Forecast Accuracy Myopia & the Need to Heed Inventory Optimization

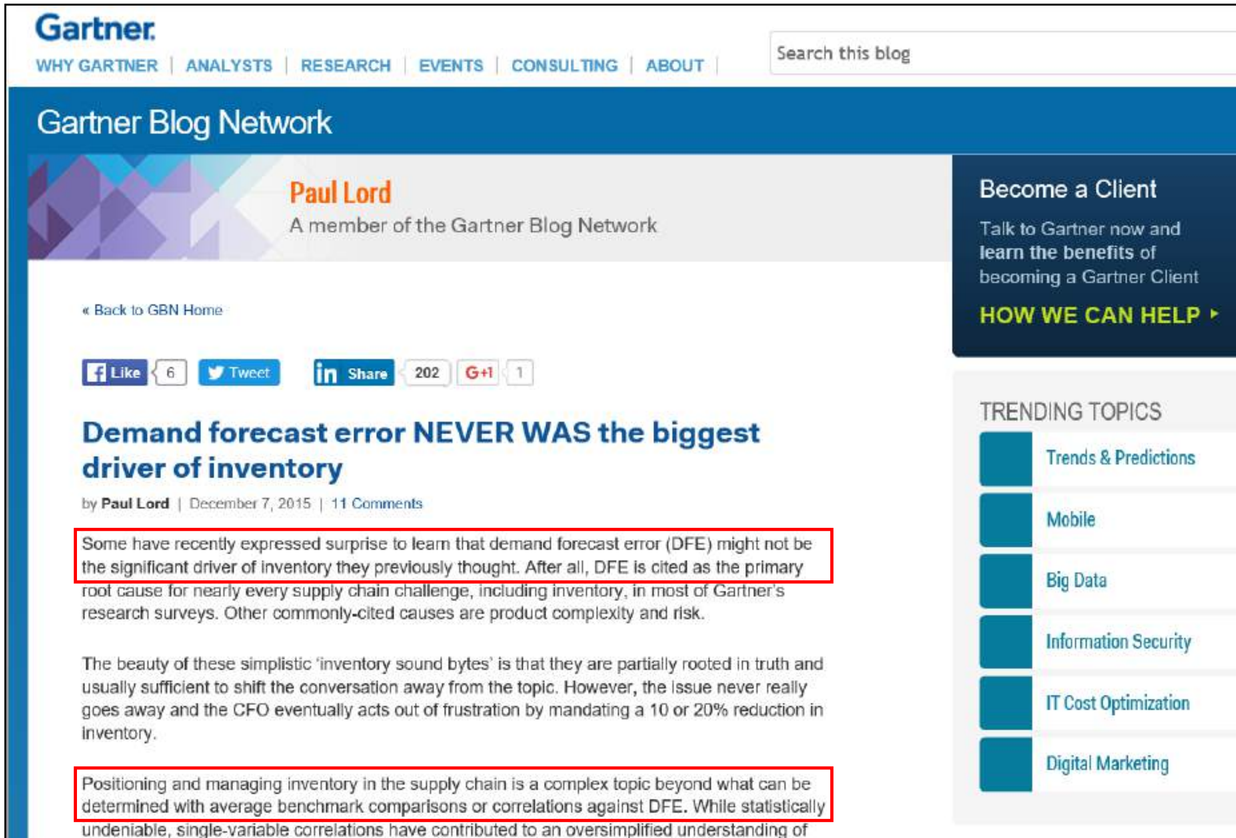
Initially Presented At:

Gartner Supply Chain Executive Conference

May 17th, 2016

Theater Topic Inspiration

- Thorough Assessment of Received RFI/RFP Constructs and Observations of Engaged Organization Priorities
- Realizations Following Significant Number of Empirical Study Results Quantifying Demand Planning and Inventory Optimization
- Burgeoning Marketplace Awareness of Forecast Accuracy Myopia (such as the following Paul Lord blog)



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Demand forecast error NEVER WAS the biggest driver of inventory

by Paul Lord | December 7, 2015 | 11 Comments

Some have recently expressed surprise to learn that demand forecast error (DFE) might not be the significant driver of inventory they previously thought. After all, DFE is cited as the primary root cause for nearly every supply chain challenge, including inventory, in most of Gartner's research surveys. Other commonly-cited causes are product complexity and risk.

