

Inventory Optimization Application Provider's Perspective

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Agenda

- **Credits**
- **Inventory Optimization**
  - Where does it fit in SCM?
  - Why is it important?
- **Optimization Problem**
  - Basic
  - Complications
- **i2 Solution**
- **Building a Decision Support Tool vs. Solving the Optimization Problem**

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Inventory Optimization

Inventory Optimization enables you to improve service levels, reduce inventory and reduce lead times by optimizing the position and levels of inventory across your supply chain to meet market demand.

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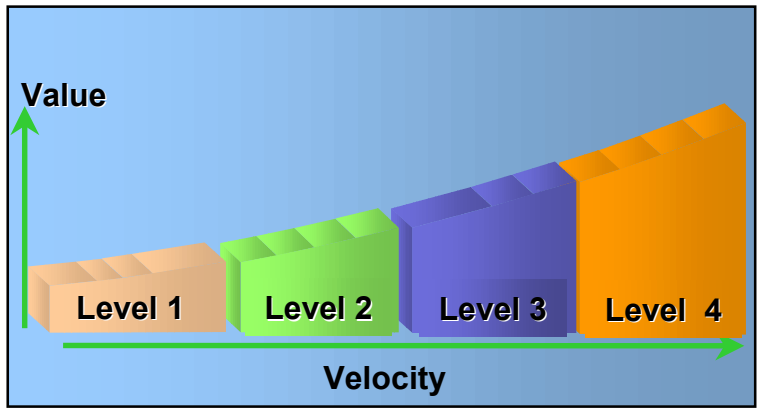
Evolution of SCM

Maturity Level 1
Point Excellence

- Local Wins – Global Confusion
- Isolated Excellence Programs
- No Early Warning

Maturity Level 2
Enterprise-wide SCM

- Global Objectives – Local Actions
- Consensus Demand Plan
- Integrated Master plan
- Forecast driven Allocated ATP & CTP
- Demand-Supply Synchronization



Maturity Level 3
Total Profitability & Collaboration

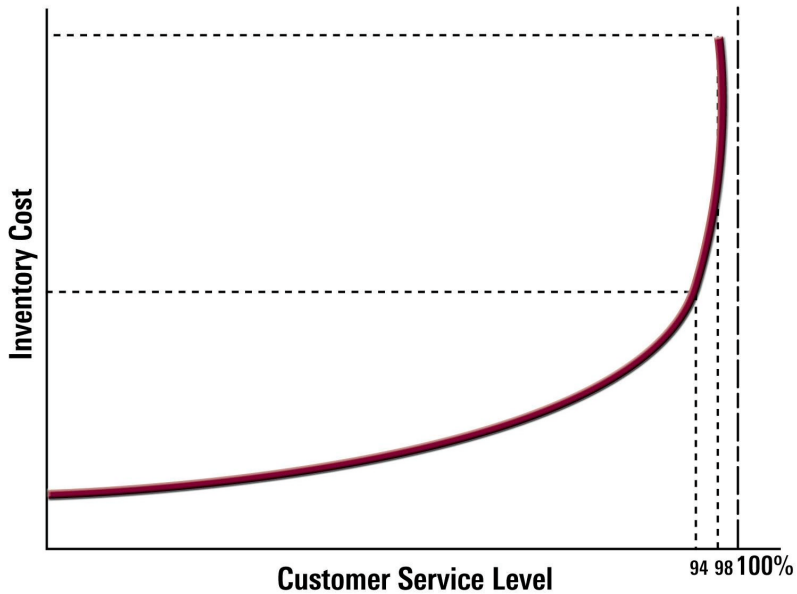
- Inventory Optimization
- Integrated Planning & Execution
- Collaborative Demand and Supply shaping, with customer & vendors

Maturity Level 4
Real-Time Value Chain

- **Event-based** reconfiguration, optimization & execution across the value chain
- **Six Sigma** process capability over **SCM processes**

- Most companies reached Level 2 in last 5 years
- Level 3 is the next frontier

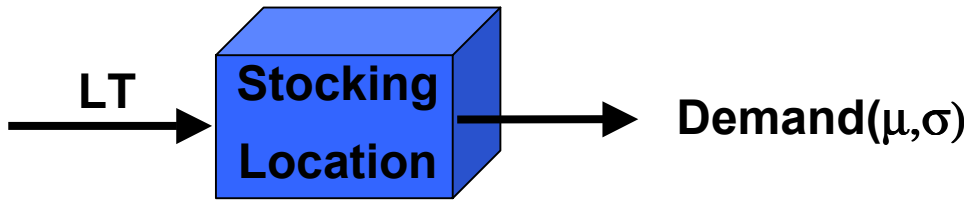
Why does inventory optimization matter?



