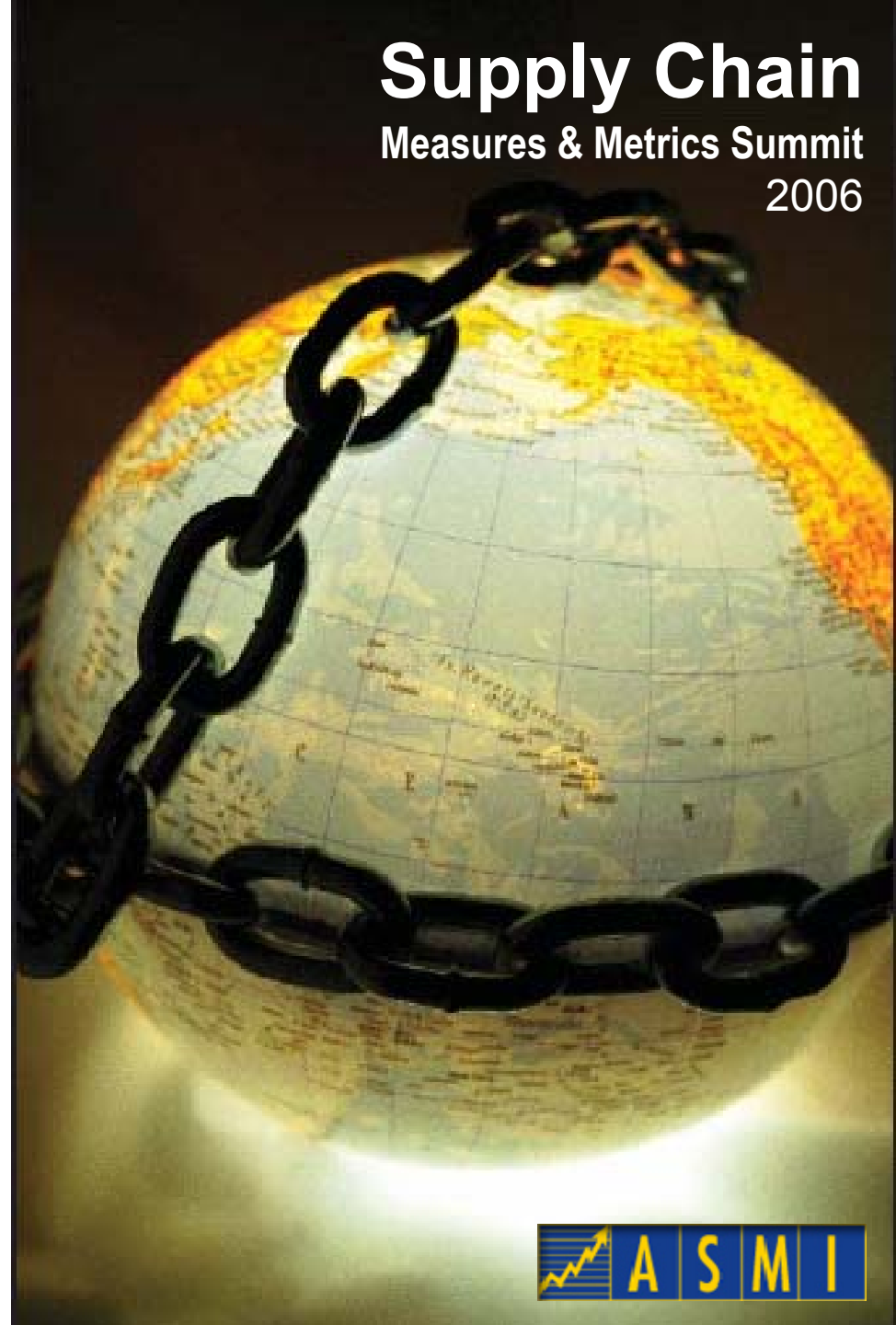


**Leveraging
Measures to
Improve
Demand Planning
and Forecasting**

Monday, July 24th, 2006





AGENDA

Leveraging Measures to Improve Demand Planning and Forecasting

WHY should I measure?

WHAT should I measure?

HOW do I implement measures?

What do I do with the results?

Why Measure?

Executives are making performance management a priority!!

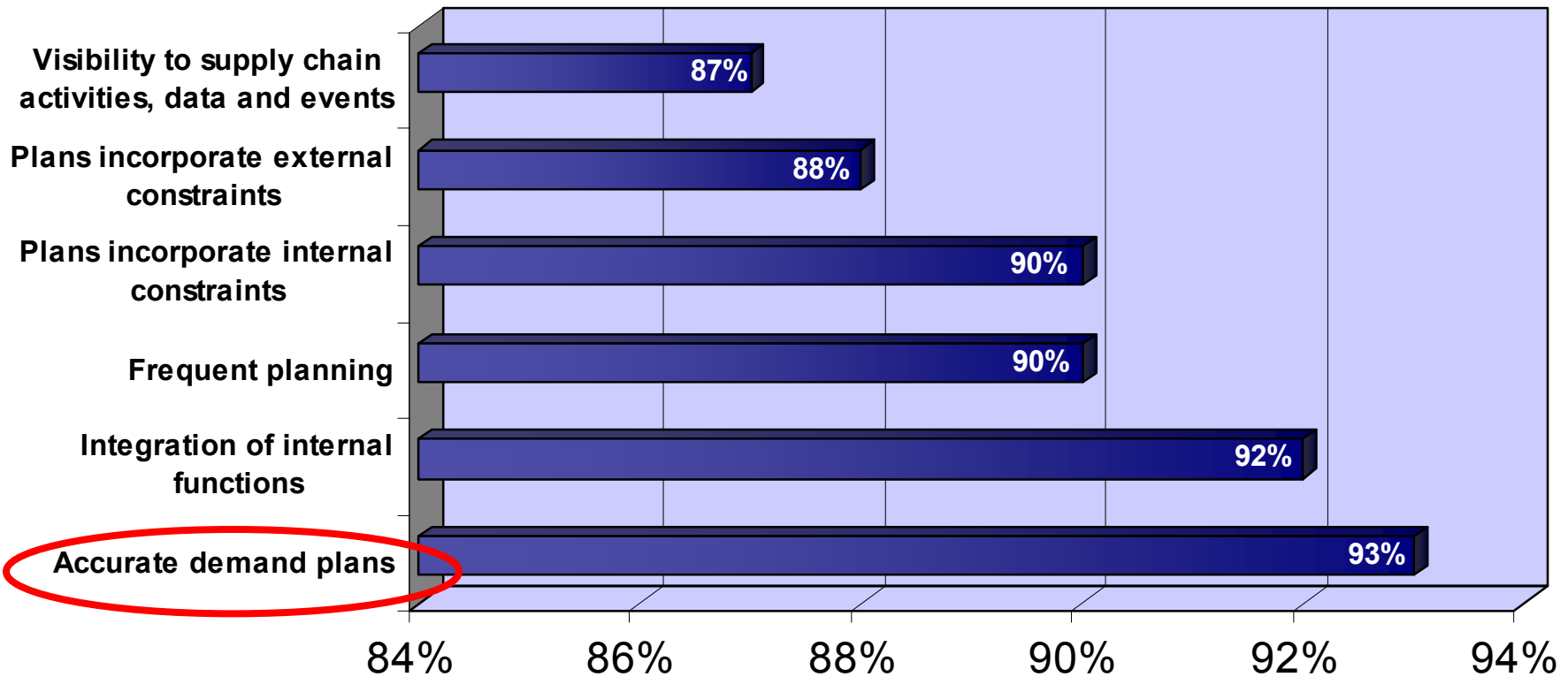
Supply Chain Professionals Top 10 Best Practice Interests

	Average Score
Implementing Performance Measures	4.20
Enabling Collaborative Relationships	3.89
Advances in Supply Chain Visibility	3.87
Best Practices in Training/Education Tools	3.66
Influencing the Boardroom to Grow the Bottom Line	3.64
Managing the Global Supply Chain	3.62
Methodologies for Better Decision Making	3.33
Moving Good through Customs Quickly	3.33
Integrating Logistics Software to ERP	3.26
RFID Technology	3.25

Source: 2003 ARC Advisory Group Survey

Company Priorities in Supply Chain Execution

- What in-house processes determine supply chain success?