The beauty of these simplistic 'inventory sound bytes' is that they are partially rooted in truth and usually sufficient to shift the conversation away from the topic. However, the issue never really goes away and the CFO eventually acts out of frustration by mandating a 10 or 20% reduction in inventory.

Positioning and managing inventory in the supply chain is a complex topic beyond what can be determined with average benchmark comparisons or correlations against DFE. While statistically undeniable, single-variable correlations have contributed to an oversimplified understanding of

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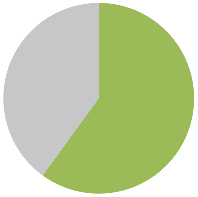
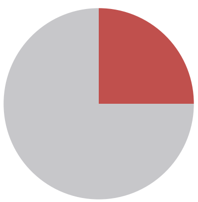
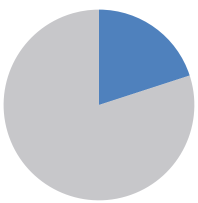
Did You Know?



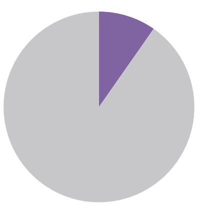
60% Proportion of Supply Chain Planning Improvement Initiatives & Related Requirements Observed focus Exclusively (or Predominantly) on Demand Planning



25% Percentage of Detailed Operational Improvements in Planning Achievable via Demand Planning Process Improvements (as distinct from high-level SI&OP benefits)



20% Estimate of Organizations Using at least Basic Statistical & Cost Methods to Determine Inventory Policy (versus Traditional, Single-echelon Safety Stock or Rules-driven approaches)



7% Proportion of Organizations Applying Advanced Demand Planning Algorithmically-Integrated via a Holistic-Model with Inventory Optimization

Source: GAINSystems Surveys

GAINSystems
Supply Chain Optimization

Presentation Objectives

- Key Presentation Objectives
  - Describe an objective means to derive prioritization of solution needs
  - Provide a quantitative (non-subjective) method to weight importance of certain factors
  - ***Not*** to diminish the value of SI&OP but to emphasize other proven-key areas

- Introduce a Means of Measuring Incremental Impacts of Key Process Improvements in a Quantitatively-rigorous Fashion: Across a statistically-significantly sample of items and time horizon

- Determine Key Measures of Performance
  - Inventory (Turns)
  - 'First-pass' Fill Rate (prior to Expediting or Substitution)
  - Activity Cost (frequency/cost of replenishment)

- Process/Algorithmic Improvements to ***Measure Independent Value-add of***
  - ***Sophisticated/'Advanced' Forecast Modeling:*** *automatic selection from* <u>*40 models*</u>
  - ***Comprehensive Inventory Policy Optimization*** considering planning error (demand & supply), <u>*stocking and stockout costs*</u>, & profitability <u>*across echelons*</u>

Simulation Scenarios

- The following scenarios were analyzed and evaluated based on inventory reduction and service level improvement

Scenario	Forecasting Method	Inventory Parameters	Service Level Target
Baseline	Traditional (Moving Average)	Traditional	N/A: Result (not Input)
Adv Fcst w/Trad'l Inv Params	Advanced	Traditional	N/A: Result (not Input)
Adv Fcst w Opt Inv Params (SL Neutral)	Advanced	Optimal	Neutral
Adv Fcst w/Opt Inv Params (SL Improve)	Advanced	Optimal	Improvement

Empirical 'Black-Box' Simulation Process Overview

- Process
  - Demand from periods prior to the simulation date is used for forecasting each day iterated
  - The records demand fulfillment and activities occurring during the specified interval without intervention or expediting
  - Includes distribution 'parents' and BOM materials for multi-echelon measurement
- Test Sample and Parameters (results are typical of dozens tested)
  - Statistically-significant sample size (1,000 after eliminating new/unprecedented items) selected randomly but matched 'demographically' for Inventory Turns and Service Level to the Population
  - Extended (6-month) horizon to cover multiple replenishment cycles (lead times) and peak season

