



## **Optimally Matching Supply and Demand Over Time**

**San Antonio, TX  
March 18, 2008**



**MIT CENTER FOR  
TRANSPORTATION  
& LOGISTICS**

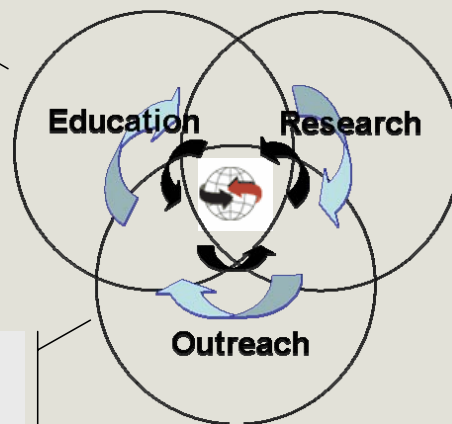
**Larry Lapide, Ph.D.  
Director, Demand Management,  
MIT Center for Transportation & Logistics  
[llapide@mit.edu](mailto:llapide@mit.edu)**

## 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

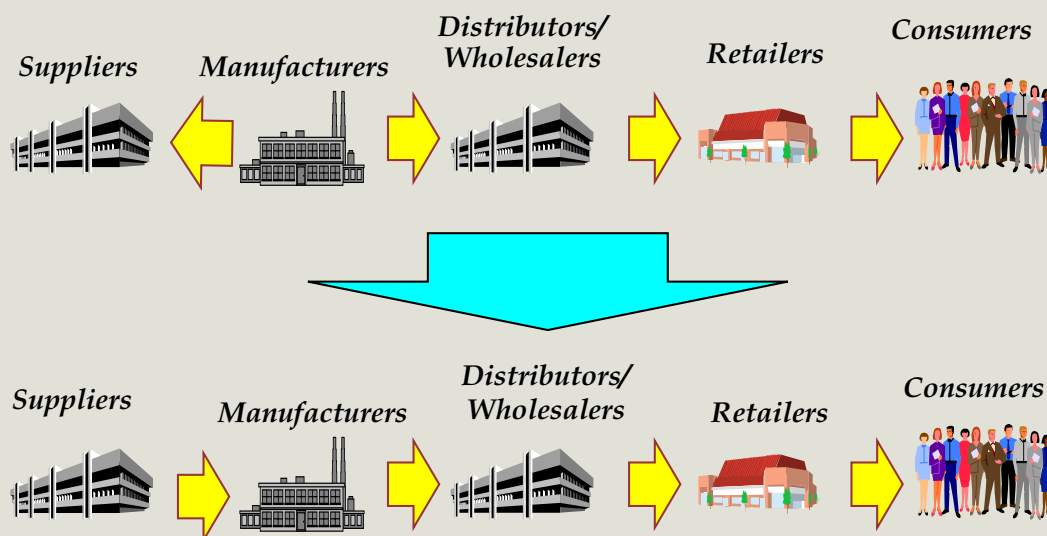
- Master of Engineering in Logistics (MLOG)
- MIT-Zaragoza Program in Logistics (ZLOG)
- MIT-LOGyCA Latin-American Logistics Innovation Center
- ESD SM in Logistics
- ESD Ph.D. in Logistics
- Executive Courses

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



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

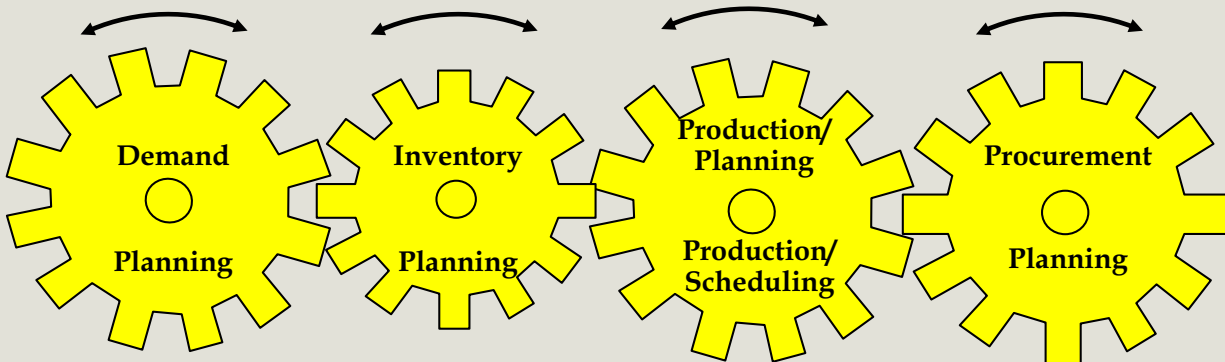
## SCM Trends – Movement from push to pull manufacturing