Source: Aberdeen Group
Manufacturing Business Technology, June 2006

Why Doesn't Everybody Measure?

- It's hard work
- Uncertain strategic value / fuzziness over strategic priorities
- Too many things are measured, and little or nothing is done to make improvements
- Reluctance to provide information
- Lack of communication between functional areas within a company, and between trading partners



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Process Measures vs. Results Measures

- Results Measures
 - Usually functionally oriented
 - Usually focused on one aspect of a process
 - Measures components of a process – but not the whole process
 - If left unchecked, drive suboptimization
- Process Measures
 - Are usually company-wide or customer focused
 - Are cross functional in nature (and sometimes cross company)
 - Measure the “total effect” of a process
 - Drive overall optimization of costs and customer satisfaction

Supply Chain Measures in Context

Companies should strive for "balanced" measures that are more process and strategic in nature

	Results Measures	Process Measures	Strategic Measures
Reliability	<ul style="list-style-type: none"> ● Fill rates by customer, commodity ● Available for customer pickup per request ● Errors by line item, activity, reason code, etc. ● Cycle count accuracy 	<ul style="list-style-type: none"> ● On-time delivery to commit, request ● Order cycle time variability ● Order processing accuracy ● Forecasting accuracy ● Planning accuracy ● Stockouts against forecast ● Manufacturing schedule adherence 	<ul style="list-style-type: none"> ● Perfect order fulfillment (right item, right qty, right place, right time, defect free, correct documentation) ● Overall customer satisfaction
Flexibility & Responsiveness	<ul style="list-style-type: none"> ● Order fulfillment lead time by customer, commodity ● Fill rates by customer, commodity ● % Expedite requests fulfilled by customer ● Capacity load & utilization 	<ul style="list-style-type: none"> ● Backlog & back orders ● Aggregate cycle times by activity ● Order cycle time ● Lead time from order receipt to manufacturer complete 	<ul style="list-style-type: none"> ● Forecasting/planning cycle time ● % Expedite requests fulfilled ● Order fulfillment lead time ● Upside production flexibility
Cost	<ul style="list-style-type: none"> ● Costs per line, per order, per activity, per shift, etc ● Load factors, lines per order, qty per line, etc. ● Freight costs per pound by mode and destination 	<ul style="list-style-type: none"> ● Logistics costs (order mgmt + distribution + freight) as a percentage of sales ● Freight costs as a percentage of sales to customer ● Distribution costs as a percentage of sales ● Inventory shrink and obsolescence as a percent of sales ● Labor productivity analysis ● Over, short, damage as % of sales ● Returns as a percentage of sales 	<ul style="list-style-type: none"> ● Total supply chain management cost as a percentage of sales ● Total delivered cost
Asset Utilization	<ul style="list-style-type: none"> ● Inventory turnover ● Days of inventory ● Return on investment ● Return on assets 	<ul style="list-style-type: none"> ● Days of inventory in entire supply chain by activity ● Total safety stocks as % of total inventory ● Safety (hedge) stocks by customer ● Dedicated inventories by customer ● Local support inventories 	<ul style="list-style-type: none"> ● Cash-to-cash cycle time ● Net asset turnover, return on net assets

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Example PLAN Measures

- Forecast availability
 - Provide a rolling 12-18 month forecast, updated monthly, by SKU / SKU family
- Forecast accuracy
 - Strive to achieve XX% forecast accuracy overall, with a long term goal of 80% (Best in Class for many industries)
- Inventory Days of Supply (DOS)
 - Calculate DOS to measure planning success

Measure	Definition	Formula
Forecast Accuracy	Forecast error, by SKU, expressed as absolute difference between actual and forecast divided by actual. Time period is in monthly buckets calculated on a 2 month lag (March actual against January forecast for March).	$\left(\frac{ \text{Actual} - \text{Forecast} }{\text{Actual}} \right) \times 100$
Inventory DOS	By product family, calculated monthly, total inventory on-hand, and total inventory on-hand plus in-transit.	$\frac{\text{Inventory \$}}{\text{Next Month Forecast \$}} \times 30$

Achieving Forecast Accuracy

- Understand the data
 - Scrub the historical demand (one version of the truth)
 - Understand the historical drivers (promotions, introductions, phase-outs, etc.)
 - Factor in future drivers
 - Identify like products for new introductions
- Best results are usually achieved in collaboration with the customer
 - Can be done directly – CPFR or similar
 - Can be done through Sales
- Incorporate forecast accuracy measures into incentives
 - Price and/or service for customers
 - Variable compensation for Sales
- Look for value to customer
 - Example, sometimes customers do not have good visibility to their consumption history, and providing this history increases your value

Example SOURCE Measures

- Supplier measures should assure timely source of goods and/or materials to support operations planning

Measure	Definition (example only – varies by needs)	Formula
Ship Complete and On-time	<p>If order shipped 7 days early to on-time & complete, score = 1</p> <p>If order shipped late, even though complete, score = 0</p> <p>If order shipped short, but on-time, score = % complete</p> <p>If order over shipped, but on-time, score = 1 - % overshipped</p> <p>If order shipped more than 7 days early, score = 0</p>	$X = \text{Score}$ $\frac{\sum_n^1 (x_1 + x_2 + x_3 + \dots x_n)}{n}$
Order Response Time	By Supplier, total days elapsed between Order Request and confirmed PO	$X = \text{PO Date} - \text{Request Date} $ $\frac{\sum_n^1 (x_1 + x_2 + x_3 + \dots x_n)}{n}$
Available Capacity	Ability to accept orders within limits of agreed capacity	$\frac{\text{Orders Placed} - \text{Orders Not Accepted}}{\text{Orders Placed}}$

Example MAKE Measures

- Operations measures should be designed to assure that assumptions made in the planning process are validated and/or updated on a regular basis

Measure	Definition (example only – varies by needs)	Formula
Ship Complete and On-time	<p>If order shipped 7 days early to on-time & complete, score = 1</p> <p>If order shipped late, even though complete, score = 0</p> <p>If order shipped short, but on-time, score = % complete</p> <p>If order over shipped, but on-time, score = 1 - % overshipped</p> <p>If order shipped more than 7 days early, score = 0</p>	$X = \text{Score}$ $\frac{\sum_n^i (x_1 + x_2 + x_3 + \dots x_n)}{n}$
Manufacturing Lead Time	By SKU, total days elapsed from confirmed PO to Actual ETD	$X = \text{ETD} - \text{PO Date} $ $\frac{\sum_n^i (x_1 + x_2 + x_3 + \dots x_n)}{n}$
Manufacturing Lead Time Variance	By SKU – actual deviation from standard lead time, measured in days	$X = \text{Actual} - \text{Standard} $ $\frac{\sum_n^i (x_1 + x_2 + x_3 + \dots x_n)}{n}$