Start | Simulation: Gartner Simulation - CSLO w/ all fcst SL Neu (17); Status: FINISHED (2016-05-12 17:42:16); User: Dist_Planner

Scenario Results

Overall Metrics

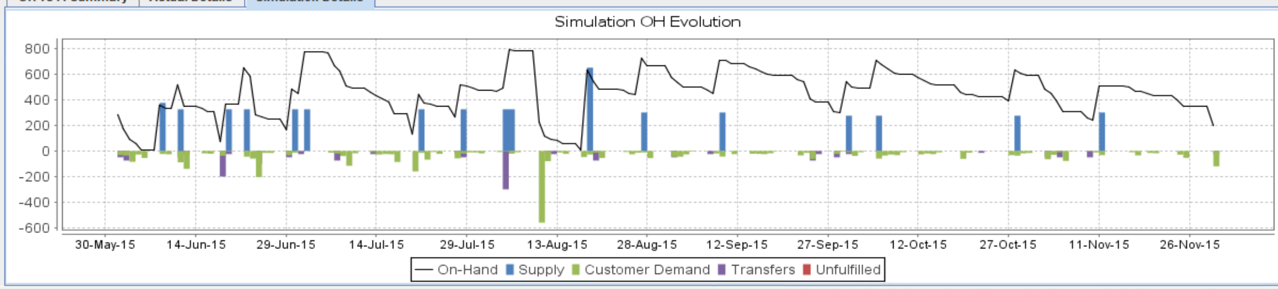
General Statistics/Parameters

Scenario Name:	Gartner Simulation - CSLO ...
Scenario Description:	Rexel USA Simulation w/ Mo...
Population:	1003 SKULs (174 SKUs)
Simulation Period:	01-Jun-2015 through 30-No...

Inventory Analysis	Actual	Simulation
Start On Hand:	$0.00	$398,375.80
End On Hand:		
Start FI:		
End FI:		
Service Level		
Service Level Target:		
Binary Fill Rate Observed:	45.3%	93.3%
Receiving	**Actual**	**Simulation**
Observed Receipts:	2638	2494