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

## SCM Trends - Now a move to Push and Pull

Aligning supply and demand plans helps ensure optimized profitability



## 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?

*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*

## Demand Management Definition

Management of matching supply and demand over time –  
in real time and during planning

## The Chasm Between Demand and Supply Management Still Looms Large

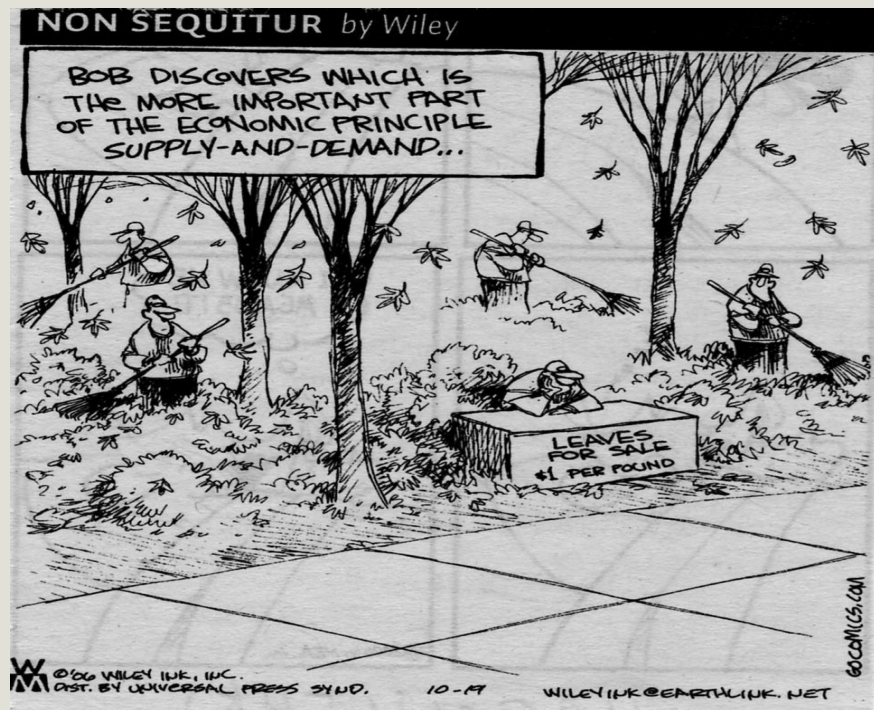
While customer-facing managers are not always easy to work with...





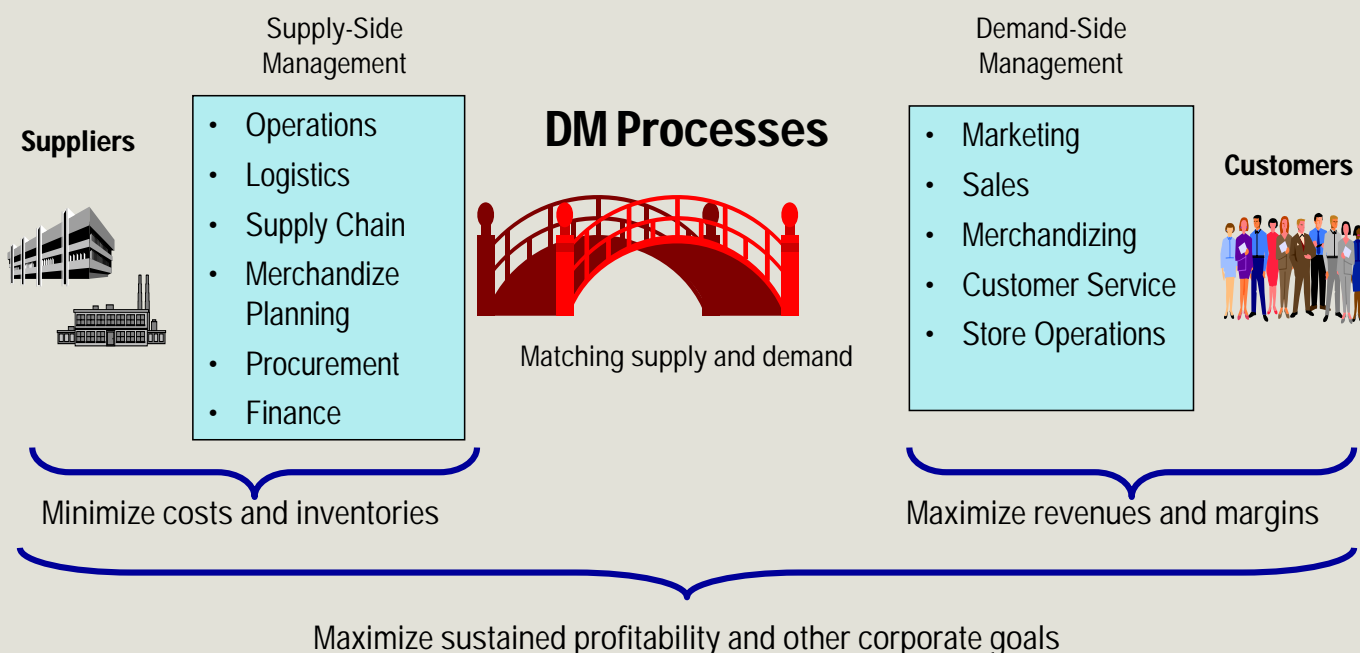
## The Chasm Between Demand and Supply Management Still Looms Large