AGENDA

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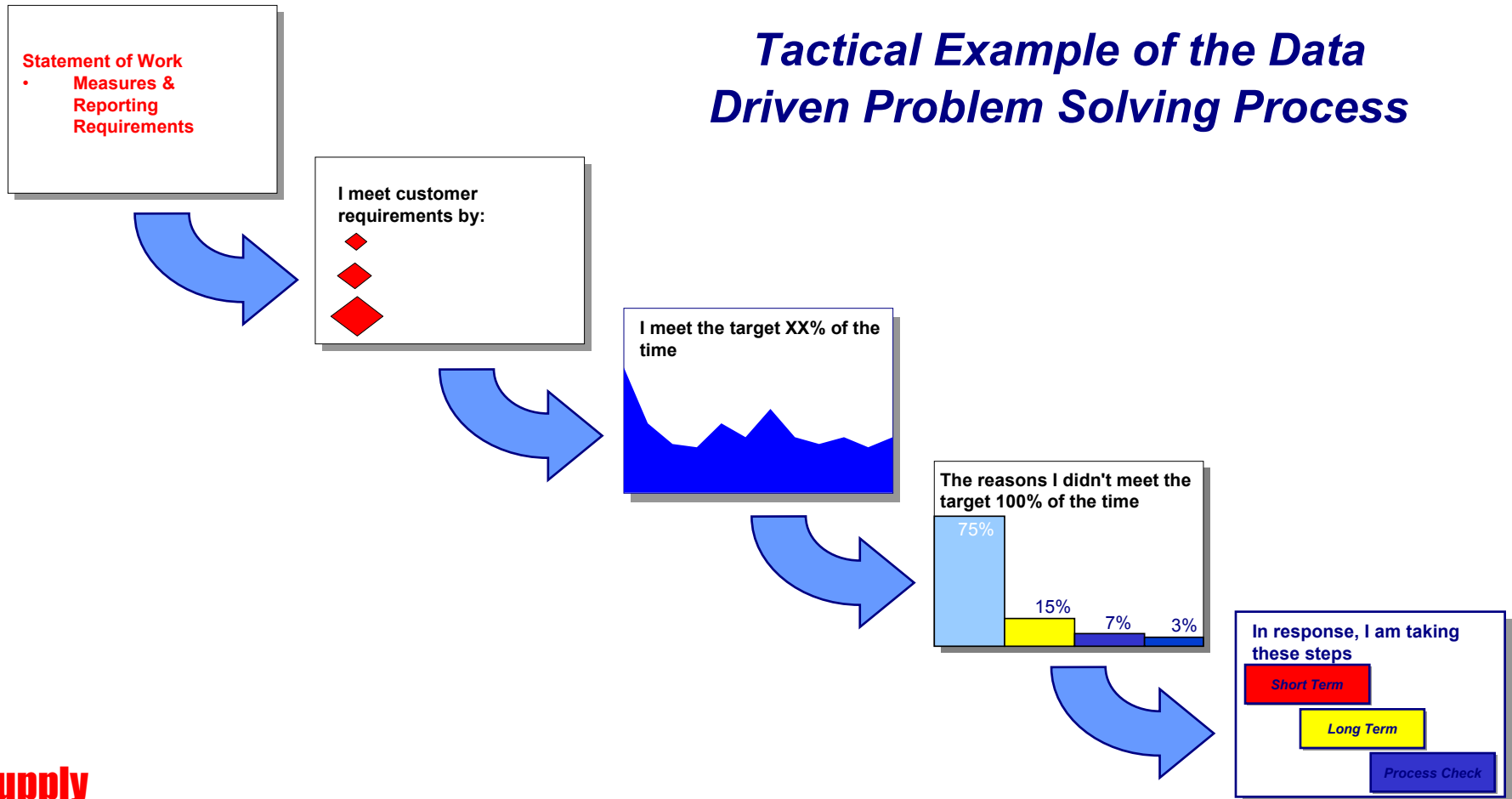
What is Validating the Value Add?

V.V.A. is

- Establishing department metrics that *support the overall corporate objectives*
- Linking *accountability* to achieve goals to *where the work gets done*
- Creating an environment where employees *use their metrics* to drive positive change in the business

How Do You Prove You Add Value?

Tactical Example of the Data Driven Problem Solving Process





Implementation – Select the Measures

- Determine which 3-4 metrics are critical to your success of your functional team
- Create value add statements that are substantially under your team or area's control and contain measurable performance goals

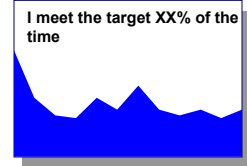
VVA (Validate the Value Add) Statements

Our team adds value by maintaining **99.21%** or better **accuracy** on material procurement

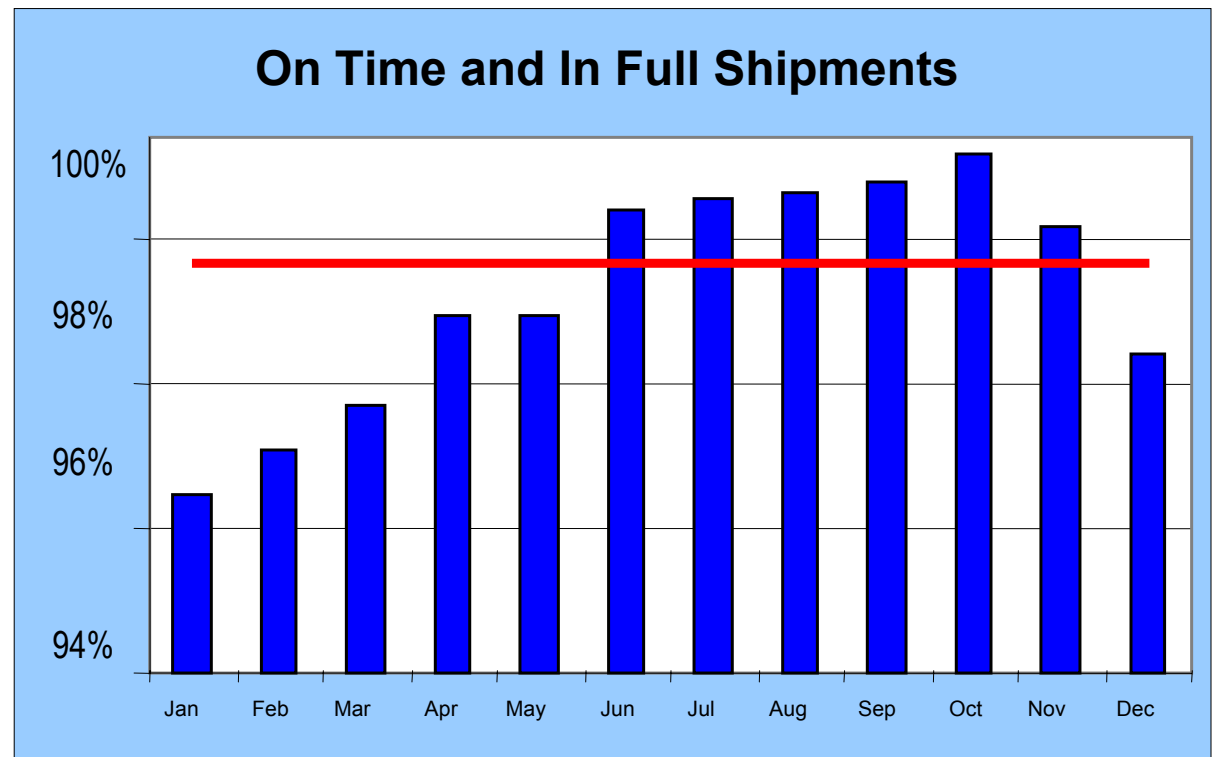
Our team adds value by ensuring that our supplier **quality** is at or above **99.67%**

Our team adds value by maintaining **98.36%** or better **on-time and in-full** shipments

