



Achieving Sustainable Productivity
meeting customer demand in an unpredictable world

Material Requirements Planning in a Demand-Driven World

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Chad Smith

Carol Ptak



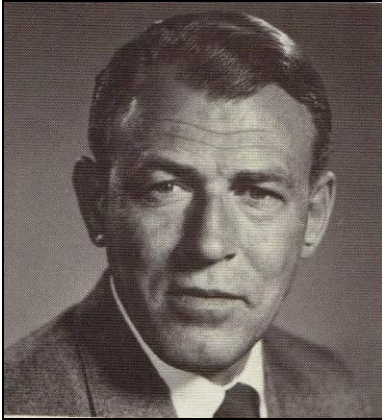
Carol Ptak is the co-author of the third edition of Orlicky's Material Requirements Planning and a partner at the Demand Driven Institute. Previously, Carol was at Pacific Lutheran University as Visiting Professor and Distinguished Executive in Residence after years of executive management experience at PeopleSoft and IBM Corporation. Ptak served as the vice president and global industry executive for manufacturing and distribution industries at PeopleSoft. Additionally, Carol is a past President and CEO of the American Production and Inventory Control Society (APICS).

Chad Smith

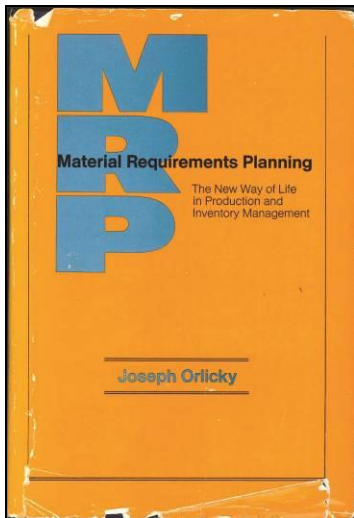


Chad Smith is the co-author of the third edition of Orlicky's Material Requirements Planning and a partner at the Demand Driven Institute. Chad is also the co-founder and Managing Partner of Constraints Management Group, a services and technology company specializing in demand driven manufacturing, materials, and project management systems for mid-range and large manufacturers.

1975: The First Significant Explanation of MRP



Joe Orlicky



*“As this book goes into print, there are some **700 manufacturing companies or plants** that have implemented, or are committed to implementing, MRP systems. Material requirements planning has become a new way of life in production and inventory management, displacing older methods in general and statistical inventory control in particular. I, for one, have no doubt whatever that it will be the way of life in the future.”*



The Evolution of Inventory Planning

1920's: Inventory Mgmt

1961: BOMP

1965: MRP

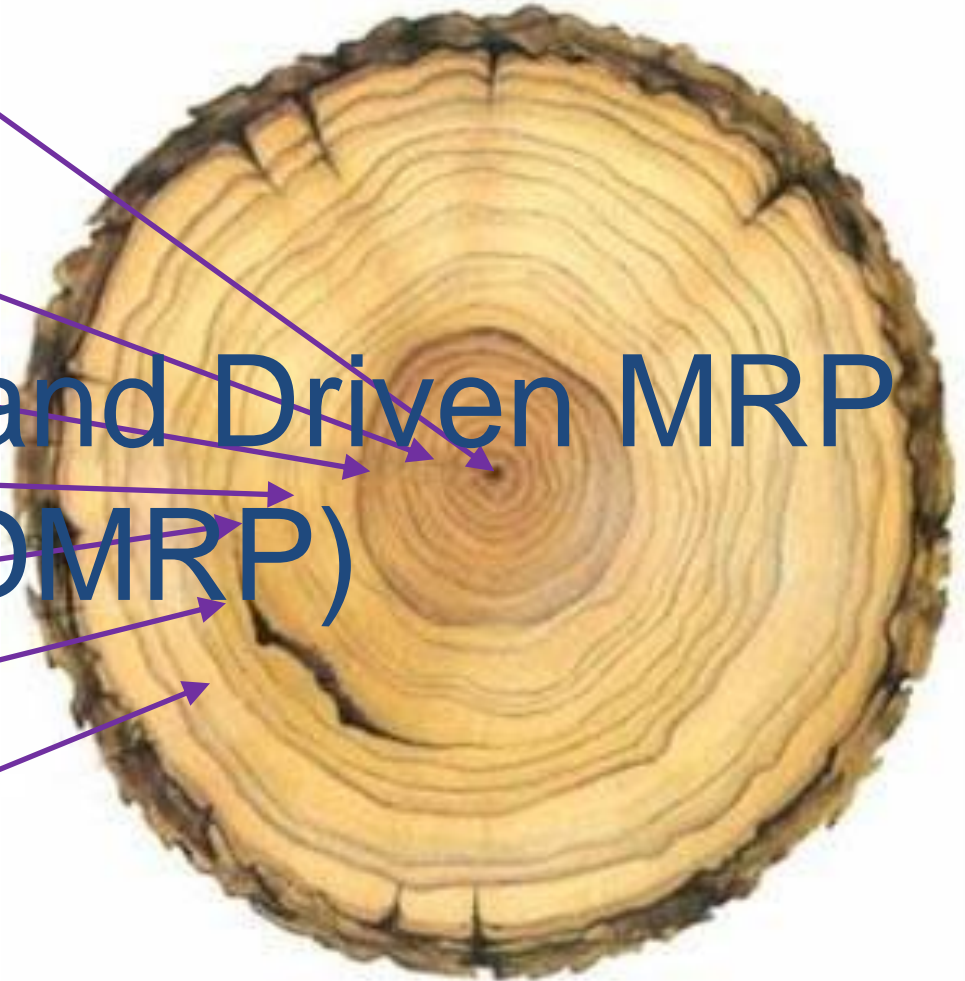
2011 – Demand Driven MRP

1972: Closed-Loop MRP

1980: MRPII

1990: ERP

1996: APS



(DDMRP)



What is Demand Driven MRP?

A multi-echelon materials and inventory planning and execution solution.

Demand Driven MRP
(DDMRP)

Material Requirements
Planning
(MRP)

Distribution Requirements
Planning
(DRP)

Lean

Theory of
Constraints

Innovation



What is the Problem we are Solving?

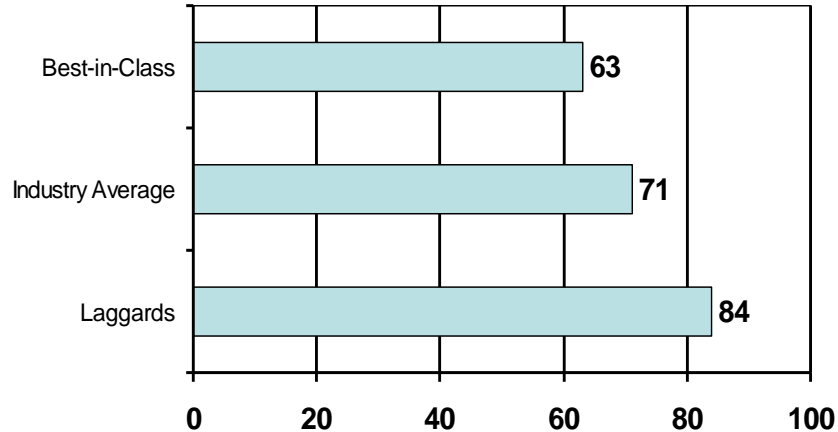
Today's formal planning systems are fundamentally broken!



Modern Planning Systems Broken?!



Companies Using Spreadsheets for Demand Management



Aberdeen Group (Demand Management, November, 2009)

“ 86% of respondents indicate that their management team has asked them to find opportunities to improve their companies supply chain planning processes and 71% of respondents have indicated the same for supply chain technology improvement. ”

Aberdeen Group (Inventory Optimization Technology Strategies for the Chief Supply Chain Officer, December 2010)



Old Rules, Old Tools, New Pressures

- Forecast error is on the rise
- Volatility in supply and demand is increasing
- Legacy planning tactics and tools are breaking down



The Planning Legacy

- ▶ Material Requirements Planning (MRP)
- ▶ Inside most modern ERP systems is MRP
- ▶ 79% of ERP Buyers implement MRP
- ▶ Conceived in the 1950's
- ▶ Codified in the 1960's
- ▶ Commercialized in the 1970's and...
- ▶ ...it hasn't changed
- ▶ What has changed?



The “New Normal”

- ▶ Global sourcing and demand
- ▶ Shortened product life cycles
- ▶ Shortened customer tolerance time
- ▶ More product complexity and/or customization
- ▶ Pressure for leaner inventories
- ▶ Inaccurate forecasts
- ▶ More product variety
- ▶ Long lead time parts/components

Worldwide there is more complex planning and supply scenarios than ever – the past is NOT an predictor for the future

The “New Normal” is Here to Stay



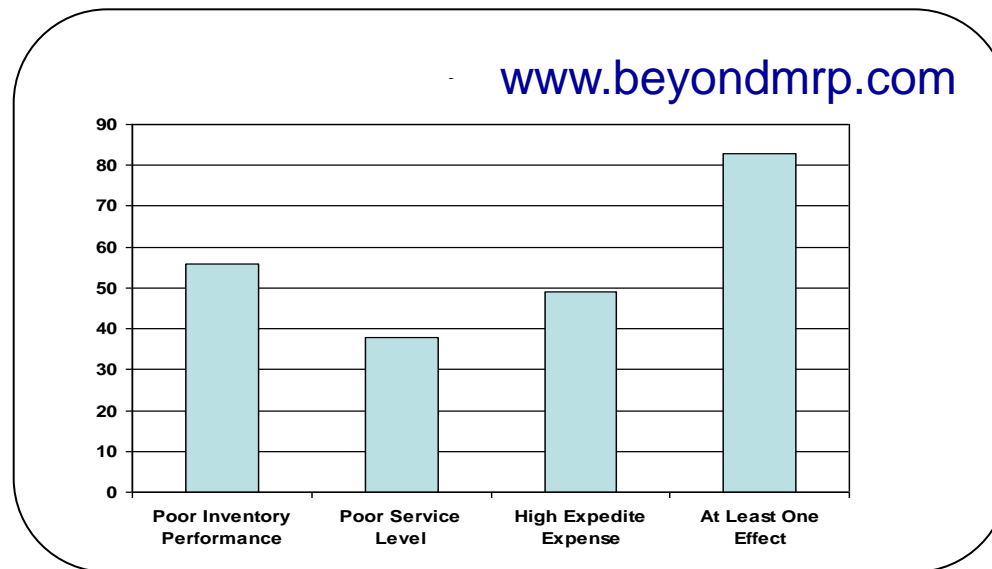
“Forty-eight (48%) percent of companies indicate that increased supply chain complexity is a top pressure.”