..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

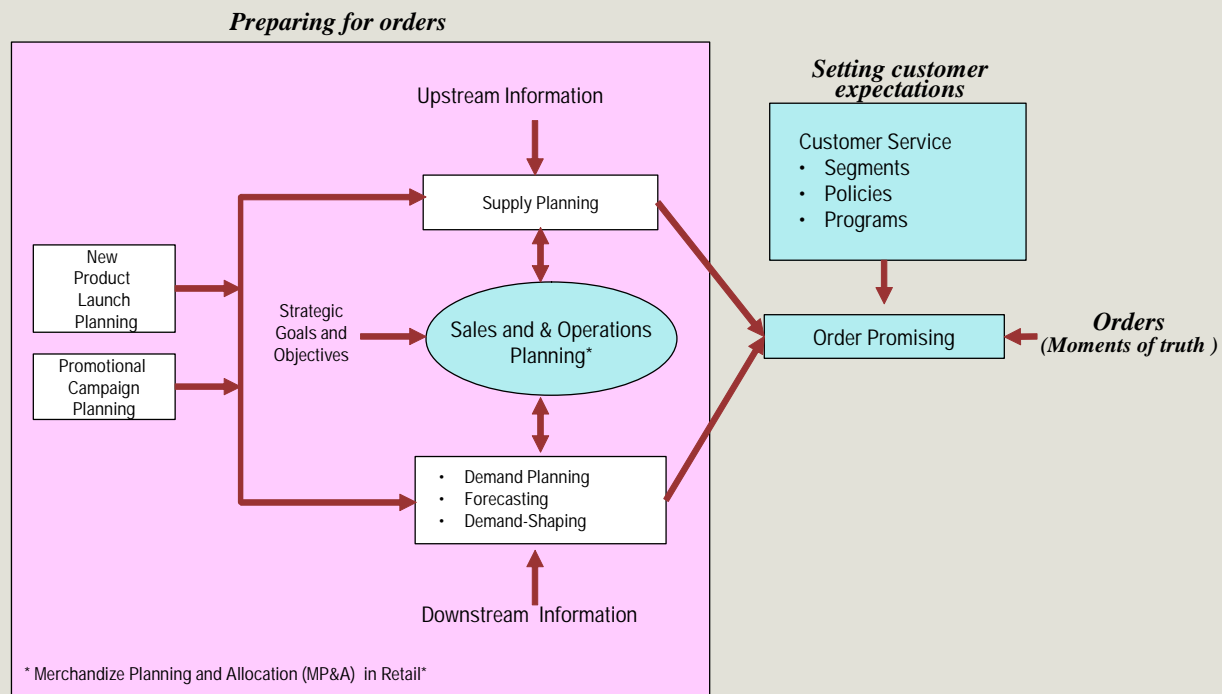


Note: L. Lapide, "Optimally Bridging Supply and Demand", Supply Chain Management Review, May/June 2007