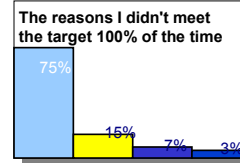
Begin Measuring



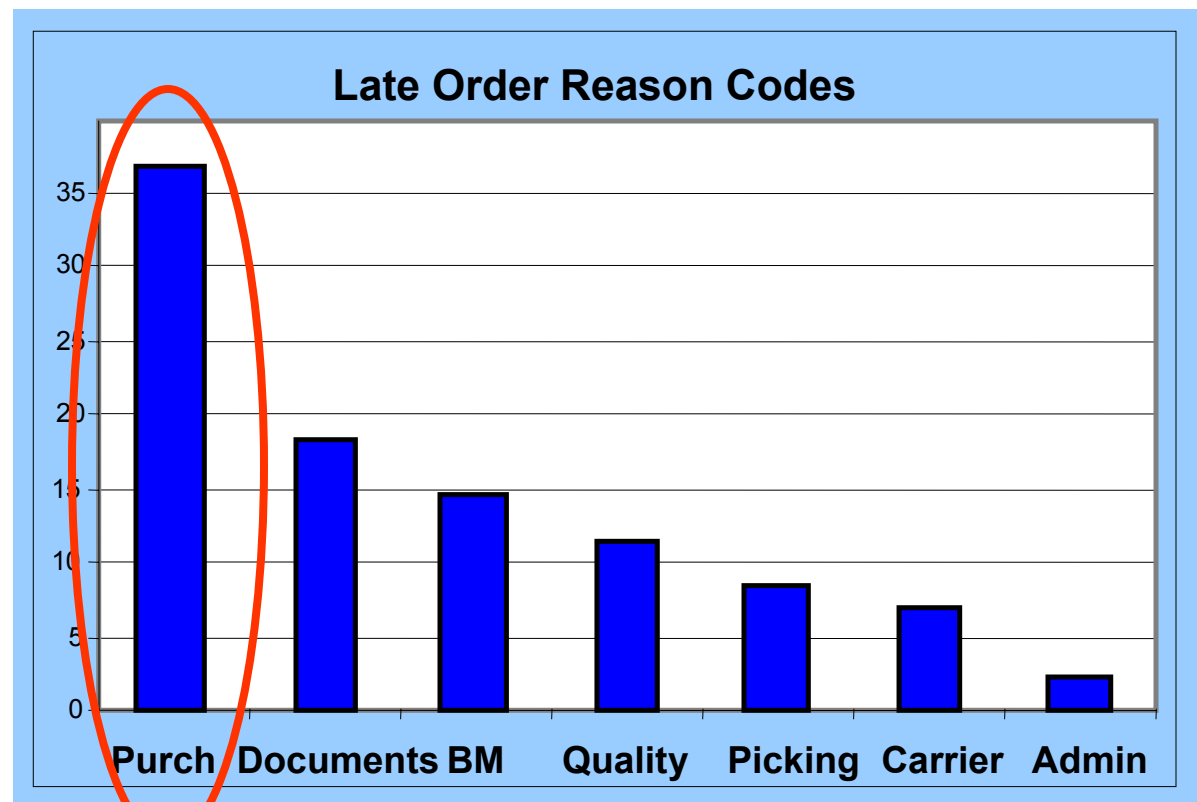
- Summarize data so that results are obvious
- Make it easy to see if goals are being met
- Include historical data to track trends

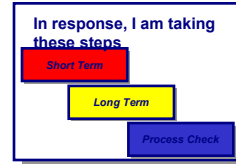


Understand *Why* You Are Not Meeting Your Goals



- A Pareto chart shows where to focus your efforts
- Often, your failures are caused by another group! This data helps point you in the right direction
- Ask "Why" 5 times, if necessary





Take Action

- Taking action will help drive change to improve your performance
- Sharing your VVA data helps mitigate emotions and finger pointing
- Explore all actions to solve the problem

We are working with Purchasing to:

- 1) Determine which suppliers have slipped
- 2) Actively issue Corrective Actions for suppliers with late shipments
- 3) Ensure all supplier Statement of Works/Contracts have receiving goals outlined

In Practice

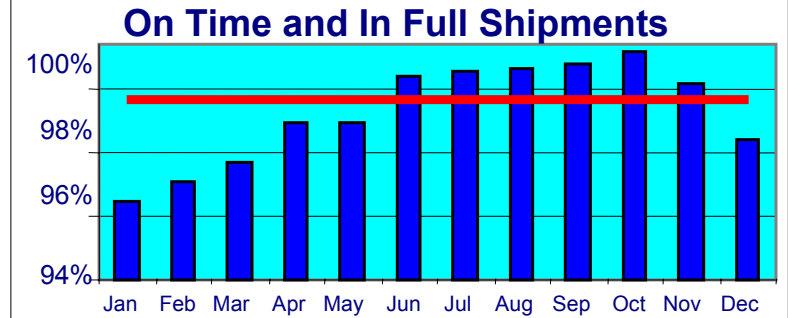
The VVA method creates a culture for employees to turn data into information and take action to drive improvement

VVA Metric

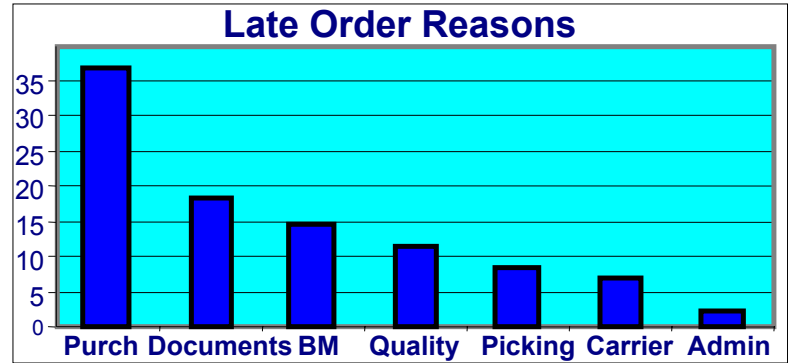


Our team adds value by maintaining 98.36% or better on-time delivery.

Results



Root Cause



Action



We are working with Purchasing to:

- 1) Determine which suppliers have slipped
- 2) Actively issue Corrective Actions late supplier shipments
- 3) Ensure all supplier Statements of Work/Contracts have receiving goals outlined

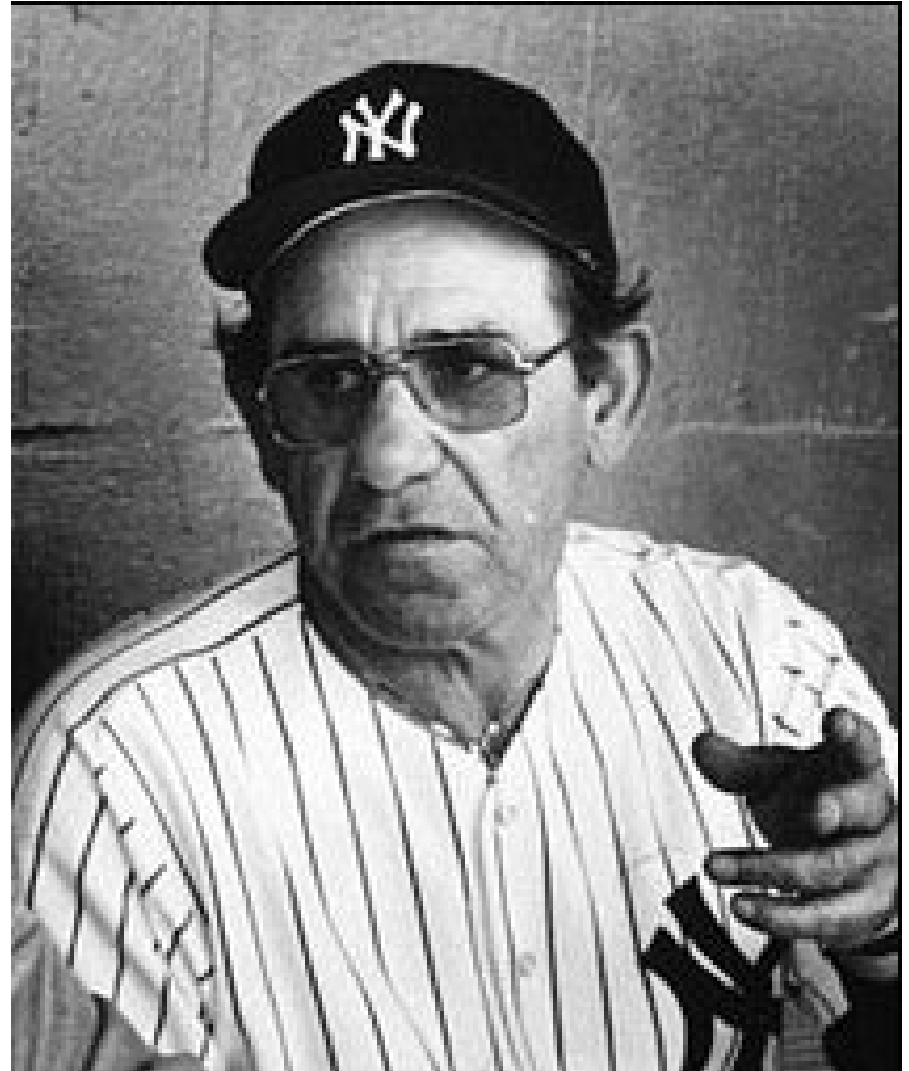
What Is The Goal?