Aberdeen Group (Enabling Supply Chain Visibility in the Cloud, November, 2010)

The Typical Effects in the New Normal

Frequent Shortages Leading to:

- Unacceptable Inventory Performance
- Unacceptable Service Level Performance
- High Expedite Related Wastes

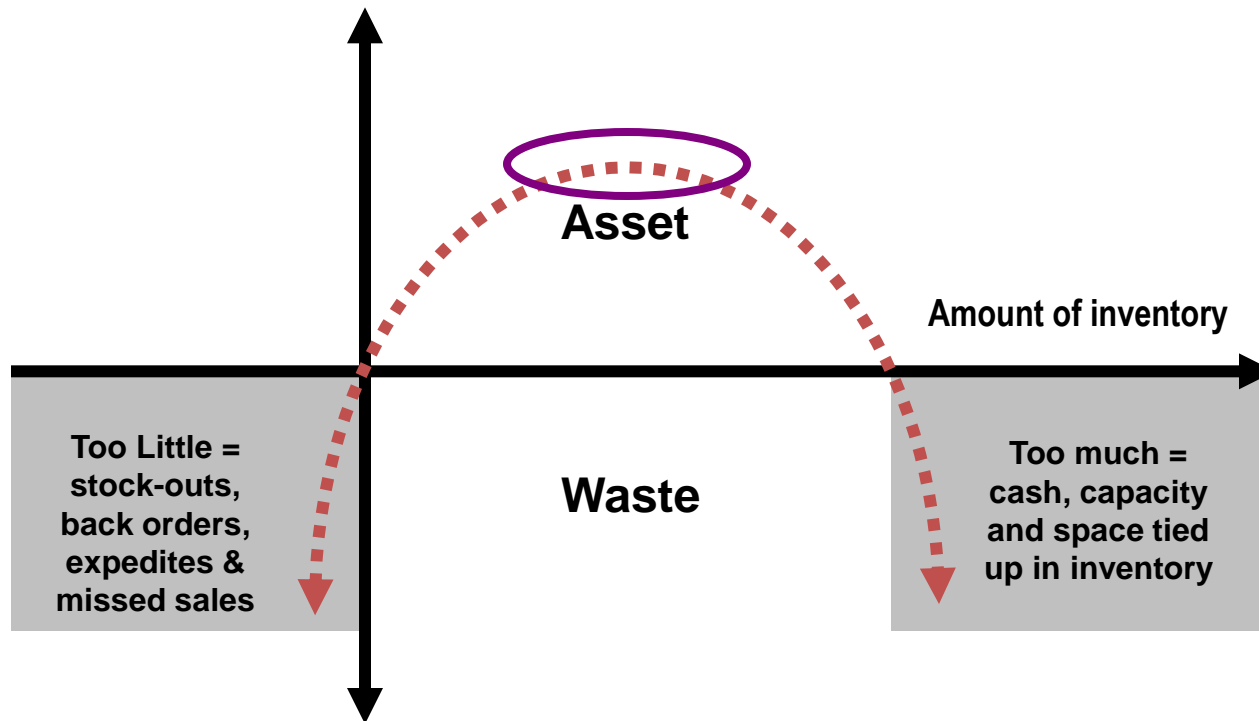


Is Improvement even possible in the New Normal?



Achieving **Sustainable** Productivity
meeting customer demand in an unpredictable world

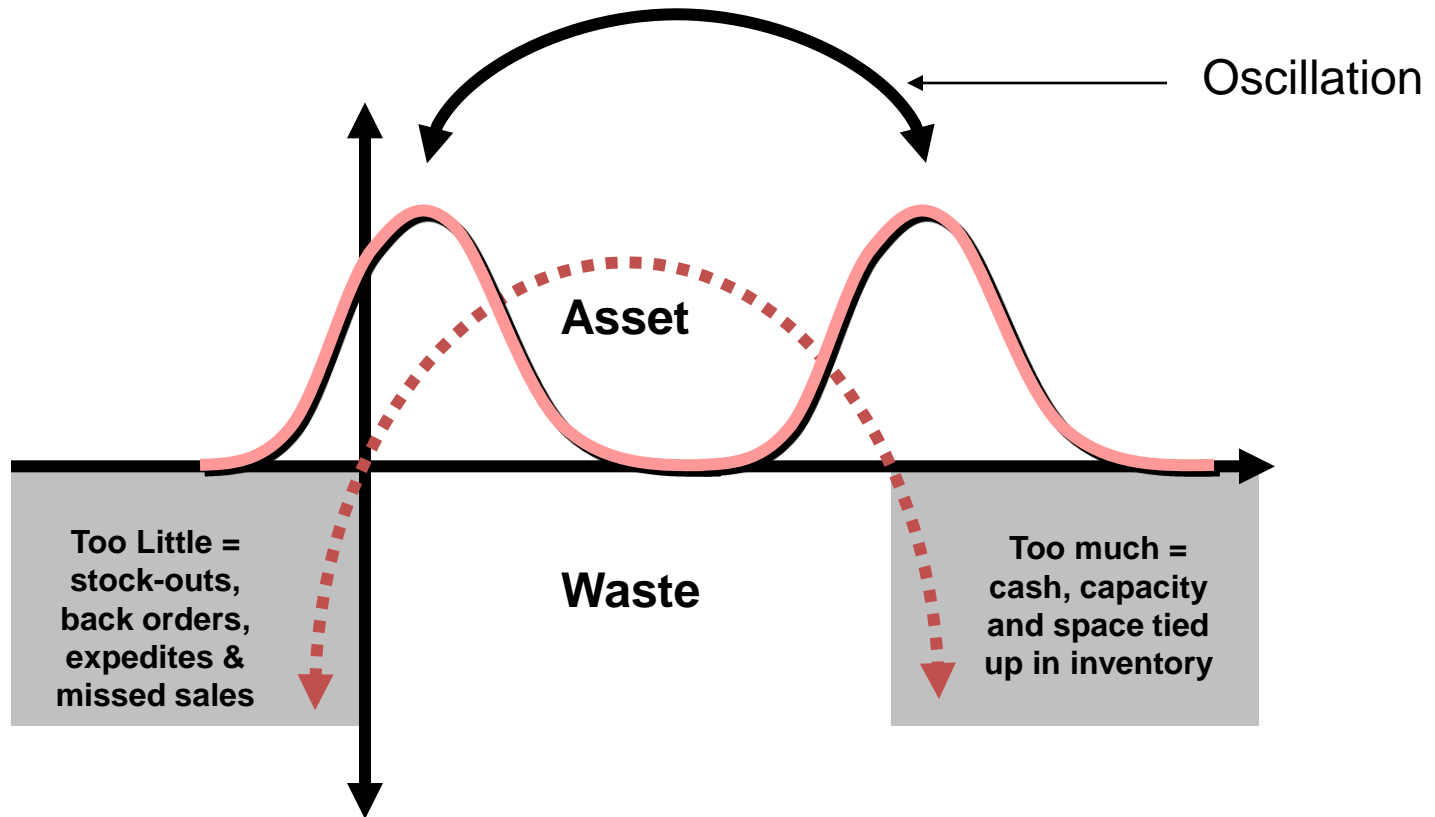
Inventory – Asset or Waste?



Unacceptable Inventory Performance

Unacceptable Service Level Performance

High Expedite Related Wastes



The Shift to Demand Driven

- The problem is not going away
- The world of “**push and promote**” is done
- Companies and supply chains need to align their working capital with actual consumption
- From “Push” to “Demand Driven”



The Five Components of DDMRP

Demand Driven Material Requirements Planning

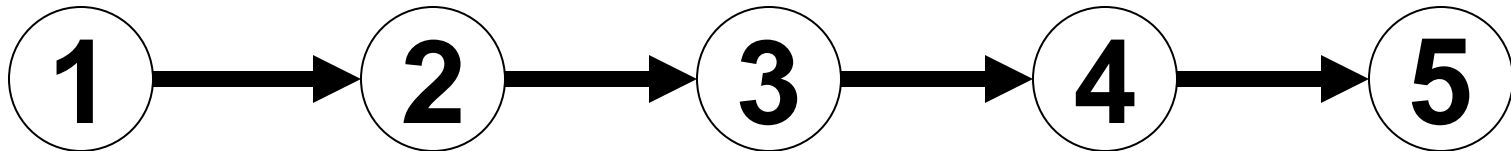
Strategic
Inventory
Positioning

Buffer Profiles
and Levels

Dynamic
Adjustments

Demand Driven
Planning

Visible and
Collaborative
Execution



Modeling/Re-modeling the Environment

Plan

Execute



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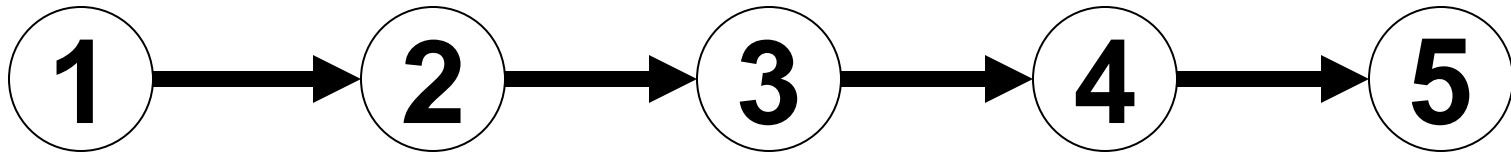
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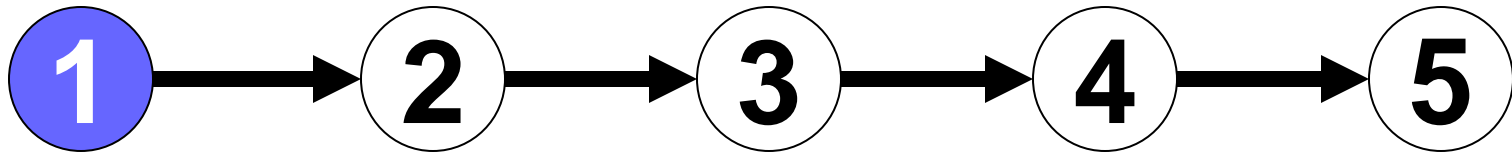
Plan

Execute

The Five Components of DDMRP

Demand Driven Material Requirements Planning

Strategic Inventory Positioning	Buffer Profiles and Levels	Dynamic Adjustments	Demand Driven Planning	Visible and Collaborative Execution
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Modeling/Re-modeling the Environment

