The Increasing Importance of Using Analytics in Supply Chain Planning and Response Management

Bob Ferrari, Executive Editor- Supply Chain Matters Blog
Managing Director- The Ferrari Consulting Group LLC

Presented to: 6th Annual Supply Chain Management Summit
Bryant University  August 22, 2013
Bob Ferrari (CSCP, CIPM) is the Managing Director of the Ferrari Consulting and Research Group LLC and serves as Founder and Executive Editor of the Supply Chain Matters Internet Blog. Bob is a highly visible supply chain thought leader, industry analyst, consultant, writer, speaker and noted global-wide blogger who provides a practical and thought provoking perspective for global supply chain support of business process needs. His background includes 20 plus years of supply chain management experience in roles that include planning, operations, fulfillment, information systems and customer service areas. Bob’s experience further includes industry consulting with both mid-market and enterprise technology vendors including SAP AG and Oracle Corporation. Bob has an MBA from Babson College, and a Bachelor of Science in Business Administration from Northeastern University.
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Key Messages

The Planets of Business Needs and Information Technology Are Aligning Toward More Leveraged Use of Predictive Analytics in SCM

Planning processes need to move toward more timely decisions and better prediction of events and business outcomes

Predictive Analytics + Constraint Modeling = Best Outcomes for your Business
Introduction - Who I am
Snapshot of today’s global supply chains along with the implications
Explore what are predictive analytics capabilities
Converging forces (Business, IT and Supply Chain)
Impacts on supply chain planning process adoption
Implications and takeaways
Recommendations
Introduction

- Independent supply chain and B2B industry analyst- previous leadership roles at AMR Research and IDC
- Multiple years of supply chain business planning, operational and IT systems implementation experience
- Recognized supply chain strategic and tactical thought leader, technology market influencer
- Consultant in supply chain strategy, business process, and information technology deployment
- Founder and Executive Editor Supply Chain Matters blog
A Simple Supply Chain

Suppliers

Manufacturing Plant

Distribution Center

Retail Store

TIME
End-to-End Supply Chain

Physical, Information, and Financial Flow

Supply Chain Matters

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## Supply Chain Business Process Evolution

### Classic Era
**Inside-Out Orientation**
- APICS sequential MPS-MRP planning processes
- Primarily push-driven
- Historic and transactional based information flows
- Four walls focused
- Planning & execution distinctly different
- Reporting/decision-making driven by historic data
- Functional stovepipes

### Transitional Era
**Lean JIT Concepts**
- Major emphasis on cost reduction and control
- Outsourced production and component supply
- Lean/JIT/Six Sigma / continuous improvement
- Pull-driven supply chain orientation
- Transition to demand focused planning and decision-making concepts
- Breaking down of functional stovepipes

### Networked Era
**Outside-In Orientation**
- Demand drives the networked supply chain
- Combination push-pull supply chain network
- More dynamic business cycles/events
- Planning and execution cycles merge together
- Forward-looking analytics and decision-making
- Connected / informed / responsive network
- Business Intelligence
- In-memory analytics
- Cloud-based applications

### IT Enablers
- Client-Server ERP
- Enterprise Data Warehouse
- ERP coupled to Specialty Best-of-Breed Applications
- Collaborative Applications
- Business Intelligence
- In-memory analytics
- Cloud-based applications
Business Process View

Strategic Network Design and Decision Support

Product Lifecycle Management
- Product Design, Release, Change

Supply Planning
- Plan and Synchronize Network Supply

Demand Planning
- Forecast & Synchronize Demand

Customer Relationship Management
- Demand Chain and Promotion Management

Responsive Replenishment and Execution

Supplier Management
- Order Driven Procurement

Production Planning & Scheduling

Transportation Planning

Distributed Order Mgt & Adaptive Logistics

Demand Supply Balancing

Plan Source
- Source / Plan

Plan Make
- Plan

Plan Deliver
- Execute

Product Lifecycle Management

Supplier Management

Production Planning & Scheduling

Transportation Planning

Distributed Order Mgt & Adaptive Logistics

Demand Supply Balancing

Plan Source
- Source / Plan

Plan Make
- Plan

Plan Deliver
- Execute

Supply Chain Matters
Today’s Supply Chains

• Complex, global-based value-chains
  • Segmented-Open-Closed-Vertically Integrated- Outsourced