- Improved Demand Planning is not a goal – it's a means to an end!
- What is the goal?
 - Reduced inventory
 - Improved service level
 - Customer satisfaction / customer leverage
- What are the trade-offs?
- What is the cost of each?
- What is your plan?

Begin With the End in Mind!

You got to be very careful if you don't know where you're going, because you might not get there.

- Yogi Berra



Show Me The Money!

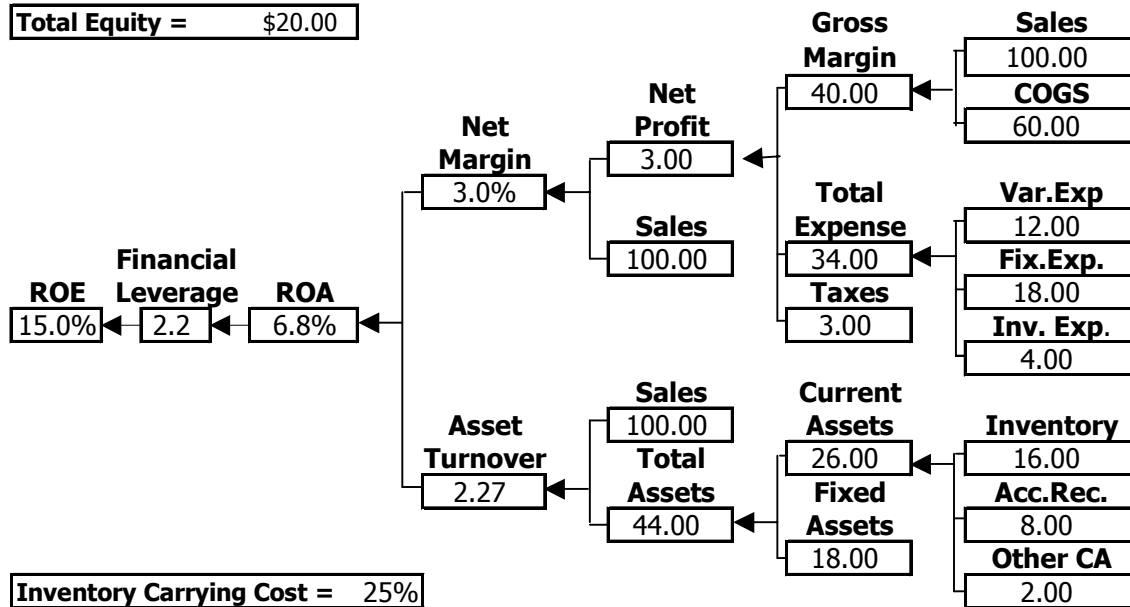
		Production Lead Time →		
Forecast Error	Quantity	100	Quantity	100
	Reorder Time Fence	30	Reorder Time Fence	30
	Review Time	1	Review Time	1
	Order Quantity	5	Order Quantity	5
	Acquisition Time	8 wk	Acquisition Time	4 wk
	Acquisition Error	1	Acquisition Error	1
	Transit Time	4	Transit Time	4
	Transit Error	1	Transit Error	1
	Forecast Error	50%	Forecast Error	50%
	Service Level	97%	Service Level	97%
	Safety Stock - WOS	7.38	Safety Stock - WOS	5.99
	Quantity	100	Quantity	100
Reorder Time Fence	30	Reorder Time Fence	30	
Review Time	1	Review Time	1	
Order Quantity	5	Order Quantity	5	
Acquisition Time	8 wk	Acquisition Time	4 wk	
Acquisition Error	1	Acquisition Error	1	
Transit Time	4	Transit Time	4	
Transit Error	1	Transit Error	1	
Forecast Error	30%	Forecast Error	30%	
Service Level	97%	Service Level	97%	
Safety Stock - WOS	4.21	Safety Stock - WOS	3.49	

At this example company, one week of inventory was worth \$8.8M, which would save ~\$600,000 annually in interest alone

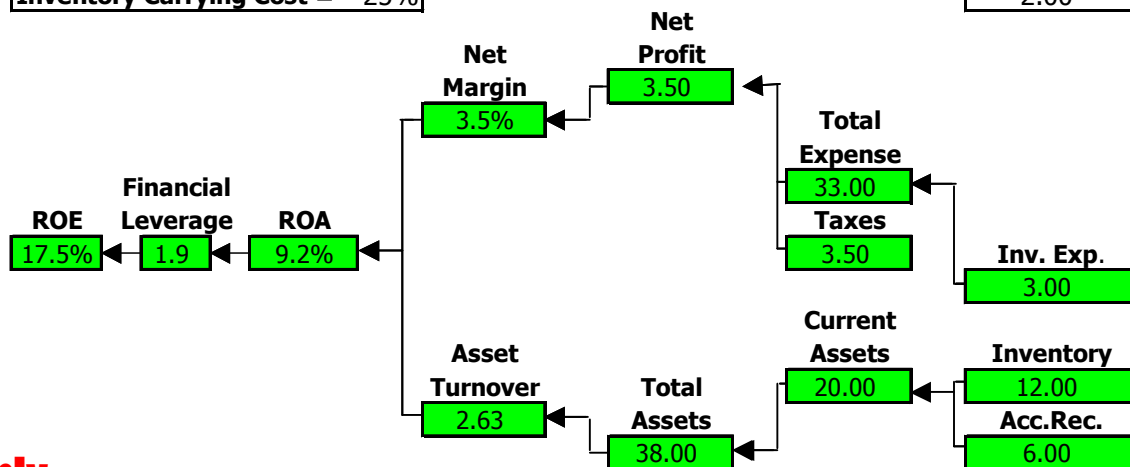
Link Measures to Business Performance

The DuPont Model

Total Equity = \$20.00



Inventory Carrying Cost = 25%



Show Me The Money!

- In the example at left, a 25% reduction in inventory, coupled with a 25% reduction in A/R, yields a 35% increase in ROA.
- What are the key financial measures in your business, and what are the key drivers of the values of those measures?

Best Practices

Forecasting Methodology

Suggested Minimum Process Standard	Typical Best Practice Process
<ul style="list-style-type: none">● Simple processes are used to modify historic demand● Market intelligence is updated based on monthly reports from field personnel, customers, and suppliers● Appropriate methods are used to develop forecasts at the lowest level product or component/ingredient● All data sources are evaluated for accuracy	<ul style="list-style-type: none">● The forecasting calendar is defined and adherence is rigorous● Appropriate evaluation and use of methods and algorithms specific to market, product, customer cycles, etc.● Statistical analysis is combined with market intelligence to forecast trends● Capabilities exist to run simulations based on all appropriate techniques (e.g., moving average, exponential smoothing, time series, regression, etc.)● Market intelligence is constantly updated through collaboration with field personnel, customers, and suppliers● Collaborative processes (internal and external) are used to refine forecasts at the SKU and component level

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Best Practices

Demand Forecasting

Suggested Minimum Process Standard	Typical Best Practice Process
<ul style="list-style-type: none">● Specific responsibility is assigned for management of the forecasting process● Robust market intelligence (rather than simply shipment data) is used to develop a long-term operational forecast● Market intelligence is processed, analyzed, and disseminated on a timely basis● Planned changes in products, services, pricing plans, and promotions are considered in the forecast● Collaborative Planning, Forecasting, and Replenishment (CPFR) techniques are used where appropriate● Performance against forecast is measured (accuracy, skew, and stability)● Short-term portion of forecast is reviewed at least weekly	<ul style="list-style-type: none">● A formal, structured process exists to collect market intelligence from multiple sources● Methodologies used for consensus planning and to reconcile conflicts between sources, as well as measure the accuracy of each input's forecast● Forecasting process is given high priority in the business with the goal of achieving operational competitiveness● Majority of forecasted sales volume has been forecasted with specific customers● Rapid decision-making cycles (daily or shorter) based on forecast variance, order changes, market intelligence, etc.● Planning fences are used to minimize "noise" injected into adjacent supply chain processes● Whole business works toward, and is accountable for a single forecast method● Real-time exchange of data between supply chain members