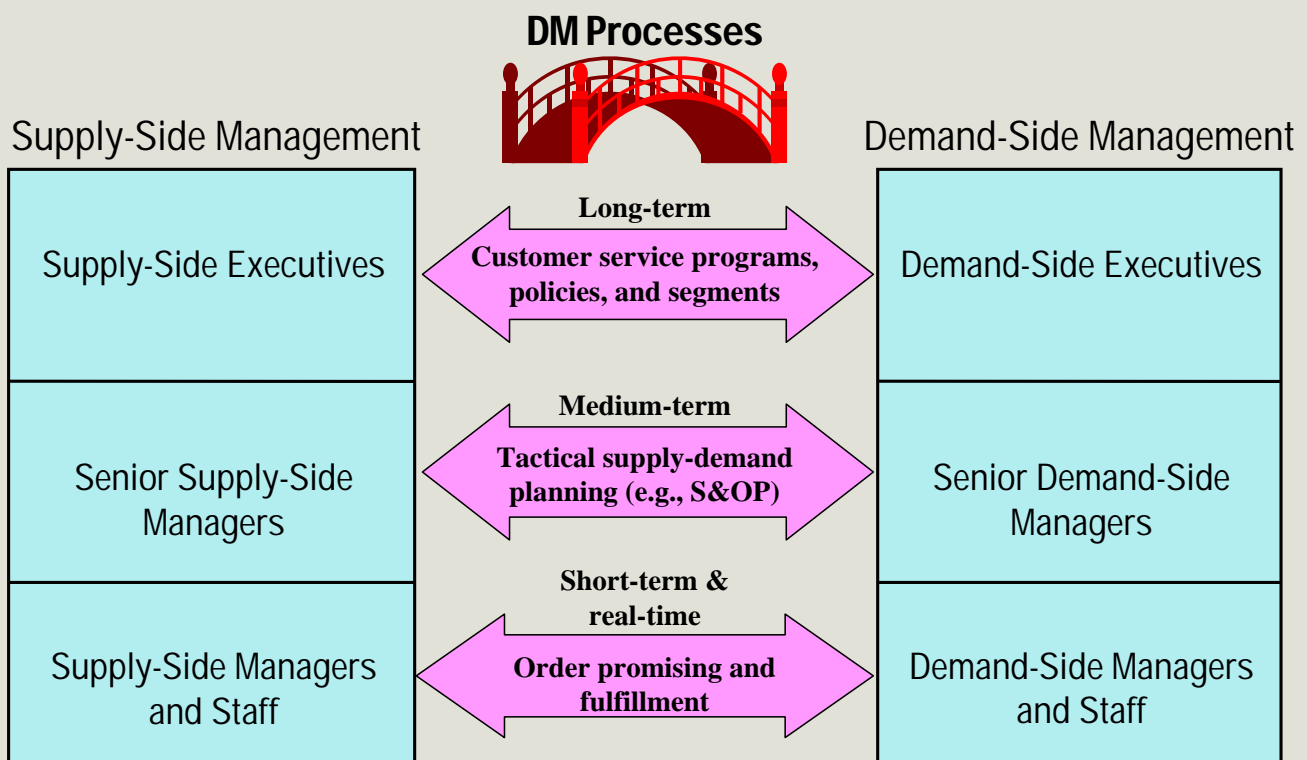
## Major Question Being Addressed by DM Research