• Servicing more demanding customers:
  • Increased product complexity
  • Technology-enabled online consumer
  • Shorter product development cycles

• Multiple years of cost-cutting, lean and demand-driven initiatives

• Explosion in data- drowning in data

• Dramatic increases in supply chain disruption and risk events
The New Normal

Risk  Complexity  Unpredictability

Balancing Efficiency – Agility - Responsiveness

In a 7 Day by 24 Continuous Cycle
Balancing Supply Chain Performance Objectives

Customer Service and Responsiveness

Top Line Revenue Growth

Efficiency
Supply Network Costs
Labor Productivity
Integrated Planning and Execution

Asset Utilization
Facility Utilization
Inventory Turns
Cash-to-Cash Cycle Time

Cost Reduction, Productivity and Profitability Growth

Perfect Order Fulfillment
Fill Rate

Source: MIT Supply Chain 2020 Program, Adapted by Ferrari Research Group
What are Predictive Analytics Capabilities
Analytics Defined - Tom Davenport

Predictive and Prescriptive Analytics

Descriptive Analytics (the “what”)

<table>
<thead>
<tr>
<th>Degree of Intelligence</th>
<th>Optimization</th>
<th>Predictive Modeling</th>
<th>Randomized Testing</th>
<th>Statistical Analysis</th>
<th>Alerts</th>
<th>Query / Drill Down</th>
<th>Ad Hoc Reports</th>
<th>Standard Reports</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>“What’s the best that can happen?”</td>
<td>“What will happen next?”</td>
<td>“What happens if we try this?”</td>
<td>“Why is this happening?”</td>
<td>“What actions are needed?”</td>
<td>“What exactly is the problem?”</td>
<td>“How many, how often, where?”</td>
<td>“What happened?”</td>
</tr>
</tbody>
</table>

Source: Analytics At Work, Thomas H. Davenport, Babson College
Supply Chain Analytics - Davenport

**Content Types**

**Information**
- What will happen? (Prediction / Simulation)
- What happened? (Reporting)

**Insight**
- What’s the best that can happen? (Optimization)
- How and why did it happen? (Modeling)

**Demand forecasting**
- Yield management, product mix, scheduling, routing optimization

**Product quality, delivery performance, asset utilization**
- Process control, bottleneck analysis

Source: *Analytics At Work*, Thomas H. Davenport, Babson College, 2011
Analytics Within Supply Chain Processes

- Deployed in supply chain process for quite some time
  - Supply chain planning and optimization
  - Transportation scheduling and routing
  - Factory and production process scheduling
  - Multi-echelon inventory optimization/ network design

- New advances in information technology, now open new opportunities and awareness

- Dramatically accelerated clock speed of business and added complexity and risk
Analytics and Big Data
An Analytically-Driven Process

- “Big-Data” term often over-hyped and used to convey all sorts of concepts
- Organizations are literally drowning in data but lack meaningful insights
- Analytics is essentially how to process, analyze and visualize vast arrays of information in more innovative ways
- Analytics-enabled decision-making in speed, quality and context
- Both a qualitative and quantitative mindset:
  - What do we know vs. what do we think we know
- Requirement of augmented or new skills
Example - Anticipate and Exploit

The Weather Channel

From Cable Network to Business of Forecasting Consumer Behavior

The Weather Company

Analytics Applied to Supply Chain Planning

- Sensing individual product demand changes ahead of the competition
- Timing the best possible time to seek additional capacity and/or resources
- Defining the most appropriate segmentation of supply chain(s)
- Identifying new opportunities for responsiveness, reducing inventory or decreasing costs

Ability to simulate or compare different response scenarios to market opportunities and/or supply chain non-alignment quicker than industry competitors
Converging Forces in Business, Supply Chain and IT
“As a group, CEO’s are investing more in customer insights than any other functional area. They are seeking a better understanding of individual customer needs and improved responsiveness”

2012 IBM Global Chief Executive Officer Study of over 1700 CEO’s Across 18 industries

Top CFO and Finance priorities over next 2-3 years:
- 73 percent cite lowering costs and increasing productivity
- 61 percent cite investing in analytics, planning, budgeting/forecasting
- 44 percent cite needs for upgrading organizational skills

2013 Accenture CFO Survey of 1250 Senior Finance Executives from Multiple Industries

Top Cited Concerns:
- Our inability to predict future performance in the new normal of permanent market volatility (70 percent)
- Worried about the resilience of their supply chains (80 percent)

March 2012 Accenture Outlook: Preparing for the Unpredictable
“Two-thirds of respondents report that use of information (big data) and analytics is creating competitive advantage for their organizations.”