Plan

Execute

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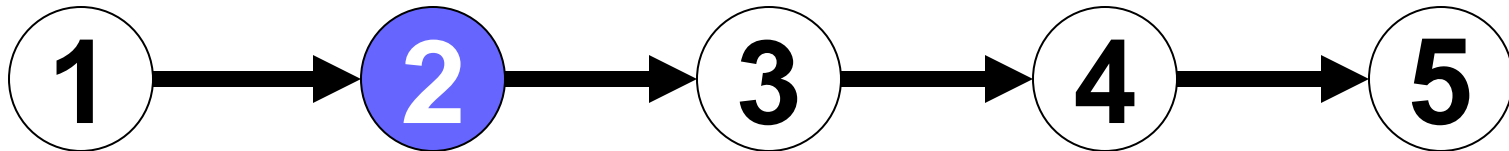
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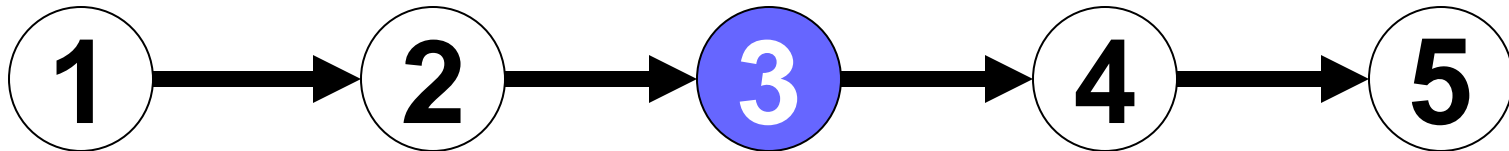
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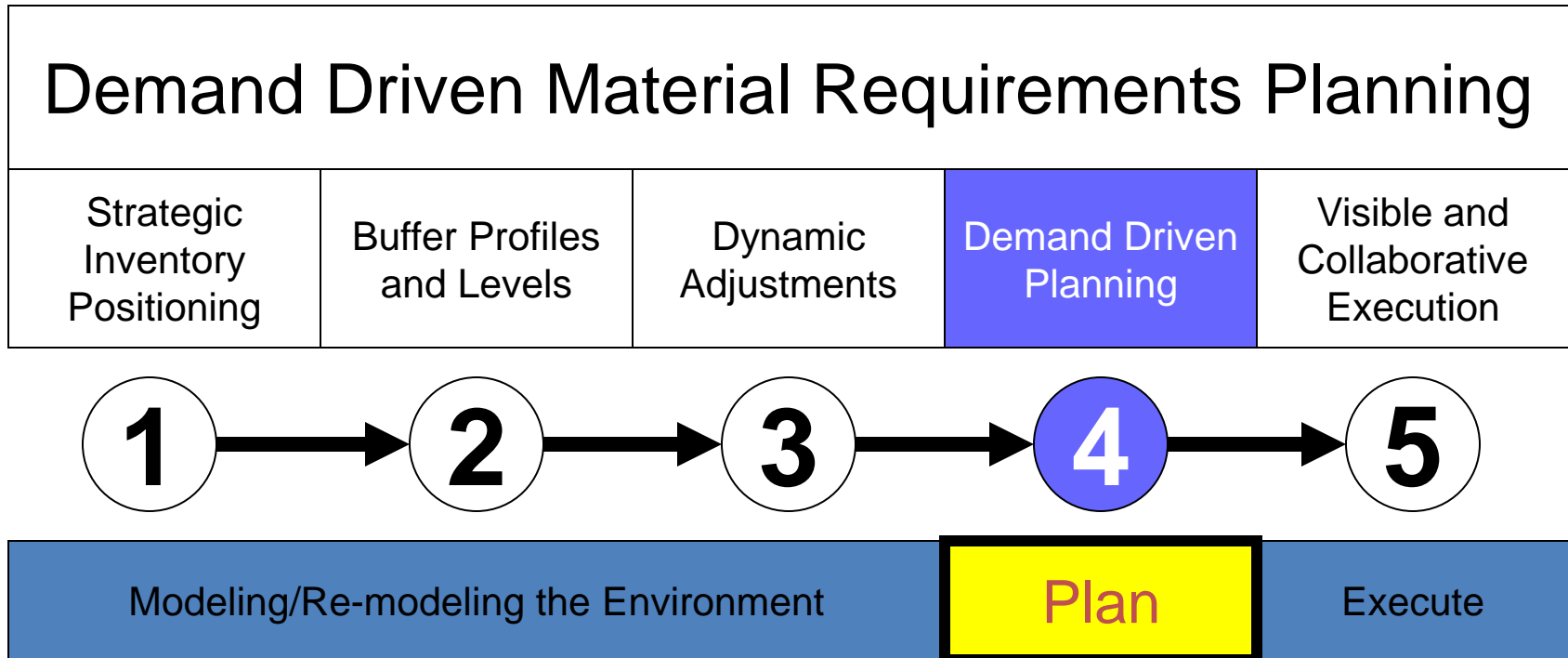
Modeling/Re-modeling the Environment

Plan

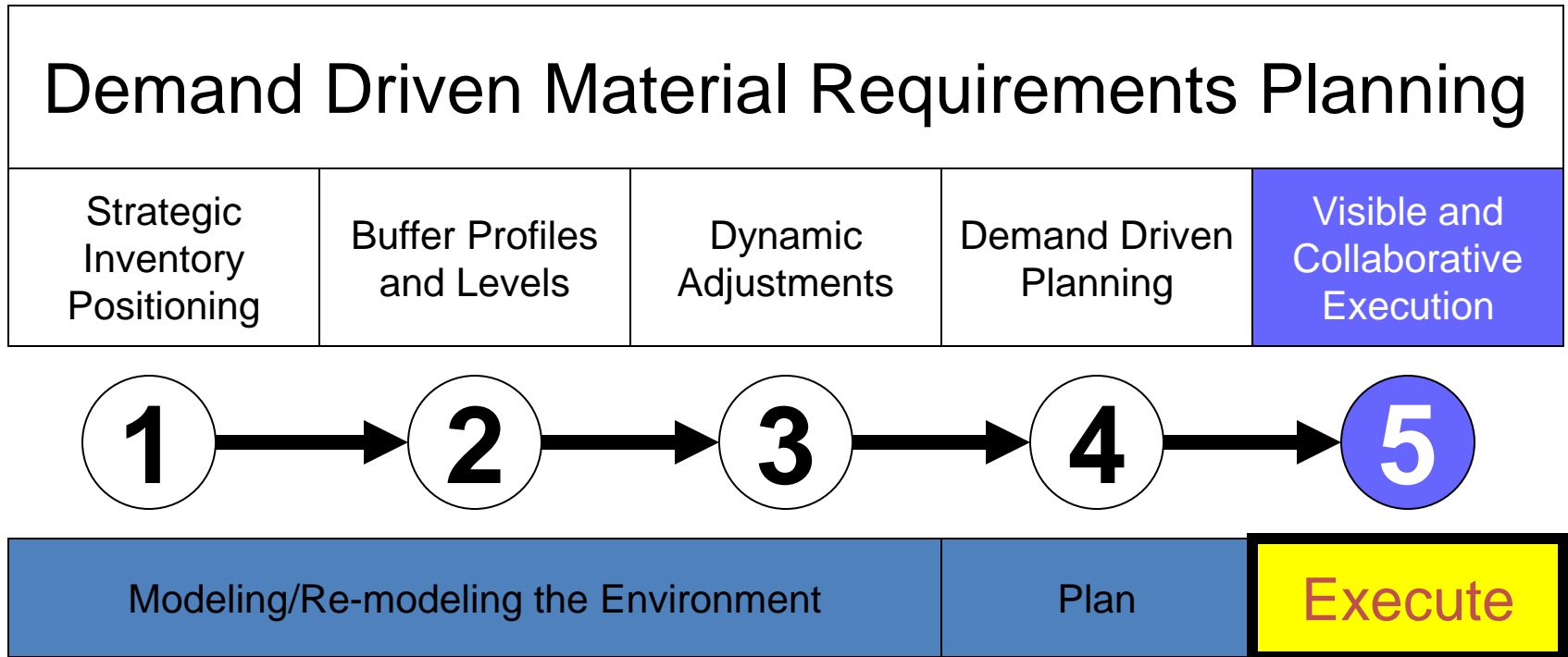
Execute



The Five Components of DDMRP



The Five Components of DDMRP



Strategic Inventory Positioning

Where?

(Position)

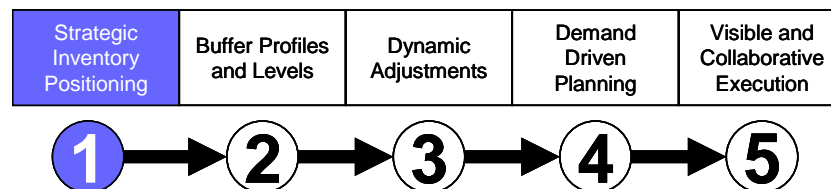
BEFORE

How Much?

(Quantity)

When?

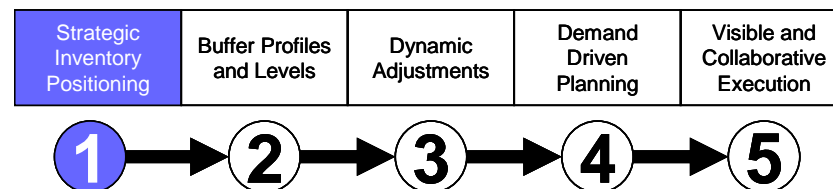
(Timing)



Answering “Where?”

6 Factors

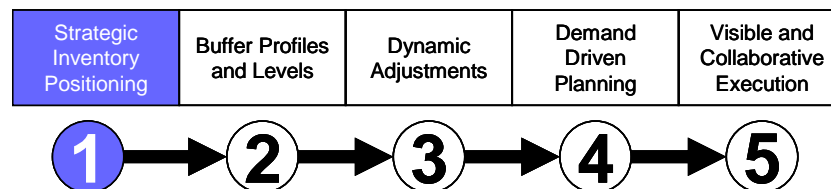
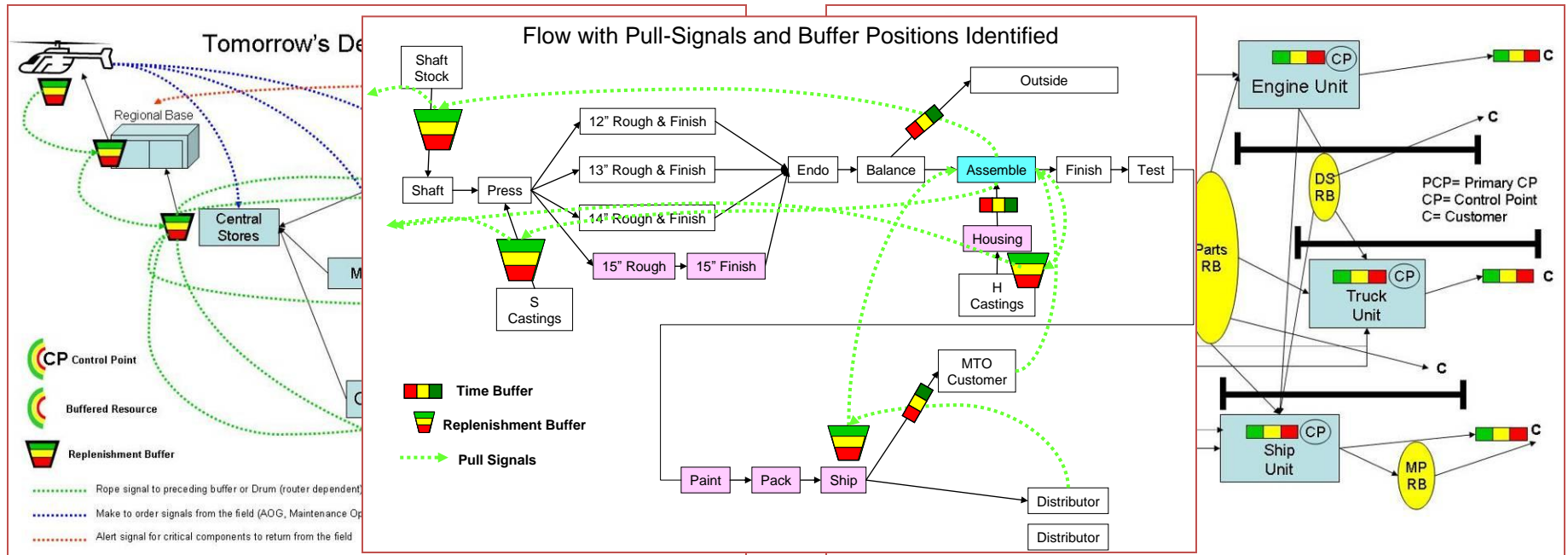
1. Customer Tolerance Time
2. Market Potential Lead Time
3. Supply and Demand Variability
4. Inventory Flexibility and Matrix BOM
5. Supply and Distribution Net Structure
6. Critical Resource Considerations