Key Sim KPIs

OH vs FI Summary | Actual Details | Simulation Details



Details

Show More Details | Show Dependent Demand | Show Supercession SKULs

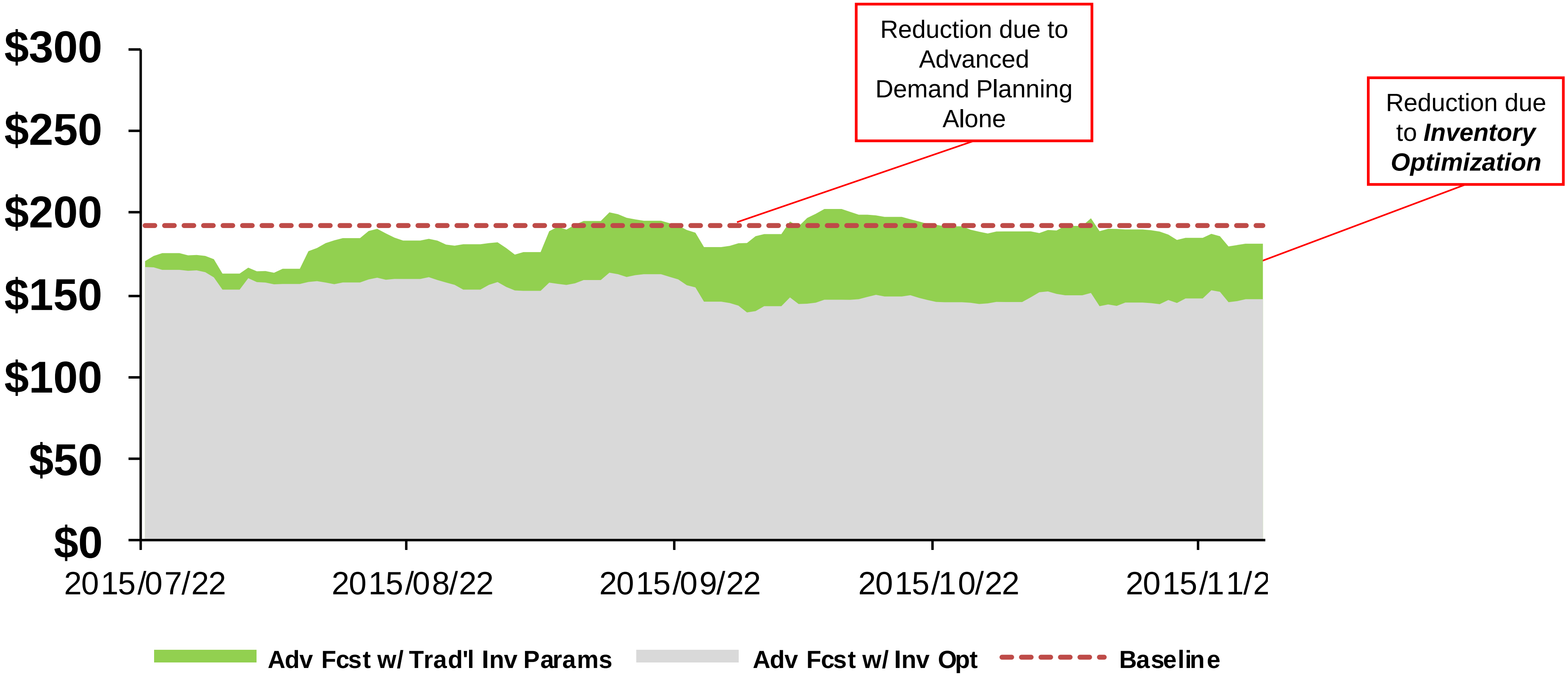
Location	Item	Avg OH$	Avg FI$	Avg Daily Balance	Avg Stock Out Time	Days Understocked	Dmd Lines	Dmd Lines On Time	Misses	Supply Lines	Avg Dmd Qty	Std Dev Dmd Qty	Cost	Lead Time	Service Level	End ORQ	End SS	Total Demand	Growth ... Last 12 ...
PRT	421698	$36.16	$27.12	$16.00			5	5	0	1	3	3.18	$2.26	1.00	97.00	15	6	23	-0.47
NSH	421698	$135.60	$76.84	$60.00			1	1	0	1	6	0.00	$2.26	1.00	95.00	25	7	22	-0.75
NHV	421698	$79.10	$101.70	$35.00	8	8	26	25	1	6	10	15.18	$2.26	1.00	94.00	75	8	286	0.61
MNS	421698	$1,014.74	$953.72	$449.00	2		273	272	1	19	18	38.69	$2.26	1.00	99.50	250	256	3,782	-0.08
MNF	421698	$61.02	$72.32	$27.00	3	3	23	22	1	5	5	3.85	$2.26	1.00	99.90	50	16	125	-0.40
MNC	421698	$137.86	$171.76	$61.00			30	30	0	6	11	11.92	$2.26	1.00	99.00	75	46	253	1.01
KIN	421698	$79.22	$48.93	$34.00	8	8	2	1	1	2	29	28.99	$2.33	1.00	60.00	25	5	43	-0.17
HRF	421698	$881.40	$992.14	$390.00	2	3	270	267	3	18	15	23.61	$2.26	1.43	99.00	225	281	4,363	-0.20
CNC	421698	$56.50	$33.90	$25.00			5	5	0	1	2	1.05	$2.26	1.00	99.50	25	5	17	0.03
BID	421698	$47.46	$51.98	$21.00	6	6	7	6	1	2	5	4.31	$2.26	1.43	99.50	25	14	21	-0.21
BEV	421698	$58.76	$67.80	$26.00	8	8	14	13	1	4	7	6.75	$2.26	1.00	97.00	25	15	47	0.62
TUL	42350	$8.37	$2.79	$3.00								0.00	$2.79	1.00	60.00	1	2	1	-0.92
STO	42350	$13.68	$6.84	$6.00								0.00	$2.28	1.00	99.90	1	4	0	-1.00
PPK	42350	$112.00	$98.00	$32.00			4	4	0	1	3	3.00	$3.50	1.00	99.50	20	13	35	-0.77
FTL	42350	$98.00	$59.50	$28.00			1	1	0		11	12.73	$3.50	1.00	70.00	25	6	86	-0.32
DCO	42350	$203.00	$168.00	$58.00			1	1	0	2	13	10.43	$3.50	1.00	92.00	25	20	101	-0.88

