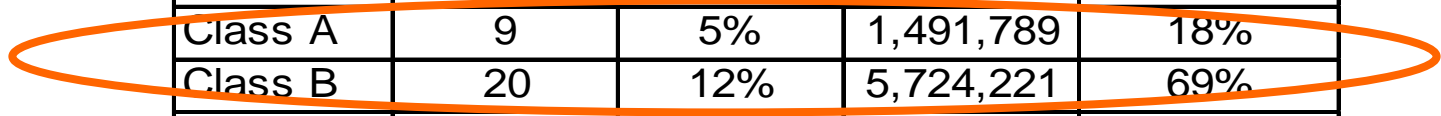
Ordering Rate  
( This is a Measure of Variability)



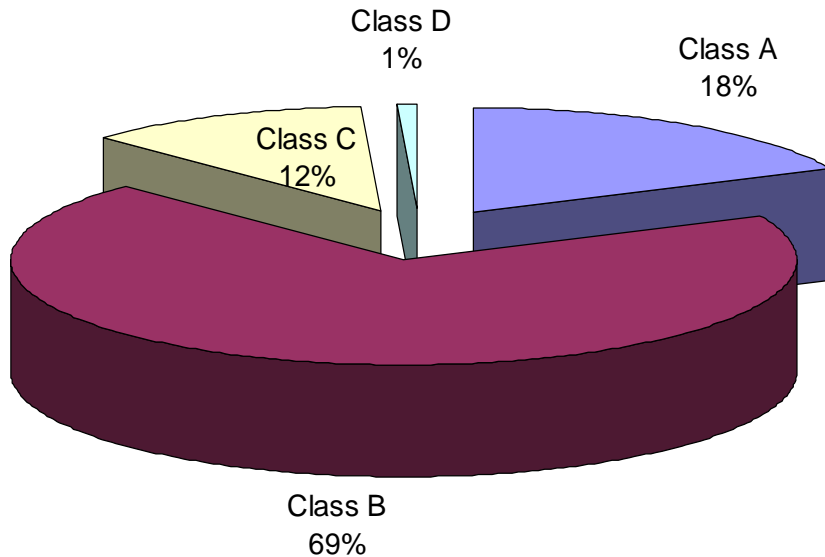
\* Circle Size = Daily Mean +/- 10% - This is a measure of Volume

# SKU Stratification Breakdown for One Product Line

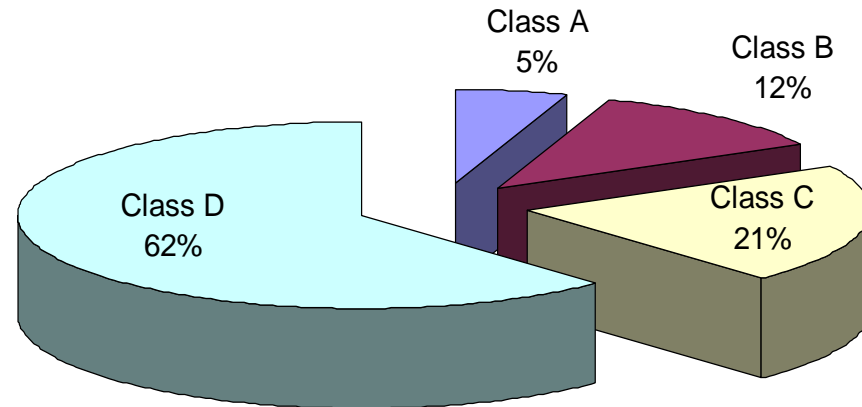
SKU Class	# of SKUs	% of SKUs	Class Vol.	% Class Vol.
Class A	9	5%	1,491,789	18%
Class B	20	12%	5,724,221	69%
Class C	35	21%	981,589	12%
Class D	104	62%	58,822	1%
ALL	168	100%	8,256,421	100%



Total Demand Vol.



SKU Count



# Adopting “Multi-Tier” Best Techniques for Intuit

	<i>Inventory at Distribution</i>	<i>Inventory at Manufacturer</i>	<i>Mfg Cycle Time</i>	<i>Dist Cycle Time</i>	<i>Impact to Customer if Dist is OOS</i>
<b>A</b>	FG on Hand	FG on Hand or Comp. on Hand	<b>1-2 Days</b>	<b>1 Day</b>	<b>2-3 Days</b>
<b>B</b>	FG on Hand	Comp on Hand	<b>3-5 Days</b>	<b>1 Day</b>	<b>4-5 Days</b>
<b>C</b>	FG on Hand	Nothing on Hand; Mfg on Demand	<b>3-5 Days</b>	<b>1 Day</b>	<b>4-5 Days</b>
<b>D</b>	Nothing on Hand Post Launch Build	Nothing on Hand post launch; Mfg on Demand	<b>3-5 Days</b>	<b>1 Day</b>	<b>4-5 Days</b>

**SUPPLY CHAIN IMPACT:**  
*Intuit can meet a maximum of a 5 day backlog recovery time for any SKU using this methodology*

# Early Warning Trigger

This system scans about 6500 every morning

## ■ What is it?

- A DYNAMIC action-based tool that automatically calculates supply vs demand and creates a “signal” to buyers when stock gets to levels lower than desired safety stock

## ■ Benefits

- Helps reduce or eliminate the impact of stockouts as the planner can trigger a PO to build product immediately rather than wait for the weekly build plan process.



# Example Impact on Lead Time: Product OOS at Disti, Comp in stock at MFG

## ■ Old Process

**1 week planning + 5 days + 2 days FF**

**= 14 days order fulfillment lead time for an out of stock at the Distributor**

## ■ New Process

**Same day planning trigger + 2 days build cycle + 2 days FF**

**= 5 days order fulfillment lead time for an out of stock at the Distributor**

# Example Impact on Lead Time: Product OOS at Disti and MFG

## ■ Old Process

1 week planning + 2 weeks component Lead Time  
+ 5 days build cycle + 1 days FF

= 27 days order fulfillment lead time for an out of stock at Disti and Mfg

## ■ New Process

Same day planning trigger + 3 days build cycle + 1 days FF

= 5 days order fulfillment lead time for an out of stock at the Distributor