Dampen variability

Compress lead times

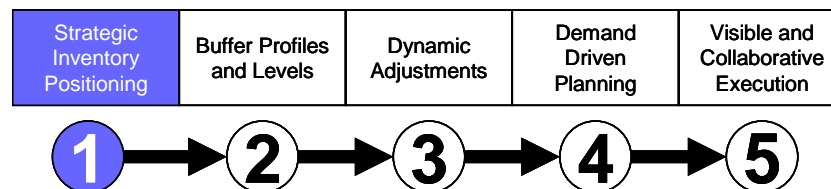
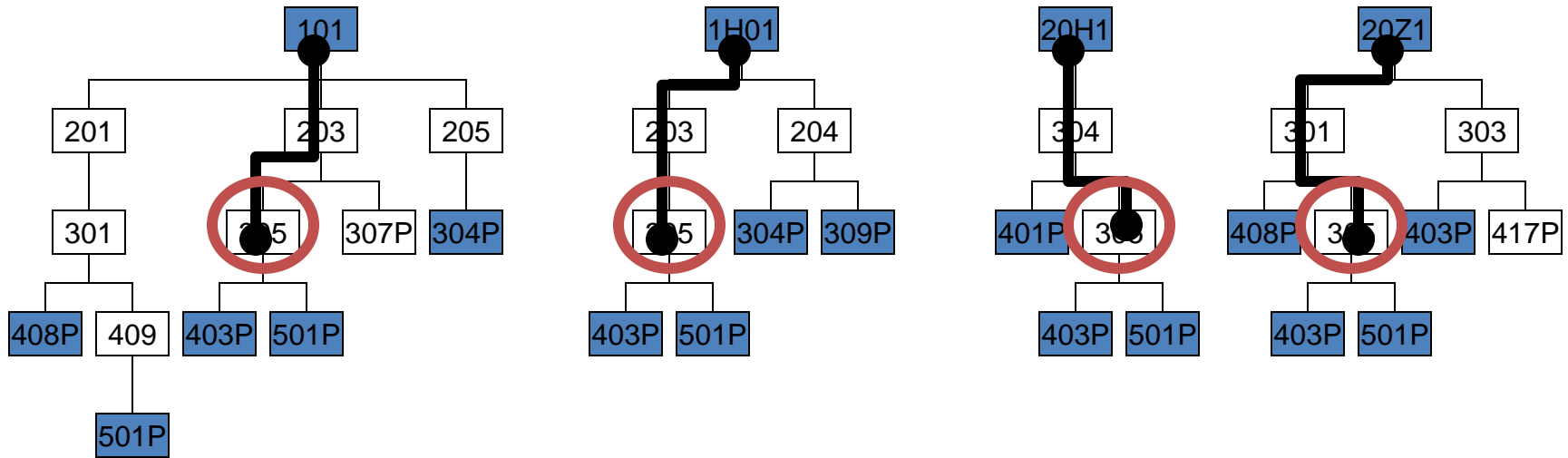
Better leverage working capital



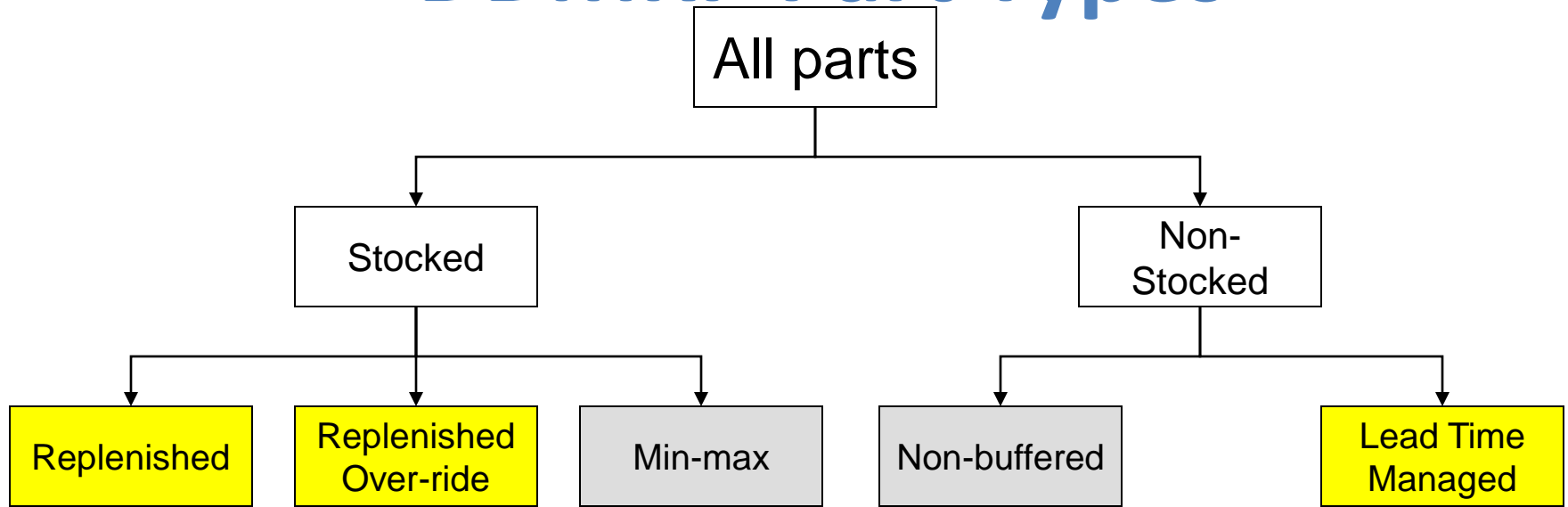
ASR LT + Matrix BOM

ASR Lead Time = The longest unprotected sequence in the BOM

Matrix Bill of Material depicts relationships between ALL child and parent items



DDMRP Part Types

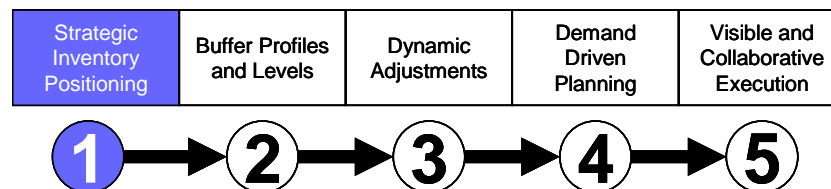


Typically \approx 20% of Purchased Parts are strategic

Typically \approx 10% of Manufactured Parts are strategic

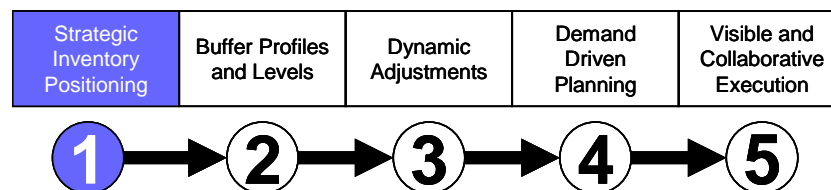
Typically most Distributed Stock is strategic

= strategically positioned and managed part = non-strategic part



Failure to properly position inventory is a huge source of waste for most manufacturing and supply chain companies.

Position and Pull



Buffer Profiles and Levels



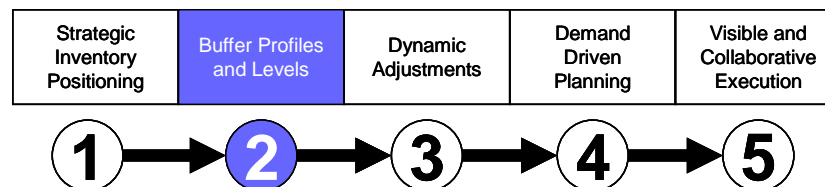
Group Trait Inputs

+

Individual Part/SKU Inputs

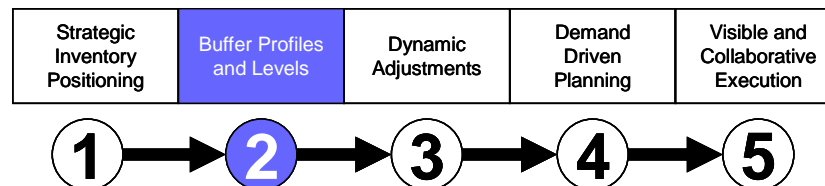
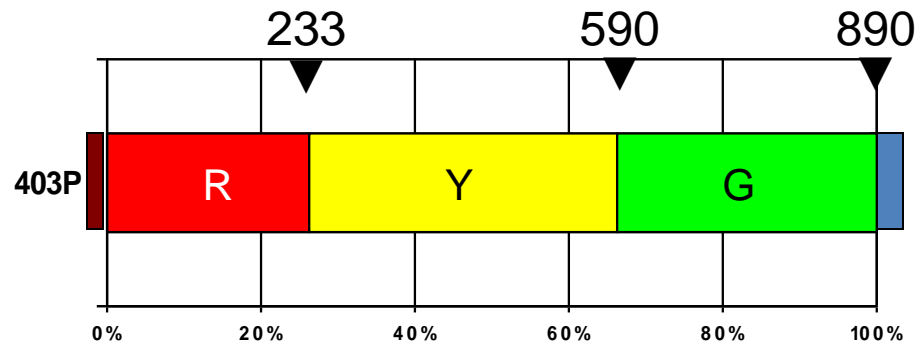
Lead Time Category
Make, Buy or Distributed
Variability Category
Significant Order Multiples

Average Daily Usage
Appropriate Discrete Lead Time
Ordering Policy (min, max, multiple)
Location (distributed parts)