Displays Item-level Results for Selected Scenario

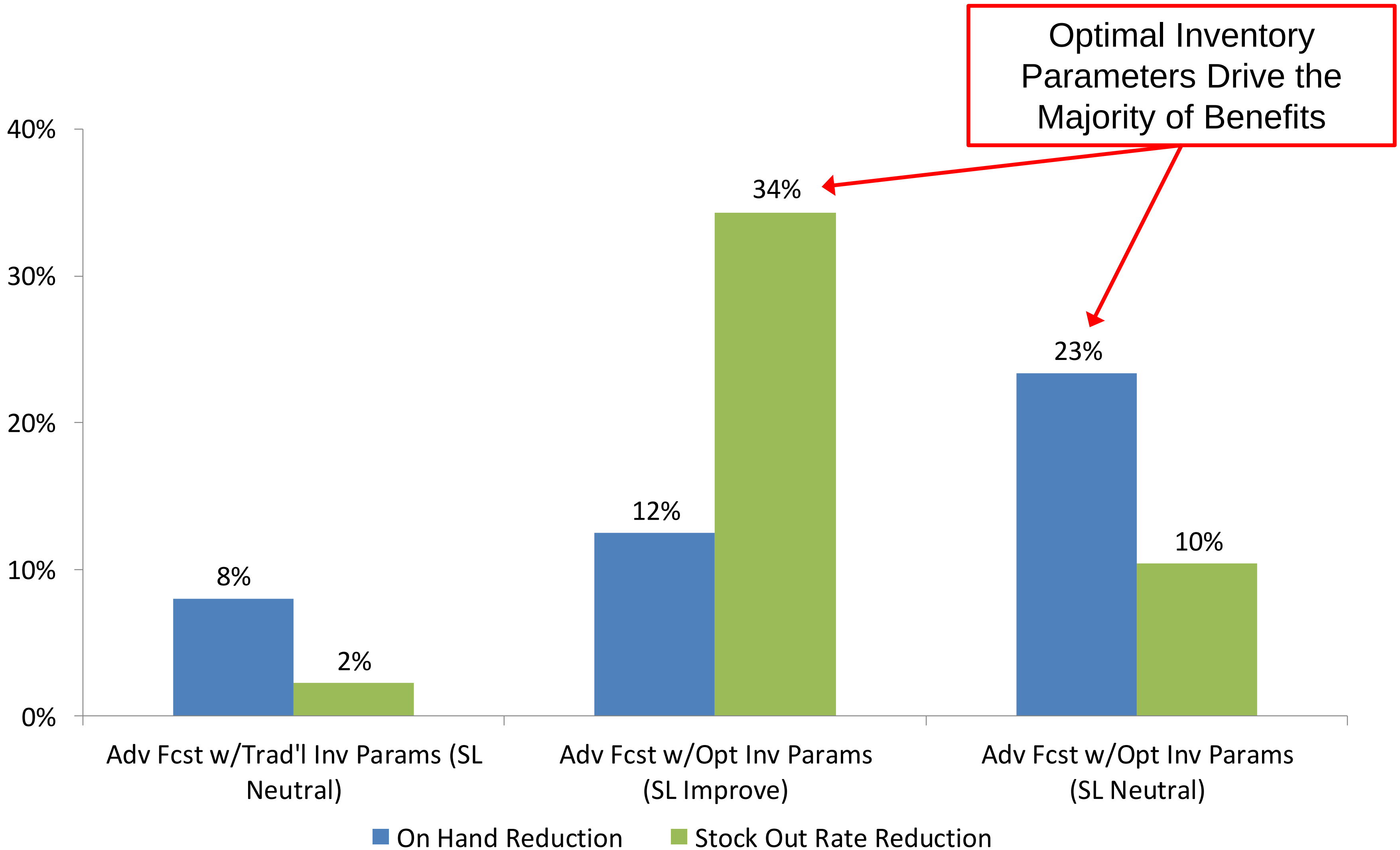
Simulation Results: On Hand Evolution

- For a service level neutral scenario, the following shows the opportunity for inventory reduction due to inventory optimization