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



## The 3 major 'bridging' processes involve joint decision-making at all levels



## Service-Related Policies and Programs Set Customer Expectations in the Long-Run

### 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

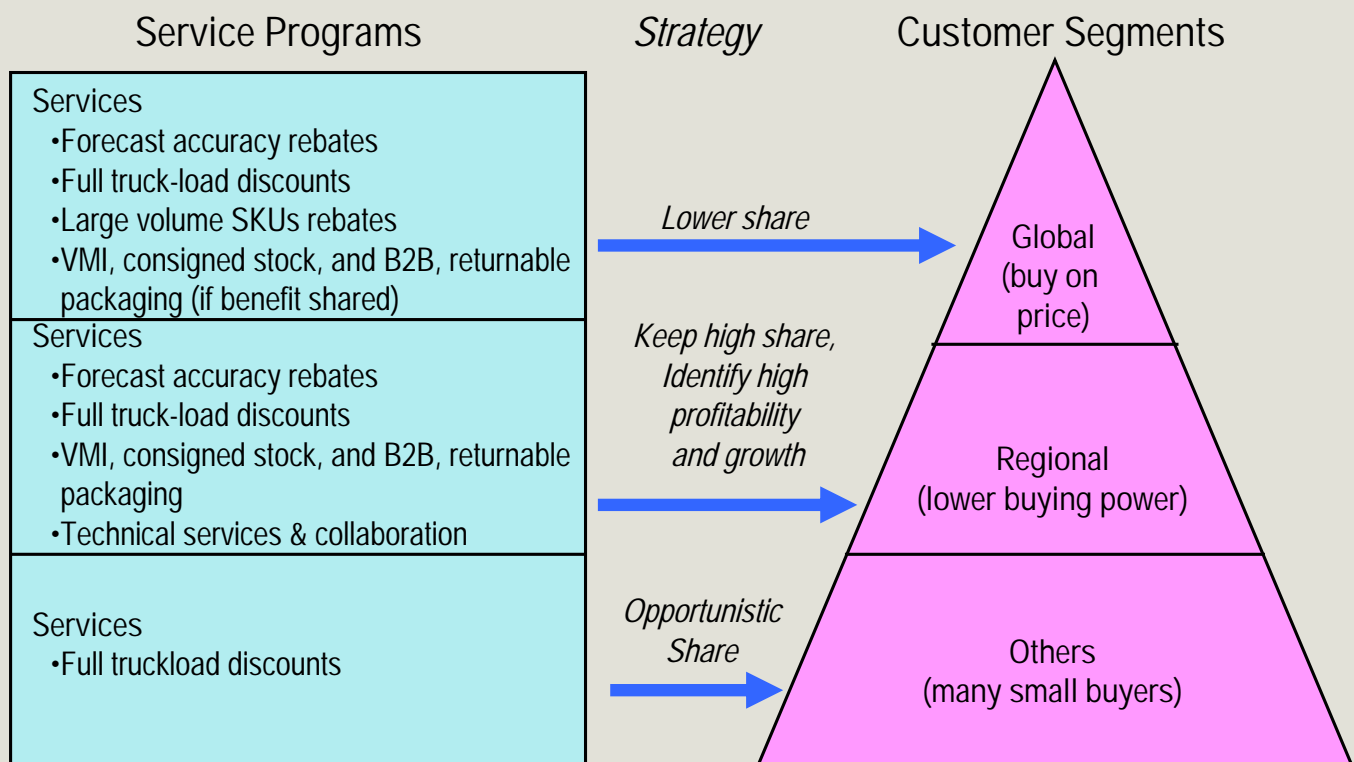
### Customer Segments

Top Tier

Mid Tier

Lowest Tier

## Illustrative Customer Segmentation and Programs

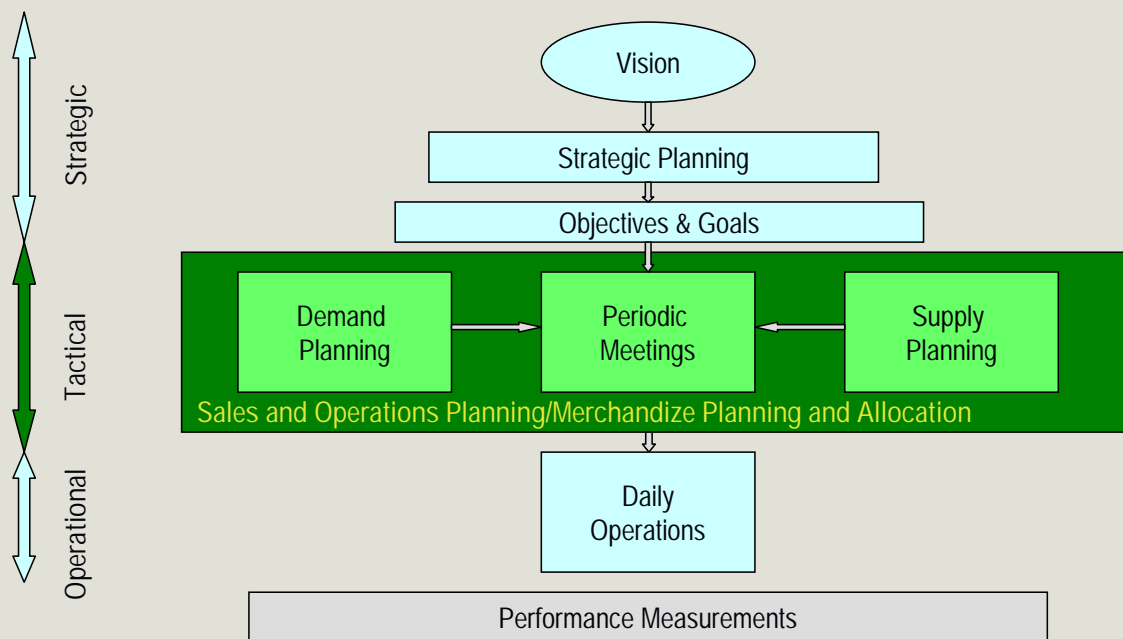


## Service Segmentation August 2006 DM Survey Findings

- 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



Source: Peng Kuan Tan, "Demand Management: A Cross-Industry Analysis of Supply-Demand Planning", MIT Master of Engineering In Logistics Thesis, June 2006