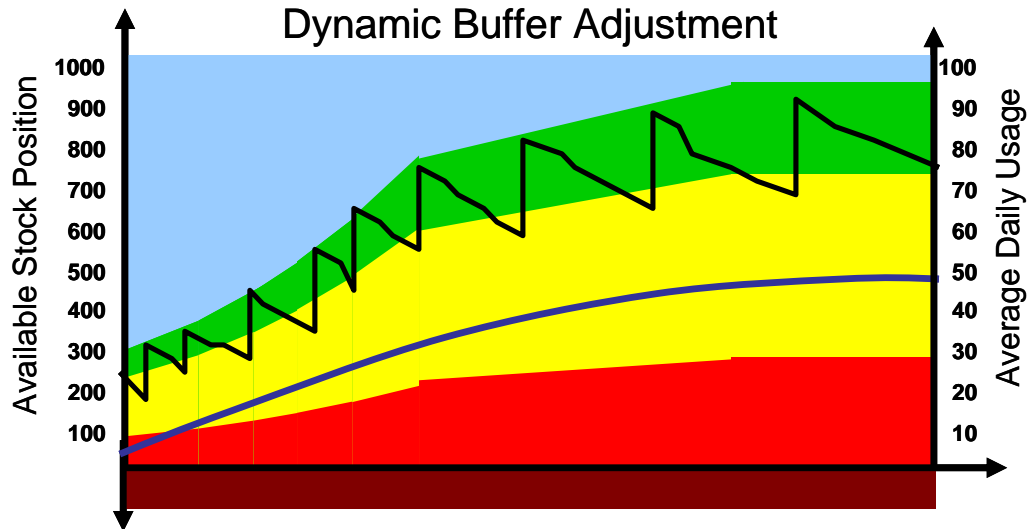


Buffer Profiles and Levels

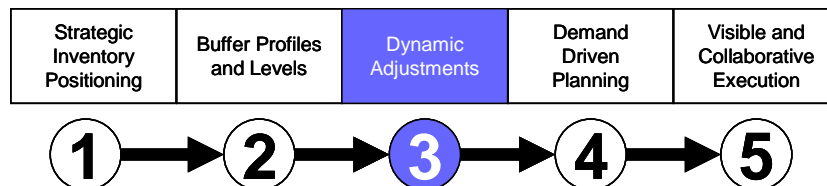
Part: 403P Lead Time: 21 days	Buffer Profile: B11MOQ
Green Zone	300
Yellow Zone	357
Red Zone Base	179
Red Zone Safety	54



Dynamic Adjustments

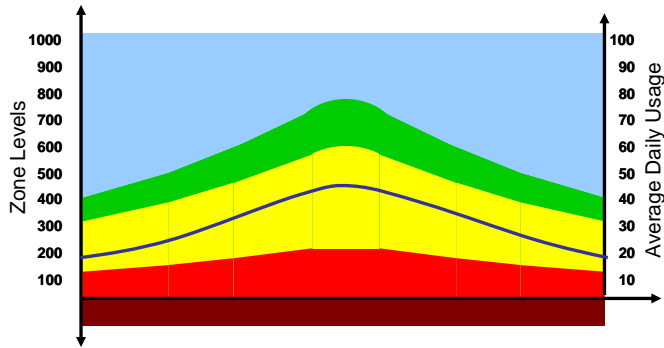


Recalculated Adjustments

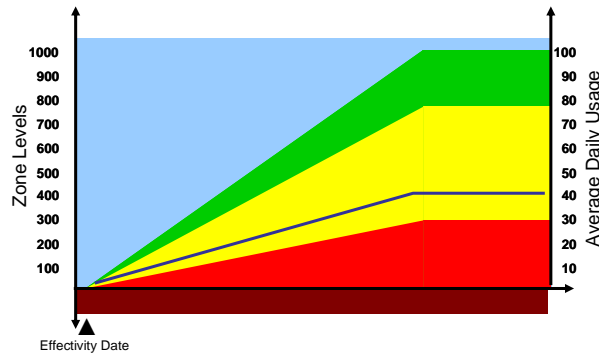


Dynamic Adjustments

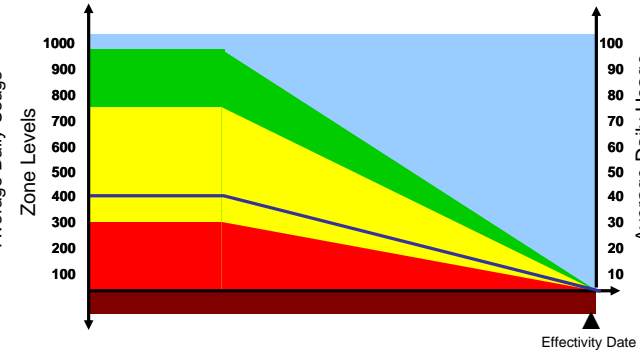
Seasonality



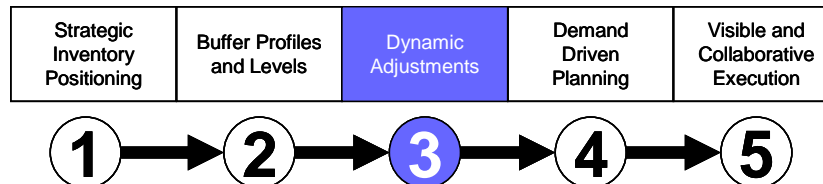
Ramp Up



Ramp Down



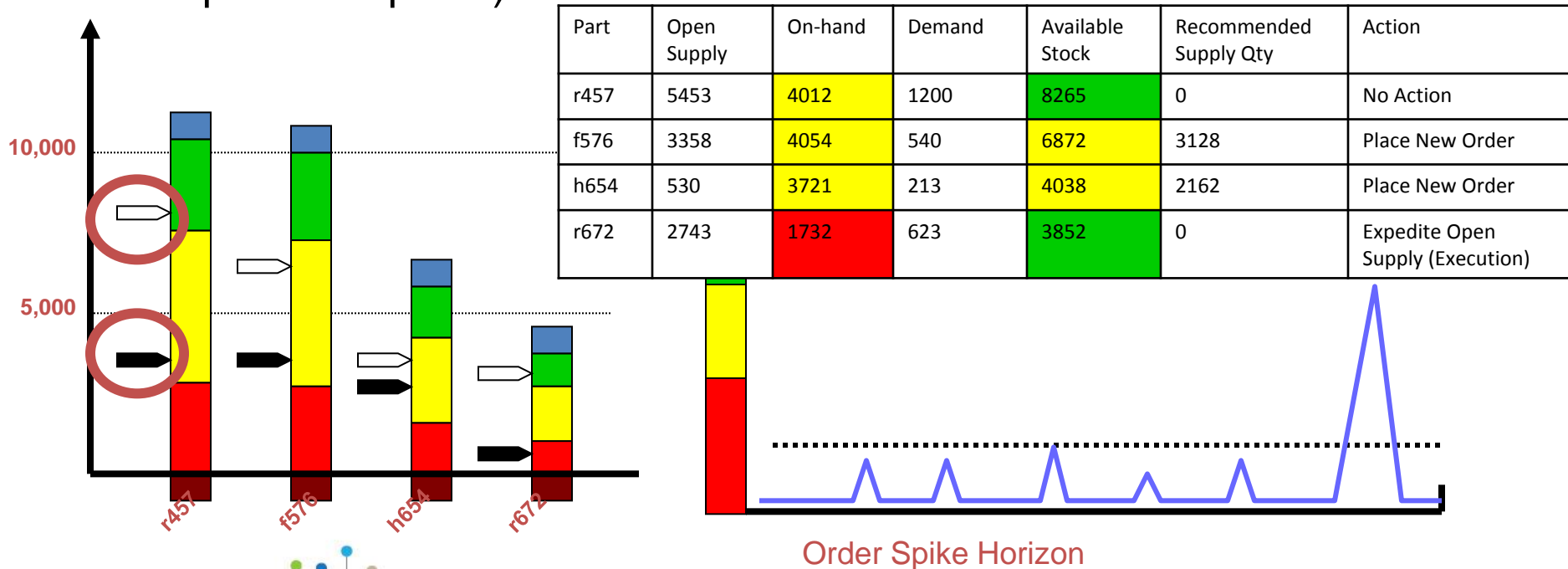
Planned Adjustments



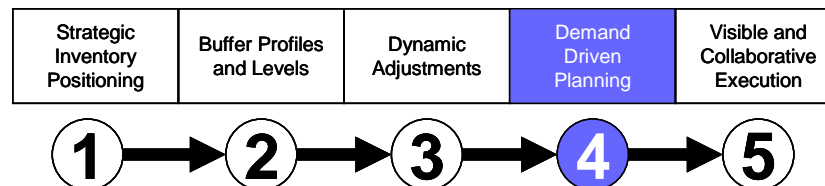
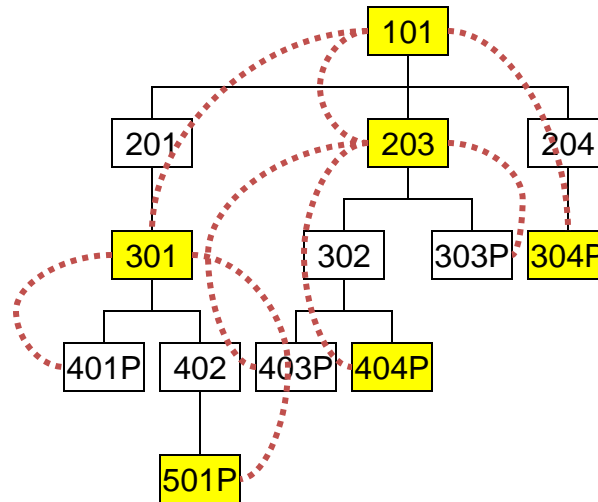
Demand Driven Planning

Supply generation is based what zone the available stock equation places the part

Available stock = on-hand + on-order – demand (past due, due today and qualified spikes)



De-Coupled Explosion



Highly Visible & Collaborative Execution

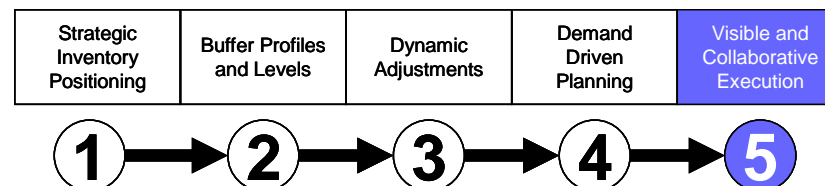
Priority by Buffer Status

Problem: Priority by DUE DATE

Order #	Order Type	Due Date	Customer
MO 12367	Stock	5/12/2011	Internal
MO 12379	MTO	5/12/2011	Super Tech
MO 12465	Stock	5/12/2011	Internal
MO 12401	Stock	5/14/2011	Internal
MO 12411	Stock	5/16/2011	Internal

Order #	Order Type	Due Date	Customer
MO 12367	Stock	Due NOW	Internal
MO 12379	MTO	5/12/2011	Super Tech
MO 12465	Stock	Due NOW	Internal
MO 12401	Stock	Due NOW	Internal
MO 12411	Stock	Due NOW	Internal

Priority 1:	
Priority 2:	
Priority 3:	
Priority 4:	
Priority 5:	



Highly Visible & Collaborative Execution

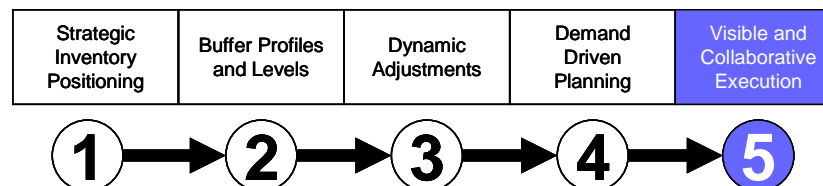
Priority by Buffer Status

Solution: Priority by BUFFER STATUS!