Simulated On Hand Evolution for Mature, Active SKULs ($ thousands)



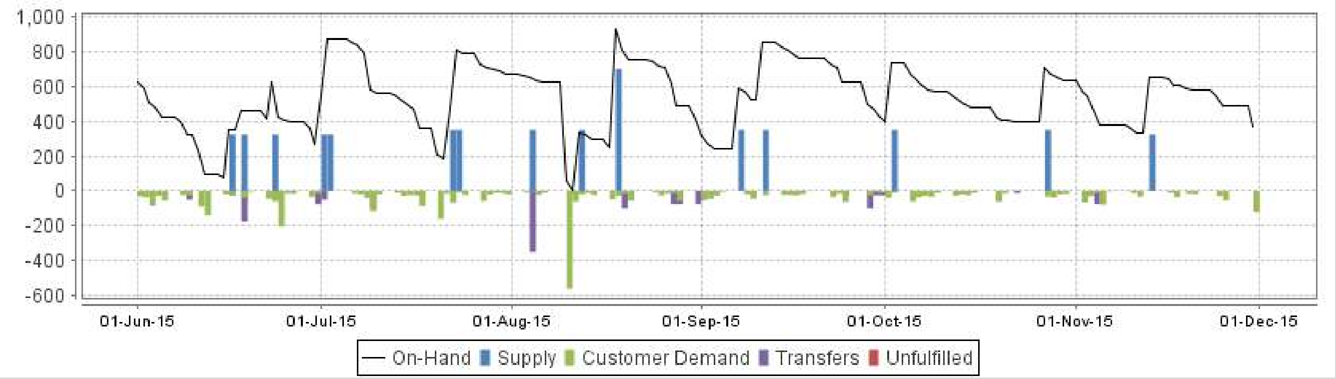
GAINS Empirical Simulation Summary



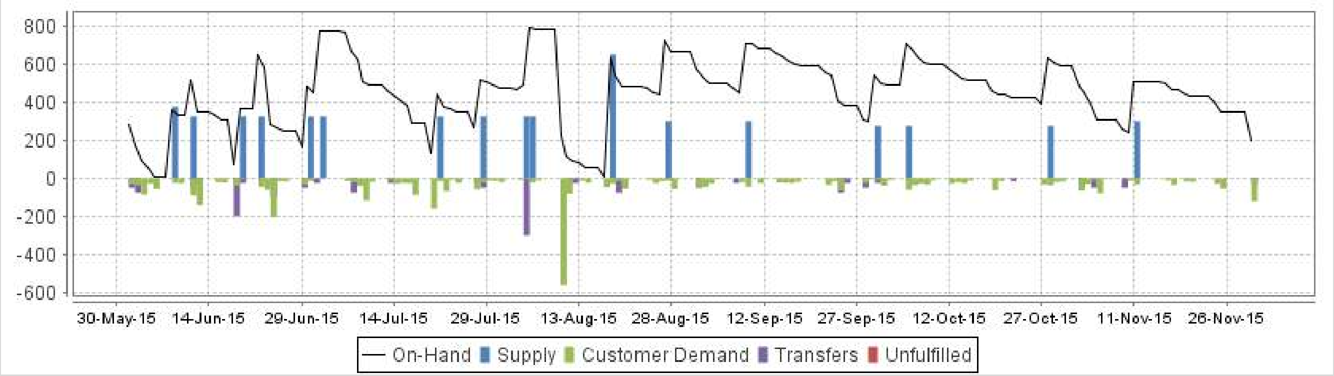
Inventory Reduction Example

- Traditional inventory parameters fail to recognize that inventory coverage above-and-beyond a 100% observed Service Level provides no incremental benefit

