Demand Forecasting, Planning, and Management

Lecture to 2007 MLOG Class
September 27, 2006

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What Are Demand Forecasting, Planning, and Management?

- **What should we do to shape and create demand?**
  - **Demand Planning**

- **What will demand be for a given demand plan?**
  - **Demand Forecasting**

- **How do we prepare for and act on demand when it comes in?**
  - **Demand Management**
Agenda

• Industry Trends

• Demand forecasting
  – Process
  – Methods

• Demand planning (with supply in mind)

• Demand management
Industry Trends – Movement From Push to Pull Manufacturing

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

Figure by MIT OCW.
Now Moving to Demand-Driven and “Commercialized” Supply Chains

Aligning supply and demand plans to helps ensure optimized profitability
Agenda

• Industry Trends
  • Demand forecasting
    – Process
    – Methods
  • Demand planning (with supply in mind)
• Demand management
A Business Needs a Forecast of What Might Happen, Not Just a Real-time View

Image from comic strip removed due to copyright restrictions.
## Why Do Companies Need to Forecast?

Demand forecasting supports corporate-wide planning activities

<table>
<thead>
<tr>
<th>Level of Forecast</th>
<th>Purposes</th>
</tr>
</thead>
</table>
| Strategic (years) | Business planning  
                    | Capacity planning                                |
| Tactical (quarterly) | Brand plans  
                        | Financial planning/budgeting  
                        | Sales planning  
                        | Manpower planning |
| Tactical (months/weeks) | Short-term capacity planning  
                           | Master planning  
                           | Inventory planning |
| Operational (days/hours) | Transportation planning  
                                  | Production scheduling  
                                  | Inventory deployment |

*Massachusetts Institute of Technology*  
*Larry Lapide, 2006  
Page 8*
Forecasting Process: Four Success Factors

1. An integrated forecast organization
2. “Single number” forecasting process
3. Part of a Sales and Operations Planning (S&OP) process
4. Performance measurements
1. Forecasting Organization

A integrated approach is driven by a stakeholder organization that is chartered with driving commitment and accountability to “single number” consensus-based forecasts

**Integrated Approach**

- Forecast administration driven by a stakeholder
- Stakeholder responsible for getting input from others
- Responsible for driving to a reconciled consensus forecast
- Less important which function is stakeholder, but usually marketing or operations
1. Forecasting Organization: Where Function Resides

Where the Forecasting Function Resides*:

- Operations/Production: 26%
- Sales: 17%
- Marketing: 13%
- Logistics: 12%
- Strategic Planning: 12%
- Forecasting Dept: 8%
- Others: 8%
- Finance: 5%

### SUMMARY OF PROS AND CONS OF PUTTING THE FORECASTING FUNCTION IN EACH TYPE OF DEPARTMENT

<table>
<thead>
<tr>
<th>Department</th>
<th>Objectivity</th>
<th>Business Understanding</th>
<th>Quantitative Skills</th>
<th>Organizational Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standalone Forecasting</td>
<td>Objective, but not impacted by demand</td>
<td>No direct contact with customers</td>
<td>High Level</td>
<td>High level of discipline</td>
</tr>
<tr>
<td>Marketing</td>
<td>Objective, but some bias from performance goals</td>
<td>Very good understanding of future customer needs</td>
<td>Low Level</td>
<td>Moderate level of discipline</td>
</tr>
<tr>
<td>Production, Operations and Logistics</td>
<td>Objective and impacted by demand</td>
<td>Little direct contact with customers</td>
<td>High Level</td>
<td>High level of discipline</td>
</tr>
<tr>
<td>Sales</td>
<td>Bias from sales goals and commissions</td>
<td>Highest level of contact with customers</td>
<td>Low Level</td>
<td>Less interest in running structured, routine processes</td>
</tr>
<tr>
<td>Finance</td>
<td>Objective, but some bias from budgeting and not impacted by demand</td>
<td>No direct contact with customers</td>
<td>High Level</td>
<td>High level of discipline</td>
</tr>
<tr>
<td>Strategic Planning</td>
<td>Objective, but not impacted by demand and view is too long-term</td>
<td>No direct contact with customers</td>
<td>High Level</td>
<td>High level of discipline</td>
</tr>
</tbody>
</table>