Order #	OH Buffer Status	Order Type	Due Date	Customer
MO 12379		MTO	5/12/2011	Super Tech
MO 12401	12% (RED)	Stock	5/14/2011	Internal
MO 12465	27% (RED)	Stock	5/12/2011	Internal
MO 12367	33% (YELLOW)	Stock	5/12/2011	Internal
MO 12411	41% (YELLOW)	Stock	5/16/2011	Internal

Priority 1:	
Priority 2:	
Priority 3:	
Priority 4:	
Priority 5:	

Order #	OH Buffer Status	Order Type	Due Date	Customer
MO 12379		MTO	5/12/2011	Super Tech
MO 12401	12% (RED)	Stock	Due NOW	Internal
MO 12465	27% (RED)	Stock	Due NOW	Internal
MO 12367	33% (YELLOW)	Stock	Due NOW	Internal
MO 12411	41% (YELLOW)	Stock	Due NOW	Internal



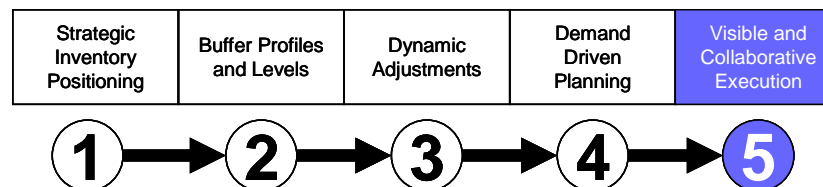
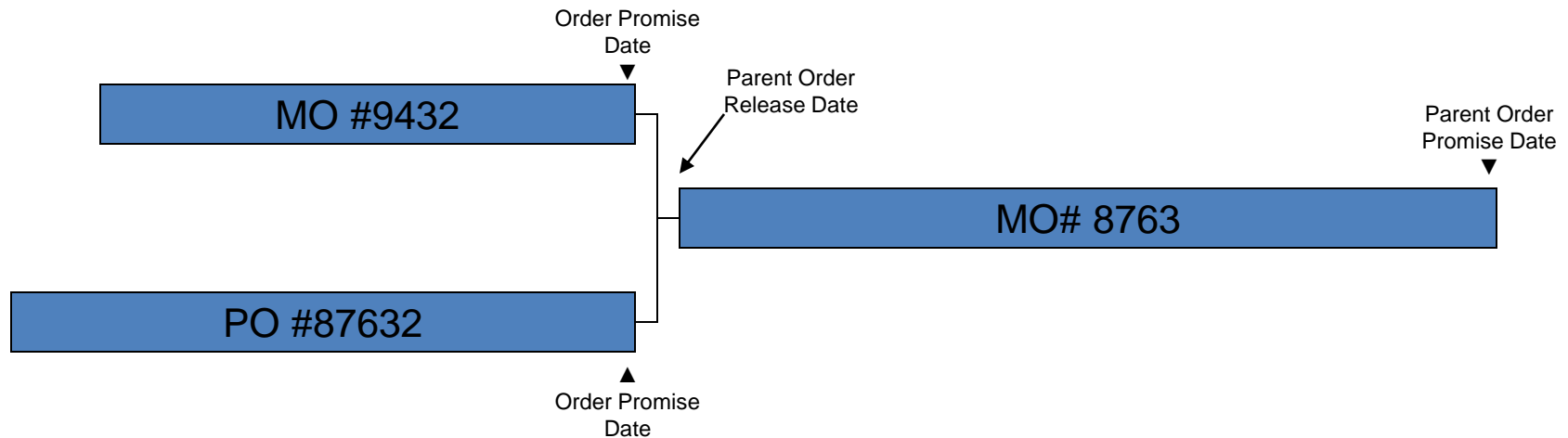
Highly Visible & Collaborative Execution

Material Synchronization Alert

Material Synchronization Alert

Today's Date: 5/20/2011

Demand Order #	Part #	Release Date	QTY	Order Type	Shortage	Supply Order #	Part #	Order Type	QTY	Promise Date
MO 532-32	SAG	5/24/2011	40	Replenished	5	PO 625-71	PPZ	Replenished	30	5/25/2011
MO 531-47	FPS	5/28/2011	60	NB	60	PO 611-54	PPY	NB	60	6/2/2011



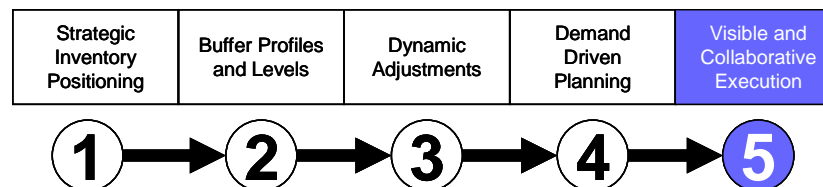
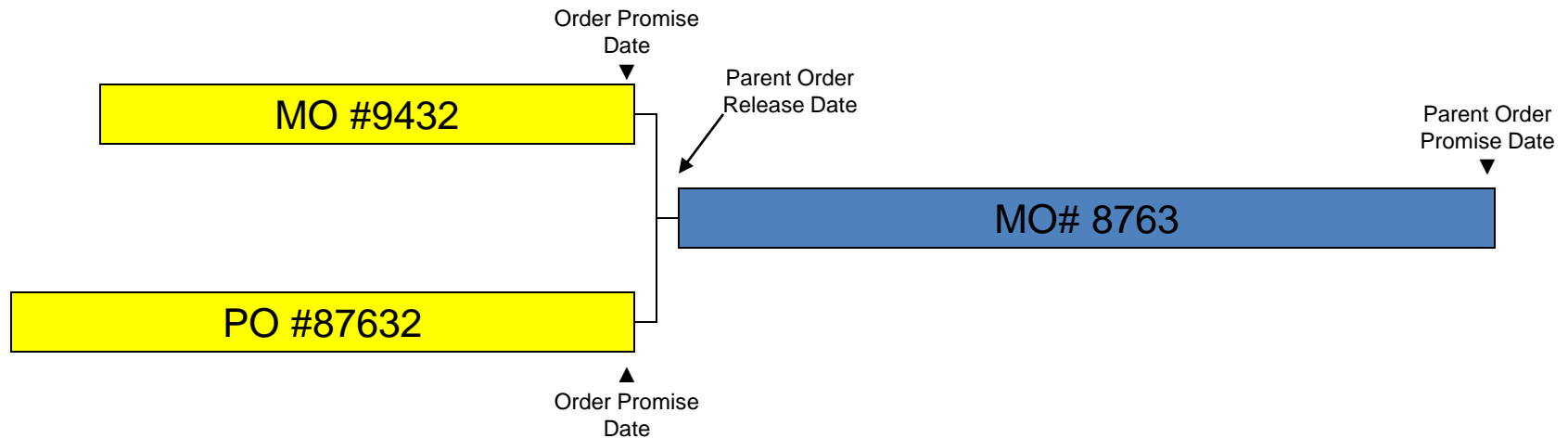
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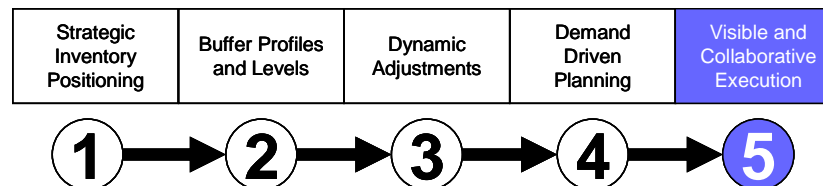
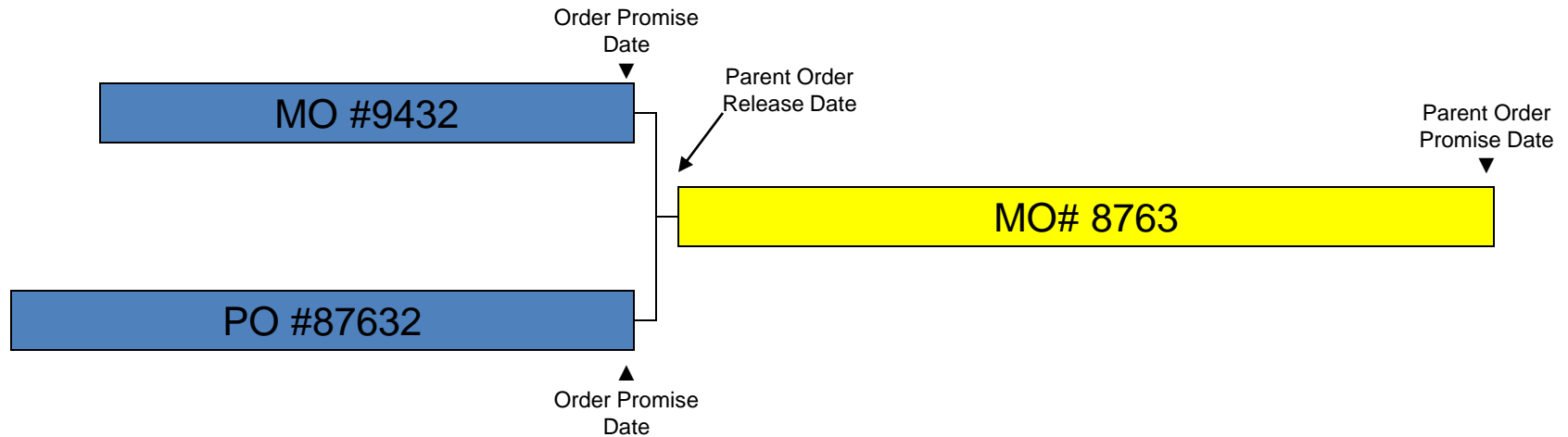
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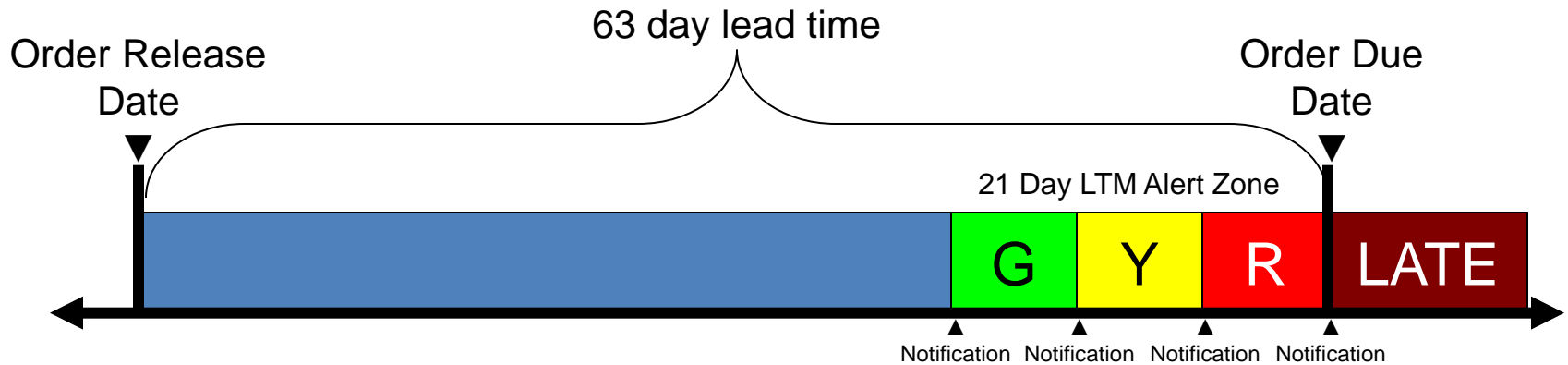
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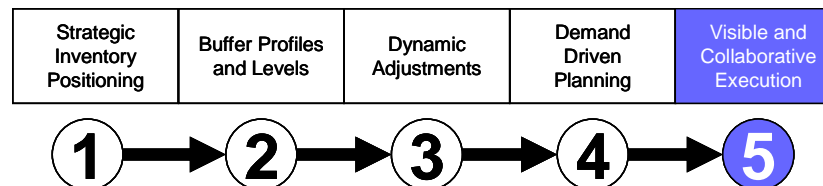
Highly Visible & Collaborative Execution Lead Time Alerts