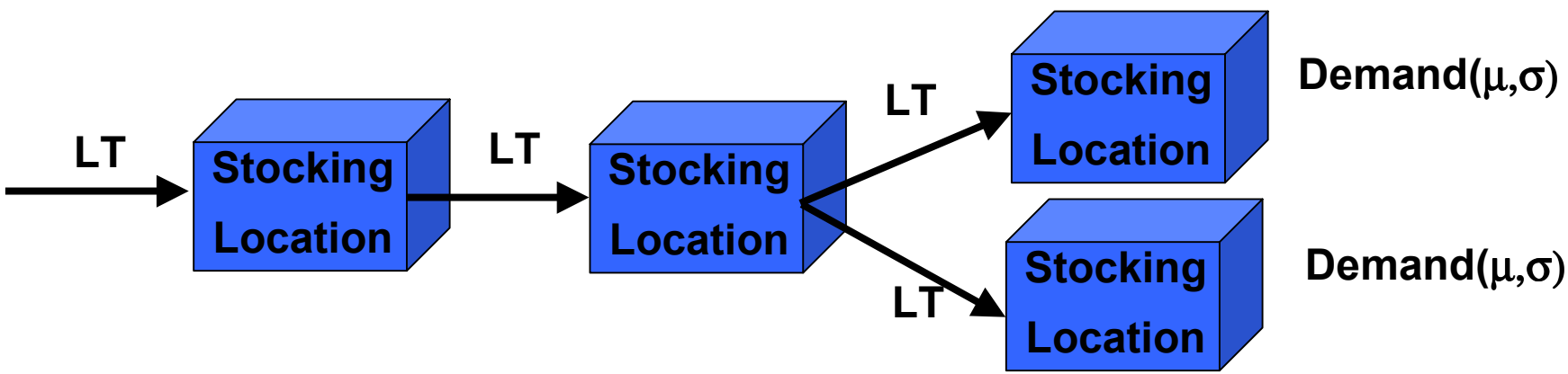
2% increase in service level can double the inventory cost!

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Single/Multiple Echelon Inventory Optimization



- **Inputs**: Demand, Lead Times (LT), Customer Service Levels (CSL) and Order Lead Times
- **Output**: Time-phased safety stock level



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Why is this not a trivial problem?

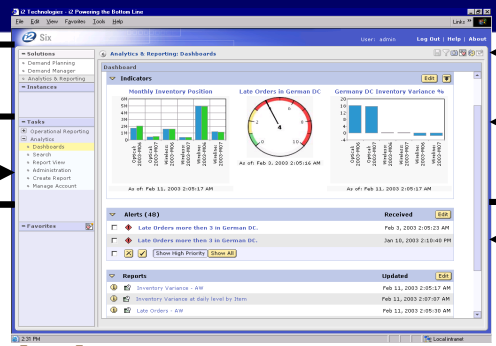
- **Demand and Demand Variability**
  - Different channels will have different demand signals
- **Supply Lead Time and Lead Time Variability**
  - Different products have different capacity requirements and lead times
- **Different products have different costs**
- **Supply Network Structure**
  - Assembly, Aggregation/Pooling Effect, Yield, Binning, Alternates
- **Different customers require different service levels**
- **Variation to the problem: Maximize CSL s.t. budget constraints**

Note that all of these factors still do not prevent us from formulating (and solving) the optimization problem.

But, is that enough?

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i2 Inventory Optimization Solution and Steps



5. Decide

Inventory Policy & Scenario

2. Analyze Inventory

- Segment Products
- Analyze Demand

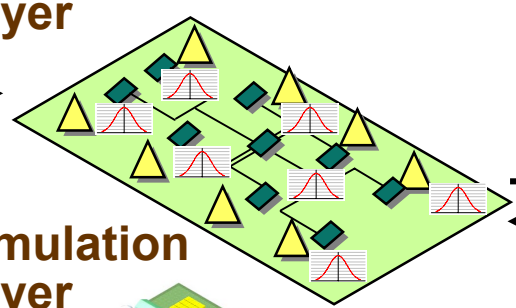
3. Optimize

- Optimize Scenarios
- Analyze Sensitivity

Analytics Layer

$$\sigma_D^2 \mu_L \sigma_L^2 = \mu_D$$

Optimization Layer



4. Validate

- Validate optimized policies

Simulation Layer

1. Establish Baseline

- Simulate current situation
- Validate against historical performance



6. Implement

- Business Rules and Control Policies

Physical Supply Chain

7. Monitor and Learn

CSL & Inventory Performance

Other Concerns

- **Data Availability and Integration**
- **Data Management**
  - Aggregation, Disaggregation, Segmentation
- **Scalability**
  - Thousands of products, many stocking locations, many customers/channels with different CSLs
- **Usability**
  - Management by exception
  - Interfaces to support decision making

Note that all of these factors may be more costly to tackle and may be more important to the decision makers than how well we solve the optimization problem.

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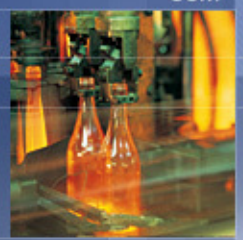
Challenge to This Audience

- **Good applications are a result of cooperative work between**
  - Business Users with information about the business problems, and domain knowledge
  - OR/IE professionals to solve the hard optimization problems
  - Software Engineers / Computer Scientists to build the architecture over which the decision support tools can be developed
  - Human Factors / User Interface Experts to make all of above palatable to the end user

How do we leverage current academic research?

How do we influence the research directions?

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PLATFORM

Thank You

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