Compared with 37 percent citing benefit two years ago, a 70 percent increase in two years

Source: Analytics: The real-world use of big data
IBM Institute for Business Value and Said Business School, University of Oxford
2012 survey of over 1100 professionals across 26 industries
Key Benchmarking Data

SCM World Chief Supply Chain Officer 2010 Survey

- The ability to find and access supply chain data needed for decision-making
  - Laggard: 28% | Average: 31% | Best-in-Class: 41%

- Cross-functional metrics
  - Laggard: 32% | Average: 35% | Best-in-Class: 41%

- Online visibility into financial supply chain events (invoice, PO, payment...)
  - Laggard: 31% | Average: 41% | Best-in-Class: 54%

- End-to-end supply chain data and process visibility
  - Laggard: 28% | Average: 32% | Best-in-Class: 38%

- Online (real-time) visibility into supply chain issues/disruptions
  - Laggard: 28% | Average: 35% | Best-in-Class: 41%

- The ability to make mid-course changes to our shipments (reallocate or...)
  - Laggard: 28% | Average: 35% | Best-in-Class: 41%

N=396

Source: SCM World / Aberdeen Group Chief Supply Chain Officer Report Survey June 2010
IT Technology Convergence

- From **OLTP** to in-memory database and highly scalable **OLAP**
- Sequential processing to MPP
- Data attached to the application to de-coupled streaming databases
- Data aligned to business constraints, insights and decision-making support
- Data warehouse to bundled analytical appliances
- Centralized to distributed data management, ownership and control of data
- Mobile and social enabled applications to accommodate mobility and time-critical needs
Impacts on Supply Chain Planning Processes
The ability to extract insights at sophistication levels not easily achieved in the past:

- From historic sequential to more predictive and near real-time planning and fulfillment information insights
- Ability to leverage advancements in in-memory computing, visualization, business intelligence
- Analysis of both structured and unstructured data
- Availability of cloud computing and composite apps allow teams to fill-in process gaps
- New sense and respond capabilities can be leveraged to orchestrate desired business outcomes
- Mobile and social enabled applications to accommodate virtual mobility and time-critical needs
Supply Chain Process Convergence

- More rapid and volatile business cycles are motivating many manufacturers and retailers to re-look at sequential planning and execution processes
  - Converge planning with sensing of orders, changed events, disruptions, market opportunities
  - Augment planning with analytics, and shift emphasis toward more predictive capabilities
  - True decision support fueled by embedded analytics

*Insights-Enabled Execution*
An S&OP Information Architecture Blueprint

<table>
<thead>
<tr>
<th>Exception and Response Based Planning</th>
<th>Best Optimized Business Outcomes</th>
</tr>
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<tbody>
<tr>
<td>Continuous or Ad-Hoc Analysis and Review</td>
<td>Insertion of Additional Analysis or Predictive “Apps”</td>
</tr>
</tbody>
</table>

### S&OP Information Utility (Streaming Data)
- S&OP Information Utility
- Business Activity Monitor and Management Platform
- Management Dashboard (Sense and Respond)

### In-Memory Enabled Faster Planning and Decision Support Cycles
- What-If Scenario Management
- Simulation
- Enhanced Collaboration
- Analytics-Based Decision Support

### Data Types
- Leading Indicator Data
- Demand and Supply Planning Data
- Execution and Fulfillment Data
- Demand & Financial Sensing Data
- Unstructured Data

### Analysis and Review
- Continuous or Ad-Hoc Analysis and Review
- Exception and Response Based Planning

### Best Optimized Business Outcomes
- Continuous or Ad-Hoc Analysis and Review
- Exception and Response Based Planning
Emerging Area of Interest - Supply Chain Control Tower

- More timely decision-making vs. supply chain wide visibility tool
- Forward looking vs. historic perspective
- Spanning organizational / physical boundaries of the value-chain
- Support two-way interaction and collaboration
- Alert to abnormal conditions
- Identify consequences to events
Global distributor and wholesaler of pharmaceutical drugs and medicines servicing hospitals, pharmacies and healthcare providers.

