Optimally Matching Supply and Demand Over Time

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MIT Center for Transportation & Logistics

• “Drive supply chain innovation and accelerate its adoption into practice.”

• Founded in 1973 as an interdisciplinary unit in the MIT School of Engineering (ESD)

• Conducts research in transportation, logistics and supply chain management

• Directly involves over 60 faculty and research staff from 11 departments and schools at MIT

- Master of Engineering in Logistics (MLOG)
- MIT-Zaragoza Program in Logistics (ZLOG)
- MIT-LOGyCA Latin-American Logistics Innovation Center
- ESD SM in Logistics
- ESD Ph.D. in Logistics
- Executive Courses

- Supply Chain 2020
- Healthcare (MEHD)
- Security & Resilience
- Transportation
- Humanitarian
- Emerging Markets
- Energy/Carbon
- Demand Management
- Age Lab

- Three-tier partnership model
- Exchange community
- Collaborations
- Communications

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SCM Trends – Movement from push to pull manufacturing

Make what we will sell, not sell what we make!

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SMC Trends - Now a move to Push and Pull

Aligning supply and demand plans helps ensure optimized profitability

Demand Planning

Inventory Planning

Production/Planning

Production/Scheduling

Procurement Planning
Optimally Matching Supply and Demand Has Become More Important

- SCM moving from primarily reducing costs and inventories to also enhancing revenues
- Sales and Operations Planning (S&OP) is hot
- “Commercialize” a supply chain
- Demand-driven supply chains
  - P&G’s CDSN and AMR’s DDSN concepts
  - Demand is viewed as variable and (somewhat) controllable
  - Maximize corporate profitability, rather than maximize revenues and minimize costs
- This requires better Demand Management processes
A common perception is that Demand Management is about Demand Forecasting?

<table>
<thead>
<tr>
<th>What should we do to shape and create demand?</th>
<th>Demand Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>What will demand be for a given demand plan?</td>
<td>Demand Forecasting</td>
</tr>
<tr>
<td>How do we prepare for and act on demand when it comes in?</td>
<td>Demand Management</td>
</tr>
</tbody>
</table>
Management of matching supply and demand over time – in real time and during planning
The Chasm Between Demand and Supply Management Still Looms Large

While customer-facing managers are not always easy to work with...
The Chasm Between Demand and Supply Management Still Looms Large

..they do have a difficult job that SCM can help them do.
The Chasm Between Demand and Supply Management Still Looms Large

DM processes bridge supply and demand-side management to help optimize decision-making

**Supply-Side Management**
- Operations
- Logistics
- Supply Chain
- Merchandise Planning
- Procurement
- Finance

**Demand-Side Management**
- Marketing
- Sales
- Merchandizing
- Customer Service
- Store Operations

Matching supply and demand

Minimize costs and inventories

Maximize revenues and margins

Maximize sustained profitability and other corporate goals

Note: L. Lapide, "Optimally Bridging Supply and Demand", Supply Chain Management Review, May/June 2007

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What strategies, principles, methods and solutions can be leveraged to optimally match supply and demand over time?
Three major DM processes -- long-term, medium-term and short term/real-time – that need to be integrated

Preparing for orders

Upstream Information

Supply Planning

Sales and & Operations Planning*

• Demand Planning
• Forecasting
• Demand-Shaping

Downstream Information

Setting customer expectations

Customer Service
• Segments
• Policies
• Programs

Order Promising

Orders (Moments of truth )

New Product Launch Planning
Promotional Campaign Planning

Strategic Goals and Objectives

* Merchandize Planning and Allocation (MP&A) in Retail
The 3 major ‘bridging’ processes involve joint decision-making at all levels

**Supply-Side Management**
- Supply-Side Executives
- Senior Supply-Side Managers
- Supply-Side Managers and Staff

**Demand-Side Management**
- Demand-Side Executives
- Senior Demand-Side Managers
- Demand-Side Managers and Staff

**DM Processes**
- Long-term: Customer service programs, policies, and segments
- Medium-term: Tactical supply-demand planning (e.g., S&OP)
- Short-term & real-time: Order promising and fulfillment
Differentiated Service Programs

High Tier Services
- Sharing of downstream data (e.g., POS)
- Sharing of replenishment plans and sales forecasts
- Co-managed inventory programs

Mid-Tier services
- Special handling and packaging
- Reduced delivery cycles times
- Full-truckload discounts

Basic Services
- Standard delivery cycle time
- Standard handling and packaging

Customer Segments

Top Tier
Mid Tier
Lowest Tier
Illustrative Customer Segmentation and Programs

<table>
<thead>
<tr>
<th>Service Programs</th>
<th>Strategy</th>
<th>Customer Segments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Services</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Forecast accuracy rebates</td>
<td>Keep high share, identify high profitability and growth</td>
<td>Global (buy on price)</td>
</tr>
<tr>
<td>• Full truck-load discounts</td>
<td></td>
<td>Regional (lower buying power)</td>
</tr>
<tr>
<td>• Large volume SKUs rebates</td>
<td></td>
<td>Others (many small buyers)</td>
</tr>
<tr>
<td>• VMI, consigned stock, and B2B, returnable packaging (if benefit shared)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Technical services &amp; collaboration</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Services</strong></td>
<td>Opportunistic Share</td>
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<td>• Full truckload discounts</td>
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## Service Segmentation August 2006 DM Survey Findings