Lead Time Alerts

Today's Date: 5/20/2011

Status	Order #	Days Left	Part Type	Part #	ASRLT	Request Date	Promise Date
!	PO 4532	LATE	Purchased	PPD	105	5/15/2011	5/19/2011
!	PO 5120	6	Purchased	PPI	63	5/26/2011	5/26/2011
✓	PO 5214	10	Purchased	PPJ	45	5/24/2011	5/30/2011
✓	PO 5290	12	Purchased	PPF	36	6/1/2011	6/1/2011



What Execution Looks Like

Purchased Items

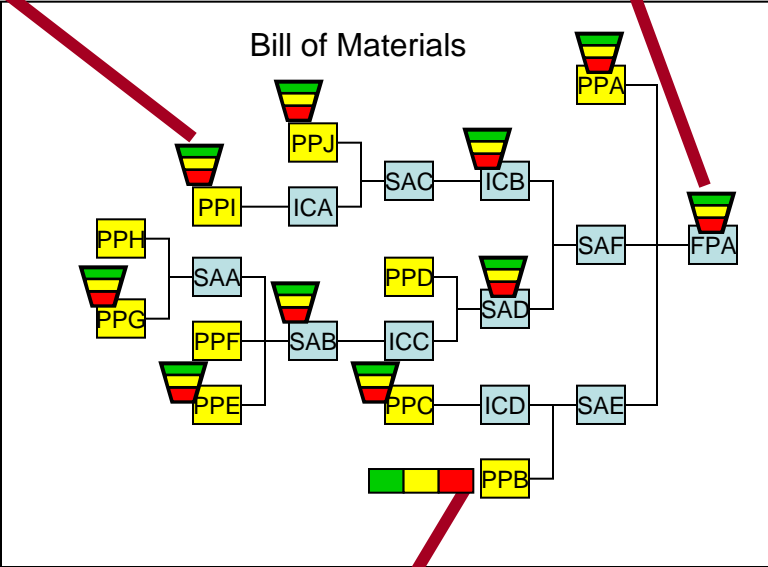
Order #	Due Date	Buffer Status
PO 820-89	05/12/09	Critical 13%
PO 891-84	05/12/09	Med 39%
PO 276-54	05/12/09	Med 41%

Manufactured Items

Order #	Due Date	Item #	Buffer Status
WO 819-87	05/24/09	FPA	Critical 13%
WO 832-41	05/22/09	SAD	Critical 17%
WO 211-72	05/22/09	ICB	Med 34%

Distributed Items

Item #	Location	Buffer Status
FPA	Region 1	Critical 11%
FPA	Region 2	Med 41%
FPA	Region 3	Med 36%



Supplier 1



Supplier 2



Supplier 3



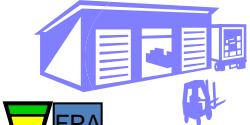
Purchased Parts List

- PPG
- PPB
- PPD
- PPA
- PPI
- PPC
- PPJ
- PPF
- PPH

Region 1



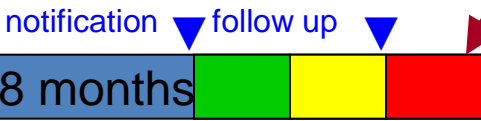
Region 2



Region 3



Lead Time Managed Parts



The Five Components of DDMRP

Demand Driven Material Requirements Planning

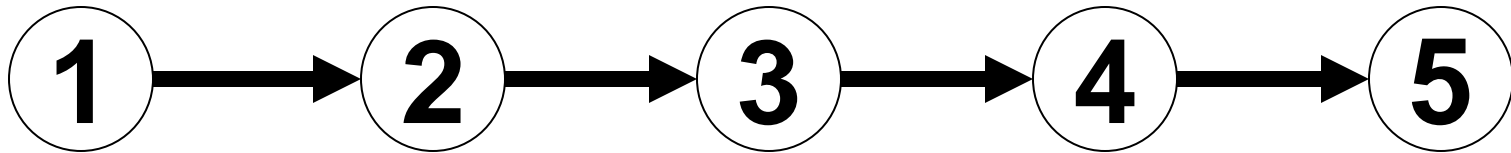
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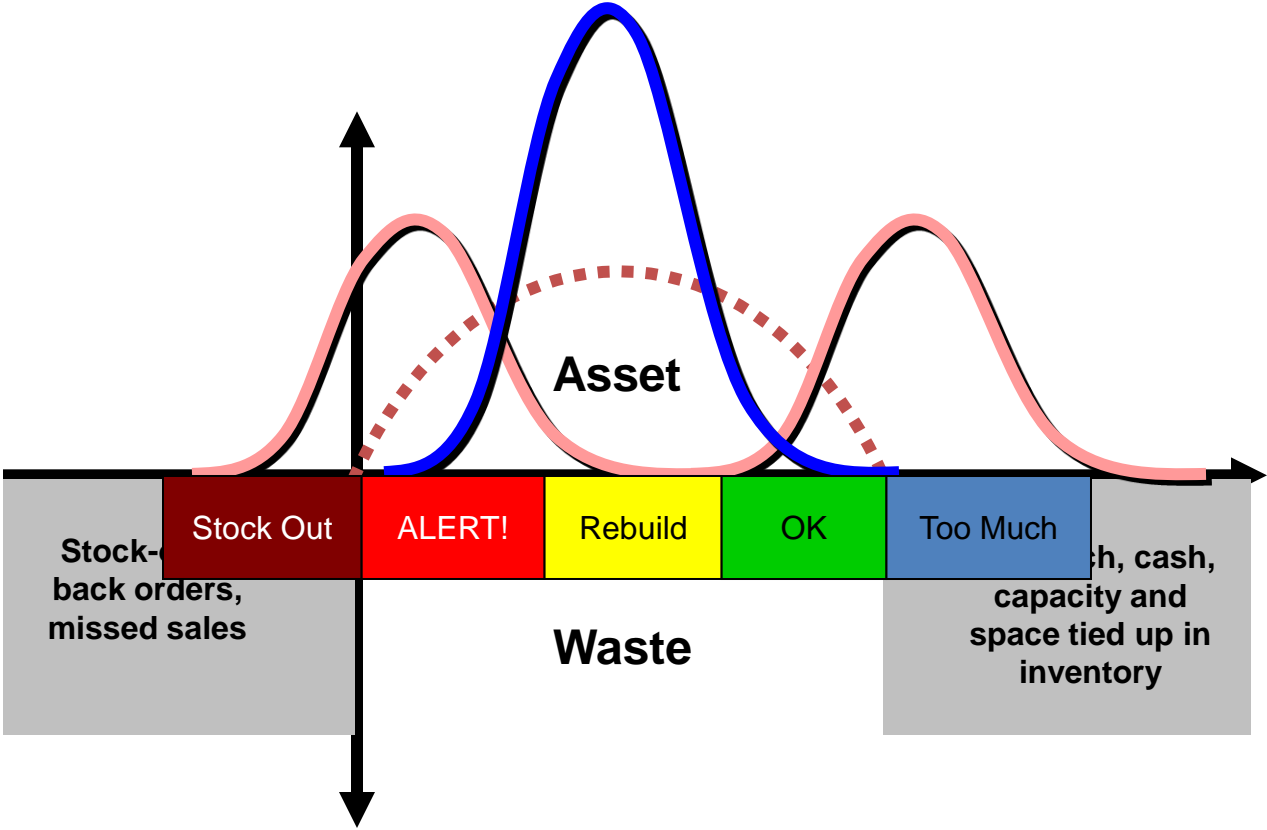


Modeling/Re-modeling the Environment

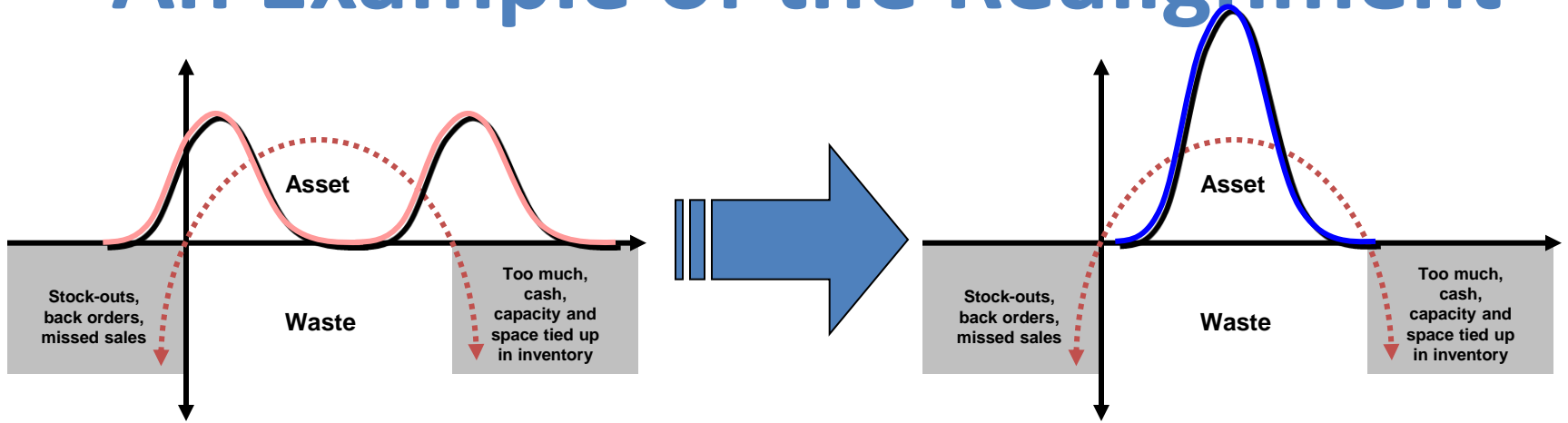
Plan

Execute

The Power of DDMRP

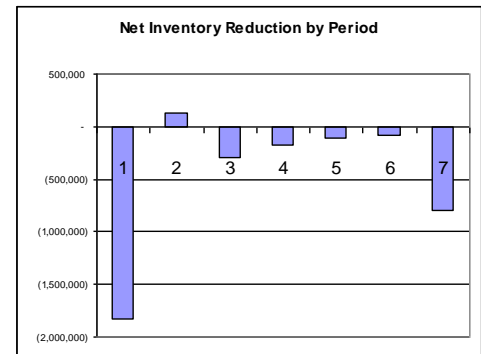
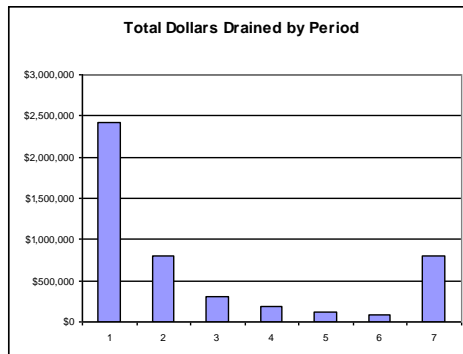
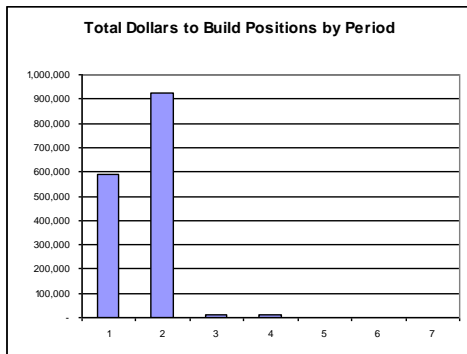