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Best Practices

Demand Management

Suggested Minimum Process Standard	Typical Best Practice Process
<ul style="list-style-type: none">● Proactive demand management balances high customer services and high manufacturing efficiencies and minimizes inventory costs● Flexible manufacturing allows fast ramp up/down to meet spikes in demand● Demand plans are shared with suppliers on an agreed upon schedule or when upside or downside flex agreement is violated	<ul style="list-style-type: none">● Controllable drivers of demand volatility eliminated through demand shaping● Collaboration with channels and customers on markdowns and other techniques to move nonperforming products● Products are classified and managed in tiers according to volume and variability● Actual demand drives manufacturing and postpones assembly where possible (build/assemble to order)● Suppliers have online visibility of demand for their components, inventory levels of their components, and current factory backlog of their components

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AGENDA

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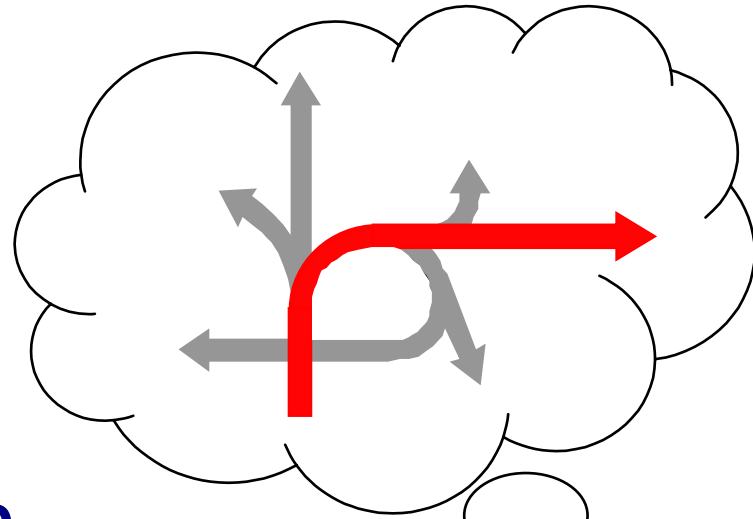
WHY should I measure?

WHAT should I measure?

HOW do I implement measures?

What do I do with the results?

How do I
take this "data"
and turn it into an
actionable plan?



Forecast Accuracy

“There are two kinds of forecasts... Lucky & Lousy”

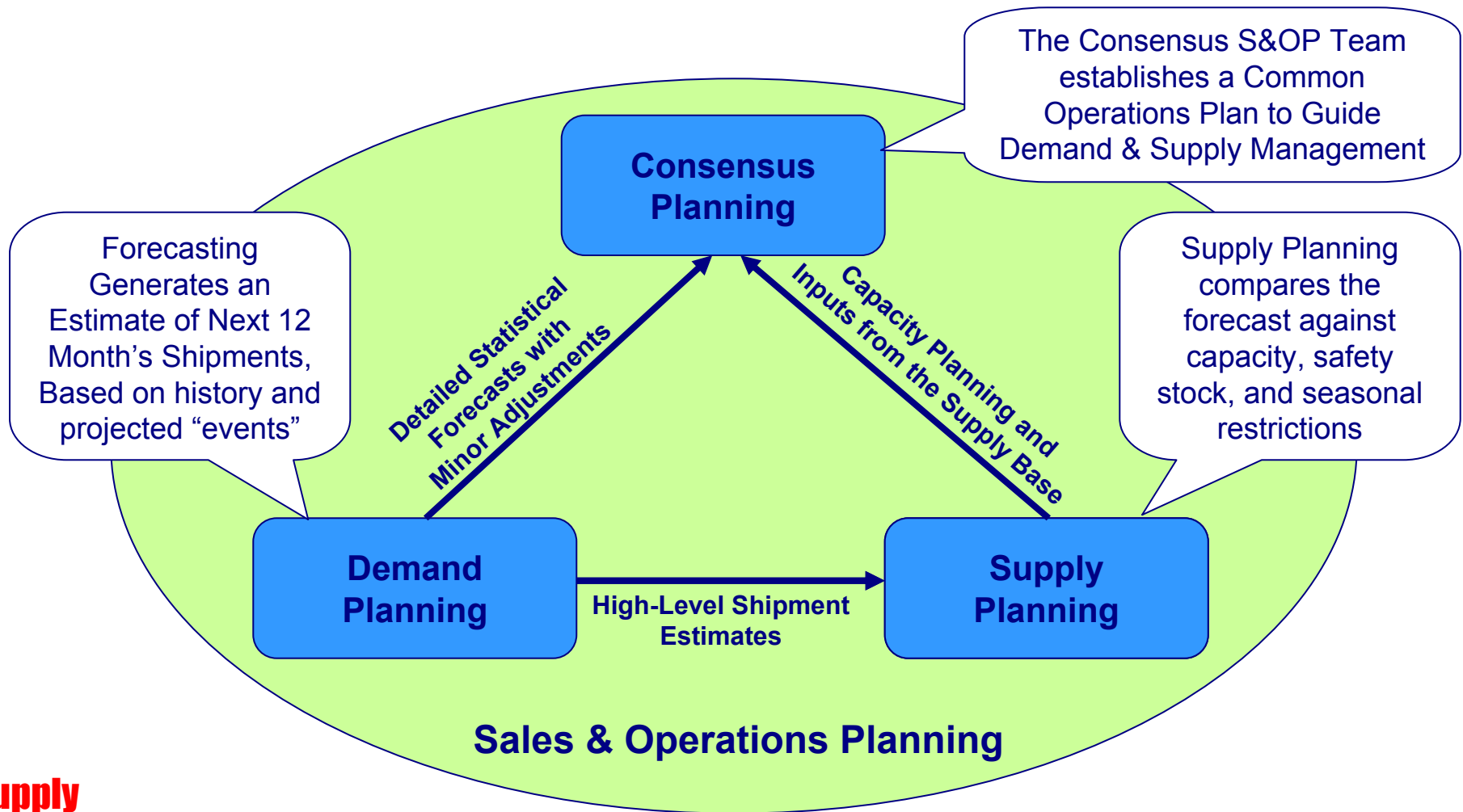
Les Shindleman

- There are, however, a number of ways to improve your luck!
 - Talk to your customer
 - Compare forecasts / projections to history
 - Track and incent forecast accuracy
 - Plan in the aggregate / postpone where possible
 - Implement Sales & Operations Planning

