

Supply Chain Planning: Summary

- Review of intent, learning goals and approach
- Review of class sessions

Intent and learning goals

- Develop your understanding of supply chain phenomena and challenges
- Develop your modeling skills and tool kit, applicable to supply chain planning
- Learn tactics, concepts and counter-measures for supply chain improvement

Approach

- Models, frameworks and general principles for supply-chain conceptualization: how to think about supply chain challenges?
- Specific tools and software: how to develop a solution plan?
- Cases and applications: how to apply in practice?

Overview

- Primary challenge: given uncertainty and constraints, how to design and plan a supply chain to meet certain goals?
- Types of uncertainty and constraints will vary with context
- Applicable counter-measures and tactics will vary with context

- **Class 1: Introduction, Meditech**
 - Supply chain dynamics with new product introduction
 - Supply chain challenges
- **Class 2: Inventory Models**
 - Two simple models, periodic review, order-up-to and continuous review, reorder point
 - Cycle stock set by order frequency or lot size
 - Safety stock depends on demand variability over replenishment lead time plus review period
 - Service measures: probability of stock-out in replenishment cycle vs. fill rate

- **Class 3: Steel Works**
 - Exercise of simple inventory models for analysis and diagnosis of inventory system
 - Opportunities for risk pooling from consolidating production and distribution
- **Class 4 – 5 : Supply Contracts**
 - Sequential optimization leads to sub optimization
 - Contracts can move supply chain towards global optimum, facilitate risk sharing
 - Examples include buy back, revenue sharing, capacity reservation
- **Guest Speaker, Mike Watson, LogicTool**
 - Supply chain tactical planning in practice

- **Class 6: Instron**
 - Supply chain analysis of assembly system
 - Application of inventory and capacity models to size inventories and staff
 - Tactics – hold components, assemble to order
- **Class 7: Multi Echelon Inventory Systems**
 - Inventory models for risk pooling
 - Inventory models for postponement
 - Strategic inventory placement model
 - Reebok case – example of postponement

- **Class 8: HP: Network Printer Design for Universality**
 - Global supply chain for short-life-cycle products
 - Benefits of risk pooling from universality and localization
 - Different tactics for different phases of life cycle
- **Class 9: Supply Chain Integration**
 - Bullwhip phenomena: causes and remedies
 - Push-Pull boundary – key tactic in supply chain design

- **Class 10: Safety Stock Placement in Supply Chains**
 - Applications at HP – digital camera, ink jet pens
 - Where to de-couple: prior to product proliferation; prior to adding a lot of cost
 - Optimal placement depends on cost accumulation and lead times
- **Class 11: HC Starck**
 - Inventory tactics to reduce customer lead time
 - Intermediate de-coupling inventories, EOQ analysis for production cycle time

- **Class 12: Supply Chain Integration**
 - Application of RFID
 - Raytheon case study
 - Framework for evaluation of benefits
- **Class 13: Strategic Partnering**
 - Barilla case
 - Example of Bullwhip, VMI initiatives

Manufacturing System and Supply Chain Design: Summary

- Review of intent, learning goals and approach
- Review of class sessions

Intent and learning goals

- Develop your understanding of system design issues
- Develop your modeling skills and tool kit, applicable to system or network design
- Learn tactics, concepts, and approaches for system planning and design

Approach: Three Segments

- Manufacturing system design
- Supply chain planning and design
- Flexibility and capacity planning

Approach

- Models, frameworks and general principles for conceptualization of design issues and challenges
- Specific tools and software: how to develop a solution plan?
- Cases and applications: how to apply in practice?

- Class 1: Queuing Model for Lean Design
 - Application of queuing model for assembly system design, buffer sizing
 - Illustration of simple model to capture uncertainty and key tradeoffs
 - Model useful for building intuition

- Class 2: System Design: Queuing Models
 - Relevant queuing models and formulae for system design: M/M/1; M/M/k; M/G/k/k; M/G/∞
 - E.g.: $D = \text{expected wait time in queue for G1/G/1}$

$$= \frac{\rho}{1-\rho} \left(\frac{1}{\mu} \right) \left(\frac{SCV_a + SCV_s}{2} \right)$$
 - Design issues for recovery area for marathon: various service systems
 - Design issues for design of PC factory: parallel vs. serial stations; kitting vs. line-side stocking; location of constraint

- **Class 3: System Design: Manzana**
 - Diagnosis of service system
 - Issues with dispatch rules; job release; incentives; load balance
 - Queuing model for predicting response times

- Class: Guest Speaker: Mitchell Burman
 - Description and analysis of transfer lines or flow lines
 - Role of buffers for increasing throughput in lines with unreliable machines
 - Bottleneck principles apply in design of transfer line
 - Application of models for design of transfer lines at HP

- Class 4 - 5: Supply Chain Design
 - Typical network design study
 - Issues –customer aggregation; product aggregation; cost modeling; demand modeling
 - Solution strategies – optimization; modeling software
 - Hub and spoke strategies and system designs
 - Buy.Com case study
 - MetalWorks Case –opportunity to do it yourself

- Class 6: Decentralized Distribution Systems
 - Centralize or not?
 - Diagnosis of GM Cadillac pilot: misaligned incentives
 - Decentralized system with cooperation and search— relative performance depends on search cost

- **Class 7: Revenue Management**
 - Transportation nat'l Group case – application of RM to storage rental
 - Use of optimization to assess potential and provide guidelines for setting prices
 - Challenges of introducing RM in this context
- **Class 8: Pricing Strategies**
 - Principles of RM
 - Use of coupons (mail-in rebates) by manufacturer to achieve global optimization of SC
 - Smart pricing in supply chains

- **Class 9: Supply Chain Design: Configuration**
 - Optimization model and framework for supply chain configuration – selection of options at each stage of network
 - Illustration of trade off between cost and time
- **Guest Speaker: Mike Romeri, PRTM**
 - Supply chain implementation challenges
 - Creation of supply chain solutions

- **Class 11: Procurement strategies**
 - Supply contract game
 - Insights into bidding strategies
 - Need to be on efficient frontier
 - Need only compete against neighbors
- **Class 10: Capacity Planning: Seagate**
 - Example of capacity planning under uncertainty
 - Value of flexible capacity as an hedge

- Class 12: Flexibility and Capacity Planning
 - Framework for thinking about flexibility and its benefits
 - Principles for deploying flexibility
 - Limited flexibility can achieve benefits of total flexibility
 - Key is to chain as many plants and products together as possible
 - Assign comparable loads to each plant