Figure by MIT OCW.
1. Forecasting Organization: Skills and Tasks*

- **Skills needed**
  - Quantitative
  - Computer
  - Oral communications
  - Understanding of the business
  - Process management

- **Dividing up the work by**
  - Sales channels
  - Product lines or brands
  - Geographies
  - Skill sets

*Source: L. Lapide, “Organizing the Forecasting Department”, JBF, Summer 2003
2. Single Number Forecasting Process: Manufacturer

One Number Forecast/Plan

- Accountability/Commitment
  - General Manager/CEO/CFO
- Divisional GMs/Presidents
- Marketing/Sales
- Operations/Logistics

Company

Divisions/Regions

Product Lines/Channels/Sales Territories

Production Lines/Warehouses/SKUs
2. Single Number Forecasting Process: Retailer

One Number Forecast/Plan

- Accountability/Commitment
  - General Manager/CEO/CFO
- Divisional GMs/Presidents
- Merchandisers/Buyers
- Store Operations

- Departments/Stores
- Items/Category
- Chain/Channels
- Company
2. Single Number Forecasting Process: Forecasting & Planning Hierarchies

Single number forecasts/plans need to be translated into terms stakeholders can understand.
2. A Hierarchy Is Leveraged By Top-Down and Bottom-Up Forecasting in Baseline Forecasting
2. The Hierarchy is Also Leveraged When Incorporating Market Intelligence Into Forecasts/Plans
3. Part of an S&OP Process

An S&OP Process Is Driven by a Baseline Demand Forecast

Demand

- Baseline Demand Forecast
  - Must be estimate of true unconstrained demand
  - The “Sanity” check
  - Must represent unbiased, unemotional view
  - Often generated via statistical methods
  - Should include all known impacts on demand such
    - New product plans
    - Promotional/pricing plans
    - Competitive landscape

Supply

- Rough Cut Supply Plans
- Supply Constraints

S&OP Meetings

- Unconstrained Demand Forecast
- Constrained Demand Forecast
- Supply Plans

Figure by MIT OCW.

- **Number of meetings**
  - One: To match supply and demand
  - Three: Demand, then supply, then final executive-level adjustments

- **Frequency and length**
  - Monthly or weekly
  - 2 hours to half of a day

- **Cross-functional**
  - Demand forecasting organization
  - Supply chain
  - Operations (e.g., manufacturing, logistics)
  - Marketing
  - Sales
  - Finance
3. Part of an S&OP Process: Success Factors

1. Ongoing routine S&OP meetings
2. Structured meeting agendas
3. Pre-work to support meeting inputs
4. An unbiased baseline forecast to start the process
5. Cross-functional participation
6. Participants empowered to make decisions
7. An unbiased, responsible organization to run a disciplined process
8. Internal collaborative process leading to accountability/consensus
4. Performance Measurements

Demand Forecasting Needs Process-based Performance Metrics (e.g., KPIs)

- Forecast accuracy
- Variance to baseline forecast
- Forecast versus budget
- Adherence to demand plan (i.e., sales and marketing plan)
Forecasting Methods

Times Series ➞ Uses prior history to project

Life Cycle ➞ Uses the sales curve of similar products or product lines

Cause-Effect ➞ Uses cause-effect relationships, uses forecast of cause to predict effect

Judgmental ➞ Uses opinion-based information
Forecasting Methods

Forecastsers need to understand demand variation

- Seasonal
- Promotional/Event
- Trend
- Business Cycle
- Unknown

Percent of Demand Variation Analysis
(Components of Demand Variation)
## Forecasting Methods

Product lines need to be segmented to help identify the types of forecasting methods needed.