## 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

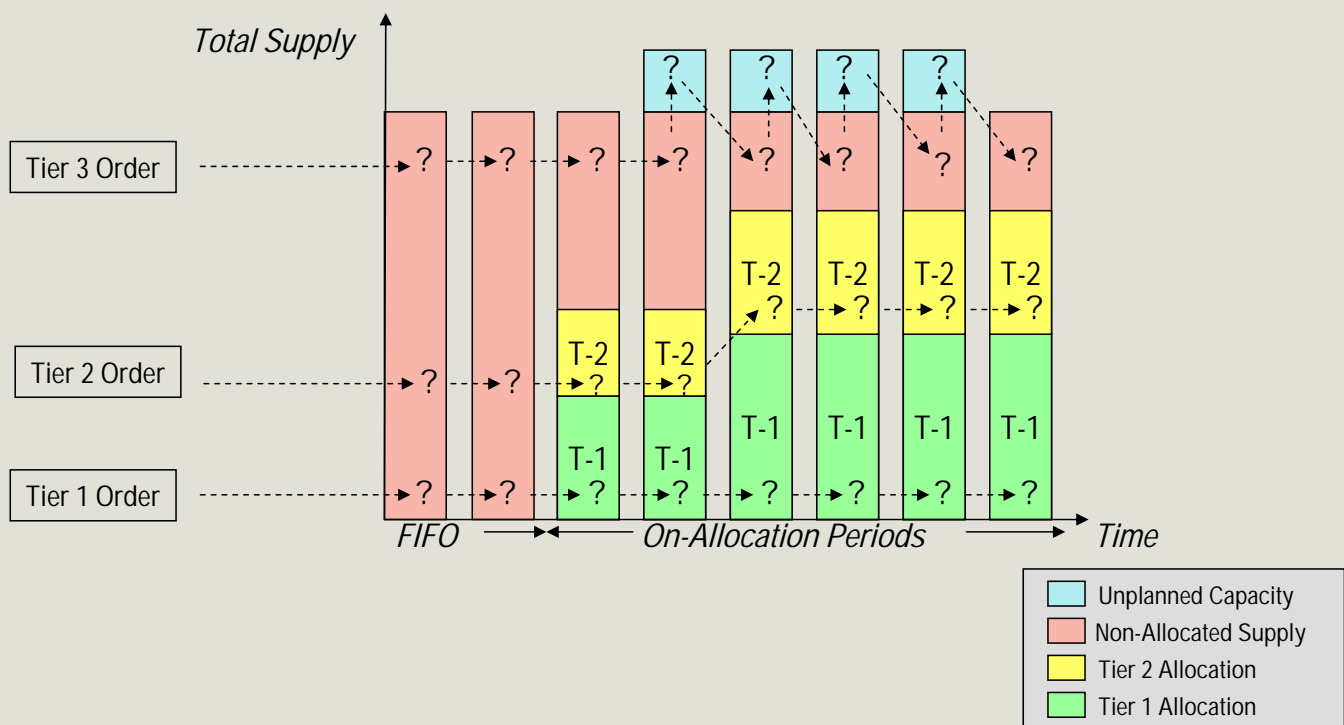
- Do I fill this customer's order right now (FIFO)?
- With what supply should I fulfill it with?
  - On-hand versus on-order inventories?
  - Scheduled versus future production capacity?
  - Available versus future materials?
- With what priority should I fill it?
  - Before versus after another customer's 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?

**Larry Lapide, Ph.D.**  
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**llapide@mit.edu**



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