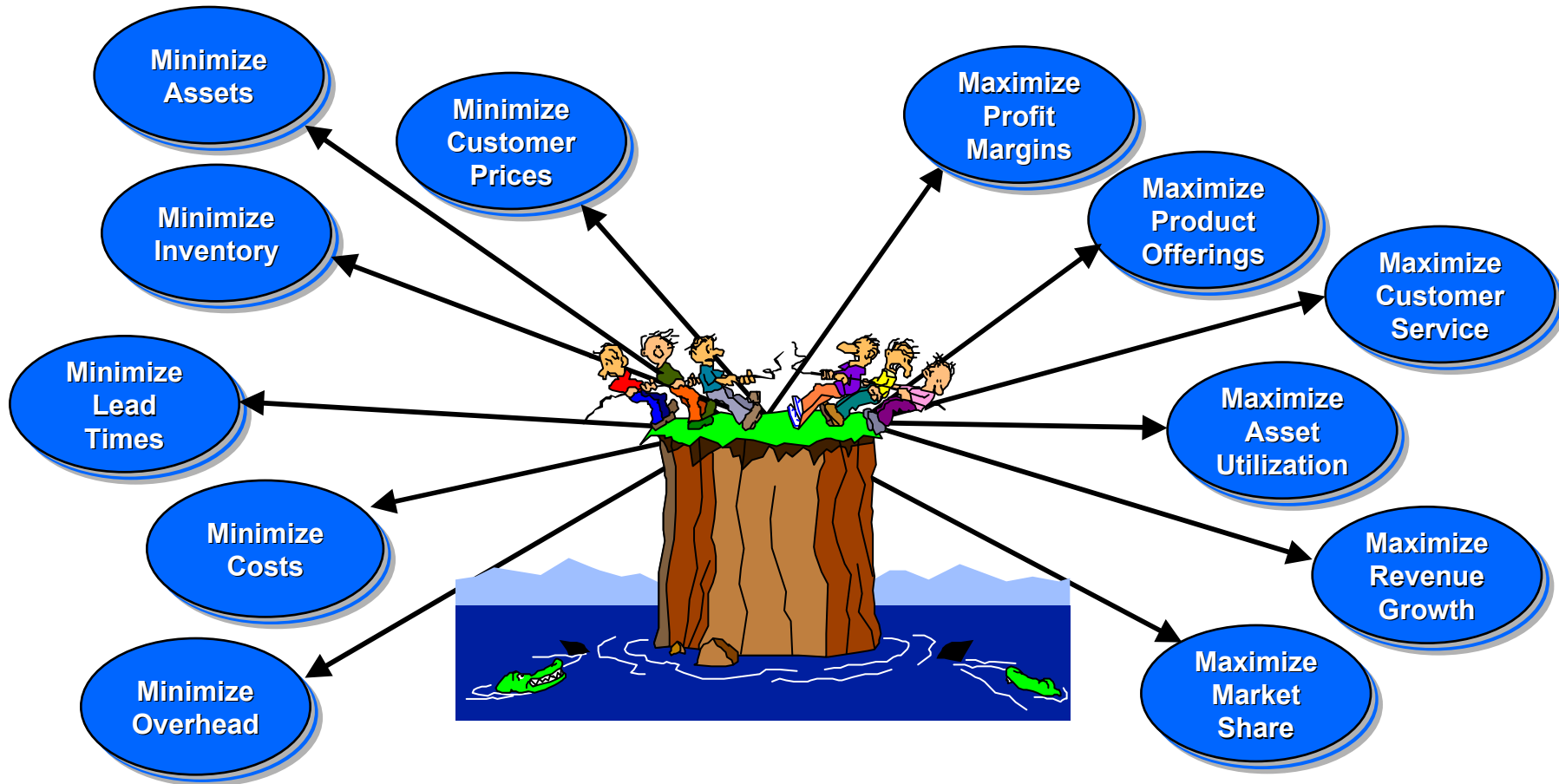
**“Sales and Operations Planning is THE ANSWER!
Uh, what was the question again?”**