A predictive capability that synthesizes market intelligence from customers, manufacturers and other sources to identify significant or unusual upticks in orders for specific pharmaceuticals that could trigger a broader market shortage. Can also identify potential areas of abuse.

If supply shortage occurs or is expected, an automatic allocation system is recommended and initiated that allocates limited supplies of that drug to customers based on a set of pre-defined parameters.

If network-wide shortage is predicted, it can trigger alerts to procurement supply team to augment inventory of specific likely drug alternatives that customers will likely substitute.
A global wired and wireless network infrastructure equipment provider

Within a year of implementing analytics capability, the company could determine in near real-time, when a product was not selling as expected, and trigger demand shaping recommendations for other similar products.

Alternatively, if product sales trend higher than forecast, a quick analysis of likely sales growth based on available sales forecasts triggers a review of contract manufacturing material and capacity planning options to determine timing options to boost production both short and long-term.
Implications and Takeaways
Implications and Takeaways

- Today’s rapid clock speed of business change is a given
- Extended and global supply chain now constantly challenged with complexity / variability / volatility and risk
- Planning and S&OP teams drowning in data but lacking important insights
- Sequential planning and execution processes must come together to keep-up with current clock speeds of business
- Senior management converging on need for improved business responsiveness and predictive decision-making
- Technology convergence will open new opportunities in supporting more predictive decision-support capabilities, at a more affordable cost and quicker learning curve
A Revised Goal

- Extensible Integrated Business Planning and Response Management
  - Making timely, more well informed and insightful decisions based on information insights and business goal context
  - Single information and intelligence-based repository that supports combined planning and execution decision-making
  - Abilities to sense and respond to market opportunities and/or supply chain risk
  - Anticipate or shape market, product demand, supply or fulfillment changes quicker than competitors
  - Simulate or compare various business scenario options
  - Enable supply chain to orchestrate desired business outcomes
Recommendations
Re-Orient Supply Chain Planning

- No longer a sequential process - rather one of continuous response
- Integrate planning and fulfillment information
- Augment with both response management and predictive analytics capabilities
  - Analytics + Constraint Modeling to best outcomes
  - Consider moving from KPI’s to Key Responsive Indicators (KRR)
- Develop and nurture new skill requirements
Plan for Impact on Existing People and Process

- Recognize the growing awareness of the power of a predictive analytics driven process
- Be cognizant that predictive analytics capabilities are still evolving
- Begin the re-skilling process within your supply chain teams
- Encourage academic institutions such as Bryant University to develop curriculum that provides students with broader analytical and business skills
Leverage Power of Newer Technology Tools

Leverage Current Converging Forces of Advanced Technology

- Data attached to an application to de-coupled streaming planning and execution data feeding an information utility
- OLTP central data warehouse to in-memory, highly engineered, OLAP “apps”
- Data aligned to business constraints, insights and predictive decision-support capabilities
- More emphasis on data visualization / simulation and planning scenario tools
- Augmenting existing IT investments with more predictive and business intelligence capabilities
Other Recommendations

- The goal is enhancing supply chain planning and decision-making vs. that of technology and tools
- Supply chain and business teams must take ownership with IT partnership and support
- Begin in small, managed scope and expand
- Tailor the process, data sources and analytics tools to support specified opportunities based on business priorities
- Include the change management and skills impacts in your milestones. Consider centralization of capability
- Critical to strive for high data quality and well understood information taxonomy
- Not a rip and replace of existing systems but rather an insertion of augmented capability
Final Thoughts

A vibrant planning process supporting timely decisions and better prediction of events and business outcomes

Seize the opportunity of the alignment of business, supply chain and IT planets toward more leveraged use of predictive analytics

From Key Performance Indicators (KPI’s)

To Key Responsive Indicators (KRR)
Thank You

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Appendix Slides