Adv Fcst w/Trad'l Inv Params



Adv Fcst w/Opt Inv Params



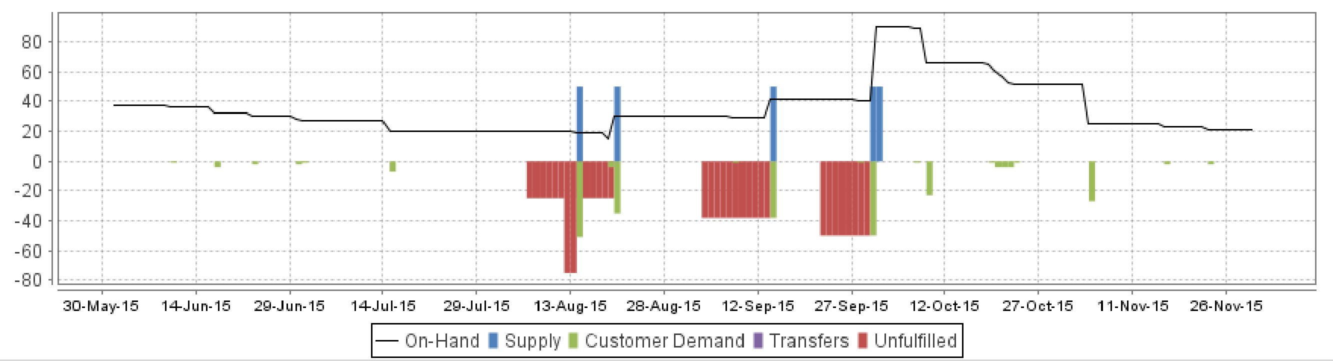
Incremental Benefits

29%	Less Inventory
50%	Fewer Stock Outs

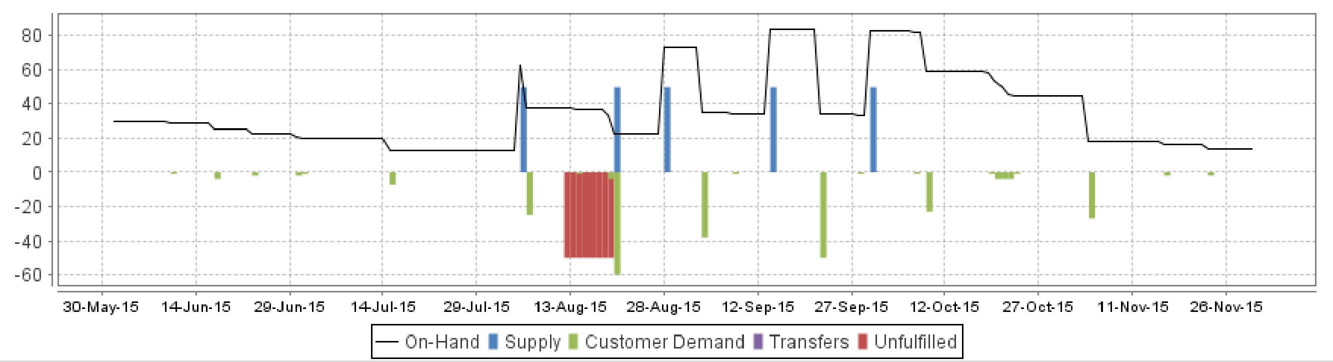
Service Level Improvement Example

- An optimal inventory policy approach is required to achieve a high Service Level in a lumpy demand pattern environment while maintaining efficient inventory levels

Adv Fcst w/Trad'l Inv Params



Adv Fcst w/Opt Inv Params



Incremental Benefits

75%	Fewer Stock Outs

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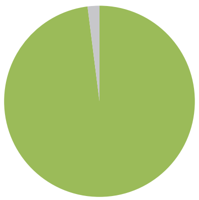
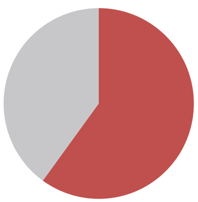
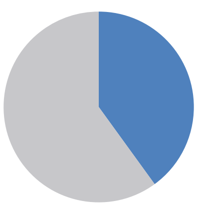
You Probably Already Knew…