Brad Barton / Gary Jones

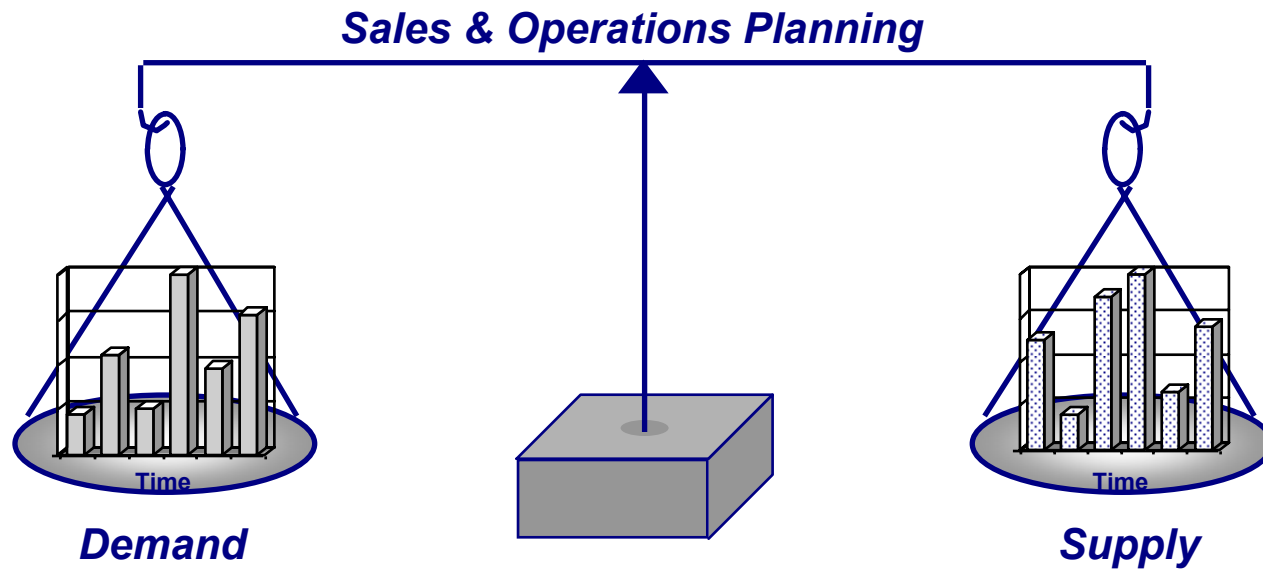
Sales & Operations Planning At a Glance



The Challenge of an S&OP Process is to Manage Seemingly Conflicting Objectives

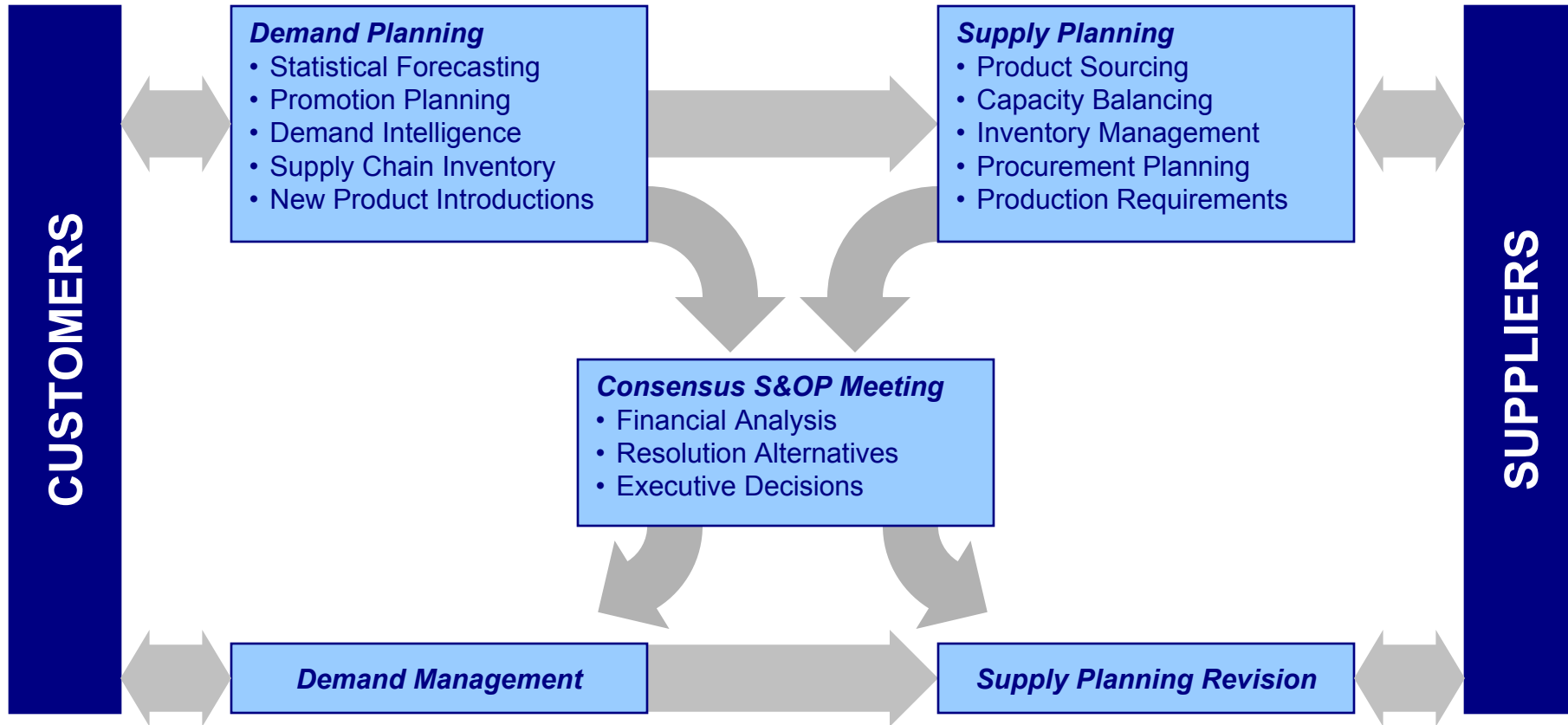


The Key is to Synchronize Supply with Demand, to the Greatest Extent Possible



Sales & Operations Planning is a process that proactively identifies anticipated imbalances between Demand and Supply, and seeks optimal resolutions

Overview of a Classic Sales & Operations Planning Process



Best Practices Involve Customers and Suppliers in the Planning Process

Best Practices

Sales & Operations Planning

Suggested Minimum Process Standard

- Sales and Operations Planning (S&OP) cuts across discrete functions to bridge silos with representation from marketing, sales operations, and finance
- Formal monthly meetings are held to address business performance issues and link business strategy to operational capabilities
- There is a coordinated functional approach to satisfying market requirements
- A single-number operational forecast agreed upon by consensus process drives all functional responses (financial forecast may be variation on operational forecast)

Typical Best Practice Process

- Weekly meetings link business strategy to detailed facilities and capabilities, including review of sales forecast changes, pull ins and push outs, and effects of on-hand inventory and pipeline
- Requirements are mapped against resources
- New Product Introductions (NPI) are integral to the planning process
- Product life cycle is integral to the planning process with special attention to end of life (EOL)
- Plans are compared and reconciled with goals and budgets (but not necessarily matched to them)

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Do I Need to Revamp My S&OP Process?

- “If you are trending negative on three or more of these for one or two periods, you should consider taking major action soon:
 - Forecasts are missed for some critical product families
 - Earnings projections are missed
 - Inventories are increasing
 - Backlogs are increasing
 - Expedite charges are increasing
 - Agreed-upon alignment of supply and demand is not being sustained across the entire organization
 - Inventories are not aligned with planned deployments
 - The planning process takes too long”¹

¹ Maha Muzumdar and John Fontanella, “The Secrets to S&OP Success,” *Supply Chain Management Review*, April 2006

Sales & Operations Planning is a Tool, not a Silver Bullet

- Successful sales and operations planning is achieved through discipline and adherence
- Communication and coordination of both intra- and inter-company resources are required to deliver significant results
- “Low tech” tools and techniques can be implemented quickly to support the development of an initial S&OP process
- Once key S&OP principles, concepts and disciplines are adopted, more sophisticated *Advanced Planning and Scheduling* tools can be implemented to further optimize the supply chain

Lessons Learned in the Real World

- If you are not going to take action on it, don't measure it!
- Key questions that must be asked and answered:
 - Will I change my behavior, or ask my people to change their behaviors, based on this measure?
 - Does the potential benefit to be gained from this information exceed the cost of obtaining it?
- You will have a greater immediate impact measuring fill rates by customer / commodity and % expedite requests fulfilled by customer than forecast accuracy by SKU
- Build from key components up to the overall process measures, but know where you are going before you begin

Keep In Mind...

- The greatest measures *not used* are not worth spending the time
 - The culture must change for maximum benefits
 - Integrate and emphasize what is critical
 - Corporate, Regional, and Shop Floor metrics need to be aligned and owned
- Develop and foster an environment that utilizes performance measures
 - Involve employees
 - Actively discuss improvement areas
 - Drive improvement of the business and not just pay for performance
- Teams and Employees function best under a spirit of approval rather than criticism
- Information does not guarantee action

How Do You Measure Up?

	Poor Practice	Inadequate Practice	Common Practice	Good Practice	Best Practice
Metrics Aligned and Driven by Corporate Goals	<ul style="list-style-type: none"> Key Performance Indicators (KPIs) are poorly defined with weak links to goals. 	<ul style="list-style-type: none"> The KPIs required to achieve company goals are clearly defined. 	<ul style="list-style-type: none"> The KPIs required to achieve company goals are clearly defined and measured. 	<ul style="list-style-type: none"> KPIs are defined, performance is measured, and targets are set. A top 10 list (or similar) drives functional behavior and company goals. 	<ul style="list-style-type: none"> Each KPI is clearly defined with an actual-to-target gap analysis and improvement plan. An embedded metrics hierarchy exists to associate functional metrics to a top 10 list, and to provide drill downs as needed (e.g. nested measures with red/yellow/green indicators).
Balanced Scorecard of Performance Measures	<ul style="list-style-type: none"> Financial measures are the primary measures of performance. 	<ul style="list-style-type: none"> Each functional department or work team measures the performance of its own process. Manipulation or gaming of metrics occurs to achieve desired results (e.g. on-time fill rate to commit vs. request). 	<ul style="list-style-type: none"> Each functional department or work team measures the performance of its own process. Functional measures are aggregated to form a company-wide view. 	<ul style="list-style-type: none"> A balanced scorecard of market, process, and financial measures is used to make informed decisions and track performance. Process metrics and results metrics are balanced to prevent suboptimization. 	<ul style="list-style-type: none"> A balanced scorecard of customer, operational, employee, and financial measures is used to make informed decisions and track performance. Improvement targets and plans are in place to support each measure.
Measurement Process and Culture	<ul style="list-style-type: none"> Metrics are used sporadically—either functionally or individually. Metrics offer little ability to capture or track data for nonfinancial measures. 	<ul style="list-style-type: none"> Metrics are reported on a regular basis, but often used by only a few individuals. Data integrity leads to a mistrust of measures. 	<ul style="list-style-type: none"> Metrics are clearly displayed within the company, and communicated company-wide (e.g. intranet, etc.). Definitions are clear and agreed upon. Reports are “seen” but not “used” by the majority of employees. Most managers don’t use reports to drive the business. Data integrity issues may exist—but are actively being addressed as they’re discovered. 	<ul style="list-style-type: none"> Metrics are used as a part of regular review meetings for all functions to drive business improvements. Data is turned into information to make decisions. Metrics reports are used by key employees and managers to drive the business. 	<ul style="list-style-type: none"> Metrics are used as a part of regular review meetings across all functions and levels (e.g. linking strategy to shop floor metrics to ensure all employees are marching to the beat of one drum). Metrics are used to drill down and change the process to get the desired results. Metrics are clearly displayed within the company, and have been made a part of the culture.
Process Focused Metrics	<ul style="list-style-type: none"> Financial measures are the primary measures of performance. 	<ul style="list-style-type: none"> Functional and financial metrics are used, but may be driving suboptimization. There is no clear linkage between functional metrics and their financial leverage. No measure of Perfect Order is maintained. 	<ul style="list-style-type: none"> Elements of process metrics are collected, but not actively aligned to drive process behavior. 	<ul style="list-style-type: none"> A clear understanding of the financial impact of metrics exists across all levels. Elements of process metrics are in place and actively viewed from a process perspective on a regular basis. Indexing (such as Perfect Order Index) is performed on an ad hoc basis. 	<ul style="list-style-type: none"> Active indexing (such as the Perfect Order Index) is used with key metrics—root cause drill down is readily available through linkage. Measures are used with customers to agree upon process improvements.

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Q & A

If you have any additional questions, please contact:

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