<table>
<thead>
<tr>
<th>Product Segment</th>
<th>Common Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>New products</td>
<td>• Life cycle</td>
</tr>
<tr>
<td>Mature products</td>
<td>• Time series (with trend and seasonality)</td>
</tr>
<tr>
<td>Promoted and event-based products</td>
<td>• Time series</td>
</tr>
<tr>
<td></td>
<td>• Event, cause-effect</td>
</tr>
<tr>
<td>Slow-moving or sporadic</td>
<td>• Croston’s</td>
</tr>
<tr>
<td></td>
<td>• Poisson</td>
</tr>
<tr>
<td>Kits and subassemblies</td>
<td>• Parent-child relationships</td>
</tr>
<tr>
<td></td>
<td>• Planning bills</td>
</tr>
<tr>
<td>Cannibalized</td>
<td>• Dependent</td>
</tr>
<tr>
<td></td>
<td>• Life cycle</td>
</tr>
</tbody>
</table>
Bottom-Up and Top-Down Forecasting

Aggregated product demand is less variable than individual demands,

… so a forecast of the aggregate is more accurate then individual forecasts aggregated
Bottom-Up and Top-Down Forecasting

**BOTTOM-UP FORECASTING**
- Forecast At Entity Level
- Aggregate Forecast

**TOP-DOWN FORECASTING**
- Forecast At Group Level
- Disaggregate Forecast
- To Entity Level
Bottom-Up and Top-Down Forecasting

However, top-down does not always work

… so bottom-up followed by top-down and middle-out is often best
Multi-tier Forecasting Methods Make Use of POS/Consumption and Other Downstream Information

Multi-tiered Forecasting

Manufacturer Order Forecast = Distribution Pipeline Information (inventory, sales) + Consumer Demand (POS or Point-of-Consumption) Information

Figure by MIT OCW.
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Demand Planning (with supply in mind)

The 4P’s of marketing:

- Product decisions - packaging and sizes
- Pricing decisions - list and discounts
- Promotional decisions - consumer and trade
- Place – distribution and sales channels

While demand plans are developed by Marketing and Sales, they should be made in the context of supply-side planning.
Demand Planning (with supply in mind)

Supply-side issues to consider when demand planning

- Supply feasibility of demand plan
- “True” profitability analysis of demand plan
- Supply-opportunity based plans – e.g., excess inventories or plant capacity
- Jointly optimized supply and demand plan
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Demand Management Processes Bridge Supply and Demand-Side Management To Optimize Decision-Making

Supply-Side Management
- Operations
- Logistics
- Supply Chain
- Merchandize Planning
- Procurement
- Finance

Demand-Side Management
- Marketing
- Sales
- Merchandizing
- Customer Service

DM Processes
Matching supply and demand
- Long Term
- Medium term
- Short Term

Minimize costs and inventories
Maximize revenues and margins
Maximize sustained profitability

Figure by MIT OCW.

Larry Lapide, 2006
Page 34
Demand Management Process Scope

- Supply Planning
  - Upstream Information
  - Strategic Goals and Objectives
  - Global S&OP
    - Optimization
    - Risk Mgmt
  - Demand Planning
    - Forecasting
    - Demand-Shaping

- Customer Service
  - Segments
  - T&Cs
  - Programs

- Order Promising
  - Orders (Moments of truth)

- New Product Launch Planning

- Promotional Campaign Planning

- Downstream Information
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
Order Promising Needs to Address Complex Customer Demand Questions

– Do I fill this customer’s order right now?
– If not now, when?
– Should I fill it using available or planned inventories?
– Should I fill it using available or future production capacity?
– Should I fill it using available or future materials?
– Is this customer’s order more important than another customer’s future order?
– Is this customer order more important than a warehouse or plant replenishment order?
– If I take the order, at what price?
The Importance of Order Promising

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

– MIT 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)
Questions?