98% Proportion of Organizations that would Benefit from Empirically-driven Prioritization of Operational Improvements



60% Reduction in Elapsed Time versus Subjectively Debating Supply Chain Improvement Priorities when Shifting to an Empirical Methodology



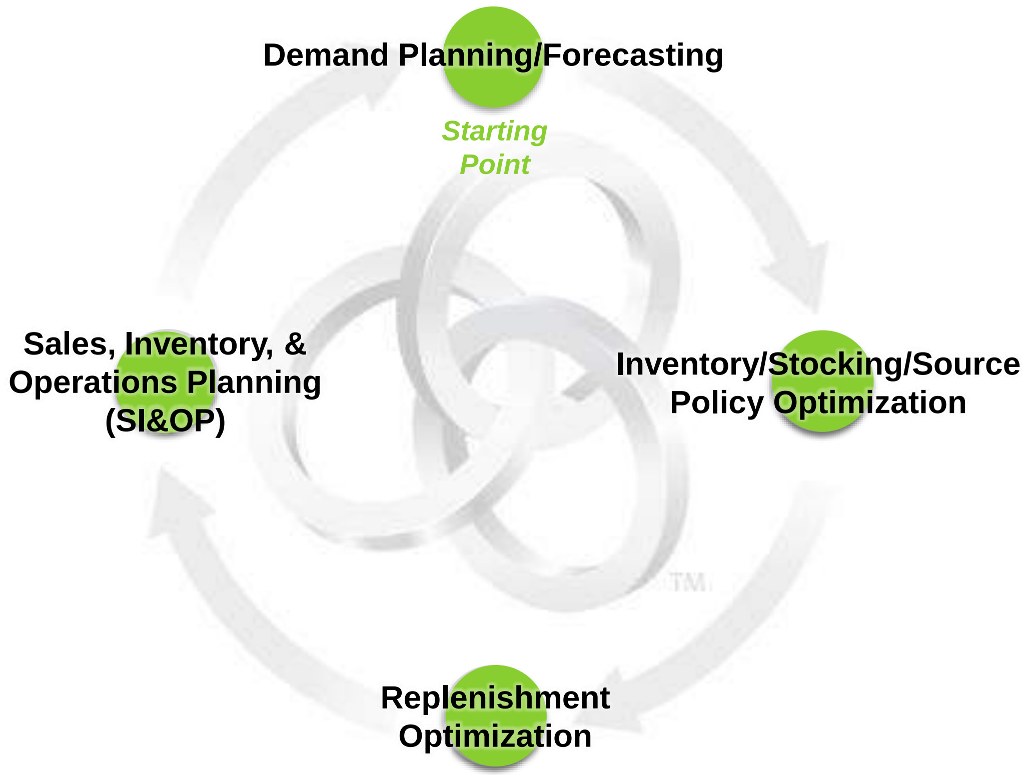
40% Proportion of audience likely leaving with more questions than were answered…

We'd thoroughly enjoy continuing these discussions and how these concepts could apply in your organization at Booth 718

Source: Unabashed Speculation

The GAINS Solution Overview: Single & Multi-Echelon Planning

1. **Auto-selects the optimal forecast model** over lead time given historical patterns
2. Synchronizes top-down/bottom-up changes in various units-of-measure (supporting SI&OP)
3. Automatically applies **Leading Indicator Analysis** to predict changes not yet reflected in history



1. Coordinate & **Collaborate with Suppliers**
2. **Optimize** planning **with Production** (for in-production parts)
3. Enables robust **scenario simulation**
4. **GAINS Mobile** allows for broad-based & accessible collaboration (iPad)
5. **KPI Dashboard** for graphical performance management ‘drill-down’

1. Determines the **optimal Service Level** and stock **policy** for each SKUL
2. Automatically & dynamically **determines** the **Order Quantity & Buffer**/Service **Stock minimizing total costs**
3. Determines the **optimal source for each SKUL**

1. Provides **automated** &/or exception-based, **profit-prioritized purchase recommendations**
2. Recommends **optimal** and feasible transfers and **re-distribution** across the network
3. Automatic order-minimum-adherence, price break, substitute, & alternate suppliers decisions