An Example of the Realignment



Projected Inventory Reductions Over 1 Year

	Mo 1	Mo 2	Mo 3	Mo 4	Mo 5	Mo 6	Mo 7-12	Totals
Inventory Beginning of Period	\$ 9,564,443	7,738,294	7,869,529	7,569,990	7,392,764	7,278,870	7,194,836	\$ 9,564,443
Projected Inventory Reductions (consumption)	(2,415,391)	(796,305)	\$ (313,565)	\$ (187,875)	\$ (113,894)	\$ (84,033)	\$ (794,430)	\$ (4,705,494)
Projected Inventory Increases - (purchases)	\$ 589,242	\$ 927,540	\$ 14,025	\$ 10,649	\$ -	\$ -	\$ -	\$ 1,541,456
Net Inventory Reduction by Period	\$ (1,826,149)	\$ 131,235	\$ (299,540)	\$ (177,226)	\$ (113,894)	\$ (84,033)	\$ (794,430)	\$ (3,164,038)
Inventory End of Month	\$ 7,738,294	\$ 7,869,529	\$ 7,569,990	\$ 7,392,764	\$ 7,278,870	\$ 7,194,836	\$ 6,400,406	\$ 6,400,406
% Cumulative Inventory Reduction	19.1%	17.7%	20.9%	22.7%	23.9%	24.8%	33.1%	33.1%



Is DDMRP really different?

	DDMRP	ERP/MRP	Kanban/Super	Spreadsheets
5 Zone Buffers	YES	RARELY	NO	RARELY
Dynamically Adjusted Buffers	YES	SOME	SOME	SOME
Planned Adjustments to Buffers	YES	YES, but ¹	NO	RARELY
Relative Priority Based on Buffer Status	YES	NO	NO	RARELY
Globally Managed Buffer Profiles	YES	NO	NO	NO
Decoupled BoM Explosion	YES	YES, but ³	YES, but ²	NO
ASR Lead Time Calculation	YES	NO	NO	NO
Qualified Order Spike Horizon and Threshold	YES	RARELY	NO	RARELY
Material Synchronization Alert	YES	YES, but ⁴	NO	NO
Multi-Location Buffer Status Visibility	YES	SOME	SOME	RARELY
Lead Time Managed Parts	YES	NO	NO	NO
Matrix BoM + ASR Lead Time Analytics	YES	NO	NO	NO
Simple and Visible	YES	RARELY	YES	YES, but ⁵

YES, but¹ (Planned positions are often forecast driven and, thus, not integrated into a demand driven framework)

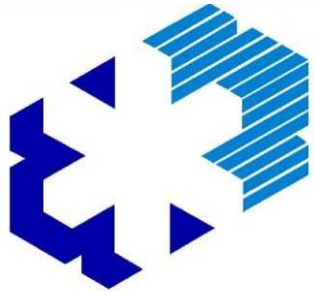
YES, but² (Kanbans have no recognition of the BoM, they simply treat every connection as independent and factor only on-hand and on-order stock positions)

YES, but³ (While almost every MRP system has the ability to do what is called “two level master scheduling,” it requires someone with extensive MRP background and is a very advanced technique. We have never seen it successfully implemented)

YES, but⁴ (Shortage lists are typically limited to current and past shortages not future potential misalignments)

YES, but⁵ (Most homegrown systems are simple and visible ONLY to the person who uses the tool)

Early Adopter Results



**OREGON
FREEZE
DRY**



Mountain House Division:

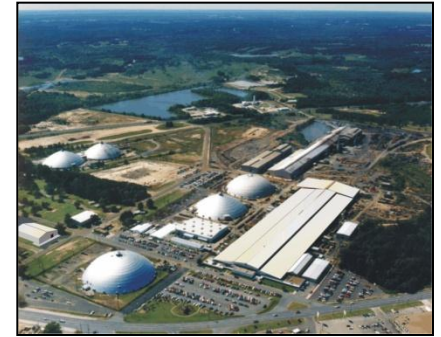
- Sales increased 20%
- Customer Fill Rate improved from 79% to 99.6%
- **60% reduction in inventory**

Industrial Ingredient Division:

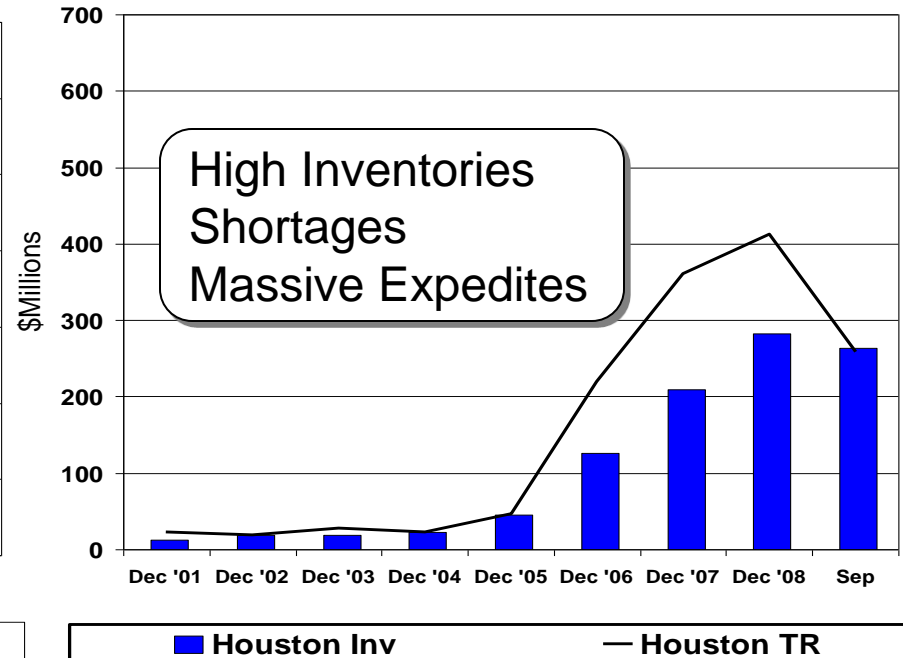
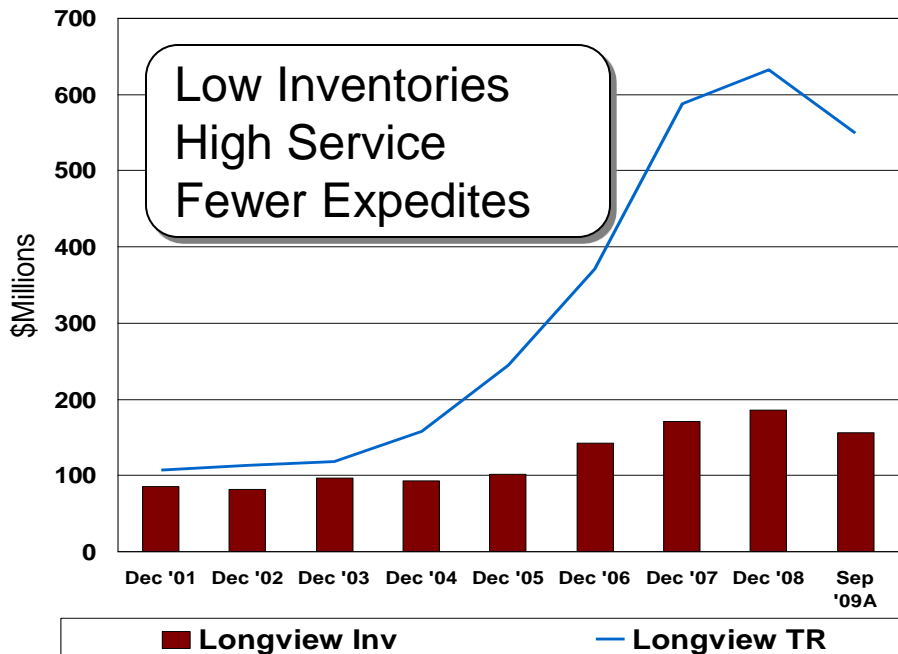
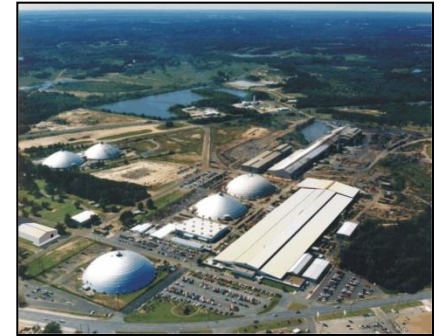
- 60% reduction in make to order lead time
- 100% On-Time-Delivery
- 20% reduction in inventory

Raw Material
No out of stock
Reduced inventory \$2.5M+

Early Adopter Results



Early Adopter Results



What Would “Papa Joe” Say about DDMRP?

*“Traditional inventory management approaches, in pre-computer days, could obviously not go beyond the limits imposed by the information processing tools available at the time. Because of this almost all of those approaches and techniques suffered from imperfection. They simply represented the best that could be done under the circumstances. **They acted as a crutch and incorporated summary, shortcut and approximation methods, often based on tenuous or quite unrealistic assumptions, sometimes force-fitting concepts to reality so as to permit the use of a technique.***

*The breakthrough, in this area, lies in the simple fact that once a computer becomes available, the use of such methods and systems is no longer obligatory. It becomes feasible to sort out, revise, or discard previously used techniques and to institute new ones that heretofore it would have been impractical or impossible to implement. It is now a matter of record that among manufacturing companies that pioneered inventory management computer applications in the 1960s, **the most significant results were achieved not by those who chose to improve, refine, and speed up existing procedures, but by those who undertook a fundamental overhaul of their systems.**”*

35 Years Later Industry Finds Itself in Another Time of Transition and Re-Examination





Achieving Sustainable Productivity

meeting customer demand in an unpredictable world



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