- **Criteria Used to Segment Customers for Service (% of companies)**
  - Do not segment: 24%
  - Customer importance: 43%
  - Sales: 38%
  - Channel: 34%
  - Profitability: 27%
  - Delivery time Requirements: 24%

- **Differentiated services offered (% of companies)**
  - None (all customers get same service): 28%
  - Delivery cycle times: 47%
  - Special handling and Packaging: 40%
  - Co-managed inventory: 37%
  - Sharing of downstream information: 29%
  - Sharing of replenishment plans and sales forecasts: 25%
S&OP/MP&A: Routine Tactical Planning
Processes to Match Future Supply and Demand

Vision

Strategic Planning

Objectives & Goals

Demand Planning

Periodic Meetings

Supply Planning

Daily Operations

Performance Measurements

Routine Planning August 2006 DM Survey Findings

– Market survey on frequency of updating supply-demand plans (% of companies)
  • 14% do not routinely update
  • 15% do it annually or longer
  • 17% quarterly
  • **30% monthly**
  • **24% weekly**

– Market survey on planning ‘time buckets’
  • 14% yearly
  • 21% quarterly
  • **32% monthly**
  • **21% weekly**
  • 3% daily
Routine Planning August 2006 DM Survey Findings

– Market survey on planning horizon of routine plans (% of companies)
  • 24% two or more years
  • 41% one to two years
  • 19% six to nine months
  • 15% less than six months

– Market survey on external data used as inputs to planning:
  • 57% customer-provided forecasts
  • 46% inventories in customer’s warehouses or stores
  • 40% POS data
  • 34% replenishment plans from customers on co-mgmt inventory programs (such as VMI and CPFR)
  • 33% inventories in suppliers’ warehouses
  • 31% supplier-provided forecasts of materials/components availability
  • 29% customer’s warehouse withdrawals
Routine Planning August 2006 DM Survey Findings

- Market survey on type of demand-shaping done during planning (% of companies)

  - 38% None, pre-determined marketing and sales plans
  - 38% ad hoc identification of marketing & sales program and pricing
  - 27% push-up or delay planned marketing programs
  - 22% push-up or delay new product launches
Potential Advances to Decades-Old S&OP

– Better incorporation of new product launch and promotional plans
– Global (worldwide) planning
– Use of downstream (e.g., POS) and upstream external data
– Use of optimization and risk management techniques
– Demand planning with supply in mind (i.e., demand-shaping principles)
  • Supply feasibility of demand plans
  • “True” profitability analyses of demand plans
  • Supply-opportunity based demand plans (e.g., excess inventories or plant capacity)
  • Jointly optimized supply and demand plan
The Importance of Order Promising

– Accurate Order Promising
  • Insures making a promise you can keep
  • Reduces expediting costs
  • Increases customer satisfaction

– Priority-based order promising
  • Charging closer to what the market will bear
  • Provide better service to more important customers
Order Promising Needs to Address Complex Customer Demand Questions

– Do I fill this customer’s order right now (FIFO)?

– With what supply should I fulfill it with?
  • On-hand versus on-order inventories?
  • Scheduled versus future production capacity?
  • Available versus future materials?

– With what priority should I fill it?
  • Before versus after another customer’s expected order?
  • Before versus after a warehouse’s replenishment order?

– At what price?
### Promising and Customer Priority August 2006 DM Survey Findings

- Market survey on order promising shows (% of companies)
  - 11% do not promise at the time of an order
  - 49% use a standard lead time list
  - 42% check available inventory (Available-to-Order, ATP)
  - 24% check production schedules (ATP)
  - 14% check available production capacity, parts and materials (Capable-to-Order, CTP)

- Market survey on customer priority criteria shows (% of companies)
  - 41% none, i.e., first-come-first served (FIFO)
  - 36% customer with largest sales
  - 17% highest profitability customers
  - 16% highest margin customers
Illustrative Order Promising Logic

Note: Promising, planning, and customer segmentation integrated to foster optimized supply-demand matching in real time.
Data is needed to support ‘optimized’ DM

- Real-time supply chain visibility

- Decision support information/reports (with % of companies having readily available)
  
  - Product Profitability reports (56% of companies)
  
  - Customer Profitability reports (40% of companies)
  
  - Activity-Based-Costing (ABC) reports (32% of companies)
  
  - Total Costs-to-Serve customer reports (28% of companies)
In Conclusion

– Optimized DM is the next important advancement in supply chain management
– All three types of bridging processes require improvement and integration for optimized performance (not just costs and inventory reduction)
  1. Customer segmentation and service policies
  2. Tactical planning (S&OP and MP&A)
  3. Order promising
– Supply chain managers need to connect with customer-facing managers to make this happen
– It’s also about shared decision-making and the information needed to support it
Questions?

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